

# Undergraduate Symposium on Research, Scholarship, and Creative Endeavors



"Passion alone  
can take you far,  
but when  
partnered with  
the support of  
professors and  
the program, I  
was able to go  
further than I  
imagined  
possible."

*-Frances Brunner,  
Senior, Fashion  
Design*

April 5, 2024  
Kent State University  
Student Center Ballroom



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# Welcome

## from the Vice President for Research and Sponsored Programs



I warmly welcome all the undergraduates and faculty mentors involved in the eleventh annual Undergraduate Symposium on Research, Scholarship, and Creative Endeavors!

It is simply incredible to view the fantastic breadth of scholarship presented by our students, and I encourage all of you to take a few minutes to look around at the posters and presentations of your colleagues.

Hands-on involvement in research and creative activities can be one of the most memorable learning experiences of your undergraduate years and can prepare you for your next step, whether that be graduate study or launching your career. By undertaking a research, scholarship, or creative activity experience while here at Kent State University, you are joining an ever-increasing number of graduates who are not simply learning via lectures and textbooks but who are actively creating knowledge.

To the faculty mentors involved, you have invested great time and energy dedicating yourselves to your research and guiding an undergraduate student through this process. The invaluable skills you have helped refine and bring to life in your mentees will serve them well regardless of their future plans.

Congratulations to all on your posters and presentations and the culmination of all your hard work! I hope you take a minute to think about all you have accomplished, and I look forward to hearing about your future successes.

Sincerely,

Douglas L. Delahanty, Ph.D.

Vice President for Research and Economic Development

# Special Thanks to...



## Denise Joseph

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**Denise Joseph** helped organize the 2024 submission categories for the Undergraduate Research Symposium and collected the necessary data for our master list of student submissions.

Denise is new to Kent State University and is working with the Division of Research and Economic Development, as well as assisting the Office of Student Research.



## Lenore Kohl

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**Lenore Kohl** collected student submissions, edited abstracts, and designed the interior of the program for the 2024 Undergraduate Symposium on Research, Scholarship, and Creative Endeavors.

Lenore is a junior English major with a concentration in Professional Writing. Through Kent State's Writing Internship Program, Lenore was selected as a writing intern for the Office of Student Research during the Spring 2024 semester.



## Aisha Ahammed

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**Aisha Ahammed** is a sophomore at Kent State University, majoring in Computer Science. She has been with the Office of Student Research as a Web and Marketing Assistant since the Fall 2023 semester and participated in SURE 2023 researching Generative AI.

Aisha helps the department make changes to the website and update information regarding SURE, the Symposium, and various other programs, as well as create posters and visual aids.

# Special Thanks to...



**Michael Hawkins**

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**Michael Hawkins** provided his expertise with our student researchers on writing the abstracts for their symposium submissions.

Michael is the Data Librarian and Head of the Map Library in Research and Instructional Services at Kent State University. He also serves as an Assistant Professor for the University Libraries.



**Hilary Kennedy**

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**Hilary Kennedy** is head of the Student Multimedia Studio at Kent State University and assisted students in creating the posters for their presentations at the symposium.

She works closely with maker technology and multimedia at University Libraries.



**Zach Mikrut**

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**Zach Mikrut** instructed students on the appropriate and effective presentation style and delivery for their research at the Undergraduate Research Symposium.

Zach is the Director of LaunchNET at Kent State University. He assists students, faculty, and alumni in entrepreneurship and innovation.



# Special Thanks to...

## Faculty Mentors

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Thank you to all the faculty mentors who shared their expertise and invested time and energy in working with and providing valuable guidance to our student scholars. The dedication of faculty mentors ignites the flame of interest in our students, driving them into research and preparing them for their future studies and careers.

# **Thank you to our Corporate and Non-Profit Supporters**

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# Aeronautics and Engineering

**Elle Airhart, Sophomore, Computer Science; Jishu Medki, Ph.D. Candidate, Aerospace Engineering**

Mentor: Xuhui Chen, Ph.D.

Creation and Testing of Anomaly-Based Intrusion Detection System

This research involved creating and testing an Intrusion Detection System (IDS) for drones and UAVs. This is a continuation of current graduate research by Jishu Medhi and my mentor, Dr. Xuhui Chen. I mainly helped test an anomaly-based IDS to protect and mitigate malicious attacks in real-time more efficiently while also remaining small enough to not inhibit drone functionality. It utilizes reinforcement learning to learn from collected datasets to detect both new and old threats. A virtual environment was used to test models with preselected datasets. In addition, a similar model was reconstructed to compare with the new system. Both models analyzed the data while still being able to perform basic tasks. The next step is to test the models with simulated attack code in real-time.

**Nicholas Baird, Senior, Mechatronics Engineering**

Mentor: Hossein Mirinejad, Ph.D.

Establishment of a hardware-in-the-loop testing platform for evaluating automated fluid therapy delivery systems

Novel approach for evaluating automated fluid management systems through a hardware-in-the-loop (HIL) test bed, integrating both hardware (e.g., infusion pump, patient monitor) and software (e.g., patient model, blood pressure waveform generator, fluid resuscitation controllers) components. This setup simulates realistic resuscitation scenarios for testing fluid resuscitation control algorithms, offering a unique environment that bridges the gap between purely simulated tests and the complexities of real-world applications. It enables the testing of actual devices within a closed-loop system, providing a cost-effective alternative to clinical and animal studies and allowing extensive testing iterations without the associated high costs. The development includes a MATLAB-based graphical user interface for real-time monitoring of vital signs and medication dosages, integration of a blood pressure generator with an existing patient model, and a PID controller for fluid management. Efforts are ongoing to enhance the system's performance and develop a portable demonstration setup with the aim to advance automated critical care systems.

## **Souleyman Dansoko, Junior, Physics**

Mentor: Michael Fisch, Ph.D.

### X-ray Studies of Ionic Liquid Crystalline Materials

An ionic liquid is composed of ions; for example, a molten table salt. Liquid crystalline materials are composed of anisotropic molecules that flow like liquids. However, they maintain some degree of order like in solids. An ionic liquid crystal is a material composed of molecules that form liquid crystals and are also composed of ions, so they form an ordered ionic liquid. X-ray analysis of liquid crystalline materials provides data about their structural information, such as crystal defects, orientational parameters, and order parameters. The purpose of this research: Learn about physical properties such as bulk phase (e.g. liquid, liquid crystal, crystal), molecular organization, long-range orientational and position order, and ability to form technologically useful ordered samples.

## **David Dreyer, Senior, Aerospace Engineering**

Mentor: Ali Abdul-Aziz, Ph.D.

### Material Testing of Fused Deposition Modeling (FDM) Using Printed Part Applications

The use of “3D Printing” and additive manufacturing has grown considerably, and their use has applications now ranging from prototyping to final product. This has influenced many industries. The most popular process is fused deposition modeling, or FDM. This research has identified a new area of study of print parameters affecting the physical properties of the printed part. The parameters that are under review pertain to the number of walls, percentage of infill, and infill pattern. These parameters make up the effective “hollowness” of a printed part. By varying these parameters, we can achieve different strength to weight ratios, as well as other effects of these variables such as manufacturing time. By testing these new parameters, we will have a greater understanding of the FDM process.

## **Katie Horn, Senior, Aeronautics; Kyle Rediger, Senior, Aeronautics**

Mentor: Jason Lorenzon, J.D.

### Future of UAS Operations

Katie Horn and Kyle Rediger have researched to help design a new part of the National Airspace System that will expand the nation's aviation commerce when it comes to unmanned aircraft. While working with their mentor Jason Lorenzon, Katie and Kyle were tasked with looking at the laws of many state constitutions, National Transportation Safety Board rulings, and the Ohio Constitution to make sure they could correctly apply the laws of the state to the laws of the Federal Aviation Administration, as well as the transportation regulations that are given under the United States Constitution.



**Jacqueline Johnson, Senior, Aeronautics**

Mentor: Stephanie Fussell, Ph.D.; Benjamin Kwasa, M.Eng., Ph.D.

**Simulator Sickness in Virtual Reality (VR)**

In the XR Lab, our focus was on investigating simulator sickness: A set of symptoms linked to motion sickness arising from differences between visual and vestibular cues in virtual environments (VE). This issue poses a significant challenge to integrating virtual reality (VR) into aeronautical training due to its recurrence. Using the collaboration between the XR Lab and applied transport category aircraft systems class, we conducted a study to gather data on VR utilization in training. Students engaged with the VR system to familiarize themselves with the Boeing 737 flight deck, followed by a questionnaire assessing the usability and learning experiences provided by VR. The questionnaire sought to evaluate the suitability of VR as a resource in a course-like setting and to document instances of simulator sickness experienced by users. This research contributes valuable insights towards optimizing VR training environments and minimizing the impact of simulator sickness in aeronautical education.

**Sydney Maller, Senior, Aerospace Engineering**

Mentor: Yanhai Du, Ph.D.

**Zero Emission Aeronautical Systems using Hydrogen Fuel Cells**

Developments in aviation are closely associated with performance characteristics; however, there are other important advancements to consider. Aviation is consuming a noteworthy amount of our total Carbon Footprint here on Earth with no foreseeable decline. With no Carbon Footprint, Hydrogen Fuel Cells are a promising alternative to standard jet fuel. The objective of this research is to evaluate the potential and viability of hydrogen fuel cell power as an alternative for combustion fuel. The scope of this research is commercial flight; however, the intent of this research is to broaden the implementation to all types of propulsion.

**Andrew Pertz, Sophomore, Aerospace Engineering**

Mentor: Ye Lu, Ph.D.

**Co-Delivery of Multiple Small Entry Probes Using Aerocapture Maneuver**

Aerocapture is a widely studied and ingenious method to decelerate an approaching spacecraft into orbit of a target planet. This comes with numerous benefits such as increased deliverable payload to orbit, reduced travel time, and use of a less expensive launch vehicle. Aerocapture maneuvers come with challenges related to uncertainties and high heat loads from the atmosphere. Moreover, the use of aerocapture has allowed for the delivery of an entry probe during flight, termed co-delivery. This study focuses on analyzing the feasibility of co-delivery aerocapture of multiple entry probes as both science instruments and a means to control the trajectory of the orbiter to the planet Venus.

# Architecture

## **Lillianna Aliberti, Senior, Interior Design**

Mentor: Tina Patel, M.A., M.F.A.

### Healing through Creative Activity

From 1972 to 1991, Commander Jon Burge and officers under his command targeted and tortured over 120 predominantly African American men, often producing false confessions of crimes. The Chicago Torture Justice Center in Woodlawn, Chicago was born out of reparations for survivors of police torture and their families to heal in 2015. Through researching The Tea Project, the transformative nature of art became an impetus for the design of the Center. This place of healing will provide a sense of community and reclamation to survivors as they encounter art, advocacy, and memorialization. The plane(s) are altered and unfolded through discrete manipulations to provide avenues of healing. The juxtaposing of pattern as a relief cut or suspension on these planes will demonstrate an unexpected beauty.

## **Tiffany Chang, Senior, Interior Design**

Mentor: Tina Patel, M.A., M.F.A.

### Ongoing, Unfolding

From 1972-1991, Chicago Police Commander Jon Burge and his “Midnight Crew” targeted communities of color, producing false confessions to crimes and forcing survivors of torture to spend years—or even decades—incarcerated. In 2015, Chicago City Council passed a Reparations Ordinance to provide restitution for the Burge survivors and their family members. The Chicago Torture Justice Center (CTJC) was born out of these reparations. Racialized and generational trauma severs relationships, leaving layers of loss and pain and structural scarring. Recognizing and respecting their struggle is essential for the process of unfolding politicized healing and coping with grief. The spatial intent of the CTJC aims to embrace and dismantle the “creases” generated by police and state brutality through autonomy, self-advocacy, storytelling, and memorialization.

## **Samuel Clemente, Sophomore, Architectural Studies**

Mentor: Jeanne Smith

### Not Green Enough: Community Engagement in Urban Green Space Projects

68% of the world will live in cities by 2050, and as Cleveland’s population has declined in recent decades, the issue of unequal access to green spaces is worth looking into. I will show which means of engagement in a local green space project will yield more motivation in citizens to be involved with such projects in Cleveland. Through archival research and resident surveys within Cleveland, I will show that more involved means of engagement, like decision-making processes with citizens and listening sessions, will result in more support for projects.

### **Sarah Joseph, Senior, Architecture**

Mentor: Rui Liu, Ph.D.

#### **Exploring Alternatives for Sustainable Concrete Production**

As one of the most widely used architectural materials, concrete contributes significantly to environmental degradation, generating about 8% of global CO<sub>2</sub> emissions. The large carbon footprint comes from cement production and limestone calcination. To address this, an alternative to limestone is crucial—one that will yield the same results without the environmental impact. This project explores volcanic rock as a substitute, known for enhancing mechanical properties and reducing CO<sub>2</sub> emissions. The feasibility of incorporating ground volcanic rock into concrete production will be assessed, anticipating improved properties and substantial emission reduction. This study aims to pave the way for a more sustainable and environmentally-friendly approach to modern concrete.

### **Devin McCue, Senior, Architecture**

Mentor: Rui Liu, Ph.D.

#### **Nature's Blueprint: A Biomimetic Approach to a Structurally Optimized and Wellness-Oriented Design**

Nature has been a source of inspiration for human design for all of history due to its inherent desire to reach a state of equilibrium or balance. Through studying various forms of structure found in nature, this research seeks to understand the reasoning behind their formations and the applications that it has in the built environment. These forms can be as simple as bees using hexagons as an efficient means of tessellating a surface, or as complex as schools of fish arranging themselves in a manner that reduces drag and energy expenditure. In doing this research, we can provide future architects with ideas for forms that not only address technical and structural challenges, but that are also exciting and reminiscent of nature.

### **Karenza McNeil, Junior, Architecture**

Mentor: Rui Liu, Ph.D.

#### **Innovative Connections: Advancing Timber in Structural Engineering**

This research studies integrating timber with composites to enhance structural connections. Timber, appraised for aesthetics and sustainability, is reconsidered for its adaptability in construction. The study focuses on advancing timber connections with different technologies and materials in structural engineering. The objective is to amplify the performance, sustainability, and architectural potential of timber-based structures. The research contributes to the structured evolution of timber in engineering, conveying contemporary challenges and encouraging resilience in construction for a viable built environment.

## **Christina Meyer, Senior, Interior Design**

Mentor: Tina Patel, M.A., M.F.A.

### Oblique

The Chicago Torture Justice Center was born out of reparations for survivors of police torture and injustice. In this plan, we would like to re-envision the place of healing for the survivors by providing them a space to heal, dismantle, and create a center of community and advocacy. An oblique approach to the journey offers possibilities for new discoveries as we unpack and rebuild. Navigating through the oblique represents challenges for those to encounter and overcome. Hence, the oblique line and plan—both literal and metaphorical—will create a sense of transcendence where the community will gather to remember, heal, and advocate. This unique approach to the design of space offered discoveries as it uncovered a new perspective and opportunities for reparative power towards new paradigms.

## **Nic Miller, Junior, Architecture**

Mentor: Rui Liu, Ph.D.

### Reinventing the Skyline: Revolutionizing Structural Design through Topology Optimization

This research delves into the integration of topology optimization into architectural design, illuminating its transformative potential in revolutionizing structural systems. Topology optimization—a mathematical method optimizing material distribution within objects or spaces—leverages criteria and/or genetic algorithms to maximize system performance. Through iterations in programming and utilizing tools like Ameba & Fusion360, methods of applicability are showcased through optimized 2D&3D iterations with various constraints. Looking ahead, topology optimization could reshape architectural practices, particularly in skyscraper design and overall structural system development. By embracing this technique, architects can achieve a newfound harmony between artistic vision and structural integrity, ushering in a future characterized by precise balance and innovation in architectural design.

## **Aaron Muth, Senior, Architecture**

Mentor: Rui Liu, Ph.D.

### End-Of-Life Strategy: Optimizing the Lifespan of a Skyscraper

Existing skyscrapers have a finite lifespan that averages about 100 years untouched. The end of this lifespan requires a decision to either dismantle the skyscraper or to reconvert the building by restructuring the existing framework. The problem is that existing methods often lack consideration of the impact on the economy, people, and environment of the area. Using the research method of literature review through analyzing existing case studies' method and impact, the objective of this research is to analyze the future of dismantling skyscrapers vs. having the ability to reconvert and utilize the same superstructure, aiding in more efficient methods and setting precedent on how to prolong the lifespan of new buildings while mitigating the negative effect this process may have on the immediate area.

**Joel Semancik, Senior, Architecture**

Mentor: Rui Liu, Ph.D.

**A Grain of Truth: Sand's Role in Construction**

This study aims to explore how to use sand as a base construction material while maintaining its ability to return to its original state. Conducting research on how it has been done historically allows a basic understanding of the topic to be formed. In addition to research, basic physical form-finding practices are performed in an attempt to discover the limits of sand construction. Investigating the ability sand has to be used and reused in construction can impact the sustainable applications of modern construction materials.

**Elena Varner Waltz, Junior, Art History**

Mentor: Melanie Renée Roll, M.A.

**Studio Glass: The Blurred Line Between Fine Art and Craft**

Glass as a material has been in use since the Paleolithic era, but its classification as a fine art and studio practice did not occur until the 1960s. Looking at the ways in which glass has been linguistically defined over time helps to understand the juxtaposition between glass as a form of craft and glass as a fine art. The American Studio Craft Movement and the American Studio Glass Movement, along with changing definitions in art, allowed for the beginnings of the overlap in classifications that glass now holds. While glass has been previously defined as a utilitarian craft, contemporary glass art and artists continue to blur the line between fine art and functional object.



# Biology – Cell

## **Somtochukwu Abraham, Junior, Biological Sciences**

Mentor: Helen Piontkivska, Ph.D.

### Understanding ADAR Editing Dynamics: Insights from Literature Review

Accurate measurement of ADAR (Adenosine Deaminases Acting on RNA) editing requires careful consideration of various factors. This study reviews existing literature to explain the intricacies of ADAR editing, emphasizing the need for diverse assessment methods. While current methods may overlook critical factors, this review identifies potential avenues for improvement. Although no original data are presented, the review suggests new methods to enhance accuracy in ADAR editing measurements. This study underlines the significance of synthesizing existing knowledge to advance understanding of ADAR editing mechanisms and their implications in viral infection contexts.

