



HONORS COLLEGE  
*The UNIVERSITY of OKLAHOMA*

# 38<sup>TH</sup> ANNUAL UNDERGRADUATE RESEARCH DAY

8 a.m. to 3 p.m. | Conference  
3 to 4 p.m. | Reception  
Thursday, April 16, 2026

Thurman J. White Forum Building

# PROGRAM SCHEDULE

8 to 8:30 a.m.	<b>Registration</b>
8:40 to 8:50 a.m.	<b>Welcome, Dean Paul Gilmore</b> Forum Room
8:50 to 9 a.m.	<b>Remarks, Provost André-Denis Wright</b> Forum Room
9:10 to 11:10 a.m.	<b>Session I Oral Presentations, Non FYRE</b> Engineering, B1 Arts, Psychology, and Engineering, B3 Life Sciences, B5
9:10 to 11:10 a.m.	<b>Session I Poster Presentations, Non FYRE</b> Super Suite B2/4/6
9:10 to 11:10 a.m.	<b>Session I FYRE Poster Presentations</b> Conference Room B
11:10 to 11:25 a.m.	<b>Break for Lunch Segment</b> Forum Room
11:25 to 11:27 a.m.	<b>Welcome, Dean Paul Gilmore</b> Forum Room
11:27 to 11:37 a.m.	<b>Remarks, President Joseph Harroz, Jr.</b> Forum Room
11:40 to 12:45 p.m.	<b>Lunch</b> Forum Room
12:45 to 1 p.m.	<b>Break for Session II Presentations</b>
1 to 3 p.m.	<b>Session II Oral Presentations, Non FYRE</b> Biomedical Engineering and Biology, A1 Life Sciences, A3 Arts, Economics, and Psychology, A5
1 to 3 p.m.	<b>Session II Poster Presentations, Non FYRE</b> Super Suite B2/4/6
1 to 3 p.m.	<b>Session II FYRE Poster Presentations</b> Conference Room B
3 to 3:05 p.m.	<b>Break for Reception</b> Conference Room A
3:05 to 3:07 p.m.	<b>Closing, Dean Paul Gilmore</b> Conference Room A
3:07 to 3:15 p.m.	<b>Remarks, Vice President Matt Hulver</b> Conference Room A
3:15 to 4 p.m.	<b>Reception</b> Conference Room A
4 p.m.	<b>Conclude</b>

## **FYRE Poster Conference Room B**

*Synthesis and Characterization of Isopentenyl Pyrophosphate*  
**Avery Adams, Shanteri Singh, Dodge Family College of Arts and Sciences**

Isopentenyl pyrophosphate (IPP) is an isoprenoid molecule and is key to allowing for the creation of some structurally diverse organic molecules and can help develop different types of antibiotic and anticancer molecules. The goal is to properly synthesize IPP molecules in reactions that can allow us to produce these organic molecules. In this study, IPP was synthesized in a pyrophosphate reaction through column purification, thin layer chromatography (TLC) testing, and rotary evaporation. Monophosphate and diphosphate functional groups develop and are separated through this process so that they can be individually tested and so that they can be put through the NMR. The phosphorus spectrum showed two distinct groups consistent with diphosphates, and the proton spectrum was consistent with that which was to be expected to the qualities of IPP. With this synthesis, it allows for different connections and diversity of organic and biologically active molecules that can be further used for continued development of pharmaceuticals.

## **Non-FYRE Poster B2/4/6 Super Suite**

*Analysis of Highland Village Park's Detention Pond for a Potential Smart Stormwater Systems*  
**Raktim Adhikary, Jason Vogel, Gallogly College of Engineering**

The goal of this research project is to provide insight to the Oklahoma Water Survey regarding potential installation of a new Smart stormwater system. Smart stormwater systems are advanced infrastructure solutions that integrate digital technologies and data-driven decision-making with on-the-ground valve systems to optimize management of stormwater best management practices (BMPs). In this study, we monitored the reservoir over the course of 3 months for depth, pH, specific conductance, turbidity, and temperature during both static and storm conditions. During the three-month period, we noted impact and recovery of pond water quality as impacted by storms. The findings of this research provide a first glimpse into ways that a smart stormwater system could improve the functioning of the detention pond.

**Non-FYRE Poster**  
**B2/4/6 Super Suite**

*Comparative Analysis of Preventive Health Care Utilization Between International and Domestic Undergraduate Students*

**Maame Abena Adjeiwaa, Moses Olayemi, Dodge Family College of Arts and Sciences**

The US Health system consistently ranks last among eleven of the most highly developed countries in the world in terms of access, equity, care, and administrative efficiency. Despite the supposed availability of university health services in the US, several studies show that international students often face unique challenges, such as navigating complex insurance systems and cultural differences, which influence their frequency of seeking preventive care compared to their domestic peers. This student-led research project seeks to discover and investigate differences in preventive health care access and utilization among international and domestic undergraduate students at the University of Oklahoma (OU). This study will take a quantitative approach, with surveys distributed via university email channels to gather information on healthcare consumption habits and perceived impediments to access and use of resources. This study will include an intended sample of 379 undergraduate students and adapt Preventive care utilization items from the Centers for Disease Control and Prevention Behavioral Risk Factor Surveillance System. Insurance literacy items will be drawn from validated short-form measures, using reliable questions to evaluate a personal understanding of their insurance and its policies. Barrier-related questions will assess financial, cultural, logistical, and informational obstacles.

Under the supervision of Dr. Moses Olayemi, the student researcher will analyze data to identify specific service shortages. The findings will be communicated as undergraduate research presentations at OU, at a local conference, and submitted to peer-reviewed journals in public health or higher education. Findings will inform OUs policies and enhance health equity for international students.

**FYRE Poster**  
**B2/4/6 Super Suite**

*Caregiver Ability to Estimate Pediatric Patient Weight in the Emergency Department*

**Eman Ahmed, Ryan Brown, Dodge Family College of Arts and Sciences**

Background: Weight-based dosing is fundamental to pediatric medication safety. However, in emergency and telehealth settings clinicians may rely on caregiver-reported weights rather than directly measured values. Because pediatric dosing calculations depend heavily on accurate weight, substantial estimation errors may increase the risk of inappropriate medication dosing. Despite this clinical importance, limited research has evaluated how accurately caregivers can estimate their child's weight during emergency care visits.

Methods: This study evaluates the agreement between caregiver-reported weight estimates and measured weights in a tertiary pediatric emergency department. Caregivers of children younger than 18 years presenting for non-emergent conditions were asked to complete a brief questionnaire prior to triage. The survey collected the caregivers estimated child

(cont.) weight along with demographic information, access to a household scale, timing of the most recent weight measurement, prior healthcare utilization, and sports participation. Following survey completion, each child's weight was measured using a calibrated digital scale. Patients requiring immediate stabilization or specialized weighing equipment were excluded from participation.

Results: The primary outcome will assess the proportion of caregiver estimates that fall within  $\hat{A}\pm 20\%$  of the child's measured weight. Secondary analyses will examine whether estimation accuracy varies by factors such as caregiver role, child sex, access to a home scale, time since last recorded weight, and sports participation. Categorical comparisons will be analyzed using chi-square testing, and confidence intervals will be calculated for reported estimates. Data collection is currently underway with a target enrollment of approximately 300 participants, which provides adequate power to identify meaningful differences between comparison groups.

Conclusion: Evaluating the reliability of caregiver-reported weight estimates may provide important insight for emergency medicine and telehealth settings, where accurate medication dosing decisions must often be made before a measured weight is available.

**Non-FYRE Poster**  
**B2/4/6 Supersuite**

*In the Belly of the Beast: Investigating Adaptive Radiations Through the Gut Microbiome of Specialists and Generalist Pupfish*

**Isabel Alejandro, Laura Stein, Dodge Family College of Arts and Sciences**

Organisms have evolved multiple ways to find and compete for food, and the types of food they consume are known as their dietary niche. Dietary niches can be either generalist or specialist, where generalists consume a variety of food items while specialists consume few, and evolutionary success in these niches may come with tradeoffs. Generalists tend to prioritize flexibility, while specialists tend to optimize efficiency, maximizing their potential within their small dietary range. These types of tradeoffs are well-documented in anatomical traits (i.e., jaws, eyes), but we do not know if these tradeoffs exist for more responsive dietary phenotypes such as the gut microbiome. The gut microbiome refers to the community of bacteria that aid in digestion, nutrient absorption, and metabolism inside the digestive tract, and it is influenced by genetic and environmental factors. However, the mutual impacts of the relationship between the microbiome, evolved dietary niche, and the current diet are unknown. Here, we investigate how the environment and evolved differences interact to influence the gut microbiome in *Cyprinodon* pupfishes of different dietary niches: *C. variegatus*, a generalist, *C. brontotheroides*, a snail-eating specialist, and *C. desquamator*, a scale-eating specialist. While generalists have a balanced diet of carbohydrates and protein, the specialists have a protein-rich diet, allowing us to manipulate diet and compare across species. Data collected from microbial plating will allow us to analyze whether the gut microbiome is primarily affected by genetic differences or environmental context and how evolutionary niche relates to the plasticity of the microbiome.

**FYRE Poster**  
**Conference Room B**

*Atomistic simulation for short range orders for binary alloys*

**Mustafa Alhayek, Iman Ghamarian, Gallogly College of Engineering**

This study investigates how the arrangement of atoms in two-element metal alloys affects their structural and mechanical properties. It focuses on binary alloys with a body-centered cubic crystal structure and equal composition of each element. Even though many alloys are assumed to have a random distributed atom, this study models the chemical short-range order, which shows that atoms may prefer specific arrangements with neighboring atoms rather than random. Understanding this arrangement is essential because it can affect how the alloys behave under stress. Using computational simulations, the atomic systems were modeled, and their physical characteristics were evaluated. These simulations were performed at the OU supercomputing center (OSCER). First, the atomic structures are generated and then used to determine the lattice parameter, which is the size of the repeating unit cell in the crystal. This shows how the existence of different elements in an alloy affects the whole structure of the alloy. Then, the stacking fault energy is calculated, which represents a controlled shift in the atomic layers, and the energy change is measured due to the shift. This data is important because it helps to determine how easily a material can deform and how defects move within it. All calculations and models are performed using an efficient computational framework that performs an accurate calculation of atomic interactions. The findings of the research could help in building designs with stronger and more reliable materials by providing a better understanding of how atomic structure influences the physical properties of an alloy.

**Non-FYRE Poster**  
**B2/4/6 Super Suite**

*Performance Evaluation of Transport Protocols for UAV-Assisted Networks*

**Ahmed AlNusairi, Mohammed Atiquzzaman, Gallogly College of Engineering**

This study evaluates transport-layer behavior in a UAV-assisted network scenario using the NS-3 simulator. Two ground nodes communicate through a UAV relay, and the performance of TCP Cubic and TCP BBR is measured under a sweep of nominal UAV speeds between 5 and 25 m/s. Throughput, end-to-end latency, and packet loss ratio are collected from FlowMonitor logs. The literature review motivates the need to compare loss-based and bandwidth-oriented congestion control in highly dynamic flying ad hoc networks. Results show that TCP Cubic sustains roughly double the throughput of TCP BBR ( $\approx 19.7$  vs  $9.8$  Mbps), while TCP BBR yields an order-of-magnitude lower average latency ( $\approx 2.96$  vs  $29.4$ ms). Packet loss is negligible across all runs. These findings highlight a throughput latency tradeoff and underscore that protocol choice should be guided by application priorities rather than a single universal optimum.

**Non-FYRE Poster**  
**B2/4/6 Super Suite**

*The Hidden Costs of Self-Silencing: Authenticity, Emotion Regulation, and Anxiety*

**George Altmann, Mauricio Carvalho, Dodge Family College of Arts and Sciences**

Self-silencing refers to the tendency to suppress one's thoughts, needs, and emotions in order to maintain relationships or avoid interpersonal conflict. A growing body of research links higher levels of self-silencing with greater anxiety. Individuals who frequently suppress their thoughts and emotions often experience increased internal tension, emotional dysregulation, and persistent worry. Because self-silencing discourages open expression and limits opportunities to seek support, it may sustain unresolved interpersonal stress and contribute to elevated anxiety. Research on emotion-regulation processes supports this perspective. Habitual emotion-suppression has been associated with poorer psychological adjustment, heightened physiological stress responses, and greater anxiety. Although suppressing emotional expression may temporarily reduce interpersonal conflict, emotion-regulation frameworks suggest that it often increases internal distress and cognitive load. In interpersonal contexts, these patterns may also involve emotional-labor strategies such as surface acting or masking genuine emotions, which are linked to emotional exhaustion and psychological strain. In the present research, we propose that authenticity plays a central role in these processes. Suppressive relational strategies may undermine authenticity by creating a mismatch between internal experiences and outward behavior. This internal external incongruence has been linked to poorer psychological adjustment and relationship functioning. Building on relational models of emotion regulation and self-silencing, the present study examines authenticity as a mechanism linking self-silencing to anxiety. We test a mediation model in which self-silencing predicts greater regulation of emotional expression and lower authenticity, which in turn predicts higher anxiety. We hypothesize that emotion regulation and authenticity will mediate the association between self-silencing and anxiety.