## **Abigail Allio, Senior, Neuroscience; Matthew Puelo, Junior, Neuroscience; Muhammad Naveed, Graduate Student, Biology**

Mentor: Min-Ho Kim, Ph.D.

### Magnetothermal stimulation disaggregates amyloid-beta by inducing changes in its secondary structure

Amyloid-beta ( $A\beta$ ) is a key protein involved in Alzheimer's Disease pathology. Its misfolded aggregates form beta-sheet structures and cause neurodegeneration. We have studied the effect of mild magnetothermal stimulation on the structural characteristics of  $A\beta$ . We found that magnetic hyperthermia can destabilize  $A\beta$  by reducing its beta-sheet into structures atypical of  $A\beta$ 's aggregates. We disaggregated  $A\beta$  by magnetothermal stimulation, used PICUP to crosslink the dynamic  $A\beta$  aggregates, and studied them with SDS-PAGE. We then estimated their free energy with hyperthermia curves and found that they were less stable than control  $A\beta$ . Thioflavin T assay suggested that this is due to a lowering in the beta-sheet structure of  $A\beta$ . We believe our technique has potential to be a safe and effective alternative to conventional AD medicine.

## **Marcus Amador, Junior, Biology**

Mentor: Joseph McCormick

### A Random Walk Into Streptomyces Genetics

*Streptomyces* is a Gram-positive bacterium with two species that are of main interest in these experiments. For the first experiment, the goal was to create a mateable plasmid used in conjugations from *E. Coli* to *Streptomyces*. To verify results, agar with select antibiotics was used. For the second experiment, a cosmid clone was sought after by using Gibson assembly. A digest was performed to create a linear piece of DNA with a double stranded break that would be repaired by Gibson assembly. The final experiment was to create an in-frame deletion of a chromosome segregation gene. This was performed by creating a deletion and inserting an antibiotic in its place to verify the deletion. The antibiotic was then deleted to create the in-frame deletion.

**Kyle Backston, Senior, Biology; Leah Brenneman, Junior, Neuroscience; Roman Giacomino, Senior, Biotechnology; Emily Welch, Graduate Student**

Mentor: Colleen Novak, Ph.D.; Eric Mintz, Ph.D.

Temporal map of hepatic Fgf21 shows rhythmic expression influenced by time-restricted feeding in mice

Fibroblast growth factor 21 (FGF21) is a hepatokine that is implicated in several physiological responses related to metabolism and energy balance. FGF21 signaling in the suprachiasmatic nucleus suggests a connection with the circadian timing system. Since food is a potent zeitgeber for the liver, the primary source of circulating FGF21, we used quantitative real-time PCR to investigate the expression of hepatic Fgf21 and its transcriptional regulator, peroxisome proliferator-activated receptor alpha (Ppara), under ad libitum and 4-hour time-restricted feeding conditions (TRF). Results show rhythmic expression of Ppara and Fgf21 under both feeding conditions with significant phase differences during TRF versus ad libitum feeding, suggesting that TRF modulates the expression of hepatic Fgf21.

**Lukas Capatosto, Senior, Environmental and Conservation Biology**

Mentor: Sangeet Lamichhaney, Ph.D.

Studying Genes Associated With Thermogenesis In birds

This project aimed to identify thermogenesis genes in birds. There are two types of thermogenesis: Shivering is a physical action; non-shivering is a chemical reaction facilitated by brown fat. In birds, the mechanism that non-shivering thermogenesis would use is debated. We extracted DNA from individuals captured in the winter. We chose four genes to create primers: Serca1, Serca2, Serca3, Sarcolipin. We ran PCR with primers and DNA. This was then put through gel electrophoresis to check for singular bands indicating target gene amplification. The gel showed we got good amplification for SERCA1 and Sarcolipin. This may indicate the presence of these genes. It doesn't provide data on expression or gene function. To further this experiment, we should aim to quantify seasonal gene expression.

**Davi Cecconi Borges Massa Checan, Senior, Biology**

Mentor: Robert Clements, Ph.D.

Mechanisms of demyelination observed using confocal microscopy

The brain is a complex system in which different cell types interact to regulate normal function and respond to changes. Neurons communicate electrically via myelin-insulated axons, produced by oligodendrocytes in the CNS. Diseases like multiple sclerosis are associated with demyelination, so developing therapies to reverse or prevent it from happening is greatly needed. In the Clements Lab, we used the cuprizone mouse model of toxic demyelination to study the dynamic crosstalk between different cell types before demyelination started. A range of immunofluorescent stains were tested to find the best combinations for observing structural changes in astrocytes, microglia, and oligodendrocytes, using a confocal microscope. Understanding early events in the demyelination cascade will provide potential ways to prevent and/or reverse the many states associated with myelin dysfunction.

**Penelope Cervantes, Senior, Biology; Lukas Capatosto, Senior, Biology**

Mentor: Sangeet Lamichhaney, Ph.D.

Investigating Seasonal Gene Expression Patterns Associated with Thermogenesis in American Goldfinches and Black-capped Chickadees

My research is to explore the genetic mechanisms of thermogenesis in birds as the temperature drops in the colder seasons of the year. By observing patterns in gene expression, specifically in Sarcolipin genes, I want to understand how birds can survive the wintertime. To achieve this goal, I will analyze tissue samples from two bird species commonly found year-round in North-East Ohio: American Goldfinches and Black-capped Chickadees. The findings of this study could provide answers about the genetic mechanisms that enable birds to adapt to colder environmental conditions and regulate their body temperature across seasons.

**Mark K. Itibrout, Senior, Biology; Ayesha Tariq, Graduate Student, Biology; Caroline Nitirahardjo, Graduate Student, Biology; Dr. Ashley M. Shemery, Ph.D., Biology; Dr. Colleen M. Novak, Ph.D., Biology; Dr. Helen Piontkivska, Ph.D., Biology**

Mentor: Helen Piontkivska, Ph.D.

Inferring ADAR editing levels in rat's brain

Adenosine deaminases acting on RNA (ADAR) editing can both affect brain health and be affected by brain inflammation due to type I interferon regulation. Here we explore ADAR editing in rat brain at a whole-transcriptome scale. RNA-seq data from rat ventromedial hypothalamus exposed to predator odor (PO) (GSE142617) was used for variant calling, base counting, and gene annotation to identify ADAR editing sites. Our results showed that ADAR editing targets are distributed across the entire transcriptome and across multiple functional pathways. Exposure to PO resulted in a shift of editing across a subset of editing targets, including in pathways related to immune response and inflammation, supporting the hypothesis that PO exposure triggers changes in gene expression that also encompass changes in ADAR editing patterns.

**Samruddhi Joshi, Junior, Biotechnology**

Mentor: Srinivasan Vijayaraghavan, Ph.D.

Protein Expressions and Purification of Recombinant Proteins

The proteins PP1Gamma1, PP1Gamma2, and SPZ1 play crucial roles in male fertility. PP1Gamma1 and PP1Gamma2 are isoforms of PP1 gamma, with Gamma2 being essential for fertility in mammals, while SPZ1 is testis-specific. Recombinant proteins of these were created to study their interactions. While Gamma1 is vital for fertility in non-mammals, it's the interaction between Gamma2 and SPZ that's particularly significant for mammalian fertility. This unique interaction underscores the evolutionary relevance of both proteins, especially as Gamma2's fertility role is specific to mammals. Understanding this interplay is crucial for interpreting the molecular mechanisms underlying male fertility and may have implications for reproductive biology and potential therapeutic interventions.

### **Madisyn Langdon, Senior, Biology**

Mentor: Edgar Kooijman, Ph.D.

#### Analysis of Lipid Composition in Muscle Tissue of Obese and Lean Rats

Skeletal muscle is a complex component of the body with significant implications for muscle contraction. Lipid metabolism is the production and breakdown of different lipids in the body for metabolic demands. Skeletal muscle plays an important role in lipid metabolism. Obesity and other metabolic diseases are characterized by fatty acid accumulation in the form of triglycerides and cholesterol esters. Furthermore, muscle tissue is vulnerable to lipid composition alterations. I hypothesized that there would be a larger content of free fatty acids, triglycerides, and ceramides in LCR models compared to HCR models. Due to this imbalance, we see the differences in the performance and health of the HCR and LCR rats.

### **Angele Nsoure-Engohang, Senior, Biology**

Mentor: Lique Coolen, Ph.D.

#### Analysis of dopamine innervation of a spinal reflex generator after spinal cord injury

Spinal cord injuries often result in ejaculatory dysfunction in males. To find a solution, it is important to look into the spinal ejaculation generator (SEG). Within the SEG, Lumbar Spinothalamic cells (LSt cells) are found, and they are the regulators of ejaculation. The SEG receives inputs from the brain to trigger ejaculation. We suspected that these inputs include dopamine. Overall, we wanted to see if we could use the dopaminergic system to restore ejaculatory function in SCI patients. To test for dopamine, a series of fluorescent immunohistochemistry experiments were done. Spinal cord tissue from rats was stained for galanin, dopamine transporter (DAT), and synaptophysin. Confocal microscopy was used to image. Through image analysis, it was found that dopamine transporters are indeed found around LSt cells.

### **Isabella Oliver, Senior, Nursing; Robin Bearss, Ph.D. Candidate, Neuroscience**

Mentor: Richard Piet, Ph.D.; Robin Bearss

#### Effects of CHPG, Kainic Acid, and AMPA on Hypothalamic Kisspeptin Neurons

Kisspeptin (Kiss1) neurons are involved with signaling in the hypothalamic-pituitary gonadal (HPG) axis. Kiss1 neurons reside in the rostral periventricular area of the third ventricle (RP3V) and arcuate nucleus (ARN). There is evidence Kiss1 neurons use glutamatergic signaling to communicate, but it was unknown if exogenous glutamate would activate glutamate receptors. Calcium imaging was used to determine if glutamate receptor activation occurred and varied depending on receptor type, sex, or brain area of transgenic mice. The glutamate agonists used include CHPG, Kainic Acid, and AMPA. Videos were captured via fluorescent microscopy and one drug was washed on per video. The results indicated there is activation of glutamate receptors and variance depending on receptor type, sex, or brain area.

**Teresa Raba, Senior, Biology**

Mentor: Sangeet Lamichhaney, Ph.D.

Exploration of Gene Family Evolution Associated with Digestive Enzymes in Pikas and Related Species: A Comparative Genomics Analysis

The American pika, an herbivorous mammal that occupies western North America, shares an ancestor with rabbits and cannot migrate from its narrow mountainous habitat. Genes passed down from a common ancestor varying in sequence or function form gene families. Family expansion and contraction occur when gene copy numbers change due to random duplications or deletions. We hypothesized that American pikas have expanded gene families related to digestive enzymes due to their habitat-determined diet. Using computational tools, we compared protein sequences of the American pika to seven distantly related taxa to identify gene families, copy number evolution, and gene family functions. Analyses show gene family expansion relating to protease enzymes in the American pika, possibly contributing to their metabolism of plants in their habitat.

**Autumn Redd, Junior, Neuroscience**

Mentor: Lique Coolen, Ph.D.

Expression of Cholecystokinin in the Spinal Ejaculation Generator after Chronic Spinal Cord Injury in Male Rats

To trigger ejaculation, LSt cells receive sensory inputs and release four neuropeptides (galanin, enkephalin, cholecystokinin, and GRP) into autonomic and motor target areas within the lumbosacral spinal cord. Earlier research suggested that galanin, the general marker for LSt cells, and GRP are reduced following spinal contusion injury in male rats, while enkephalin is unaffected. The effects of SCI on cholecystokinin expression are unknown. In the present study, the expression of cholecystokinin mRNA within LSt cells was examined after mid-thoracic contusion injury in male rats using multiplex fluorescent in-situ hybridization. Images of transcript expression in LSt cells were captured using confocal microscopy. Analysis of transcript levels is currently in progress using Fiji/Image J. Preliminary observations have confirmed that 100% of LSt cells co-express galanin and cholecystokinin.

**CeCe Stoddard, Sophomore, Biology; Grace Wehry, Junior, Biotechnology**

Mentor: Edgar Kooijman, Ph.D.

Binding Abilities of Fibrillin Protein in a Lipid Monolayer

Lipid droplets (LD) are organelles that play an integral role in metabolic processes. In plants, LD are prospects for biotechnological applications in agriculture and medicine. LD consist of a neutral lipid core, phospholipid monolayer, and binding proteins. Lipid-protein interactions are studied in order to understand how the monolayer affects LD function and ability to recruit binding proteins. We used fibrillins 1A and 7A proteins, which are components of plant stress response and physiology. Pendant drop tensiometry is the technique used to measure the interfacial tension between a neutral lipid droplet and protein. An amphipathic alpha-helix is present in both fibrillins and may facilitate LD binding. Data suggests that alpha-helix is involved in the insertion of the fibrillins but may not be the sole specifier.



**Andrew Whitfield, Senior, Biology**

Mentor: Manabu Kurokawa, Ph.D.

Regulation of  $\Delta$ Np63 by the E3 ligase HUWE1 in keratinocytes

The p63 gene is a member of the p53 family that utilizes alternative promoters to create different isoforms (TAp63 and  $\Delta$ Np63) that have different roles specified by their context. It has been shown that  $\Delta$ Np63 plays a crucial role in the proliferation of basal epidermal cells, such as keratinocytes. Huwe1 encodes a protein that tags protein substrates for proteasomal degradation. The Kurokawa lab has discovered that HUWE1 regulates the abundance of all isoforms of p63 (unpublished). Therefore, we propose that  $\Delta$ Np63 is negatively regulated directly by HUWE1 in keratinocytes. Here, we characterize the in vivo phenotype of keratinocyte-specific Huwe1 KO in our mouse model, suggesting a crucial role of HUWE1 in the context of skin development.

**Roger Williams, Senior, Neuroscience**

Mentor: Min-Ho Kim, Ph.D.

Magnetic Nanoparticles Increase Expression of Autophagy Related Proteins in Human Microglia Cells

Alzheimer's disease (AD) is a neurodegenerative disorder which is characterized by the buildup of extracellular amyloid-beta protein and intracellular tau tangles. While the mechanisms behind why there is such significant neural death in AD remains debated, a number of labs have been looking at these amyloid-beta plaques as a potential therapeutic target. My research involves using magnetic nanoparticles which apply localized heat when applied with a magnetic field. This causes the cells which uptake them to trigger their immune response and utilize the chaperone mediated autophagy cascade to potentially increase the degradation of these extracellular amyloid-beta plaques.

**Logan Yost, Junior, Neuroscience; Ellie Marhefka, Senior, Biology**

Mentor: Lique Coolen, Ph.D.

Characterizing the Spinal Ejaculation Generator in a Mouse Model

Spinal cord injury (SCI) in males causes anejaculation. Based on results found in rats, the ejaculatory reflex is regulated by a reflex generator in the lumbar spinal cord called the spinal ejaculation generator (SEG). The SEG contains neurons called lumbar spinothalamic (LSt) cells that mediate the ejaculatory reflex. While the rat SEG is well characterized, much remains unknown about its function in mice. Mouse models could allow for genetic access to neurons which isn't possible in rats. We found increased SEG neuron activation in mice that ejaculated compared to those that did not. This result is similar to findings in rats and supports using mice as a model for SCI induced sexual dysfunction.

# Biology – Ecology

## **Kurt Binder, Sophomore, Agribusiness**

Mentor: Eric Cotton

### Can you save the world with a chicken?

The USA sends 35 million tons of food waste to its landfills a year, accounting for 20% of overall waste. This waste turns to CO<sub>2</sub> gas and methane that is detrimental to our atmosphere. To reduce this waste, green methods such as composting can utilize this waste stream and turn it into nutrient-dense compost or soil. Which method of composting will utilize the most nutrient-dense compost? Two methods of thermophilic composting were utilized. In the first method, food waste was composted by itself, utilizing carbon-rich materials. This pile was flipped periodically. The second method utilized chickens who would scratch and eat off the compost pile after it had gone through the thermophilic process. The pile without chickens yielded the most nutrient density.

## **Molly Braniff, Junior, Environmental Studies**

Mentor: Oscar Rocha, Ph.D.

### Changes in the Behavior of Juvenile *Basiliscus vittatus* Throughout the Day

The *Basiliscus vittatus* (Brown Basilisk) is a lizard species distributed in the lowlands throughout the Neotropics. This study was conducted to determine how behaviors of Brown Basilisk juveniles varied between the morning and afternoon at the Campanario Biological Station in Costa Rica. Over three days, lizards present were observed for ten minutes each (at most six lizards/hour), and frequencies for these behaviors were recorded: head movement, body movement, head bob, change in location, eating/licking, and sitting still. The analysis showed that total activity was higher in the afternoon, and there was little significance in the differences in the frequencies of each activity during the morning and afternoon periods. These findings revealed that Brown Basilisk juveniles spend most of the time foraging and staying vigilant.

## **Emily Campbell, Senior, Biology**

Mentor: Lauren Kinsman-Costello, Ph.D.

### Phosphorus Sink or Source?: the Effects of Microtopography on a Restored Wetland

Agricultural runoff is a source of increased phosphorus (P) loading into Lake Erie, potentially fueling harmful algal blooms. Constructing wetlands can limit this; however, legacy P in soils may be released into surface waters. The site Trumbull Creek in Ashtabula County features hummock/hollow microtopography and pools. We collected 48 soil samples and analyzed for water-extractable P, bioavailable P, Fe, and Al. Sorption capacity found that all can sorb phosphate; pool sediments have twice the capacity than upland soils, corresponding to 5x Fe content. Bioavailable P (mg P/kg soil) ( $9.69 \pm 6.48$ ), ( $10.61 \pm 6.14$ ), and ( $7.64 \pm 5.98$ ) and water-extractable P ( $0.13 \pm 0.08$ ), ( $0.26 \pm 0.11$ ), and ( $0.14 \pm 0.09$ ) in pools, hummocks, and hollows, respectively (mean  $\pm$  sd).