**Oral Presentation  
Room A3**

*Impact of Bridge Helix Mutations in SpCas9 on DNA Cleavage Specificity: Enhancing the Safety of Genome Editing Tools*

**Joshua Anthony, Rakhi Rajan, Dodge Family College of Arts and Sciences**

CRISPR-Cas (Clustered Regularly Interspaced Short Palindromic Repeats-CRISPR associated) systems are RNA-directed endonucleases functioning as a bacterial and archaeal adaptive immune system by targeting and destroying foreign genetic material. CRISPR-Cas systems use sequence complementarity of specific RNAs called CRISPR RNA (crRNA) to target nucleic acids, which makes them excellent genome editing tools. In recent years, Cas9, a type of CRISPR nuclease, has been approved in a treatment for sickle cell disease as well as seeing use in a wide variety of gene editing applications due to its ability to target and cleave DNA when guided to specific sites by its crRNA. However, a major limitation of Cas9 is its propensity for off-target cleavage on DNA substrates that differ from the intended target. To address this limitation, recent studies have introduced amino acid substitutions within the highly conserved arginine-rich bridge helix (BH) region of Cas9; while this approach has been shown to reduce off-target cleavage, it often suffers from limited in vivo efficiency. In this study, we introduced novel proline mutations in the BH to disrupt a main-chain hydrogen bond that stabilizes the helical conformation of the bridge helix. Hypothesizing this would decrease off-target cleavage. Using site-directed mutagenesis, we generated the SpCas9LP-TP variant and evaluated it via DNA cleavage assays against on-target and off-target DNA substrates. SpCas9LP-TP exhibited reduced off-target cleavage while maintaining wild-type on-target cleavage efficiency. However, future studies are needed to benchmark this variant against existing high-fidelity Cas9 models both in vitro and in vivo.

**FYRE Poster  
Conference Room B**

*Effect of palmitate in KPC242 pancreatic tumor cell line*

**Isabella Antony, Kamiya Mehla, Dodge Family College of Arts and Sciences**

Obesity is associated with increased cancer progression due to elevated circulating lipid levels and inflammation. This study investigates the effects of lipid treatment (palmitate) on KPC242 pancreatic cell line to model an obesity-like microenvironment in vitro. Cells were cultured and exposed to different concentrations of palmitate for 48 hours. Following treatment, RNA was extracted, converted to cDNA, and analyzed using RT-qPCR to assess changes in gene expression. This approach aims to determine whether lipid exposure alters some inflammation of gene expression in KPC242. This finding will help better comprehend the relationship between obesity and pancreatic cancer progression.

**Oral Presentation  
Room A1**

*Gene regulation and functional response of the blood-brain barrier to administered anti-inflammatory microglia in a human stroke organoid model*

**Isaac Atkins, John Clegg, Gallogly College of Engineering**

Microglia are the resident immune cells of the central nervous system and the first responders to cerebrovascular injury. Following ischemic or hemorrhagic stroke, the inflammatory signaling cascades driven by cytokines and interleukins in the CNS drive microglial polarization to either a pro-inflammatory (PIM) phenotype which worsens neural damage or changes it to an anti-inflammatory (AIM) phenotype which drives repair. PIM signaling often becomes dysregulated and produces a harmful positive feedback loop that manifests as secondary neuroinflammation (SNI). SNI post-stroke prolongs neurovascular barrier dysfunction, leading to impaired healing and long-term cognitive decline. Repolarization of PIM to an AIM state is a promising therapeutic avenue for resolving IS and ICH SNI. This project aims to produce a blood-brain barrier (BBB) injury phenotype in a 3D organoid model to mimic stroke and the recovery phase. This model evaluates barrier function and regulation of key barrier-associated genes, such as ZO-1 and CLDN-5, in response to AIM administration. It was hypothesized that AIM treatments will reduce BBB leakiness and improve barrier function. To test this hypothesis, the BBB organoids are generated using astrocytes, pericytes, and endothelial cells, then exposed to cytokines such as TNF-alpha and IL-1 $\beta$  to generate a stroke-injury phenotype. Following this, inflammatory BBB organoids are treated with AIM-conditioned media, cocultured with AIM, to see the reparative effects, if any, in the post-stroke BBB injury phenotype. RT-PCR will be used to quantify relevant altered gene expression for junction proteins; FITC-dextran uptake studies will evaluate barrier leakiness; and immunofluorescence staining will reveal cellular organization.

**Non-FYRE Poster**  
**B2/4/6 Super Suite**

*Micellization and gelation of Pluronic F127 solutions in the presence of salts*  
**Zachary Barnes, Reza Foudazi, Gallogly College of Engineering**

This research aims to understand the effects of salts on the micellization and gelation phase transitions of Pluronic F127 polymer solutions. In previous research, salts were found to increase both the critical micellization temperature (CMT) and sol-gel transition temperature of block copolymer solutions. This research expands on these findings by testing different salts &nbsp; to control CMT and gelation behavior. Differential Scanning Calorimetry was used to determine the CMT and sol-gel transition temperature of samples. Rheological measurements were collected to analyze the storage modulus and loss modulus of each sample as well. The results indicate the elevation of phase transition temperatures depends on the relative position in the Hoffmeister series of each ion. The findings are helpful in many of the potential applications of F127, such as the design of targeted drug delivery and wound repair systems.

**Non-FYRE Poster**  
**B2/4/6 Super Suite**

*Comparative Analysis of Neuromorphic Hardware Architectures for Real-Time, Energy-Efficient Edge Intelligence*  
**Abiel Berhanu, Mike Banad, Gallogly College of Engineering**

Edge devices need real-time, low-energy intelligence under tight memory and power budgets. Neuromorphic hardware offers promise via sparse, event-driven processing and in-memory computation. We compare five major architecture families for edge AI: (A) digital spiking research chips (Intel Loihi 2), (B) digital spiking “fixed-function” chips (IBM TrueNorth), (C) mixed-signal/analog in-memory compute (AIMC) with phase change memory (PCM), (D) event-based vision SoCs (SynSense Speck + DVS), and (E) large-scale neuromorphic platforms used as references for programmability/accuracy (BrainScaleS-2, SpiNNaker). We define a measurement rubric (energy per inference/spike, latency, memory footprint, on-chip learning, toolchain maturity, and sensor integration) and provide a qualitative comparison grounded in vendor docs and peer-reviewed reports. We find Loihi 2 and AIMC-PCM offer strong energy-latency advantages for SNNs/CIM workloads; Speck-class SoCs are the most turnkey for ultra-low-power vision; TrueNorth remains a historical baseline with excellent efficiency but limited onchip learning; and BrainScaleS-2/SpiNNaker serve as valuable programmability benchmarks rather than edge deployables. We close with workload-to-hardware mapping guidelines for keyword spotting, event-vision, anomaly detection, and low-duty sensor fusion.

**FYRE Poster**  
**Conference Room B**

*Implementation of Polymers of Different Structural Capabilities Endemic to Differing Polymer Classifications*  
**Josh Bishop, Arif Abdullah, Gallogly College of Engineering**

Polymers are vital in importance in the many varied realms of materials science, and of integral meaning to the development of new technologies and properties. Of polymers, three groups distinguish themselves: thermoplastics, thermosetting polymers, and elastomers. Of these, thermoplastics and thermosetting polymers are especially important for their combination of properties which can balance cost and quantity without sacrificing the strength of mechanical properties. Studying the specific combinations of properties of these two types of polymers provides valuable information in the realm of engineering and beyond. Reviewing multiple sources and studies, some findings can be drawn about the use and implementation of polymers in materials science at large scale. Specifically, studying the glass-transition temperature can provide information about the structural properties of the specific materials use, and also acknowledging the specific structure of thermosetting and thermoplastic polymers should elucidate the areas in which each of the specific types could be used. We can also point to the use of vitrimers, which can mix properties of thermosetting and thermoplastic polymers, for instance allowing for more economical and sustainable recycling of plastics, usually impossible for thermosetting materials. Looking for advancements in polymer science can allow a window for financial and ecological benefits previously unavailable.

**non-FYRE Poster**  
**B2/4/6 Super Suite**

*The Acquisition of Chinese Word Order by Chinese as a Second Language Learners*  
**Jin Bohling, Jie Zhang, Dodge Family College of Arts and Sciences**

Chinese word order is a central part of Chinese language acquisition and serves as the foundation for evaluating acquisition by Chinese as a second language learners. Pienemann's Processibility Theory (PPT) (1998) introduces a set of language acquisition stages and Wenying Jiang (2009) research adapts this model to Chinese word order acquisition. Students enrolled at the University of Oklahoma (OU) have the opportunity to take Chinese language courses. However, these courses do not refer to a degree of language acquisition obtained by the students. This project aims to assess Chinese program students' acquisition of the Chinese word order and identify their challenges in the acquisition process. Participants consisted of 41 OU students enrolled in a Chinese course between second and sixth semester. Participants were administered a questionnaire comprised of 14 translation exercises, each targeting a stage of Chinese word order acquisition. The data was evaluated by the following aspects: (1) acquisition stages in each course level, (2) the differences between heritage learners and non-heritage learners' acquisition in each course level, (3) Chinese learner word order acquisition in comparison to PPT, and (4) grammatical error analysis. The analysis suggests that that

(cont.) Chinese word order acquisition is non-linear, although potentially more linear for non-heritage learners. Additionally, Chinese L2 acquisition may not abide by PPT. Furthermore, the error analysis illustrated the most commonly made errors and the most error prone semesters. These findings may be used to improve Chinese instruction and better understand how college Chinese language learners acquire Chinese as a second language.

### **Oral Presentation Room B1**

*Controlling hydrogel properties with Polymer Additives*

**Alseny Boiro, Reza Foudazi, Gallogly College of Engineering**

Hydrogels are a crosslinked polymers network capable of retaining large amounts of water while maintaining structural integrity, making them highly valuable in biomedical and materials engineering applications. This study investigates the influence of high-molecular weight polyethylene oxide (PEO) additives on the swelling behavior of hydrogels obtained from crosslinking polyethylene glycol diacrylate (PEGDA). PEGDA serves as a photo-cross linkable precursor that forms a stable three-dimensional network upon UV exposure, while PEO acts as a water-soluble polymer additive. The study hypothesizes that incorporating high-molecular weight PEO enhances hydrogel mechanics and alters phase behavior through physical entanglements and potential phase separation effects. Hydrogels were prepared via UV-induced crosslinking, and their structural physical properties were characterized using swelling measurements. Understanding these precursor and polymer additive interactions provides insight into tailoring hydrogel systems for advanced applications in biomaterials, tissue engineering, and soft matter design.

### **FYRE Poster Conference Room B**

*Bur Oak Defense Chemical Comparison*

**Lucas Bost, Heather McCarthy, Dodge Family College of Arts and Sciences**

Due to climate change, many species of trees may have difficulties surviving in locations where they currently thrive. To make sure that forests will still exist in the future, finding what affects these trees will be vital. The intent of this research is to investigate how populations from across the western range of bur oaks (*Quercus macrocarpa*) respond to various climates. This study uses leaves collected in common gardens located in and composed of bur oak populations from three states (Oklahoma, Illinois, and Minnesota). Previous research has shown that growth and survival of all populations were similar in the northern and central gardens, but that Oklahoma populations did much better in Oklahoma. This research investigates potential causes for the greater survival rate of these oaks, focusing on the possible role of herbivory and plant defense compounds. This study will use image analysis of tree canopies to estimate herbivory and spectrophotometry to find the number of tannins and phenols (defense compounds) in the different populations of bur oak. This would then answer the question, why are there differing amounts of herbivory observed in the three populations of oak? The Oklahoma oaks have a lower amount of herbivory observed, so we would expect the Oklahoma populations to have a higher concentration of phenol and tannins.

### **FYRE Poster Conference Room B**

*Is there a significant difference in peer connectedness between smokers and non-smokers?*

**Carson Boswell, Jeong Kyu Lee, Dodge Family College of Arts and Sciences**

Background: Tobacco remains a leading cause of preventable disease, with peer influence strongly predicting youth smoking. However, research examining peer connectedness and smoking initiation among Singaporean young adults remains limited.

Aim: This study examined differences in peer connectedness between college students in Singapore who had ever tried smoking and those who had never smoked, to explore whether peer influence is linked to tobacco use.

Methods: In 2021, an online cross-sectional survey was conducted among 129 students at Republic Polytechnic, Singapore. Of the study participants, about 40% were females and the majority identified as Chinese (51.9%), followed by Malay (27.8%) and Indian (7.5%). Six peer connectedness items were assessed, and differences between ever-smokers and never-smokers were analyzed using independent samples' t-tests. Study protocols were approved by the Institutional Review Board (IRB) of the National University of Singapore.

Results: Ever-smokers reported significantly higher peer connectedness scores than never-smokers across three key measures: "hang out with peers" ( $M=3.86$  vs.  $2.91$ ;  $t(74) = -3.26$ ,  $p = .002$ ), "enjoy spending time with peers" ( $M = 4.43$  vs.  $3.56$ ;  $t(74) = -3.52$ ,  $p = .001$ ), and being "accepted by peers" ( $M = 4.19$  vs.  $3.71$ ;  $t(74) = -2.11$ ,  $p = .038$ ).

(cont.) Conclusion: Findings indicate that young adults who have experimented with smoking exhibit stronger social integration and higher levels of peer interaction. Consequently, campus health promotion should move beyond individual resistance training and instead leverage these robust social networks to foster smoke-free norms and deliver prevention messages through positive peer engagement.