## **Megan Collins, Senior, Environmental and Conservation Biology**

Mentor: David Costello, Ph.D.

### Bridging the Gap: Advancing Metadata Practices in Biological Research

Conservation biological researchers continue to lag behind their counterparts in fields such as geology and geography in the generation of metadata. Beyond providing variable labels, collection time, sample site coordinates, measurement units, and data collector information, well-formatted metadata provides a comprehensive context for experimental understanding and ensures data longevity, relevance, and prevents duplication of effort. The importance of quality metadata increases with scale ex. projects executed by citizen scientists or conducted over extensive time periods. Common issues stemming from poor metadata practices including information loss, local shorthand development, and data set incompatibility are explored. This project aims to propose effective solutions by delving into the methodology for the establishment of intuitive, standardized data collection and metadata generation practices. By investigating current practices, identifying gaps, and proposing solutions, this project aspires to catalyze improved metadata practices, fostering collaboration and enhancing the overall quality of conservation biological research.

## **Owen Conroy, Senior, Zoology**

Mentor: Oscar Rocha, Ph.D.; Harlee Rush

### What's the buzz around flowering dogwoods? - an analysis of pollinator influence and tree morphology on fruit production in *Cornus florida*.

Little is known regarding physical attributes or specific pollinator species that contribute to flowering dogwood (*Cornus florida*) reproductive success. Ten *C. florida* trees were selected, and sample blooms from each tree were collected. For two weeks following collection, trees were sampled daily, and insects found were collected and recorded. Later, a sample of fruiting bodies was done with the same methods. Average of flowers per tree, berries per tree, species richness, species abundance, and percent fruiting success (PFS) were calculated, and a positive correlation has been seen between PFS and species richness. In addition, a positive linear correlation between tree DBH and flower number ( $R^2 = 0.9029$ ), berry number ( $R^2 = 0.9203$ ), and PFS ( $R^2 = 0.9031$ ) was seen.

## **Adriana Cooper, Senior, Environmental Studies; Nora Haddon, Junior, Environmental and Conservation Biology; Claire Ebner, Senior, Environmental and Conservation Biology**

Mentor: Lauren Kinsman-Costello, Ph.D.; David Costello, Ph.D.

### How Sedimentation and Urea Influence Sulfur Cycling in Urban Aquatic Ecosystems

Anthropogenic impacts are affecting urban aquatic ecosystems by increasing salinization, sedimentation, and agricultural runoff. We hypothesized that when sedimentation and urea concentrations increased in sulfate-impacted streams, anoxic conditions would increase, leading to higher sulfate reduction and sulfide accumulation. At the end of a three-week study, concentrations of sulfate and hydrogen sulfide from 30 experimental urban stormwater-fed streams that received 1 of 5 urea treatments and 1 of 5 sedimentation treatments were analyzed. Most streams reached 0 mg/L of dissolved oxygen (DO) by the second day. Initial samples contained high sulfide concentrations  $>250$   $\mu\text{mol/L}$ . We are further exploring the relationships between DO, sulfur species, urea, and sedimentation treatments to understand how multiple stressors impact the biogeochemistry of urban aquatic ecosystems.

**Claire Ebner, Senior, Environmental and Conservation Biology; Renn Schipper, Graduate Student, Biology; Olufemi Akinnifesi, Graduate Student, Biology**

Mentor: David Costello, Ph.D.

Effects of Multiple Stressors on Algal Biofilm Growth: Manipulating Sediment Deposition and Urea Nitrogen Concentrations

Agriculture puts an exorbitant amount of stress on freshwater ecosystems through land use change and excess nutrients from fertilizers. Recently, there has been an increase in urea-based fertilizers with its effects on freshwater ecosystems being less studied. To test the effects of agricultural stressors on streams, we utilized a flow-through mesocosm experiment with 30 streams and a gradient design with 5 sediment (0-30 g/L) and 5 urea treatments (0-240 µg/L). We measured algal growth and community composition over 22 days. Preliminary results indicate the lowest urea treatment (30 ug/L) combined with the minimal sediment treatment (0-7 g/L) yielded the greatest biofilm growth. This study shows excess sediment can inhibit algal capacity to take up nitrogen fertilizers, which can exacerbate nutrient loading in sensitive downstream ecosystems.

**Hana Esber, Junior, Environmental Studies**

Mentor: Michael Back, M.A.; Kenneth Anderson; Lauren Kinsman-Costello, Ph.D.

Wetland surface water extent at St. Joseph's River Restoration Project using PyGEE- SWToolbox

We investigated wetland inundation and asked: How does a recently restored wetland flood throughout the typical year? What is the most accurate water index/threshold to use on new wetland projects? We estimated inundation timing and extent at the H2Ohio St. Joseph's River Restoration Project (SJRE) using a Python-Google Earth Engine Surface Water Analysis Toolbox (PyGEE-SWToolbox). SJRE is intensively monitored by the H2Ohio Wetland Monitoring Program. We ran several analyses with different thresholds, settings, and used the water hydrograph tool to identify peak surface water events and generated raster images to map inundation patterns. Results show that SJRE floods from St. Joseph's River, tile drains, there is peak surface water during winter months, and ice/snow reflection might be a factor influencing the water extent tool.

**Sav Herald, Senior, Environmental Studies**

Mentor: Sarah Smiley, Ph.D.

Water, Sanitation, and Hygiene in Rural Zambia

The purpose of this research was to analyze water, sanitation, and hygiene (WASH) access for adults living in rural Western Zambia, and to compare the findings with goal 6 in the Sustainable Development Goals (SDGs) established by the United Nations in 2015. Research utilized qualitative, participatory research in the form of anonymous surveys conducted with 362 adults. Questions about primary source of water, types of toilets used, and hygiene practices were asked to better understand WASH access and conditions within rural Western Zambia. Data was organized to analyze the levels of unimproved vs. improved access within the area studied. One major finding is a substantial number of adults in rural Western Zambia are living with unimproved access to water, sanitation, and hygiene facilities.

## **Augustin Holman, Senior, Horticulture**

Mentor: Sarah Eichler, Ph.D.

### Sclerotia Development in Morchella spp. On Nutrient Amended Media

Morel mushrooms are highly valued mushrooms prized by culinary chefs and mushroom enthusiasts. Morels are typically found in spring. Overharvesting, climate change, and habitat loss are negatively affecting wild populations. There is an increasing need to cultivate morels under controlled conditions to preserve wild morels. Few growers have successfully produced these mushrooms. I collect spores from wild mushrooms and grew them under laboratory conditions. After germinating, the spores are transferred into specially prepared growing media. The mycelium accumulates nutrients into dense woody structures called sclerotia. Sclerotia have been shown as an important life stage before the mushroom body develops. Discovering which nutrient amendments increase sclerotia production is an important step in the commercial production of morel mushrooms.

## **Jada Howard, Senior, Biology**

Mentor: Matthew Lehnert, Ph.D.

### Superhydrophobicity of the Labial Sheath of the mosquito, *Culex pipiens*

This study examines the wettability of the labial sheath of the mosquito, *Culex pipiens*. It was hypothesized that the sheath provides self-cleaning abilities through superhydrophobicity. I employed three methods to assess wetting properties: the capillary-rise technique, contact angle measurements of water droplets on the surface of the sheath, and SEM-3D imaging to quantify topographical surface roughness. The capillary-rise technique revealed that the sheath is hydrophobic, which was further confirmed with contact angle measurements of droplets that exceeded 150°, indicating superhydrophobicity. The superhydrophobicity is attributed to a wax layer on the cuticle and the surface roughness, which suggests that the wetting properties are best explained with the Cassie-Baxter model.

## **Erin Kelly, Senior, Biology**

Mentor: Gregory Smith, M.S.

### Evaluation of Thermal Drones as a Technique for Estimating White-tailed Deer Population Size in Northeast Ohio

White-tailed deer are more abundant than ever. Deer in such large numbers have resulted in devastating ecological impacts. Browsing and trampling reduces the forest structure, resulting in the reduction of biological diversity. Forest damage is often correlated with herd size. Management of deer hinges on accurate measures of deer numbers. New technology has the potential to make deer counting more efficient. This study will test thermal drones by comparing drone counts to those from traditional methods. The goal of the study is to evaluate drone technology as a possible replacement, or supplement, for traditional methods. Surveys will be within the 607-hectare watershed surrounding Lake Rockwell, the drinking water reservoir managed by the City of Akron. Deer counts using all methods will be conducted and compared.

## **Miranda Kissel, Senior, Zoology**

Mentor: David Ward, Ph.D.

### Understanding the Growth of Biomass in a National Park

We investigated the factors influencing the growth of biomass in grasslands under various fertilizer conditions at Cuyahoga Valley National Park (CVNP). Overall, we established 30 plots in a grassland ecosystem. The plots were randomly treated with different environmental factors (nitrogen, phosphorous, potassium + micronutrients). We assessed how the growth of grass biomass under these different conditions would be affected. We estimated the growth of biomass using a Disc Pasture Meter that estimated the aboveground standing grass biomass in a non-destructive manner. We found a useful and rapid means of using the DPM to develop an equation to assess the grass biomass in a non-destructive manner with a limited number of samples, and thereafter used the Disc Pasture Meter only.

## **Samuel Large, Senior, Environmental and Conservation Biology**

Mentor: Jannifer Mapes, Ph.D.

### Trees in heat: visualizing the capacity of campus trees to persevere under a changing climate

Global climate change affects local places uniquely. This project aimed to develop a methodology to enhance the local Kent State Main Campus tree inventory to determine which trees will be most affected by a changing climate. The data, adaptability ratings, and projected changes in habitat suitability by 2100 under a low and high emissions scenario for more than 125 species were derived from climate summaries produced by the United States Forest Service's Tree Atlas 4. After being added as additional fields in the inventory using R (4.2.2), the data were projected spatially with QGIS (3.28.15 'Firenze') using bivariate symbology, illustrating each tree's relative adaptability and projected change in habitat suitability under a low emissions scenario. For reproducibility purposes, only open-sourced software and data were used.

## **Ciara Matos, Junior, Environmental and Conservation Biology**

Mentor: David Ward, Ph.D.

### Turf wars: Invasive grass species do not necessarily have priority effects

Invasive plant species can demonstrate priority effects by beginning growth before native plants, thereby increasing their fitness. We tested priority effects on native Red Fescue (*Festuca rubra*) and invasive species Smooth Brome (*Bromus inermis*) and Bermuda grass (*Cynodon dactylon*). We grew each grass species alone, with a conspecific neighbor, with concurrent treatments in which two different species were planted simultaneously, and with a priority treatment wherein a different species was introduced after the establishment of a species 21 days prior to planting the heterospecific neighbor. Relative interaction index values of all three species indicated stronger effects of intraspecific competition than interspecific competition.

## **Ruth Morara, Sophomore, Environmental and Conservation Biology**

Mentor: David Costello, Ph.D.

### Effects of climate change on nutrient cycling by decomposers in an ombrotrophic bog

Ombrotrophic bogs are characterized by sole-dependence on precipitation for moisture and are influenced by elevated temperatures and rising carbon dioxide (CO<sub>2</sub>) concentrations. Potential impacts on decomposition were tested in an ombrotrophic bog (Marcell Experimental Forest, Bovey, MN). In 2021, enclosures were used to manipulate temperature and CO<sub>2</sub> levels. Cellulose cotton strips buried in the soil as a carbon source for microbes were removed after six months for analysis of phosphorus (P) and nitrogen (N). In ambient CO<sub>2</sub>, microbial P uptake didn't respond to increasing temperatures. At elevated CO<sub>2</sub>, P uptake was fastest at ambient temperatures and declined with warming. Though an interaction between CO<sub>2</sub> and warming was observed, more data is needed (deeper soils, nitrogen) to understand the consequences of climate change on nutrient cycles.

## **Jessica Palo, Senior, Horticulture**

Mentor: Sheren Farag, Ph.D.; Sarah Eichler, Ph.D.

### Ustilago maydis: Creating an Inoculum to Grow Huitlacoche

Corn Smut is an enlarged tissue caused by a basidiomycete fungal pathogen called *Ustilago maydis*. This pathogen is limited to corn and is from Pre-Columbian Central Mexico, where the Aztecs would eat the softer, earlier stages of the gall known as huitlacoche. My individual investigation has centered around developing protocols to produce huitlacoche intentionally for commercial sale. I've created a laboratory grown inoculum and tested different inoculums on a sweet corn cultivar grown in a greenhouse with positive results. This semester I am using the huitlacoche that was grown in the greenhouse to recreate my inoculum protocols and confirm results. I am trying different inoculation methods, and I will be inoculating multiple cultivars of corn to see if one is more susceptible than the others.

## **Stephanie Petrycki, Senior, Zoology**

Mentor: Christie Bahlai, Ph.D.

### Building Design and Bird Fatalities: An On-Campus Bird Window Collision Study

In northeast Ohio, Kent State University is situated in a common flyover area for migratory birds. With its large green spaces and both manicured and wild habitats, the campus houses and provides stopover resources for many bird species. The Kent campus has a variety of buildings, some of which are modern window-forward designs that are thought to pose the highest risk to birds. Window surveys on the Kent campus were conducted from April to October 2023. Buildings were selected to survey a variety of building heights, window surface area, and window tint. Cedar Waxwings had the greatest collisions with buildings on campus. Additionally, Cunningham Hall and the Integrated Science Building tied for the highest number of fatal collisions.



**Brooke Schmitt, Sophomore, Zoology**

Mentor: Christie Bahlai, Ph.D.; Kathryn Grage

**Campus Insect Communities**

Due to growing human impacts and a changing climate, insect populations are declining. This decline threatens the balance of the ecosystems that make up our natural world. Because of this, it is important to investigate the ways in which we can promote insect biodiversity and try to mitigate some of these harsh impacts. We hypothesized that compared to mowed lawns, unmowed areas may provide more suitable habitat patches that will improve insect taxa richness, diversity, and abundance. In order to investigate, we selected six sites across campus to collect invertebrate samples and test for differences between mowed and unmowed lawns. Our results indicate that preserving unmowed areas may be one solution to help insect populations recover.

**Brandon Smith, Senior, Zoology; Kurt Brubach, Junior, Zoology; Audrey Monge, Junior, Environmental and Conservation Biology; Mikayla Cully, Sophomore, Pre-Veterinary Medicine; Ava Daniel, Sophomore, Environmental Studies**

Mentor: Oscar Rocha, Ph.D.

**Identifying the Optimal Conditions for Bat Tent Construction**

Fruit-eating bats construct what are known as “bat tents” to provide safe roosting areas during the day in the rainforests of Costa Rica. The purpose of this study was to determine and measure what factors the Thomas fruit-eating bat (*artibeus watsoni*) searched for to create a bat tent. We analyzed what conditions were most common to find bat tents in by measuring understory density, canopy coverage, and host plant count in 12x12 meter plots in both mature-growth and edge-growth forest. We found no correlation between understory vegetation density. Tent presence increased with an increase in canopy coverage, and higher densities of bat tents in forest edges than mature forests.

# Biomedical Sciences

## **Christopher Blank, Junior, Biology**

Mentor: Colleen Novak, Ph.D.

### Chronic Oral Administration of Microcystin and Body Temperature and Composition In Mice.

Cyanobacteria, or blue-green algae, are a prevalent public health concern found in many freshwater sources, including the Great Lakes. Input of nutrients drives excessive growth of blue-green algae, leading to the development of harmful algal blooms (HABs). One of the most common species of cyanobacteria found in Lake Erie HABs is *Microcystis aeruginosa*, which produces the toxin microcystin. Microcystin-LR (MS-LR) is a known hepatotoxin in humans, and pre-clinical in vivo studies have shown deleterious effects on other organs and tissues including the kidney, heart, lungs, reproductive system, nervous system, and the immune system. Here, we treated male and female mice (N= 10) with either vehicle (water) or MS-LR (50 mg/kg) orally using gavage every other day for 3 weeks. Compared to vehicle, MS-LR did not significantly impact body weight, weight gain, fat mass, or lean mass. On the other hand, core body temperature, assessed using non-invasive transponders, was elevated.

## **Kayleigh Bucci, Senior, Biology**

Mentor: Manabu Kurokawa, Ph.D.

### The Role of Dietary Fat on Breast Cancer Development

20% of breast cancer is categorized by a subtype called “HER2 – positive breast cancer” (HER2+), and 10-15% of breast cancer is categorized by another subtype called “triple-negative breast cancer” (TNBC). There are different types of fatty acids that can be found in varying concentrations of everyday and special diets. Here we investigated the impact of dietary fat on mammary tumorigenesis using mouse models of breast cancer. We found that saturated fatty acid (SFA) high fat diet (HFD) diet slows down tumor growth in HER2+ breast cancer but promotes growth in TNBC. Similarly, SFA low-fat diet (LFD) slows down tumor growth in TNBC but increases growth in HER2+ breast cancer. We also investigated polyunsaturated fatty acid (PUFA) HFD and LFD and saw no difference.

**Kendra Dillon, Junior, Neuroscience; Dayanara Lohr, Graduate Student, Neuroscience; Alyssa Novak, Graduate Student, Neuroscience; Anna-Maria Petriv, Lab Technician, Neuroscience**  
Mentor: Aleisha Moore, Ph.D.

Classical progesterone signaling in kisspeptin neurons is not required for negative feedback regulation of the GnRH pulse generator in mice

Fertility depends on the ability of progesterone to suppress gonadotropin-releasing hormone (GnRH) neuron activity and pulsatile luteinizing hormone (LH) secretion in a homeostatic negative feedback loop. The cell population containing progesterone receptors (PGR) that relays feedback to GnRH neurons is unclear. This study addresses the hypothesis that progesterone receptor (PGR) expression in neurons co-expressing Kisspeptin, Neurokinin B, and Dynorphin (KNDy cells) is required for negative feedback. Using mice with PGR knocked out from kisspeptin cells, we determined that, compared to controls, loss of PGR does not alter LH pulse frequency or the suppression of LH by exogenous progesterone. Similarly, RNAscope detected no change in kisspeptin and dynorphin mRNA expression in knockout mice. This suggests progesterone signaling in KNDy cells is not essential for negative feedback.

**Kendra Dillon, Junior, Neuroscience; Dayanara Lohr, Ph.D., Neuroscience**

Mentor: Aleisha Moore, Ph.D.

Investigating whether the loss of progesterone receptors in KNDy cells is sufficient to mimic reproductive dysfunction in PCOS

Polycystic ovary syndrome (PCOS), the leading cause of female infertility, is characterized by raised luteinizing hormone (LH) pulsatility driven by impaired hypothalamic gonadotropin-releasing hormone (GnRH) neuron regulation. GnRH neurons are regulated by cells co-expressing kisspeptin, neurokinin B, and dynorphin (KNDy neurons) which act as the GnRH/LH pulse generator. The Moore laboratory previously identified that PCOS-like mice display decreased progesterone receptor (PR) expression in KNDy neurons. To investigate if this is sufficient to induce the PCOS phenotype, we utilized female mice with PRs knocked out from kisspeptin neurons. We used in situ hybridization to determine changes in KNDy peptide expression. Preliminary data indicates that although KNDy peptide expression was not significantly altered between groups, mice lacking PRs in KNDy neurons experienced decreased fertility compared to WT controls. Therefore, the mechanism by which the loss of PR in KNDy cells leads to infertility requires further investigation.

## **Anna Duraney, Junior, Neuroscience**

Mentor: Aleisha Moore, Ph.D.; Alyssa Novak

### Investigating the role of proopiomelanocortin (POMC) neurons in impaired steroid hormone feedback in polycystic ovary syndrome

Elevated gonadotropin-releasing hormone (GnRH) and luteinizing hormone (LH) release characterizes the leading cause of anovulatory infertility – polycystic ovary syndrome (PCOS). Increased GnRH/LH pulses resist inhibition by estradiol, showing PCOS to be a state of impaired steroid-hormone feedback. Previously, we showed that PCOS-like mice display a surprising increase in estrogen receptor alpha (ER $\alpha$ ) colocalization with POMC cells compared to fertile mice. As POMC is upregulated by estradiol, we used fluorescent immunohistochemistry in mouse brain slices to investigate the possibility that elevated POMC expression contributes to GnRH/LH hypersecretion. However, no differences in the density of POMC immunoreactivity were detected between control and PCOS-like mice, suggesting other mechanisms are responsible for impaired steroid hormone feedback of GnRH/LH release in PCOS.

## **Monica Flores, Junior, Nursing**

Mentor: Louise Steele, Ph.D.

### Bioeffects of Therapeutic Ultrasound Exposure on the Movement and Recovery of *C. elegans* Nematode Worms

In previous work, *C. elegans* exposed to ultrasound exhibited a reduction in movement<sup>1</sup>, but many worms made a prompt recovery. Our goal was to verify how many worms recover, how long it takes them to recover, if they swim as fast as untreated worms, and if they bend their bodies as far as untreated worms do. Three hours after exposure, worms that recovered had a thrashing rate similar to that of unexposed shams, which led us to conclude that their mobility had been fully restored. We are also determining whether they bend at the same angle as shams. This work has contributed to a more detailed understanding of the effects of therapeutic ultrasound on neuromuscular function in *C. elegans*.

**Elayna Hallal, Senior, Neuroscience; Grace A Sonick, Graduate Student, Psychology; Anna E Crites, Graduate Student, Psychology; Allianna K Hite, KSU graduate, Psychology; Aliyah J Ross, Junior, Neuroscience; Amanda L Shafer, Sophomore, Psychology; Manuela Simoes Rodrigues, Senior, Psychology; Lee Gilman, KSU Faculty, Neuroscience**

Mentor: Lee Gilman, Ph.D.

Chronic unpredictable stress affects high-salt diet consumption and willingness to work for reinforcer in rats.

Our study investigates how chronic unpredictable stress affects rats' unhealthy diet consumption and willingness to work for a palatable reinforcer. We hypothesized stress would increase high-salt food consumption, and that access to high-salt food would reduce willingness to work for a palatable reinforcer. Male and female Wistar rats were assigned high-salt, low-salt, or both diets. Over 12 weeks, rats underwent operant testing, with stress exposure occurring during weeks 5-9. Early results reveal low-salt food is initially preferred, but post-stress preference for high-salt food modestly increases in rats with access to both diets. Rats on a low-salt diet showed heightened reinforcer incentive salience, mainly during stress weeks. Future directions will focus on determining causality and translatable treatment avenues.

**Patrick Hull, Senior, Biology; Colby Clavecilla, Junior, Biology**

Mentor: Ronald Seese, Ph.D.

Mapping the Brain Networks that Influence Adrenaline Release

Dysautonomia is a neurologic condition that is caused by the autonomic nervous system being overactive. This results in problems with involuntary bodily functions like breathing, blood pressure, and more. Dysautonomia can affect anyone, but it predominantly affects those with autism and PTSD. Little is currently known about dysautonomia and its "pathway" due to lack of research so far. We studied dysautonomia in the cerebral cortex by inducing stress in marmosets through the adrenal medulla to track the consequential neuron activity. We hypothesize that dysautonomia has a prominent influence in the cerebral cortex of the brain. Mapping the areas of the brain that are affected by dysautonomia would be a significant first step to find effective, targeted treatment.

**Ellie Marhefka, Senior, Biology; Logan Yost, Sophomore, Neuroscience**

Mentor: Lique Coolen, Ph.D.

Characterizing Steroid Receptor Expression in the Mouse Spinal Ejaculation Generator

The spinal ejaculation generator (SEG) is made up of Lumbar Spinothalamic (LSt) neurons within the L3 and L4 sections of the spinal cord. In males, these cells coordinate ejaculation. In females, however, their function is unknown. We hypothesized that sexual dimorphism in the SEG may be due to differences in steroid receptor expression. To investigate this, RNAscope was used to probe for estrogen receptor (ER), androgen receptor (AR), and galanin in female (n=5) and male (n=6) spinal cords. We captured images using a fluorescent microscope. We found that, qualitatively, ER but not AR was expressed by female LSt neurons. Conversely, we found a large proportion of male LSt neurons expressed AR and not ER. So, the hypothesis was supported.

**Autumn Reed, Senior, Biology**

Mentor: Heather Caldwell, Ph.D.

**The Sex Specific Effects of Oxytocin Receptors on Embryonic Neurogenesis**

In mice, oxytocin mRNA can be found in female but not male embryos at embryonic day (E)16.5, while oxytocin receptor (Oxtr) transcripts are found in both. Disrupting Oxtr at E16.5 results in behavioral changes in adulthood, suggesting that Oxtr in male embryos may be acted upon at this timepoint, guiding neurodevelopment. We used Oxtr knock-out (-/-) mice to explore the sex-specific effects of Oxtr on neurogenesis, the birth of new neurons, at this developmental timepoint. We hypothesize that female Oxtr knock-out embryos will have fewer markers of neurogenesis than female wild-type embryos due to the lack of Oxtr, similar to the level seen in male embryos. We will compare neurogenesis across sex and genotype to observe sex differences in which Oxtr is implicated.

**Autumn Reed, Senior, Biology**

Mentor: Heather Caldwell, Ph.D.

**The effects of disrupted oxytocin receptor signaling on neurogenesis**

We used Oxtr knockout (-/-) mice to explore the sex-specific effects of Oxtr on neurogenesis at embryonic day (E)16.5. We hypothesized that at E17.5, both sexes of Oxtr -/- mice would have fewer markers of neurogenesis than control mice due to the absence of Oxtr signaling. To test this hypothesis, we injected bromodeoxyuridine (BrdU), a marker of dividing DNA, into Oxtr heterozygous dams at gestational day 16.5, then collected the embryos 24 hours later. Immunocytochemistry was performed to detect BrdU; NeuN, a protein marker found in all neurons; and Ki-67, a protein produced during cell divisions. The presence of these markers allows us to compare sex and genotype to evaluate the impact of Oxtr signaling on neurogenesis.

**Aliyah Ross, Junior, Neuroscience; Jasmin Beaver, Graduate Student, Psychology; Allianna Hite, KSU graduate, Psychology; Grace Sonick, Graduate Student, Psychology; Anna Crites, Graduate Student, Psychology; Elayna Hallal, Senior, Neuroscience; Lauren Scrimshaw, Senior, Psychology; Lee Gilman, KSU Faculty, Neuroscience**

Mentor: Lee Gilman, Ph.D.

**Investigating cortical GABA polarity under conditions of high salt diet**

Anxiety disorders share pathological fear generalization as a shared symptom. Typical non-pathological fear generalization is when a fear response is elicited to another similar situation. The anterior cingulate cortex (ACC) is a brain region associated with fear generalization, and consuming high salt increases fear generalization in female mice but decreases it in males. Given that high salt can make GABA have an excitatory effect, we sought to compare how high- and low-salt diets affect fear generalization when GABA agonists are infused into the ACC. I hypothesized females on a high-salt diet given a GABA agonist would exhibit increased fear generalization while males would have decreased fear generalization. Data analyses are ongoing, but our findings currently do not support our hypothesis.

## **Aditya Sahani, Sophomore, Biology**

Mentor: Robert Clements, Ph.D.

### **MRI Analysis of Mouse Brain Slices: Investigating Potential Treatments for Multiple Sclerosis**

It is imperative to better understand the fundamentals of the brain to better understand the diseases that harm it. Multiple Sclerosis is a debilitating autoimmune disease that is characterized by demyelination of the central nervous system. In this experiment, slices of mouse brain were treated with various controls and dyes and were observed under a confocal microscope. Subsequently, the treated brain slices were subjected to Magnetic Resonance Imaging (MRI) analysis to give a clear image of the brain and to assess myelin content, tissue integrity, and neuronal morphology.

**Lauren Scrimshaw, Senior, Neuroscience; Elayna Hallal, Senior, Neuroscience; Allianna Hite, KSU graduate, Psychology; Aliyah Ross, Junior, Neuroscience; Anna Crites, Graduate Student, Psychology; Grace Sonick, Graduate Student, Psychology; Jasmin Beaver, Graduate Student, Psychology; Amanda Shafer, Sophomore, Psychology; Lee Gilman, KSU Faculty, Neuroscience**  
Mentor: Lee Gilman, Ph.D.

### **Appetitive operant conditioning acquisition sex-dependently enhanced by PMAT deficiency**

Plasma membrane monoamine transporter (PMAT) is a low affinity, high capacity transporter of dopamine and serotonin. Around 30% of humans have a PMAT polymorphism associated with reduced PMAT function. With no known drugs selectively inhibiting PMAT, the effects on behavior remain unknown. The objective of this study was to use PMAT-deficient mice to investigate how reduced PMAT impacts performance for a reinforcer. We hypothesized PMAT knockout (KO) mice would complete operant acquisition before their wildtype (WT) and littermates, due to prolonged dopamine and serotonin signaling. We've observed that all KO mice completed within 40 days, while their same sex WT counterparts required 100+ days. Future directions include evaluating the effects of sex hormones and how stress interacts with sex and PMAT to alter operant behaviors.

# Chemistry

## **Sera Brady, Senior, Biology**

Mentor: Sanjay Abeysirigunawardena, Ph.D.

### Understanding RNA-Protein Interactions Using Phage Display

Phage display is a powerful directed evolution technique that can be used to develop antibodies, drugs, design proteins, and further study RNA-protein interactions. The point of this project was about optimizing phage display experiments in a way to avoid non-specific binding of phages to the surfaces that we use in phage display. Streptavidin-coated magnetic beads were used as the surface where different surface coverages were analyzed. By varying the concentration of RNA, we are able to change the surface coverage of the beads. By optimizing this technique to reduce non-binding, we can further research to understand the impact of nucleotide modifications on RNA.

## **May Cheline, Senior, Chemistry**

Mentor: Yaorong Zheng, Ph.D.

### Enzyme Controlled Photoactivated Fluorophore Conjugated Novel Platinum (IV) Chemotherapeutic Agents

The use of photoactive chemotherapeutic Pt(IV) agents has allowed for increased precision with cancer treatments. However, these compounds have drawbacks from these advancements; namely, the photoactivity prevents pure isolated compounds from being analyzed in an illuminated world. The use of “click chemistry” (azide-alkyne cycloadditions), especially utilizing the dibenzylcyclooctyne ligand for catalyst-free click reactions, allows for highly precise and efficient conjugation of dyes to Pt(IV) prodrug complexes. To both overcome this issue and effectively understand the mechanisms for these compounds in vivo, this research demonstrates the use of caged FITC-DBCO compounds and the subsequent click reaction product to demonstrate both enzymatically uncaged versions of these compounds for better yields, analysis, and precision in photoactive chemotherapeutic prodrugs.



**Max Ciarlariello, Junior, Biochemistry; Micah Lockhart, Freshman, Biochemistry; Aftab Mollah, Graduate Student, Chemistry**

Mentor: Sanjay Abeysirigunawardena, Ph.D.

Discovery and Characterization of Known Methyl Reader Protein Involved in Epitranscriptomic Regulation of Gene Expression

Epitranscriptomic gene expression regulation involves post-transcriptional modifications of nucleotides on diverse RNAs, with N6-methyl adenosine (m6A) being the predominant modification. Methyl writers, a class of RNA methyltransferases, add this modification, while methyl erasers, demethylases, maintain m6A levels. Methyl reader proteins, determining the fate of m6A-modified mRNA, recognize N6 methylations. Our previous research identified hnRNP A1 as a potential methyl reader. This protein, responsible for mRNA stability, localization, and alternative splicing, likely recognizes N6-methylations through the aromatic cage on its exterior. To test this hypothesis, we conducted site-directed mutagenesis experiments and calorimetric studies on F34A and W37A mutants, along with the wildtype protein. Results affirm that the aromatic cage in hnRNP A1 indeed recognizes m6A nucleotide modifications, consistent with other known methyl readers.

**Serene Fawaz, Senior, Biochemistry**

Mentor: Diana Goncalves-Schmidt, Ph.D.

Gold Nanorods (AuNR) Synthesis via Seedless Method and Analysis of Glioblastoma Multiforme (GBM) Cancer Stem Cells (CSC)

Glioblastoma is a fast-growing incurable form of a brain tumor. Even after a few months of treatment, GBM is likely to recur. Our motivation for this research was to find a way to stop GBM recurring by targeting cancer stem cells (CSC) by creating Gold Nanorods. CSC are thought to be involved in recurrence as they can activate several repair mechanisms against conventional anti-cancer therapies and can switch between proliferative and quiescent modes.

**Man Kshetri, Ph.D. Candidate, Biochemistry; David Richardson, Junior, Biochemistry**

Mentor: Yaorong Zheng, Ph.D.

Designing Novel NIR Activatable Pt(IV) Prodrugs to Eliminate Cancer Cells

Carboplatin, a second-generation platinum compound, is an alternative to cisplatin used in cancer treatment. Carboplatin has less ototoxicity, nephrotoxicity, and peripheral neuropathy than cisplatin. The development of our new prodrug involved conjugating an amphiphilic Pt(IV) prodrug derived from carboplatin with IR783, a fluorescent dye. This results in an approach that involves a NIR-activatable prodrug that leads to cancer cell elimination through mitochondrial damage and the induction of light controlled DNA damage. A sixteen carbon aliphatic chain at the axial tail of the complex and the hydrophobic properties of the dye allowed for the formation of liposomes when combined with lipids, which improves the stability and solubility of the resulting prodrug. When the complexes were exposed to NIR light, they underwent photoreduction, releasing an IR783 derivative and carboplatin, inducing apoptosis. The NIR-activatable prodrug showed excellent efficacy in eliminating drug resistant ovarian cancer cells and produced promising results in a mouse model.

## **Natalie Radatz, Junior, Chemistry**

Mentor: Hao Shen, Ph.D.

### Recycling Lignocellulosic Biomass with Nanocatalysts

Lignocellulosic biomass is a renewable source from plant waste material such as cotton stalks. This biomass is made up of three polymers; cellulose, hemicellulose, and lignin. The biomass is difficult to recycle due to lignin. The ultimate goal was to create a self-sustaining reaction cycle where the radicals produced from hydrogen peroxide consume the lignin of the biomass, allowing the cellulose to be hydrolyzed. To do so, a reaction where glucose produced gluconic acid and hydrogen peroxide was needed. Glucose was produced by hydrolysis of maltose using a gold nanoparticle. Two techniques were used to determine how to create this reaction: cyclic voltammetry and spectrophotometry. A filter paper determined that the reaction was successful as gluconic acid and hydrogen peroxide were both produced while the filter paper was broken down.

## **Justin Wagner, Senior, Biology**

Mentor: Elda Hegmann, Ph.D.

### Using Liquid Crystal Elastomers as Cell Scaffolds

Many people suffer from neurological disorders, such as Alzheimer's, multiple sclerosis, and Guillain-Barre. One of the defining characteristics of these disorders is the degradation of neural tissue and oligodendrocyte cells apoptosis. Liquid crystals in combination with elastomers have been used by our group to synthesize biodegradable and biocompatible ink used in the 3D printing of scaffolds. These scaffolds are designed in the configuration of artificial axons. The principle of this study was to see if the oligodendrocyte cells would attach to these scaffolds and grow around them in the upwards direction as if they were forming a new myelin sheath. This study holds the potential to enhance our comprehension of myelination and demyelination processes, particularly in the context of neurodegenerative diseases.

# Computer Science and Mathematics

## **Aisha Ahammed, Sophomore, Computer Science**

Mentor: Xiang Lian, Ph.D.

### Generative AI based music composition

This project delves into the realm of Generative Artificial Intelligence (AI) for music composition, utilizing advanced techniques to create original musical pieces. The primary tools employed include the librosa library for audio processing and TensorFlow with Keras for implementing a Deep Neural Network (DNN). This project sheds light on the intersection of Generative AI and music composition, showcasing the potential of AI systems to autonomously create intricate and expressive musical compositions. The experimentation with noisy weights adds a layer of exploration into the robustness and creativity of AI-driven music generation.

## **Anna Anello, Senior, Computer Science**

Mentor: Kwangtaek Kim, Ph.D.; Angela Ridgel, Ph.D.