**FYRE Poster  
Conference Room B**

*Synthesis and Optical Tuning of CsPbBr<sub>3</sub> Nanocrystals*

**Parker Bryan, Yitong Dong, Dodge Family College of Arts and Sciences**

Cesium lead bromide (CsPbBr<sub>3</sub>) perovskite quantum dots were synthesized to investigate how reaction conditions influence nanocrystal size and optical properties. Using a hot-injection method, precursor ratios and reaction temperatures were systematically varied to control the size of the individual dots. Higher temperatures at the time of injection generally led to the production of larger quantum dots while lower temperatures generally resulted in smaller quantum dots. Each size of dot had its own unique optical signature by absorption and photoluminescence peaks despite the composition of the crystals being the same. Additionally, in a couple of different trials, a couple specific bulky ligands (referred to as C4 and C6) that geometrically match certain facets on the nanocrystals were introduced to evaluate their effect on crystal stability and optical properties. Overall, the quantum dots were characterized by (cont.) their visible emission, which shifts as a function of particle size when exposed to UV light. This research demonstrates the tunable synthesis of perovskite nanocrystals based on variations in temperature and also the importance of precursor ratios and ligand environments in tailoring their optical and structural properties for potential use in areas such as optoelectronics.

**FYRE Poster  
Conference Room B**

*Examining the Association of Parental Influence on Dietary Habits*

**Ella Bui, Jeong Kyu Lee, Dodge Family College of Arts and Sciences**

Adolescent dietary habits are shaped by a multitude of social influences, with parental influence being one of the most significant. Since nutrition is essential for healthy development and overall longevity, it is especially crucial to understand its relationship with parental behavior. This study examined how parental support and monitoring relate to nutritional habits such as meal frequency and food choices, specifically in Singaporean youth. In 2021, a cross-sectional online survey was carried out with 129 students from Republic Polytechnic in Singapore. Around 40% of the respondents were female, and most identified as Chinese (51.9%), followed by Malay (27.8%) and Indian (7.5%). A series of Chi-square tests were performed to assess associations between parenting behaviors and nutritional outcomes. There was a statistically significant association between parental willingness to hear their child's problems and regular meal frequency among Singaporean youth:  $\chi^2(4) = 11.976, p = .018$ . This suggests that youth whose parents are more willing to listen to their problems tend to have more regular meal patterns. Findings suggest that parental emotional support, specifically a parent's openness to listening, may play a vital role in encouraging regular eating habits among youth. These results underscore the importance of the emotional environment in shaping nutritional consistency. To better understand these associations, future research should utilize larger samples and prospective designs, monitoring how shifts in communicative support influence dietary stability over time.

**FYRE Poster  
Conference Room B**

*Determining Optimal Kinetic Impactor Trajectories for Rendezvous with Potentially Hazardous Asteroids*

**Caleb Butler, Diogo Merguizo Sanchez, Gallogly College of Engineering**

The solar system contains approximately 26,000 objects that have been classified as Potentially Hazardous Asteroids (PHAs) due to the danger that they present to mankind. An impact from one of these asteroids can release up to 100,000 megatons of energy, causing global devastation. This study analyzes trajectories of a kinetic impactor, a spacecraft that can transport a device to a PHA and detonate it near it to change the PHA orbit and prevent it from impacting Earth. The trajectory from Earth to the asteroid comprises three phases: planetary departure, interplanetary travel, and planetary rendezvous. In this work, several options for planetary departures are explored, based on preliminary calculations for asteroid and interplanetary travel. In this approach, the nuclear device would detonate at about 80 kilometers from the targeted PHA rather than impacting it, as this is a more effective approach. Optimal trajectories for Earth departure to the asteroid, as options for future missions, are expected to be among the results of this work.

**Non-FYRE Poster  
B2/4/6 Super Suite**

*A Student-Led Preservice Ensemble Model for Expanding Jazz Pedagogy Access*

**Mackenzie Caddell, Lonnie Easter, Weitzenhoffer Family College of Fine Arts**

This poster presents a reflective overview of an undergraduate-initiated preservice jazz teaching ensemble, examined through the perspectives of its student founder, faculty mentor, and participating members. Centered on expanding access to jazz for beginners, the project explores how intentional ensemble design including structure, rehearsal activities, and recruitment strategies support both inclusive jazz performance experiences and early pedagogical development. Established within the University of Oklahoma School of Music, the ensemble has offered more than 50 music education majors a rare opportunity to both perform in and lead a jazz band rehearsal, allowing preservice teachers to practice instructional skills in a low-stakes, collaborative environment. The ensemble model demonstrates how student-driven initiatives can address gaps in jazz pedagogy within traditional music teacher preparation programs. This work has received national recognition from the National Association for Music Educators and has contributed to broader conversations about strengthening jazz education in preservice curricula across the country. By highlighting the ensemble's development and impact, this poster aims to offer practical strategies for institutions seeking to expand equitable jazz learning opportunities and support future music educators.

**Oral Presentation  
Room B1**

*Modeling Compound Flooding in Coastal River Systems Using Hydrodynamic Models ADCIRC and HEC-RAS*

**Maggie Chandler, Kendra Dresback, Gallogly College of Engineering**

Coastal river systems experience flooding that is caused by a combination of upstream rainfall and storm surges from the ocean. This is known as compound flooding. Compound flooding can be difficult to model using a single hydraulic model. This research focuses on coupling the hydrodynamic models ADCIRC and HEC-RAS to produce a more accurate understanding of coastal and riverine behavior during major storm events. This research utilizes data along the Tar River in North Carolina during Hurricane Irene and Hurricane Isabel. These models were used to simulate storm conditions along the river system and compare the results to observed USGS gage data to assess how well coupling the models predicts flow and water level. Challenges faced include running large simulations on a supercomputing system and ensuring vertical datum alignment. This research contributes to improving flood prediction methods and can support informed flood risk management and the design of safe infrastructure in coastal areas.

**FYRE Poster  
Conference Room B**

*Development of a Constitutive Fluorescent Repressor Operator System*

**Katherine Chapman, Valentin Rybenkov, Dodge Family College of Arts and Sciences**

Chromosome dynamics is an active field of research because of its significant role in cell survival and function. An important method of chromosome research is the fluorescent repressor operator system (FROS) which utilizes bacterial plasmids. For example, a plasmid can contain the DNA sequence for the TetR protein fused to a mCherry fluorescent protein. After it is produced in a cell, the TetR protein binds to tetO repeats on a bacterial chromosome, revealing their location with the linked mCherry fluorescent tag. Currently, the FROS system relies on IPTG to induce the production of the TetR-mCherry protein at specific times to reduce interference with normal cellular functions. However, the use of inducible promoters allows fluorescence to fade away during timelapse videos of live cells. The purpose of this experiment is to develop a constitutive fluorescent repressor operator system so it can continuously generate the fluorescent protein while under the microscope. To do this, a candidate constitutive gene was selected from the *P. aeruginosa* genome, *rpoZ*. Then, primers are designed for the pPSV35AP-tetR-mCherry plasmid and the constitutive promoter sequence. Polymerase chain reaction was used to multiply the quantity of the plasmid and the promoter fragment. After that, the *rpoZ* promoter is inserted into the plasmid through the Gibson Assembly process. Finally, the new plasmid with the constitutive promoter is transformed back into *P. aeruginosa* cells to track specific tetO repeats within the bacterial chromosome.