### Correlation-Based Feedback for Haptic Mixed Reality Button Press for Parkinson's Rehabilitation

My research focuses on Parkinson's disease (PD), specifically on the analysis of hand motion trajectories of PD patients during a simulated button push task using the Haptic-Mixed Reality Simulation (HMRS). A correlation study revealed that the Unified Parkinson's Disease Rating Scale (UPDRS) scores were inaccurate due to the inclusion of unrelated sub-scores. To address this issue, we introduced a new metric that combines hand tremor and rigidity sub-scores, resulting in a more accurate assessment. Furthermore, a correlation analysis-based method estimating the severity of hand tremors by comparing the hand motion trajectory of each PD patient with those of healthy participants, was proposed. Future studies will incorporate this result into the simulation for personalized rehabilitation.

## **Dominic Babusci, Junior, Computer Science**

Mentor: Qiang Guan, Ph.D.

### GERD Health Accessor

The GERD Health Accessor seeks to allow healthcare professionals to access patients' GERD symptoms. Historically, healthcare has been inaccessible to many people. By allowing healthcare professionals to connect to patients easily, we hope to make healthcare much more accessible. Through the GERD Health Tracker mobile app, patients submit data about their GERD symptoms and sleeping and eating habits. This up-to-date data is then stored in a MySQL database, which healthcare professionals later access through the GERD Health Accessor. The GERD Health Accessor is a desktop/web application made with Tauri and React utilizing typescript. We hope to allow for a more effective and efficient GERD treatment by bridging the gap between patients and healthcare professionals.

**Ruoming Jin, Junior, Physics; Chih-Chia Su, Professor, Biology; Kai Li, Graduate Student, Computer Science; Chase Osborne, Junior, Physics**

Mentor: Ruoming Jin, Ph.D.

#### Protein Backbone Design and Sequencing Using Generative AI

Protein backbone design and sequencing posed difficult challenges in computation in the past, but with the emergent technology of generative AI and its rapid optimization in the field, we can investigate programs which utilize similar Generative methods for backbone design and compare them in combination with current Sequencing models such as ProteinMPNN to create software capable of generating diverse sets of fully sequenced proteins from scratch. By comparing the various deep learning methods utilized in these generative models, we can gain a comprehensive understanding of the efficacy and time efficiency of these models with respect to some target protein when working in combination with one backbone model alongside a sequencing model. With this, we hope to be able to bring more accessibility to protein design within the area of biological sciences with a front-end software utilizing these methods for the purpose of generating accurate backbone structures and sequences.

**Sydney McGlaughlin, Junior, Computer Science**

Mentor: A. Bathi Kasturiarachi, Ph.D.

#### Linear Programming: Optimizing Problem Solving

Linear Programming: Optimizing Problem Solving Linear programming (LP) is a powerful optimization technique that determines nonnegative values of  $n$  decision variables,  $x_j$ , which satisfy  $m$  linear constraints,  $\sum_{j=1}^n [a_{ij} x_j] \geq b_i ; i=1, 2, \dots, m$  and maximize a linear objective function,  $z = \sum_{j=1}^n [c_j x_j]$ , where the parameters  $a_{ij}$ ,  $b_j$ , and  $c_j$  are given constants. LP originated during World War II, and in 1947, George Dantzig introduced the simplex method: a simplified version of linear programming that maximizes a linear function of several variables subject to multiple constraints. We explore the history and importance of LP and validate the notion that the simplex method always provides the most optimal solution. We do this by solving two problems using mathematical modeling and programming Microsoft Excel to perform the simplex method.

**Eva Powlison, Senior, Computer Science**

Mentor: Qiang Guan, Ph.D.

#### Designing a Compiler Optimization Profile to Minimize Silent Data Corruption

Soft errors pose an increasingly large problem to high-performance computing applications. Soft errors can cause silent data corruption, leading to incorrect program results. Certain compiler optimizations can make a program more resilient to data corruption, while other optimizations can make a program less resilient. We used a machine learning model to construct an optimization profile which improves a program's resiliency.

**Alex Tregub, Senior, Applied Mathematics**

Mentor: Ruoming Jin, Ph.D.

**Analysis of Generalized Combinatorial Optimization**

Recently published literature has described a combinatorial optimization problem that can produce a generalized solution using reinforcement learning and graph embedding. In real-world applications, generalized solutions are very important, as they allow for the problem to be solved for multiple datasets. Our primary goal to improve these solutions is to determine whether or not the solutions are optimal and can be embedded on an oriented matroid. Future work could then be focused on improving the accuracy using our metric.

**Derron Ward, Senior, Computer Science**

Mentor: Jong-Hoon Kim, Ph.D.

**VR Dance with a Purpose**

This research focuses on developing affordable, accurate skeletal tracking methods to enhance natural movement in VR and telepresence applications. Collaborating with the MASH Dance House of Jerusalem, we conducted a virtual dance recital using HTC Vive trackers. However, Vive trackers are costly and bulky. To address these limitations, we propose a computer vision-based solution using MediaPipe. MediaPipe tracks the body's skeleton with two offset cameras, providing 3D movement tracking that is as accurate as Vive trackers, but more affordable and less intrusive. Our next step is developing an input driver for SteamVR to streamline compatibility with various applications, aiming to make VR and telepresence more accessible and immersive.

**Brent Warring, Junior, Computer Science**

Mentor: A. Bathi Kasturiarachi, Ph.D.

**Simulating Probability Experiments**

The purpose of this research project is to test the effectiveness in the use of computer simulation to approximate irrational numbers. The approximation technique used is the Buffon Needle Problem. It is defined as; if one were to take a sewing needle and drop it onto a floorboard filled floor, what are the chances of that needle landing on the lines between floorboards? Interestingly, the irrational number  $\pi$  shows up in the probability, so one can approximate  $\pi$  by hand. Using computer simulation, one can speed up and improve the approximation as many more "throws" can be completed in a shorter amount of time. The experiment can even be furthered to using parallel and nonparallel gridlines, and can even be used in the 3D space.

# English / Communication / Art / History

## **Mary Rose Bihler, Senior, Communication Studies**

Mentor: Jeanne Smith

### How does emotional labor present itself in writing consultants post-pandemic?

As higher education begins to recover from the COVID-19 pandemic, I have noticed a shift in writing center work and how it has looked for consultants with regards to emotional labor. After reviewing existing research, I found that most existing literature on emotional labor in writing centers focuses on faculty and administrators rather than students and does not factor in the pandemic. Through surveying current writing consultants nationwide, my goal is to discover how their perceptions of their work have changed. Based on my research in the field of higher education, I expect to find that consultant perceptions of writing center work have changed because consultants are impacted by the same pressures as faculty in addition to the pressures of being students.

## **Korren Cullom, Freshman, Political Science**

Mentor: Rekha Sharma, Ph.D.

### Feminist Analysis of Bernice Sandler's "Men and Women Getting Along: These Are the Times That Try Men's Souls"

Bernice Sandler's speech "Men and Women Getting Along: These Are the Times That Try Men's Souls" provides a historical-yet relevant-message about the consequences of peer harassment on college campuses. While the speech mainly focuses on the effects on women, Dr. Sandler acknowledges that this issue does not occur in a vacuum; instead, peer harassment creates lasting problems for all marginalized groups. By using the feminist method of rhetorical critique, I analyzed how Sandler effectively disrupted the narrative of patriarchal standards in future generations. Sandler's words are just as important now as they were 30 years ago. "Men and Women Getting Along" is a speech that continues to spread awareness about the dangers of peer harassment.

## **Hallie Gornall, Senior, Communication Studies**

Mentor: Rekha Sharma, Ph.D.

### The Discourse Design of Sojourner Truth: a Neo-Aristotelian Rhetorical Analysis

The passing of Black male suffrage following the Civil War came as a shock to many American women. They were still denied rights granted to recently freed former slaves. This ignited the first wave of the Women's Rights Movement. However, white activists harbored prejudices that left the movement weaker than if united. In this neo-Aristotelian rhetorical analysis, I uncover how former slave Sojourner Truth made her voice heard at the first meeting of the Equal Rights Association in 1867 and a time in U.S. history that had no space for Black women. Her communicative strategies in this address and context can serve as a guide for other speakers striving to progress in societies that wish to silence them.

**Lauren Hadley, Senior, Communication Studies**

Mentor: Cristin Compton, Ph.D.

**Exploratory Study of the Perception of Internal Messages for Kent State Basketball Members**

This study explores internal messages among Kent State Basketball team members, focusing on challenges, support systems, and inclusivity, especially for Black players. Interviews delved into experiences as Division I players, highlighting racial challenges and support received. Participants emphasized the need for improved academic support and racial equity education for staff. Recommendations include enhanced diversity training and tailored resources. Findings underscore the importance of addressing racial disparities and fostering inclusivity. Insights offer valuable considerations for creating a supportive environment vital for the success of all players.

**Ogulkeyik Hudayberdiyeva, Junior, Communication Studies**

Mentor: Ikram Toumi, Ph.D.

**Enhancing Intercultural Competency in U.S. College Classrooms**

This study explores effective strategies for integrating intercultural competence into U.S. college classrooms. Through a literature review, four key strategies emerge: diversifying curriculum, organizing panel discussions and guest speakers, conducting workshops, and fostering collaborations with international students. These approaches aim to increase cultural awareness and communication skills among students. This research highlights the importance of creating inclusive educational environments in a globalized world.

**Meredith Kovitch, Senior, Art History**

Mentor: Joseph Underwood, Ph.D.

**Uncovering the Untold: Nelson Sullivan the Queer Archivist and Artist**

LGBTQ+ archives work to dismantle heteronormative histories that have been perpetuated by those in control of archival spaces. Videographer Nelson Sullivan has contributed to preserving queer history through videos of his daily life in 1980s New York City. Sullivan has contributed to the queer archive effect in collecting and curating pivotal moments in queer history. He is also comparable to artist and documentarian Nan Goldin, whose work falls in line with art historian Julia Kristeva's ideologies. In examining three videos made available on YouTube through the channel 5ninthavenueproject, Sullivan's role as a queer storyteller in control of queer narratives is made clear. Sullivan's work functions as documentary representation of queer identity in 1980s New York City, while also displaying artistic merit in his creative filming.

## **Courtney McCombs, Junior, Psychology**

Mentor: Bonnie Shaker, Ph.D.

### Reviewing The Awakening

KateChopin.org, the official website of the Kate Chopin International Society of scholars, shares the consensus that Chopin's 1899 novel *The Awakening* was "widely condemned" by contemporaneous reviewers in Victorian America for its expressions of a privileged white woman's marital dissatisfaction, extramarital affairs, and possible suicide. This "condemnation" is often used to forward the myth that Chopin stopped writing up to her death in 1904—despite well-documented evidence to the contrary. A comprehensive methodological survey of known and newly recovered contemporaneous reviews of Chopin's fin de siècle novel, retrieved and hand-transcribed from archival periodical databases, paints a different picture of *The Awakening*'s critical reception. Results suggest secondary scholars have erroneously ascribed to Chopin the very portrayal her fiction sought to debunk: that of the histrionic woman.

## **Megan Porter, Senior, Visual Communication Design**

Mentor: Jessica Barness, M.A., M.F.A

### The Stories That Define Us: Journeys and Lives Between LGBTQ+ Generations

Under the mentorship of Jessica Barness, I worked to develop an interactive prototype for a website sharing stories between generations within the LGBTQ+ community. This came after finding a gap in intergenerational storytelling within this community due to the decades of oppression and hatred they have been shown. The website aims to shine a light on these stories and create a safe space to share and learn. The prototype was created using stories already shared and stories collected through interviews. The design was inspired by the pink triangle synonymous with the LGBTQ+ community, and the stories were written and illustrated to feel like a children's storybook, balancing out the more intense topics and keeping the platform inviting and accessible.

## **Alyssa Williams, Junior, Anthropology**

Mentor: Shana Reisig, Ph.D.

### Research in Abortion: 1840-1920

Motherhood has always been a controversial topic, especially in relation to abortion. A thorough investigation through historical documents spanning from 1840 to 1920 was conducted. By searching in the AAS database, terms such as "syrup", "serum", "female wash", and "female remedy" were located in primary sources and those sources were added into a catalog. This catalog was then used as a collection of resources for a currently unreleased book by Professor Shana Reisig.



# Exercise Science

## **Katie Byers, Junior, Exercise Science**

Mentor: Meghan Magee, Ph.D.

### Player Load May Be Dependent On Rest Days In Women Soccer Athletes

15 NCAA Division I (DI) women's soccer athletes were included in this study (4 forwards, 4 defenders, and 7 midfielders). The athletes wore Polar TeamPro monitors which use an algorithm to calculate the player load, which is an arbitrary unit (au). Player load was averaged for all games with 3-days rest and all games with 4-days rest. Paired sample t-tests were used to evaluate the differences and the significance was set to  $p < 0.05$ , Cohen's d was also used to assess the magnitude of the difference. The results showed that the player load for 3-days rest ( $169.6 \pm 72.6$ ) and the player load for 4+-days rest ( $181.3 \pm 69.0$ ), which indicates there is a significant difference ( $p = 0.011$ ) where the player load was greater on 4-days rest versus 3-days rest.

## **Brianna Czoper, Senior, Nutrition; Minjee Howell, Sophomore, Journalism**

Mentor: Amy Miracle, Ph.D.

### Does Low Energy Availability Predict Injury Risk in collegiate-level athletes?

The purpose of this study is to assess both female and male NCAA Division I student-athletes and their energy availability and injury risk status to determine if energy availability can serve as a predictor of injury risk. The athletes that will be participating in this research study will be on their off-season preparing for their upcoming season. In order to determine their energy availability (EA), we will measure their body composition, energy intake, and energy expenditure. This is important to research because there is an increasing number of athletes that are overtrained and under-fueled. This can be beneficial to athletes at the collegiate level because it can improve athletics.

## **Clarice Farley, Senior, Biology**

Mentor: Angela Ridgel, Ph.D.

### The relationship between heart rate and changes in motor function in those with Parkinson's disease.

Regular exercise is associated with improved motor function. For people with neurodegenerative disorders like Parkinson's disease, exercise can improve motor symptoms such as tremor, bradykinesia, and rigidity. It is not clear how exercise intensity affects these improvements. The goal of this project was to investigate the relationship between average heart rate during a cycling-based intervention and changes in motor function. Each participant with Parkinson's disease participated in twelve dynamic bicycling sessions. Heart rate was recorded during all exercise bouts and motor function was assessed before and after each session. Results showed that those who had lower average heart rates during the exercise sessions showed a greater improvement in motor function. The results suggest that exercise intensity was not directly responsible for motor symptom improvements.

### **Connor Franks, Senior, Exercise Science**

Mentor: Meghan Magee, Ph.D.

#### Sprinting Variables in Home vs Away Games in Collegiate Women's Soccer

Data was collected from 16 NCAA DI women's soccer athletes (5 forwards, 4 defenders, and 7 midfielders) using Polar TeamPro GPS monitoring, which collected data on acceleration, distance traveled, and time spent sprinting. A paired sample t-test was used in evaluation for any differences in average home (8 games) and away game (10 games) average sprinting variables. Cohen's d effect sizes were used to evaluate the magnitude of differences found in the evaluation. Alpha was set to  $p < 0.05$ . While NCAA DI women's soccer players did not show any significant change in sprint distance and time, the number of sprints by players appears to be greater when playing on their home field versus an opponent's.

### **Elise Gambol, Senior, Exercise Science**

Mentor: Meghan Magee, Ph.D.

#### Training Loads in Home vs Away Games in Women's Soccer Athletes

15 National Collegiate Athletic Association (NCAA) Division I women's soccer athletes (forwards:  $n=4$ ; defenders:  $n=4$ ; midfielders:  $n=7$ ) were included in this study. Athletes wore Polar TeamPro monitors, which uses an algorithm to calculate player load as an arbitrary unit. Player load was then averaged for each game and separated into home ( $n=8$ ) versus away games ( $n=10$ ). A one-way analysis of variance was used to evaluate for any differences in training load in home vs. away games. The significance was set to  $p < 0.05$ . There are no differences in training loads experienced in home versus away games by this cohort of NCAA DI women soccer athletes.

# Fashion Design and Merchandising

## **Henry Becker, Senior, Fashion Design**

Mentor: Linda Ohrn-McDaniel, M.F.A.; Krissi Riewe, M.F.A

### Semper Paratus, Garments Created for the Modern World

Semper Paratus redefines tech and utility wear by prioritizing robust, naturally woven materials, challenging the conventional use of advanced polyester currently dominating the technical garment industry. Positioned at the intersection of gorpcore and quiet luxury, Semper Paratus seamlessly blends functionality, ergonomics, and human usability with precise craft, quality materials, and refined design. Prioritizing heavy, classic materials in a neutral but sophisticated color story, the collection is presented as a comparatively mature and timeless option within the world of advanced technical garments and materials. Embodying a delicate balance of practicality and sophistication, Semper Paratus harmoniously merges elements of workwear, tailoring, and techwear, creating a versatile and refined collection suitable for diverse settings.

## **Frances Brunner, Senior, Fashion Design**

Mentor: Archana Mehta, M.A.

### It's All Fluff - Sustainable Textile Development

I explore how the ego is expressed in fashion and how we can rewrite the exploitative narrative through sustainable textile development made from reprocessed jeans. The ego, fueled by the exploitation of workers and the planet's natural resources, is the constant influence that drives our decisions, responses, and creations. Understanding this ego, we build a more sustainable industry fueled by the holistic wellness of people and the planet. "Deniim" was developed by needle-felting denim shoddy (reprocessed denim fibers) to second-hand patchworked denim. This innovative, sustainable material adds aesthetic value and aids in noise-pollution reduction and thermal retention. By incorporating "Deniim" with sustainable production techniques like zero-waste patterns, upcycling, and reconstruction, I created a 4-look collection, showcased at the 2023 Redress Design Awards in Hong Kong.

## **Allison Connet, Sophomore, Fashion Design**

Mentor: Linda Ohrn-McDaniel, M.F.A.

### Knitting Beyond the Body

When thinking about knitting, the general presumption includes fashion and garments, not outside industries such as healthcare or interior design. However, unbeknownst to the public, developments within modern textile technology have allowed digital knitting to transcend beyond the traditional because of the basic structural foundations from which knitting is created.

## **Amaya Franklin, Senior, Fashion Design**

Mentor: Krissi Riewe, M.F.A; Linda Ohrn-McDaniel, M.F.A.

### Coko

Coko focuses on utilizing clothing to allow Black women to reclaim power over their bodies and heal from generational trauma that stems from systemic oppression. Historically, Black women have had to take power for themselves, usually through acts of “rebellion.” My collection uses the influence of 90s and 2000s Black culture, such as acrylic nails and bamboo earrings that at one time were deemed tasteless and unkempt by white society. These two serve as the basis of the collection, being used as print and silhouette inspiration. In addition, bright colors and cut-out shapes are used to create garments that go against traditional women’s clothing standards. The final collection serves as a love letter to Black women and their resilience and ability to conquer anything.

## **Aditi Ganti, Junior, Fashion Design**

Mentor: Krissi Riewe, M.F.A

### Knitted Sari

This research experiments with fully fashioned knitting as a medium to create a sari blouse, which is an Indian garment that is traditionally made of woven fabric. By using digital knitting machines, the garment is able to be made to size with very minimal waste. Additionally, the research seeks to create a garment that fits the contours of a woman's body through the use of a knitting technique called goring that helps to create shaping. The research was not able to successfully use goring due to the use of other techniques and stitches that caused the programming of the garment to become complex. Despite this issue, a garment was successfully produced without the use of goring.

## **Shanleigh Govender, Senior, Fashion Design**

Mentor: Linda Ohrn-McDaniel, M.F.A.; Krissi Riewe, M.F.A

### International thief thief

The evolution of fashion and clothing in Africa has been very indicative of the continent's activity at a specific time. Taking a drastic change at the arrival of Western powers, a shift can be seen due to new trade and the introduction of new materials. Print has always been at the forefront, becoming a tool of storytelling as well as cultural preservation. International Thief Thief is a collection aimed at understanding what fashion on the African continent would look like without the acts of colonization. This is explored with the use of traditional African print and silhouette, with African cultural needs at the forefront of the collection. Leaning on ancestral ways of utilizing print to communicate daily challenges and new technologies as.

### **Elie Michael Jammal, Senior, Fashion Design**

Mentor: Krissi Riewe, M.F.A; Linda Ohrn-McDaniel, M.F.A.

#### Ard

This collection is reminiscent of a tree that grows and grows, until one day it's in your lawn and you're wondering how it got to be so big. This tree provides comfort and warmth, and I aimed to convey the feeling found in its textures in our garments and accessories. I also aimed to combine natural resources with technological advances to manipulate fabric. What resulted was an agglomeration of rugged denim, warm fibers, and graphic prints that put you in the front of your yard. I drew inspiration from classic utilitarian silhouettes and details and elevated them with a handcrafted touch. Through this, I was able to create inviting pieces that, when worn, feel like a hug from the earth.

### **Tamara Maroño Garza, Senior, Fashion Design**

Mentor: Linda Ohrn-McDaniel, M.F.A.

#### What If

My focus for this thesis is the body, the garment, and the deepening relationship between the two. I like to observe how a person walks, breathes, bends, etc., and through those movements, the power clothing has over the body shows. Therefore, my thesis question is: By imposing a transformative experience onto the body through garment design, will a deeper relationship between clothing and body arise? This collection challenges the body's movement. Because when the body is met with certain challenges there is usually an internal dialogue that begins with the wearer questioning if that is where they should place their arms, or if that is the right direction of a garment, I wanted to magnify that experience and create garments that enable that internal dialogue.

### **Nadia Modjrian, Junior, Fashion Design**

Mentor: J.R. Campbell, M.F.A.

#### Translating Traditional Persian Cultural Motifs into Contemporary Textile Product Designs Using Digital Textile Technologies

This research project explores merging ancient Persian motifs with modern digital textile techniques to amplify the voices of marginalized groups in Iran's "Zan, Zendegi, Azadi" movement. Originating from Mahsa Amini's tragic death challenging hijab norms, the movement advocates women's rights. Inspired by Persian pottery, textiles, and calligraphy, motifs are reimagined with contemporary relevance, employing design elements like repetition and scale to help the artist to build their visual vocabulary. This collection aims to preserve cultural motifs and to bring them into modern design techniques, serving both wearable fashion and textile art purposes.

## **Keeley Oleksy, Freshman, Fashion Merchandising**

Mentor: Jeanne Smith

### The Impact of Verification of Instagram's Fashion Micro-influencer Engagement

Fashion brands utilizing an online platform have turned to micro-influencers to promote their products on social media. The trust transfer theory explains the processes of influencers gaining the trust of their following to promote brands' products. These processes include being verified by a social media platform to confirm the authenticity, or having a low amount of followers, which helps the influencer build a strong relationship with their followers. Based on this, does the verification of a fashion micro-influencer impact their account engagement and promotion of products? Based on the research I have conducted, the trust transfer theory does play a part in promoting products, but there are also other factors involved that ultimately influence willingness to purchase a product.

## **Lizzy Truitt, Senior, Fashion Design**

Mentor: Krissi Riewe, M.F.A

### "The Art of Making Do"

The Art of Making Do explores the history and beauty of fashion & craftsmanship within the South and the dichotomy between the relationship of the two. The seven-look collection takes inspiration from techniques of quilting, smocking, and crocheting passed down through family and applied to show the luxury and richness of southern craftsmanship. Simple silhouettes allow room to focus on mentioned techniques while elevating certain classic workwear silhouettes. All seven looks are cotton fabrics to represent the luxury of southern cotton and the role of the South within the industry. Through craftsmanship, silhouette, and fabric, the collection shows the beauty, creativity, and history of the South while commanding its own space within the fashion industry.

## **India Williams, Senior, Fashion Design**

Mentor: Krissi Riewe, M.F.A

### Identifying Afro-Surrealism Through Black American Identity

Double Conscious is a fashion collection that explores the concept of dual identity in Black Americans through an Afro-surrealist lens. In a country that is dominated by Eurocentric traditions and values, African Americans may feel a lack of connectedness to America while enduring a similar feeling to their heritage in Africa due to displacement during the Transatlantic Slave Trade. This creates a dual personhood; having one side assimilate to a culture it was born in while trying to stay connected to its own heritage, creating psychological effects still today. This collection articulates these ideas through use of color, motifs inspired by traditional African and Afro-surrealist art, and contrasting textures in fabric. These opposing elements are used to further illustrate the concept of "double consciousness", a term coined by W.E.B Dubois, or a battle between conflicting forces experienced within the psyche of African Americans.

# Physics

**Tuqa Al Hajri, Senior, Physics; Jenan Alfahaid, Graduate Student, Physics**

Mentor: Hamza Balci, Ph.D.

Using Photocleavable Biotin to Improve Sample Chamber Reusability in Single Molecule Fluorescence Microscopy

The widely used biotin-avidin linker in molecular biology experiments often leads to irreversible binding, limiting sample chamber reusability. To address this, we explored Photocleavable Biotin (PC-biotin), which dissociates from avidin under ultraviolet (UV) light exposure. Breaking the avidin-biotin bond releases DNA or protein molecules, resetting the surface for new samples. Our primary goal is to enhance biophysical study consistency by reusing slides, simultaneously reducing time and cost. Utilizing DNA samples tagged with PC-biotin and Cy5 fluorophores, we exposed the sample to UV light, finding that Cy5 molecules reduced to background levels within 10-15 minutes. This is important as it would enable using the same surface for 5-6 different conditions on the same surface, contributing to improved experimental efficiency and reliability in biophysical studies.

**Samuel Batholomew, Senior, Physics**

Mentor: Robert Polak, Ph.D.

Probabilities of Two Dimensional Order Parameters in Small Randomized Data Sets

The order parameter can be used to describe how well rod-like objects line up with one another. Recently, it has been used to study the response of crustacea to external stimuli, where it has been observed that the samples will orient themselves perpendicular to an external electric field. This response has been measured in advance of noticeable behavioral response. To understand the statistical significance of the data, we have simulated data sets of various sizes with random direction and calculated order parameter and director angles. We present the results here.

**Anna Brosch, Sophomore, Biology; Ethan Wenk, Senior, Applied Engineering**

Mentor: Robert Polak, Ph.D.

Investigative Developments for Electric Field Barriers on Aquatic Invasive Species

With the development of canals and new man-made waterway systems, issues with invasive species have come into question. To counteract the spread of invasive species, the implementation of electric barriers has been put into speculation with increased research being conducted. Our goal is to examine the effects of the barrier at different strengths on different aquatic species. A total of ten samples were analyzed from nine species, four of which were analyzed with order parameters. The experiment was conducted with a makeshift electric barrier that replicates conditions of one in the Chicago Area Waterway System. We will be analyzing the collected data on order parameters throughout the semester.

### **Connor Brown, Senior, Physics**

Mentor: Veronica Dexheimer, Ph.D.

#### Investigating Phase Changes of Dense Matter

We investigate how the equations of state for neutron stars change as we manually change certain thermodynamic variables and their derivatives.

### **Paul Fleischer, Senior, Physics**

Mentor: Antal Jakli, Ph.D.; Mahesha Jeewanthi, T.A.

#### Liquid Crystal Elastomer Swelling

Liquid crystal elastomer swelling was the subject of study for this project, with the eventual goal to use this method in 3D printing. An elastomer was created, and the effects of its 3D swelling were documented. A liquid crystal called 5CB was pipetted onto a sample of the elastomer to initiate its swelling. The volume of the swelling under different volumes of 5CB was measured. Preliminary results are presented, but the general trend is that elastomer swelling tends to swell to the same volume as the 5CB placed on top of it. It swells up into a spherical shape that matches the shape of the droplet of 5CB.

### **Delonte Goodman, Senior, Mechatronics Engineering**

Mentor: Antal Jakli, Ph.D.

#### PID Heating Stage

Dielectric measurements are applicable in many fields, such as material science, biological research, and circuit design. In these applications, characteristics such as permittivity and impedance are used to derive the dielectric measurements of liquid crystals. To obtain this, liquid crystals require heating to be applied to the samples as an electric field is generated. To apply heat to the liquid samples, a heating stage using Proportional, Integral, Derivative (PID) control will be developed. The controller for the heating stage will be an Arduino, which will regulate the heat applied to the liquid crystal samples. While obtaining the dielectric measurements for the liquid crystal sample, the device will apply the required heat using the desired temperature. The heating stage project incorporates several parts, such as the fabrication of the device, hardware, and software used in the device. Overall, the project will allow for more adaptive configurations when obtaining the dielectric measurements of liquid crystal samples.



### **Ethan Grundy, Senior, Physics**

Mentor: Veronica Dexheimer, Ph.D.

#### Phase transitions in neutron star mergers

Last summer, Connor and I worked under Dr. Veronica Dexheimer on finding the phase transition for dissociated quark matter by modeling neutron star mergers using a python code in jupyter notebook. My job was to run the code while deciding where to start the percolation, where to end the percolation, and inputting a second derivative for the beginning and the end of the percolation. My goal with changing these variables was to focus on the speed of sound vs energy graph and finding inputs that made a good graph without breaking physics, such as the speed of sound going over the speed of light.

### **Kylie Merkel, Senior, Physics**

Mentor: Hamza Balci, Ph.D.

#### The Use of Lithium Hydroxide to Break Hydrogen Bonds in DNA

The research I conducted was on the use of lithium hydroxide to break the hydrogen bond that holds DNA together. When we image DNA, it is done by fixing it on a slide using only one strand, known as the short strand. We attempted to remove the strand which is not attached to the surface, known as the long strand, by introducing lithium hydroxide, breaking the hydrogen bond. On the slides, we used a coating on the surface called PEG. This coating is very delicate and is susceptible to damage from the lithium hydroxide. I was tasked with finding a concentration and the time in which the solution can be kept on the slide without causing damage while still efficiently removing the long strand.

### **Marceline Thornton, Senior, Physics**

Mentor: Marianne Prévôt, Ph.D.; Torsten Hegmann, Ph.D.

#### Emissive nanoclusters in B4 helical nanofilaments

The purpose of this study is to maximize circularly polarized luminescence (CPL) utilizing chiral templating that manipulates the helical nature of bent core liquid crystals (BCLC) concentrated with a high quantum-yield dye (clustomesogen - NC). Using a chiral template and the achiral phosphorescent Clustomesogen allows chirality transfer, and the resulting complex induces circular polarization without aggregation-caused quenching events. This enables Clustomesogen integration at very high concentrations. Using this new, all-inclusive model in lab, we design a polarized light source controlled through the helical-type morphology of the template, giving access to a highly tunable CPL emitter displaying an excellent dissymmetry factor (  $g_{\text{CPL}}$  ). This system can aid in many optical processes or thermal-rate indicators.

# Political Science / Philosophy / Geology / Geography / Business

## **Alexandra Bathrick, Senior, History**

Mentor: Matthew Crawford, Ph.D.; Lindsay Starkey, Ph.D.

### The Subjectivity of Normality: Understanding How “Normality” Impacted Early Twentieth-Century American Psychiatry

Early twentieth-century American psychiatry experienced a drastic shift in focus from solely studying abnormality to seeking to better understand normality. This paper gives a definition of normality within early twentieth-century American psychiatry based on historical context collected mostly from the works of Adolf Meyer. The author goes on to prove that the provided definition of normality is essential in understanding early twentieth-century American psychiatry's struggle for social authority and legitimacy as a medical science because the concept of normality was used by early twentieth-century American psychiatrists to spread their authority and to prove that psychiatry belonged among the medical sciences. This paper also stresses the subjectivity of the concept of normality and how it may be taken for granted among historians and the general public.

## **Maggie Cook, Sophomore, Human Resource Management**

Mentor: Mark Whitmore, Ph.D.

### Underrepresentation of women in high tech

The underrepresentation of women in high tech is a persistent issue. Despite advancements in gender equality, women continue to be disproportionately underrepresented in technology-related fields, hindering diversity, innovation, and societal progress. This abstract explores the various factors contributing to this disparity, including gender stereotypes, biased recruitment practices, and a lack of supportive work environments. It highlights the importance of addressing these challenges through proactive measures such as mentorship programs, targeted educational initiatives, and corporate policies promoting inclusivity. Bridging the gender gap in high-tech industries is not only a matter of social justice; it is crucial for fostering a dynamic and inclusive workforce capable of tackling the complex challenges of the technological era.

**Jillian Findling, Sophomore, Geology**

Mentor: Carrie Schweitzer, Ph.D.

**Decapod Population Paleobiology and Paleoecology of the Late Mississippi Embayment, USA**

A diverse assemblage of decapod crustaceans from a well-known Blue Springs Locality of the Mississippi yields a detailed picture of ancient decapod ecology. Bishop (1983) originally described ten decapod species based on about 1300 specimens; Kornecki updated the decapod fauna in 2017. We examined nearly 1500 specimens of decapod crustacean fossils collected over four days. Several hundred specimens originally identified as species of *Tetracarcinus*, *Dakotacancer*, and *Seorsus* have later been shown to be the same species through documenting growth stages, sexual builds, and individual species variation in the front and back of the carapace. The development of carapace regions is evident in smaller versus larger specimens. It is possible that juvenile and adult *Tetracarcinus*, as well as other decapods, exhibited habitual-based evolution.

**Jordan Gallegos, Senior, History**

Mentor: Matthew Crawford, Ph.D.

**Chaos within the clergy**

In the late eighteenth century, Joseph Torpas published an article in the Peruvian periodical *Mercurio Peruano* discussing a recent case of a woman who transformed into a man. Peru's archbishop asked surgeon Joseph Torpas de Gamrila about the surgical transition process and its morality. There are case studies of clergy transitioning. Torpas de Gamrila cites Greek and Roman authors and analyzes case studies from the 17-18th century in the article. There are descriptions of genitalia and how it is altered for 'ellos que cambió el sexo'. This medical article targets surgeons who may be preparing to complete similar operations. The phenomenon of transgenderism was common well before the modern era. Joseph Torpas de Gamrila's article and the case studies show what we can learn about the history of transgenderism, especially in the early modern Iberian world.

**Christian Heller, Junior, Peace and Conflict Studies**

Mentor: Sara Koopman, Ph.D.

**Mapping May 4: A Practical Application of Archival Research**

The Mapping May 4 Project breathes life into history by transforming Kent State Library's oral histories into an interactive website with several walking tours. This digital map guides visitors through Kent State University and its surroundings, where voices from the past echo in the very places they unfolded. My research led to the development of an immersive experience, which now allows people to connect with the personal narratives of students, faculty, and guardsmen from across the dorms of Kent State during May 1-4, 1970. Come see a visual guide explaining the process behind the development of the tour and how and why each story was included.

**Alex Moir, Senior, Psychology**

Mentor: Lauren Vachon, M.F.A.

**Ohio's Rich LGBTQ+ History: Stories You Never Knew**

Archival research was conducted to uncover untold queer histories in the state of Ohio, using multiple museums as points of reference. Online museum archives such as Ohio History Connection and the Western Reserve Historical Society were scoured to find donated historical items with queer significance. Ohio History Connection as well as the Ohio Lesbian Archives were visited and the archivists were interviewed. This research uncovered the story of Georgia Hopley, prohibition agent and Suffragette in 1920s Bucyrus, Ohio, who likely had multiple romantic relationships with other women. Ohio had, and presently has, a very rich history of LGBTQ+ people, groups, and figures. There is much more to discover, and more work must be done to help tell the stories of Ohio's queer past.

# Psychology

**Carmen Barghouty, Senior, Psychology; Theresa Peters, Graduate Student, Psychology**

Mentor: William Merriman, Ph.D.

## The Effect of Word Pre-exposure on Children's Lexical Knowledge Judgments

The ability to judge one's knowledge improves during early childhood and may play a critical role in language acquisition. Our aim was to explore whether preschoolers would be prompted to use reliable, metacognitive heuristics if they were first exposed to words that contrasted in familiarity. Hartin et al. (2016) found such an effect from pre-exposing objects that contrasted in familiarity. Across two experiments, 2.5- to 4-year-old children were exposed to words that either contrasted in familiarity, were all familiar, were all non-word stimuli, or made semantic judgments about familiar words. Results of both experiments showed that there were few differences in accuracy of either word or object judgments across the various conditions. Preliminary results of a third experiment directly comparing word and object preexposure are discussed.