**FYRE Poster  
Conference Room B**

*Examining How Adult-Reported Adversity Relates to Cognitive and Psychological Functioning*  
**Rosanna Chau, Lauren Ethridge, Dodge Family College of Arts and Sciences**

Adverse childhood experiences (ACEs) can significantly impact long-term psychological and cognitive outcomes; however, the impact on neural markers for cognition is less well studied. This study investigates whether ACEs and other measures of adversity, such as household dysfunction (CHAOS), predict basic neural function at rest and during a cognitive task that requires split attention, using electroencephalography (EEG) in adults. EEG variables included resting power within standard frequency bands, and event-related potential amplitudes and latencies to attended and unattended sounds during a cognitive dichotic listening task. These variables were correlated with ACE counts and CHAOS scores to examine linear relationships and also compared between individuals with high (4 or more) or low (less than 4) ACE counts to examine non-linear long-term effects. I predict that adults with high ACE counts will show less modulation of attention in the dichotic listening task, as evidenced by more similar ERP latencies and amplitudes across attention conditions. These findings can help provide insight into how adversity relates to psychological and cognitive functioning as well as understanding the longitudinal developmental impact of environmental stress and adversity.

**FYRE Poster  
Conference Room B**

*Using density function theory calculations to explore reaction thermodynamics of water splitting reactions*  
**Fiona Chen, Hanping Ding, Dodge Family College of Arts and Sciences**

Adverse childhood experiences (ACEs) can significantly impact long-term psychological and cognitive outcomes; however, the impact on neural markers for cognition is less well studied. This study investigates whether ACEs and other measures of adversity, such as household dysfunction (CHAOS), predict basic neural function at rest and during a cognitive task that requires split attention, using electroencephalography (EEG) in adults. EEG variables included resting power within standard frequency bands, and event-related potential amplitudes and latencies to attended and unattended sounds during a cognitive dichotic listening task. These variables were correlated with ACE counts and CHAOS scores to examine linear relationships and also compared between individuals with high (4 or more) or low (less than 4) ACE counts to examine non-linear long-term effects. I predict that adults with high ACE counts will show less modulation of attention in the dichotic listening task, as evidenced by more similar ERP latencies and amplitudes across attention conditions. These findings can help provide insight into how adversity relates to psychological and cognitive functioning as well as understanding the longitudinal developmental impact of environmental stress and adversity.

**FYRE Poster  
Conference Room B**

*Effect of Genetic and Environmental Contributors to Attentional Processes in Parent-Child Dyads*  
**Abigail Clark, Lauren Ethridge, Dodge Family College of Arts and Sciences**

The effects of parenting, other environmental experiences, and inherited factors from genetic relatedness on children's cognitive development can be difficult to separate, making interventions targeted at improving childhood outcomes complex. This study investigates attention-related electroencephalography (EEG) variables between parent-child dyads to study how genetic and environmental factors influence cognitive processes. Using Event-Related Potential (ERP) metrics for unattended and attended stimuli, we analyzed relationships between parent and child performance on a dichotic listening task, which requires split attention and cognitive effort. Similarities in neural measures related to attention performance may be due to genetic relatedness or environmental factors, so to account for environmental factors, we conducted partial correlation analyses accounting for adverse childhood experiences (ACEs) and negative parenting scores during a structured observation task. Additionally, we analyzed how theta and gamma band power during this task correlate with these attentional processes and neural activity. I hypothesize that ACE effects in our analysis will not explain most of the variance, rather that correlations between parent-child dyads will be primarily explained by biological factors. Results from this study will potentially inform whether neural measures of attentional regulation are meaningful outcomes for targeted interventions related primarily to changing environmental factors such as parenting style or household environment.

**Oral Presentation  
Room A1**

*Understanding the Mechanism of Transcranial Magnetic Stimulation via Multimodal Imaging Techniques*  
**David Clark, Han Yuan, Gallogly College of Engineering**

Transcranial Magnetic Stimulation (TMS) is a non-invasive, FDA-approved treatment option for various neurological disorders, including Major Depressive Disorder (MDD). The current treatment targets the subject's left Dorsolateral Prefrontal Cortex (DLPFC) as a pathway to stimulate the connected subgenual Anterior Cingulate Cortex (sgACC), a region shown to play a critical role in depression. However, the TMS-response network is poorly defined across literature and highly variable between subjects. Also, much research has been focused on healthy subjects only. The current research project has analyzed results from multimodal imaging techniques to attempt to better define this TMS-response network across both healthy and MDD subjects. Comparing TMS-concurrent fMRI activation maps to resting state fMRI connectivity maps, we have found that the most similar connectivity maps to TMS activation

(cont.) were not seeded at the target coordinates. Furthermore, significant differences between the two groups were found outside of the expected sgACC and auditory regions, providing further proof that stimulation may not be focused on or limited to the target coordinates. These findings improve our understanding of the mechanism of the TMS-response network and suggest that treatment to depression could be improved by targeted delivery of TMS

**Non-FYRE Poster  
B2/4/6 Super Suite**

*Evaluating the Filtration Efficiency of Diacrylate Pluronic P84 Membranes for Salt Solutions*  
**Jackson Clymer, Reza Foudazi, Gallogly College of Engineering**

Membrane Filtration can be a cheaper and more efficient alternative to traditional separation techniques. Pores in the membranes allow for certain sized particles to pass through the membrane, while preventing larger molecules from entering. Lyotropic Liquid Crystal (LLC) membranes are a special type of membrane that maintains uniform pore sizes when formed, which makes them desirable for filtration processes. In this project, Pluronic P84 was diacrylated and crosslinked to form P84DA LLC membranes, which were then tested for their filtration properties against a variety of salt solutions. By calculating the conductivity of known salt concentrations, a plot of conductivity and concentration was created. This allowed for the concentration of the permeate to be found by the linear relationship. From there, the flux and rejection of the P84DA membranes were calculated in order to determine the effectiveness of the membrane filtration. By gaining an understanding of the efficiency of the P84DA LLC membrane against certain salt solutions, further experiments can be performed, looking into how environmental factors affect the selectivity of the membrane.

**FYRE Poster  
Conference Room B**

*Cross-analysis of lon-1 and lon-8 Mutants to Study Growth Regulation in C. elegans*  
**Bryan Conley, Gavin Woodruff, Dodge Family College of Arts and Sciences**

Greater knowledge regarding the roles of certain genes that determine organism's body length and size is necessary to increase success in medical treatments and preventative medicine. Caenorhabditis nematodes are a long-standing biomedical model system, and C. inopinata is a sister species of C. elegans that exhibits a much longer body length. In C. elegans, body size is strongly influenced by genes implicated in TGF- $\beta$  signaling as well as those that regulate cuticle formation. Previous transcriptomic data revealed widespread increased expression of cuticular collagen genes in C. inopinata in comparison to C. elegans across three developmental stages. At the same time, lon-1 encodes a PR-related protein that constrains body length in C. elegans. Similarly, lon-2 encodes a transmembrane-associated glypican that also regulates body length and interacts with TGF- $\beta$  signaling components. dbl-1 encodes a TGF- $\beta$  ligand that regulates C. elegans body size in a dose-dependent manner.