**Kaiya Caraboolad, Sophomore, Psychology; Izzy Niedermier, Sophomore, Psychology; Alexia Roush, Junior, Psychology; Megan Montoney, Junior, Psychology**

Mentor: Brittany Baugher; Karin Coifman, Ph.D.; John Gunstad, Ph.D.

## Protective Childhood Experiences (PCEs) and Coping in College Students

Protective childhood experiences (PCEs) produce healthy adjustment and positive outcomes later in life. PCEs measure protective experiences like emotional support and economic stability that occur in the first 18 years of life. The current study seeks to understand the influence PCEs have on college students' coping, affect, and substance use. This study includes 99 college students from Kent State University. Bivariate correlations revealed that PCEs are negatively associated with substance use and negative affect, and positively associated with physical activity. We plan to analyze daily changes in these variables measured via ecological momentary assessment. These preliminary findings indicate that PCEs have a significant relationship with affect, health, and substance use in the expected directions. Further research is needed to identify the daily benefits of PCEs.

**Joshua Daniel, Senior, Psychology**

Mentor: Angela Neal-Barnett, Ph.D.

**Why Are Suicide Rates Rising Among Young Black Males and Where Are the Interventions**

The rise in suicide rates among Black males is driven by factors like racial discrimination, socioeconomic challenges, and limited access to culturally-sensitive mental health care. These experiences can lead to feelings of isolation and despair. Addressing this issue requires an approach that includes providing mental health services that are both accessible and culturally aligned, fostering community support through mentorship and social programs, and increasing mental health awareness to reduce stigma. Additionally, advocating for policies that address economic and racial disparities is crucial. Together, these interventions can create a supportive environment that encourages mental wellness and resilience.

**Seema Dhaher, Senior, Psychology**

Mentor: Karin Coifman, Ph.D.; Benjamin Mitchell

**What Predicts Loneliness in first-year college students? Investigating personality and social factors**

College is an important developmental time for individuals to develop social skills and build social bonds that they take with them throughout their lives. Some, however, may develop feelings of loneliness, which has been shown to increase risk for illness such as cardiovascular diseases, dementia, and worsened immune function. Therefore, it is important to investigate risk factors for loneliness. We sought to specifically look at the relationship between a reward and threat sensitivity measure of personality on the Behavioral Inhibition and Activation Scale (BIS/BAS) and its relationship with loneliness, while also accounting for the size of the social network and the quality of the relationships of freshman college students.

**Logan Ernst, Senior, Psychology**

Mentor: Dana Miller-Cotto, Ph.D.; Josh Medrano, Ph.D.

**Whole Number Bias: Examining the effect of congruency in fraction comparisons**

Whole number bias (Ni & Zhou, 2005), seeing the components (i.e., the numerator and denominator) of a fraction as independent rather than as forming one number, is a common challenge in students' fraction learning (Braithwaite & Siegler, 2016). We examined third graders' (n = 63) performance on a fraction comparison task, which consisted of congruent trials where the fraction with the greater value also had the larger components, and incongruent trials where the greater fraction had the smaller components. Results showed that participants performed better on incongruent trials than on congruent trials. Results also showed that working memory did not moderate the effect of congruency. Final results will show whether effects exist for inhibitory control and cognitive flexibility. Data collection is ongoing.

**Hannah Fender, Senior, Psychology**

Mentor: Phillip Hamrick, Ph.D.

Associations between language and declarative memory abilities in early childhood: A meta-analysis

Although language learning is a matter of long-standing debate in the cognitive sciences, there is no definitive answer on what neurocognitive mechanisms actually facilitate language learning. The Declarative/Procedural model of language (Ullman, 2015) suggests that both the declarative and procedural memory systems are involved in language learning. In this present study, we conducted a meta-analysis to explore the relationship between declarative memory, which is measured by deferred imitation, and language abilities in young children. Through analyzing six studies with 14 total correlations, our results indicated that there is a significant correlation between declarative memory and language abilities in young children. These results are consistent with the Declarative/Procedural model of language, as they show that general declarative memory abilities underpin some aspects of language in children.

**Aimee Flores, Senior, Psychology**

Mentor: Cassandra Storlie, Ph.D., RN; Ahmet Abakay

What are the coping experiences of college students as it relates to the East Palestine train derailment?

The goal of this research project is examining the impacts of the East Palestine train derailment on college students and what strategies they employ to cope with the potential added stress and anxiety. Several Kent State University regional campus students are within the assessed evacuation area from East Palestine. Regional college campuses commonly serve nontraditional students and advocate for educational equity. Using a semi-structured interview format, the study will assess what changes have occurred since the train derailment, if any, and what strategies college students used to cope. We expect to find that college students who reside in the areas nearest to the disaster site will have significant changes to their daily routine and a shift in priorities after the train derailment.

**Chloe Graham, Sophomore, Fashion Merchandising**

Mentor: Lauren Vogel, M.A.

Mental Health Resources on Campus by Chloe Graham

In the summer of 2023, I participated in the SURE program. I researched alongside Dr. Lauren Vogel in the Honors College department. We worked together on making mental health resources more accessible for Kent State students. Over the summer, I toured the on-campus mental health facilities. I also designed informational brochures and coloring book pages to pass out to students. The CAPS center is staffed by licensed psychologists that provide mental health services. They offer psychological testing and diagnosing. They also offer counseling and therapy. The CARES center offers food pantries, housing resources, mental health help, and financial empowerment to students. SAS accommodations offer priority scheduling, extended time on tests, the option to live with an emotional support animal, and access to lecture visual aids.

### **Sasha Kenney, Sophomore, Psychology**

Mentor: Michelle Baldini, M.S.L.I.S.

#### Child Psychology and Literature; The Past Eighty-Five Years of Development Within the United States

Little research is found on the impacts of the development of Child Psychology in America and its influence on the development of American Children's Literature in content. As such, this project researched the previous eighty-five years of both Developmental Psychology and Children's Literature in the United States, asking whether or not the changing views of what a child should know and how they should be raised were depicted. Seventeen Caldecott winners and several Child Psychology sources were used. Following an analysis, links were found with the role of parents in the child's life and what a child should be able to know. Future studies should include a larger pool of sources on both fields, and more literature should be written on the History of Psychology.

### **Chase Lemek, Junior, Neuroscience**

Mentor: Douglas Delahanty, Ph.D.

#### The relationship between patient self-advocacy and clinical outcomes in patients with Chiari Malformation

Patients with chronic health conditions like Chiari Malformation (CM) often need to self-advocate. Minimal research has explored the relationship between patient self-advocacy and patient outcomes in CM. Participants completed the Patient Self Advocacy Scale (PSAS), Depression, Anxiety, and Stress Scale (DASS-21), and Brief Pain Inventory (BPI). Scores on the PSAS indicated a moderately high level of patient self-advocacy. The PSAS was not related to clinical outcomes. There were no differences in PSAS according to surgical status or whether a patient was on pain medication. Results suggest that participants in a clinical trial for CM have high levels of pre-existing patient self-advocacy. Further research is needed to understand how patients develop patient self-advocacy and how it contributes to the management of CM.

### **Caitlyn Lincoln, Senior, Psychology**

Mentor: William Lechner, Ph.D.

#### Examining the Relationship between Executive Function, Incentive Salience, and Negative Emotion on Moderating Alcohol Use.

Heavy drinking represents a significant public health concern. Many individuals who endorse motivation to change their drinking are interested in moderation rather than abstinence. Examining factors related to successful moderation may help identify treatment targets. The current study examined three core domains in addiction as they relate to successful alcohol moderation. Participants who experienced recent negative consequences of alcohol use were followed over 2 weeks and reported drinking goals prior to alcohol consumption as well as subsequent drinks consumed daily. Analyses revealed a significant relationship in the hypothesized direction between executive function and moderation success. Conversely, a significant relationship in the opposite direction hypothesized was observed for incentive salience. The finding that higher baseline incentive salience for alcohol predicted increased moderation success warrants further study.



**Kaitlyn May, Junior, Psychology; Jacob Brown, Graduate Student, Psychology; Keefe Maccarone, Graduate Student, Psychology**

Mentor: Yossef Ben-Porath, Ph.D.

The Examination of the Incremental Validity of the MMPI-3 CMP Scale in Predicting OCPD Over the PSY-5 Scales

Obsessive-compulsive personality disorder (OCPD) is marked by orderliness, perfectionism, and mental and interpersonal control, as well as impairment in interpersonal flexibility, openness, and efficiency (APA, 2023; Samuel et al., 2022). The MMPI-3 includes a new Compulsivity (CMP) scale, which is arguably the most relevant scale for measuring OCPD, even beyond the Personality Psychopathology Five (PSY-5; Harkness & McNulty, 1994) scales that are designed to measure personality pathology. The current study examined whether MMPI-3 CMP scores would yield incremental prediction over PSY-5 scales scores in the prediction of OCPD criteria using hierarchical regression. Our results showed incremental prediction of OCPD scores from CMP scores over the PSY-5 ( $\Delta R^2 = .18$ ), indicating the coverage of compulsivity on the MMPI-3 made the inventory better equipped for measuring OCPD.

**Cody Mitchell, Junior, Psychology**

Mentor: Rachael Blasiman, Ph.D.

The Impacts of Healthy Habits on Body Image

Healthy habits are choices we make in our life such as exercise and eating habits. These things can have a positive or negative impact on the way we view ourselves through our body image. The intentions of this research was to pull and analyze the relationships between all these factors. The results showed that people who were successful in losing weight or obtaining their body goals had a higher body image score. Those who developed negative eating habits had lower body image scores than those who did not. We also found that weightlifting was the only form of exercise significantly related to an increase in body image, and lastly, that age did not have a significant impact on the importance of body image.

**Lauren Parrish, Senior, Psychology**

Mentor: Dana Miller-Cotto, Ph.D.; Josh Medrano, Ph.D.

Whole Number Knowledge Correlates to Working Memory and Fraction Understanding

The aim of this study was to determine how basic cognitive skills such as working memory and relational reasoning relate to whole number and fraction knowledge. In recent studies, researchers have made efforts to look at how a foundational understanding of whole number and fraction magnitude can influence math achievement (Resnick et al., 2016; Schneider et al., 2018). Using a within-subjects design, third graders completed a battery of cognitive and mathematical tasks over three sessions. We found that whole number knowledge was correlated with fraction understanding and working memory, and that fraction understanding was correlated to working memory. The results of this study may influence research on the way working memory could possibly affect understanding fractions.

### **Alyssa Perez, Senior, Psychology**

Mentor: Judith Gere, Ph.D.

#### Analysis Of Possible Predictors Of Anxiety And Avoidance Attachment Style Change

There has been little research on the possibility of change in attachment patterns in adulthood. It is necessary to explore the possibility of attachment style change in adulthood because an individual's attachment style influences their ability to form close relationships with others in their life. Using a previously collected data set from 78 couples, I examined the possibility of attachment style change in adulthood through a romantic partner's use of short-term change strategies such as love, physical affection, pressure, and dominance across a 3-month period. Data analysis revealed no significant association between the use of short-term change predictors and attachment style change over 3 months. These findings indicate a need for further research on the subject of attachment style change in adulthood.

### **Bria Shackelford, Junior, Neuroscience**

Mentor: Angela Neal-Barnett, Ph.D.

#### Exploring The Relationship Between Racial Discrimination & Stress Levels

The PRADAA lab conducted a correlation study between racial discrimination and hair cortisol levels in Black college students. The study was conducted by participants taking a survey asking them about their experiences with racial discrimination. Participants then gave hair samples so that they could be used to measure cortisol levels. The results of the study showed that there was a positive correlation between participants racial experiences with employers and hair cortisol levels. The Black male participants were the only ones whose hair cortisol levels were related to racial experiences, even though they reported a lower level of stress. None of the Black female correlations were significant, but the female participants reported a higher amount of racist experiences and a higher amount of stress in general.

### **Heather Thrush, Senior, Psychology**

Mentor: Julie Evey, Ph.D.

#### Building Belonging: Loneliness Is So 2020

College students have more ways to connect than ever; however, with more than half reporting positive for loneliness (ACHA-NCHA, 2021), they feel alone and like they do not belong. A sense of belonging is an essential factor for success in college (Pedler et al., 2022). It can also guard against depression and anxiety (Gopalan et al., 2022). Four different groups of commuter college students participated in ProjectConnect, a belongingness program, in four different semesters. Comparing pretest and posttest scores of the UCLA Loneliness Scale (Russell, 1996) and the Sense of Belonging Scale-Revised (Hoffman et al., 2003), increases were found in belongingness, and decreases were reported in loneliness after participating in a six-week program.

### **Abigale Traska, Senior, Psychology**

Mentor: Yossef Ben-Porath, Ph.D.

#### Mapping Facets of Mania onto the MMPI-3

Mania is a pervasive transdiagnostic construct most commonly linked to Bipolar spectrum disorders (Kotov et al., 2017), which can lead to a number of maladaptive outcomes. For this reason, the ability to adequately assess mania, especially in a manner consistent with its multifaceted nature, is important. The Minnesota Multiphasic Personality Inventory-3 (MMPI-3; Ben-Porath & Tellegen, 2020) can be used to measure mania symptoms. Sellbom and Whitman (2023) identified the most mania-relevant MMPI-3 scales, which was supported empirically by Whitman and Sellbom (2023). The current study expanded upon this work in a college student sample using factor analytically derived mania-related criteria from rationally selected measures of psychopathology. Our results provide further support for the utility of the MMPI-3 in the assessment of mania.

### **Abigail Vild, Senior, Psychology; Maggie Willison, KSU graduate, Psychology**

Mentor: Christopher Was, Ph.D.

#### Students' Goals Are a Better Measure of Metacognition than predicted scores

Previous research has demonstrated that students are overconfident when predicting exam scores. Although intuitively asking students to predict their exam scores as a measure of knowledge monitoring accuracy makes sense, students tend to be overconfident. Several studies have attempted to increase student monitoring accuracy to increase self-regulated learning and performance. Unfortunately, previous attempts have been unsuccessful. Our study used a goal-setting approach to determine if students could more accurately predict performance. Undergraduates were administered 11 exams during the semester. Before each exam, students predicted their score, provided a satisfaction goal, and a pride goal. Predicted scores and pride goals were both higher than test scores. However, satisfaction goals were not significantly different from test scores. Satisfaction goals accurately reflect students' knowledge.

### **Maya Wargelin, Senior, Psychology**

Mentor: William Lechner, Ph.D.

#### Effects of Working Memory Training on Cigarette Usage and Withdrawal Effects

Research suggests that working memory performance (WM) is a key factor in substance use progression. We hypothesized that individuals who demonstrate improved WM over time would show a reduction in smoking. Participants who indicated at least moderate cigarette dependence completed interventions to increase WM. Linear regressions were conducted to examine the effect of change in WM on change in cigarettes per day (CPD) over a 1-month period. The relationship between change in WM and CPD was significant, but in the opposite direction of hypotheses. When variables representing cigarette withdrawal were added, the relationship between WM and CPD was no longer significant. Thus, analysis revealed that the relationship between WM and CPD may have indicated withdrawal rather than increases in control over use.

**Samantha Wehr, Senior, Psychology**

Mentor: Rachael Blasiman, Ph.D.

**Examination of Death Anxiety and Religiosity, and Irreligiosity, and Spirituality**

Three hypotheses were observed between death anxiety and religion, nonreligion, and spirituality: 1) Those who have a high religious commitment to their religion feel more comfortable with death than those who have no religion/obligation to religion, 2) individuals with a clear idea of the afterlife are more comfortable than those who do not have a clear idea, 3) those who believe in a religion correlate with feelings of fulfillment in themselves and life. Hypotheses one and three were proven to be significant, whereas hypothesis two was not significant, but a trend was found between strength in belief of afterlife and death anxiety.

**Cameron Wittschen, Senior, Psychology; Abigail Vild, Senior, Psychology**

Mentor: Christopher Was, Ph.D.

**Do Higher Attention Requirements Impact Success in Implicit Learning Tasks?**

We built upon prior research demonstrating implicit learning during concurrent explicit learning tasks. Participants watched a video lecture while completing a serial reaction time task. Results indicate participants were able to learn the reaction sequence while attending to the video, suggesting implicit learning occurs in the context of explicit tasks.

**Anthony Zahtilla, Senior, Sociology**

Mentor: Mary Himmelstein, Ph.D.; Karen Wetzel, Ph.D.; Chelsea Monheim

**Perceptions of masculinity and attractiveness among sexual minority men**

No research has yet examined how gay men stereotype other gay men due to their weight and muscularity. This study aims to identify the unique contribution of stereotyping due to perceived weight and muscularity on perceived attractiveness and masculinity of a target among gay men. Self-identified gay men (N = 239) completed an online survey where they viewed various profiles and rated the target on a host of masculinity and weight-related stereotypes as well as attractiveness. Using linear regressions, I found that greater perceived muscularity was associated with lower perceived attractiveness and adherence to masculine norms, while perceived weight only predicted lower perceived attractiveness. These results suggest that muscularity, in particular, may affect perceived adherence to masculine ideals in the eyes of other gay men.

# Social Science / Education / Public Health / Nursing

## **Samantha Allan, Junior, Speech Pathology and Audiology**

Mentor: Lisa Audet, Ph.D.

### Examining the Perceptions and Challenges of Underrepresented Students in Speech-Language Pathology and Audiology: A Qualitative Study

The fields of Speech-Language Pathology and Audiology do not reflect the cultural diversity of the general population, nor do they represent the patient population. To date, research has excluded the voices of underrepresented students pursuing these fields. This research aimed to obtain the perspectives of underrepresented KSU students pursuing these degrees. Results revealed specific motivations and challenges students encounter specific to access and belonging. Further exploration on addressing and integrating ideas related to the motivations and challenges could support greater diversity and cultural competence in the SPA programs and the profession.

## **Melissa Bearer, Senior, Public Health**

Mentor: Ashley Nickels, Ph.D.

### Clearing the Air: Challenges to Air Quality Management for Vulnerable Communities

Air pollution disproportionately affects minoritized populations. However, due to the complex nature of air pollution management, it is especially difficult to keep under control. For this research, I examined what is currently hindering progress in air pollution management, as well as where siloing—or the separation between fields—exists in current air pollution management and how this has evolved over time. After analyzing historical newspaper articles from Northeast Ohio between the years 1870-2020 and conducting interviews with air pollution experts in the fields of environmental justice, environmental policy, and public health, I propose strategies for improved communication between air pollution experts, community members, and industries to more effectively manage air pollution.

## **Mikayla Bell, Junior, Integrated Mathematics**

Mentor: Andrew Wiley, Ph.D.

### Exploring Teacher Perspectives on High-Leverage Practices

I first learned about the high-leverage practices in Inclusive Practices. I wanted to learn more about high-leverage practices and teacher preparation regarding the practices. How do teachers feel about high-leverage practices? I realized through literature that there is a gap between research and practice. How might schools decrease the gap and help preservice teachers feel more confident using high-leverage practices?

**Marissa Cobb, Sophomore, History; Carli Margolis, Freshman, Early Childhood Education; Ethan Palmer, Freshman, Aeronautics; Elena Malolepszy, Freshman, Entrepreneurship; Gavin Papineau, Freshman, Business Management; Isabelle Gibson, Freshman, Early Childhood Education; Avery Lugo, Freshman, Art Education**

Mentor: Emma Van Winkle

Kent Care Portal: Scheduling for Psychological Services

Kent Care Portal: Scheduling for Psychological Services is a project surrounding the idea of reframing the website and designing an online calendar to schedule appointments for the Counseling and Psychological Services, or CAPS. As of now, 49 students through our surveys and personal conversations have expressed their dissatisfaction with the CAPS scheduling service and website overview. Some of the data from our survey shows that 25% of students interviewed would “Always” use CAPS if scheduling was available through an online calendar. Our goal for this project is to provide students with an easier way to receive the help they need, and to make the services and their prices clear before the student steps foot in the building.

**Mallory Cunion, Freshman, Nursing; Anna Graves, Freshman, Human Resource Management; Bennett Thyren, Freshman, Fashion Design; Jaelin Apple, Freshman, Aeronautical Systems Engineering Technology; Toby Gbloguidi, Freshman, Architectural Studies; Ry Bennett, Freshman, Fashion Design**

Mentor: Denmarie Fairbanks

The Better Bathroom: Ensuring Safety & Accountability

The Better Bathroom aims to ensure safety, keeping privacy and eliminating anonymity to promote safer and cleaner community restrooms at Kent State. As students, we have experienced the unsanitary conditions and lack of safety in bathrooms. In 2022 alone there were 24 sexual misconduct incidents reported in Kent State residence halls. There is no emergency alert system for incidents such as falls or sexual misconduct. After surveying students, over 80% wish there was a system of accountability, or that improvements to restrooms would be made. The results show students are unsatisfied with the conditions in bathrooms. We created a 5–10-year plan for solutions to establish accountability in the restrooms. Our goal is to ensure safety within our community restrooms at Kent State.

**Ren Davis, Senior, Sociology**

Mentor: Tiffany Taylor, Ph.D.

**LGBTQ+ Curricula and Discourse Bans Across the U.S.**

Despite the Lesbian, Gay, Bisexual, Transgender, and Queer (LGBTQ) erasure and absence of LGBTQ content in United States public schools, the movement to ban LGBTQ curricula and discourse is growing. This study will discuss three different forms of LGBTQ erasure: the lack of queer curricula and discourse in schools, the banning of queer books from schools, and anti-LGBTQ bans affecting schools. This study's goal is to examine the question: Why is there such a large movement to ban LGBTQ curricula and discourse in U.S. public schools? This study will provide insight into what is fueling this movement and its possible effects on U.S. students. This study hopes to provide suggestions on combating the anti-LGBTQ movement and LGBTQ erasure in U.S. education.

**Olivia Eader, Senior, Environmental Studies; Kalyn Reichling, Senior, Environmental and Conservation Biology**

Mentor: Aimee Ward, Ph.D.

**Creativity and Place: The Impact of Environmental Setting on Imaginative Play**

This research aimed to connect how the external environment contributes to enhancing or suppressing creative qualities in children. We split the participants (n=8) into two groups based on age. On the first day, they went to predominantly green, natural spaces, and urban spaces on the second. We conducted the interviews using an open-ended questioning method. Questions included experiences in each location and their thoughts and emotions. After each interview, they were given art supplies and asked to draw what they experienced. We found they exhibited a sense of freedom and creativity in the natural settings. The children reported feeling safe, calm, and happy in natural environments. Our findings suggest that natural, green environments foster confidence, positive emotions, and creativity in young children.

**James Evans, Freshman, Aeronautics; Jenna McIntyre, Freshman, Exercise Science; Fennick Carlin, Freshman, Architecture; Morgan Bungar, Freshman, Fashion Merchandising; Kaniyah Edward, Freshman, Fashion Merchandising; Em DeLoach, Freshman, Fashion Merchandising; Molly Majikas, Freshman, Psychology**

Mentor: Annika Anderson

**Zen Zones: Tranquility on Kent State's Campus**

College can be an overwhelming time for students, and being around people all the time can make it feel like you can never get quality alone time. Our team is creating "Zen Zones: Tranquility on Kent State's Campus". This project focuses on creating a space that is safe and quiet for students when things get overwhelming. The goal of our project is to provide students and staff a space to escape from reality to destress. The project will be executed in an empty room(s) on campus that will be turned into a space for relaxation. We understand that students need a getaway space. Our goal is to provide a space for anyone on campus to take a break, while also being a convenient place for travel. "Zen Zones" aims to create a space where students, faculty, and staff can take a moment to focus on the present.

**Sara Evelyne, KSU Alum, graduated Dec. 2023, Sociology**

Mentor: Jessica Leveto, Ph.D.

**Centering Student-Parent Voices: Intersectional Identities and Degree Attainment of Single Mothers**

Student parents, especially single mothers in higher education, encounter nuanced obstacles on the path to degree attainment. Research highlights the imperative to amplify the voices of parenting students, centering their perspectives and lived experiences to address longstanding disparities and enact policy changes benefiting two generations simultaneously. This study analyzes the journeys of 15 single student-mothers from the '1 in 5' podcast by Ascend at the Aspen Institute. Despite financial and mental health challenges, they persisted to graduation. Autoethnography revealed parallels between my journey and podcast narratives, highlighting advocacy and aspirations for a better future as motivational factors. By centering student-parent voices, this study significantly contributes to understanding intersectional identities in higher education and the nuanced obstacles limiting opportunities for educational advancement.

**Brittany Lucia, Freshman, Advertising; Ellie Ortesy, Freshman, Fashion Merchandising; Finley Foehl, Freshman, Anthropology; Tanvi Reddy, Freshman, Fashion Design; Audra Dial, Freshman, Athletic Training; Braeden Peer, Freshman, Criminology and Justice Studies; Casey Lemley, Freshman, Criminology and Justice Studies**

Mentor: Emma Sandy

**Future flash Care - Expanding Campus-wide Childcare**

Currently at Kent State University, there is not an option on campus for students who are also parents or caregivers to take their child to a childcare facility on campus. About 2,600 of the 20,000 students struggle with childcare and the ability to obtain an education simultaneously. Our solution: provide childcare services for students campus-wide. We want to establish a center that allows children to still be children and have fun, but also where parents can feel comfortable with our services and be able to work towards their educational goals. We aim to work with the provost and the current Child Development Center throughout this process. Our objective is to take care of future generations of flashes while simultaneously taking care of current flashes.



**Niko Magda, Junior, Biology**

Mentor: Clare Stacey, Ph.D.

**The Experiences of Third Year Medical Students: A Qualitative Examination.**

Pre-medical students in undergrad might hear about how hard going through medical school is through research online or by hearing other people discuss their experiences, but hearing the experiences medical students face pale in comparison to actually living it. Not all pre-medical students might realize the physical, mental, and emotional toll medical school has on a person, and the loss of empathy towards others during this period in their life and onwards isn't researched enough. Medical students face many psychoemotional stressors in medical school, especially during M3, the year when clinical rotations begin. Understanding the problems medical students face could help educators in pre-med training and medical schools support students as they progress toward a degree.

**Kadin McElwain, Sophomore, Computer Engineering Technology**

Mentor: Rosann Gage

**The Link Between Technology Facilitated Domestic Abuse And Possible Solutions To This Problem**

I spent a total of four weeks researching the problem of technology-facilitated domestic abuse and possible solutions to this problem in response to the increase of misogyny and abuse through technology in Generation Z. This research was important for me to do, as I have had relatives and friends go through technology-facilitated abuse. There is an increase of misogyny amongst Generation Z through the influence of people like Andrew Tate and the late Kevin Samuels. Through the reading and citation of various sources, I was able to come up with six solutions to the epidemic of technology-facilitated domestic abuse, including education, not being misogynistic at all, and surrounding yourself with positive influences, among other steps. My future plans are to present this research to various domestic abuse organizations and get my work out to the public in the form of publication in various academic journals or as a possible book.

**Jessie Mellon, Senior, Sociology**

Mentor: Richard Adams, Ph.D.; Manacy Pai

**Neighborhood Environment, Emotion Regulation, and Later Life Cognitive Health**

Aging in Place—or the idea of an older adult to live in one's own community independently, comfortably, and safely—is a common desire among older adults. They do not want to change their familiar neighborhood and friends. Using an internet survey sent to older adults (65+) in various Cleveland, Ohio neighborhoods, we collected self-reported data on various factors pertaining to the qualities of one's neighborhood and their judgements on their cognitive functioning. Findings were basic demographic information and whether the 13 pre-selected dependent variables predicted cognitive functioning in older adults. Overall, three variables were related to better cognitive functioning, while one variable was associated to worse cognitive functioning.

**Evelynne Morgan, Senior, Biology; Caroline Nitirahardjo, KSU Graduate, Biology; Maimuna Majumder, Ph.D., Computer Science; Majumder Lab**

Mentor: Helen Piontkivska, Ph.D.

Comparing the Usage of Russian- and Ukrainian-Derived Search Terms to Evaluate the Impact of Misinformation, Disinformation, and Propaganda in the US

Google Search is a leading search engine that offers de-identified search histories of its users through Google Search Trends (GST). Using GST, we sought to understand the impact of misinformation, disinformation, and propaganda on the sentiments of Google Search engine users, using the Russian invasion of Ukraine as our topic of interest. We curated keyword pairs with pro- and anti- Ukrainian sentiments to understand how disinformation campaigns may influence Google users. Between September 2021 and January 2023, global and state-level spelling usage changed, with the frequency of Ukrainian spelling increasing over time, providing insights into the range of possible user sentiments. Our analysis suggests that the interpretation of information—such as using the correct spelling or place name—may be associated with various socio-economic and political factors. Overall, our findings signal a need to expand educational efforts on the interpretation of information within the social media space.

**Khang Nguyen, Sophomore, Economics**

Mentor: Curtis Lockwood, Ph.D.

Investigation of Housing Prices Using Linear Regression & Random Forest

This research study will implement linear regression and random forest models to determine the strongest variables that influence housing prices across the United States. Incorporating a dataset that encompasses housing attributes such as bedrooms, rooms, kitchens, unit types, and other socio-economic factors, we aim to uncover the predictors influencing housing prices and to rank cities on price based on the predictions from the models. Each model is trained using historical housing data, providing insights into the drivers of housing market dynamics, as well as uncovering potential hidden variables that may have an influence. Additionally, the study compares the performance of both linear regression and random forest models for predictions when faced with skewed data and various pitfalls both models may face when evaluating our data.

**Wayne Nieh, Senior, Nursing**

Mentor: Amy Petrinec, Ph.D., RN

Family Presence During Resuscitation: A Descriptive Study of Perceptions of Nursing Students

Family Presence During Resuscitation (FPDR), first proposed in 1987, has been recommended by numerous professional nursing organizations. Little is known about perceptions of nursing students, and thus, we investigated the attitudes of nursing students toward FPDR, as they will be future members of the largest healthcare profession in the United States. A descriptive cross-sectional study was conducted to identify the attitudes of nursing students toward FPDR, and if age and work experience in a healthcare setting impact their attitudes towards FPDR. A total of 96 participants were enrolled in the study. This study did not reach statistical significance in attitudes toward FPDR based on age and work experience in healthcare. However, 67.2% of the participants reported they would support FPDR.

**Mary Grace Vavruska, Senior, Nursing**

Mentor: Jo Dowell, Ph.D., APRN, CNP

Food Allergies in College Students: Knowledge, Symptom Management, and Response Times

Food Allergies in College Students: Knowledge, Symptom Management, and Response Times Abstract  
Introduction: College students with food allergies (FA) face unique challenges related to knowledge, symptom management, and response time to an allergic reaction. The purpose of the study is to examine FA knowledge, symptom management, and response time. Methods: The design is cross-sectional to examine knowledge, symptom management, and response times using a prescribed EpiPen by college students. IRB approval was obtained. Procedure: Recruited Kent State students ages 18-22 (n=75) that fulfilled the inclusion criteria. Instructions, consent, and the survey were uploaded into Qualtrics XL electronic software for easy access per mobile device. Data analysis: Using Statistical Package for the Social Sciences (SPSS) Descriptive analysis, ANOVA, and regression models will be computed. Keywords: knowledge, symptom management, response time.

# Professional Practice / Outreach / Engagement

**Makayla Brown, Freshman, Computer Science; Megan Gampolo, Freshman, Early Childhood Education; Haleigh Trussel, Freshman, Middle Childhood Education; Cece Messina, Freshman, Human Development and Family Studies; Vanessa Koren, Freshman, Art Education; Joe Stock, Freshman, Exploratory; Cole Ray, Freshman, Business Management**

Mentor: Caitlyn Mularchik

Kent State's Outdoor Oasis

Recreation and outdoor activities are beneficial to students; prioritizing this at KSU will improve student life. This project strives to help the mental and physical needs of students and allows students to make connections while providing a relaxing space to destress. The results of our survey led us to realize that students are outside often, but they do not think there is enough to do outdoors. Roughly 90% of students surveyed believe we need more outdoor activities. Students would enjoy seeing hammock areas, swings, trails, and workout and sports areas. With this new addition, students will be encouraged to create new experiences and explore campus. This Outdoor Oasis will be a great way to see students at Kent State come together and enjoy our beautiful campus.

**Seth Cunningham, Freshman, Fashion Design; Tyler Hall, Freshman, Digital Media Production; Jillian Arthur, Freshman, Digital Media Production; Ella Murray, Freshman, Interior Design; Elizabeth Walsh, Freshman, Architecture; Lee Thomas, Freshman, Mechatronics Engineering**

Mentor: Hayden Cruz

Snap-A-Snack: Solving Food Waste Through Technology

At Kent State University, we strive for change. However, two issues that we noticed on campus have been food waste and food insecurity. Research shows that 70% of students routinely do not eat all their food, and 26.1 tons of food was wasted in 2021. Our Provost Leadership Academy group wants to help fix these problems. With “Snap-A-Snack: Solving Food Waste Through Technology,” we plan to utilize technology to reduce food waste and assist individuals with food insecurity. We plan to install cameras across campus to take pictures of food that people do not want or are unable to eat themselves so that others can have it. With this system implemented, we hope to provide easier access to food and remove waste. Here at Kent State University, we are constantly striving for change. We take pride in our excellent dining services, but that’s not to say there is not much room for improvement.

**Logan Hammerschmidt, Freshman, Actuarial Mathematics; Phebe Klein, Freshman, Architectural Studies; Pheonix Sawyer, Sophomore, Aeronautics; Meg Wallace, Freshman, Biochemistry; Tariq Bankole, Freshman, Business Management**

Mentor: Michelle Jalpa-Romero

#### The Accessibility Service Experience

The Accessibility Service Experience project aims to improve Kent State University's Student Accessibility Services (SAS) by improving availability to students through making the process more user friendly. This topic was chosen because of a noticeable amount of complaints regarding difficulties with SAS. They serve over 3,000 students across all Kent State's campuses. Interviews were set up with Kent State faculty to gather information. A Google Survey was created that showed mixed results in experiences with accessibility services gaining an overall rating of 3.15/5 from responding students. Our research displays that SAS has room for improvement: misunderstandings in documentation and issues with online resources have been reported. Remediating these concerns could make accessing individual accommodations simpler and easier.

**Mac Myers, Freshman, Physical Science; Samie Cowger, Freshman, Early Childhood Education; Marissa Ziemer, Freshman, Marketing; Kai Turner, Freshman, Business Management; Lars Klocek, Freshman, Aeronautics; Emma Pry, Freshman, Early Childhood Education**

Mentor: Lauren Korpics

#### Thrift in a Flash

Did you know that students produce an average of 230 tons of waste when moving off-campus? Our project provides a solution by turning empty space on campus into a student-run thrift store in which any student can donate clothes and dorm items to be bought by other students using FlashCash and/or their declining balance. According to the data we've collected, 66.7% of KSU students would be willing to donate their unused items, and 75.9% of students said they would be at least somewhat likely to use their FlashCash at a thrift store. This would significantly reduce the amount of waste produced by students when they move out of their dorms and have nothing to do with their old items.

**Sarah Sisson, Freshman, Sociology; Madeleine Frutos, Freshman, Fashion Design; Bella Rudy, Freshman, Fashion Design; Lindsey Nottingham, Freshman, Exploratory; Alexandria Portman, Freshman, Fashion Merchandising**

Mentor: Allison Remick

#### Kent SafeGuard

Kent SafeGuard is an on-campus security service that is available around the clock for students in need of safe travel. Students who feel uncomfortable walking around could use this service at any time. Our goal is to give students a safer alternative to travel, as well as provide more lighting around Kent State's campus. We have conducted research on other universities in Ohio along with interviewing the Kent State Police Department and Office of Safety and Security. We surveyed students at Kent State and found that they do not know where to go if they felt unsafe. Our goal is to create a safe community at Kent State and have a preferable option for students to travel around the campus and city.