(cont.) col-81 encodes a cuticle collagen with increased expression in C. inopinata compared to C. elegans. Is the overexpression of specific downstream cuticle collagens downstream of TGF- $\beta$  signaling, or can nematode bodies be elongated without impacting the expression of such collagen genes? Moreover, in what ways does body shape change influence cuticle structure? Here, we aim to examine how these known body length regulators in C. elegans impact the expression of specific cuticle collagen genes known to be overexpressed in C. inopinata. Crosses were performed to generate lon-1(lf)/dbl-1(gf) double mutants as well as lon-2(lf)/dbl-1(gf) double mutants. These resultant genotypes will be crossed into an established COL-81::mNG translational reporter line to reveal how these body size genes influence collagen expression patterns. These subsequent strains will then be visualized with fluorescent microscopy to reveal if lon-1, lon-2, and dbl-1 regulate the abundance and spatial distribution of col-81. In addition, these complex genotypes will be crossed into backgrounds, harboring additional body size mutants to address the limits of body size regulation and their impacts on cuticle structure and collagen expression. This work then sets the stage for future work in understanding the genetic and developmental drivers of body size evolution.

**Non-FYRE Poster  
B2/4/6 Super Suite**

*Increasing abundance of plant invader promotes soil carbon emission in a mixed grass prairie ecosystem*

**Hazel Cruse, Lara Souza, Dodge Family College of Arts and Sciences**

Grassland ecosystems perform ecological roles that are essential to both humans and the environment. Notably, they serve as vital carbon sinks whose carbon is stored primarily underground. Despite their importance, grasslands are highly converted and poorly protected, which makes them particularly vulnerable to biological invasions. These invasions impact traits across levels of ecological organization, but their influence on ecosystem-level traits is less understood. This study examined the effects of the invasive graminoid Bothriochloa ischaemum on soil respiration (the amount of carbon dioxide released by microbial organisms) in a mixed-grass prairie in Central Oklahoma. We utilized 40 pre-existing observational plots that contained varying, relative abundances (from Zero to High) of B. ischaemum. We collected soils from each plot and established a laboratory incubation with the periodic sampling of CO<sub>2</sub> from each jar 0, 1, 2, 3, 5, 8, 15, and 30 days after soils were placed in them. Greater abundance of B. ischaemum was positively associated with soil carbon respiration at the end of our soil incubation (Day 30). This indicates greater microbial activity with increasing abundance of an invasive plant, which can enhance nutrient availability and likely positive feedback on invader performance. Increased soil respiration can also promote atmospheric CO<sub>2</sub> and deplete soil organic carbon in the long-term. This increase in microbial activity along an invasion gradient could be due to changes in the microbial community caused by B. ischaemum. Ultimately, B. ischaemum negatively impacts soil carbon respiration in this grassland system and thus requires careful monitoring and management.

**FYRE Poster  
Conference Room B**

*Protein AUF1 Phosphorylation in WI-38 Cells and its Effects in Binding with mRNA and noncoding RNA*

**Kristin Dang, Je-Hyun Yoon, Dodge Family College of Arts and Sciences**

Senescent cells, or cells that no longer divide but do not die, have resulted in long term health effects, such as cancer, through harmful accumulation. This occurs from lack of protein (AUF1) phosphorylation in the cells; protein phosphorylation acts as a molecular switch to regulate different, vital cellular processes (Mun et al., 2025). The goal of this study is to investigate the AUF1 protein phosphorylation and its effects in binding to mRNAs and noncoding RNAs, which helps to analyze AUF1 signaling pathways and gene expression in WI-38 cells. We hypothesize that the phosphorylation of AUF1 would be greater in gene expression levels compared to the control because AUF1 phosphorylation causes increased cellular function and changes in structure, thus increasing the miRNA levels, of which regulate gene expression. By using antibody anti-AUF1 to test the phosphorylation of the proteins within the cells, the protein concentration and interactions with the cells were determined. Through immunoprecipitation, or IP, the target proteins were isolated and measured. RT-qPCR measured the Ct (threshold cycles) in miRNAs, and these values will be compared to the control. Our results support our hypothesis as the range of the AUF1 phosphorylated Ct values was 15-22, which indicates there are high amounts of the target concentration miRNA, which is a significantly greater amount compared to the wildtype samples. By detecting target nucleic acids in human cells, treatment through restoring protein phosphorylation on aging cells and cancer cells can be made possible and improved as more research is conducted.

**Oral Presentation  
Room A3**

*Bioinformatic identification and analysis of a von Willebrand factor type A domain and MIDAS motif in Desulfovibrio vulgaris Hildenborough BfsA adhesin*

**Kayla Davis, Kara DeLean, Dodge Family College of Arts and Sciences**

von Willebrand factor type A (vWA) domains are conserved protein motifs associated with cellular adhesion and protein interactions in eukaryotic organisms. However, the presence and function of the vWA domain in prokaryotes remain relatively unknown. This study investigates the presence of a predicted vWA domain in *Desulfovibrio vulgaris* Hildenborough (DvH), a sulfate-reducing bacterium known for its biofilm-forming capacity. Using bioinformatic techniques, the DvH adhesin BfsA was analyzed based on its sequence and predicted structural features. Comparison of BfsA to eukaryotic and prokaryotic vWA domains revealed the structural alignment of two alpha helices and a loop region. Additionally, the conserved loop region contains a metal-ion-dependent adhesin site (MIDAS) motif (DxSxS). This motif suggests a mechanism of metal-binding interactions coordinating protein-protein behavior in the biofilm matrix. These results highlight the potential functional role of the DvH vWA domains in biofilm matrix structure and understanding the mechanisms DvH uses to colonize host surfaces.

**FYRE Poster  
Conference Room B**

*Evaluating Human Circulation and Oxygenation Using Noninvasive Vascular Technology*

**Abigail Days, Mikhail Kellawan, Dodge Family College of Arts and Sciences**

This project analyzes human circulation and oxygenation through noninvasive vascular imaging techniques, including transcranial Doppler ultrasound (TCD), near-infrared spectroscopy (NIRS), brachial artery Doppler ultrasound, and Finapres blood pressure. These techniques are used to assess circulation and oxygenation in exercise testing. TCD measures blood flow velocity in the middle cerebral arteries on both the left and right sides of the brain to provide an understanding of cerebral vascular activity. The Finapres blood pressure device continuously analyzes blood pressure to identify rapid vascular tone changes. NIRS is used to measure tissue oxygen saturation and hemoglobin measurements in peripheral, skeletal muscle, providing data on local oxygen utilization in the body. Brachial artery ultrasound analyzes vascular flow in the periphery by measuring the velocity and diameter of arteries during muscle relaxation and contraction. The collective efforts of these noninvasive tests provide an overarching analysis of central and peripheral circulation and oxygen utilization. Furthermore, the ability to cross-analyze data from these noninvasive techniques can differ depending on vascular health and physiological variables. For example, subjects with Peripheral Artery Disease (PAD) or who have been exposed to chemotherapy tend to be predisposed to poor arterial circulation. Overall, the multifactorial method allows for a comprehensive clinical understanding of cardiovascular function and oxygenation; while presenting a simplified yet applicable method compared to invasive techniques. Support is greatly acknowledged by the University of Oklahoma Health and Exercise Research Department. During this research, Abigail Days was supported by the FYRE Program and the University of Oklahoma Honors College.

**FYRE Poster  
Conference Room B**

*Population changes of terrestrial insects in Oklahoma due to the expansion of urban areas*

**Brady de Blonk, Gustavo Silvia de Miranda, Gallogly College of Engineering**

The growth of a city can impact the populations of organisms living within the area around the urban area. Issues such as this has been readily apparent in Oklahoma City as it is the 8th largest city by land area in the United States. This study aims to investigate how the terrestrial insect populations have been affected by the growth of OKC and Tulsa over the past 100 years and to see what can be done to reduce the damage caused by expansion. Using data analysis tools, the samples contained in Lloyd Noble were graphed in a population overtime graph for each of the counties in Oklahoma, and the results were matched to major expansion efforts logged by the city. The results indicated that the expansion of the cities has caused a decline in terrestrial insects across the board, pushing them outward to neighboring counties. These findings can be used by the environmental regulation board to work with city planners to minimize the impact of growth on key populations of insects.

**Non-FYRE Poster  
B2/4/6 Super Suite**

*Liposome Synthesis Using a Programmable Fluidics Approach*

**Ana Clara de Medeiros Morais, Stefan Wilhelm, Gallogly College of Engineering**

Liposomes are nanoparticles that can encapsulate both hydrophilic and hydrophobic therapeutic agents, making them important for drug delivery. However, current commercially available liposome equipment is often cost-prohibitive, creating a challenge for academic research aimed at improving organic nanoparticles for targeted delivery. Here, we demonstrate that a T-mixer-based fluidics benchtop setup, with controlled mixing of aqueous and organic phases, enables the cost-effective synthesis of liposomes. This custom fluid-mixing device was built from a 3D printer (Ender 3) motor and 3D-printed support. The system is programmable and customizable for different flow ratios of aqueous and lipidic (or polymeric) phases across different payload-encapsulating nanoparticle formulations and is compatible with the synthesis of various nanoparticle types (lipid, polymeric, and liposomes). Our current project aims to formulate fluorescently labeled liposomes that are compatible with the chemical procedures of expansion microscopy. The aim is to retain the fluorescence signal of those liposomes after cell expansion, enabling high-resolution 3D optical imaging. We will use this liposome system as a model to study intracellular nanoparticle distributions for targeted drug delivery, such as cancer chemotherapy.

**FYRE Poster  
Conference Room B**

*The Role of Exosomes in Solid Tumor Progression and Treatment*

**Meredith Decker, Dongin Kim, Dodge Family College of Arts and Sciences**

**Introduction:** Exosomes are very small vesicles released by cells and found in body fluids such as blood. They carry molecules such as proteins and RNAs that help cells communicate with each other. Recent studies show that exosomes play an important role in cancer progression, especially in the tumor microenvironment and metastasis. Metastasis is the process by which cancer cells spread from the original tumor to other parts of the body. Exosomes can affect this process by carrying regulatory RNAs, including miRNAs, circRNAs, and lncRNAs, which may influence important signaling pathways such as MAPK and PI3K/Akt. **Methods:** This project was based on a literature review of published studies about exosomes and their role in solid tumor progression. The review focused on the molecular cargo of exosomes, their origin, and their effects on cancer-related signaling pathways. **Results:** The studies reviewed showed that exosomes can promote tumor growth, metastasis, and resistance to therapy. They do this by improving communication between cancer cells and the tumor microenvironment. Exosomes may also serve as useful biomarkers for cancer detection and monitoring. **Conclusion:** Exosomes are important in solid tumor progression and may be helpful for early cancer detection and treatment. They may improve liquid biopsy methods and support the development of new therapies for metastatic cancer. More research is needed to better understand their role and clinical potential.

**FYRE Poster  
Conference Room B**

*Effects of Lysine Deacetylase Inhibitors on OAT1B1 Plasma Membrane Localization*

**Davinia Devaraj, Wei Yue, David L Boren College of International Studies**

Organic anion transport protein 1B1, also known as OATP1B1, has an important role in drug uptake. Lysine acetylation is a form of protein modification after synthesis, a post-translational modification (PTM). The focus of this study was to determine the effects of lysine acetylation in inhibitor drugs on OATP1B1 plasma membrane localization via immunocytochemistry staining and confocal microscopy. Immunocytochemistry staining comprised of seeding and fixing the cells to coverslips, addition of both primary antibodies, both secondary antibodies and DAPI, then preparation for confocal microscopy by transferring coverslips to slides. To collect data, confocal microscopy was conducted on each sample. The images obtained from this process are then analyzed using the Fiji software and the results are organized in tables and graphs. The expected results are the effects of lysine deacetylase inhibitor on plasma membrane localization of OATP1B1 can be quantitatively determined using the automated confocal workflow and be correlated with function alteration. These results can be used to provide a basis for changes in drug uptake and how this will affect drug-drug interactions (DDIs) in OATP1B1.

**Non-FYRE Poster  
B2/4/6 Super Suite**

*Operational Resilience of University Campuses Under Grid Disconnection: A Microgrid Modeling Study*

**Tobie Dodson, Moses Olayemi, Gallogly College of Engineering**

Power outages impose consequences that extend far beyond temporary inconvenience. The loss of electricity disrupts essential services, halts business operations, compromises food preservation, and can delay life-saving medical interventions. These disruptions often ripple beyond the immediate outage zone, affecting economic stability, public safety, and community resilience. In environments where continuity of service is critical- such as university campuses- grid reliability becomes not merely a matter of convenience, but of operational and research integrity. Within a university setting, such reliability metrics translate to tangible disruptions in laboratory research, data storage, student housing, dining operations, and campus safety infrastructure. The University of Oklahoma, located in Cleveland County, operates within a region historically exposed to severe weather events. Oklahoma Mesonet data indicates that Cleveland County has experienced 111 recorded tornadoes since 1950 [2], underscoring the region's vulnerability to extreme weather conditions capable of stressing grid infrastructure. Given the combination of measurable outage frequency/duration and geographic susceptibility to severe weather, enhancing campus energy resilience is a priority. This research uses the University of California, San Diego (UCSD) microgrid as a benchmark case study due to its demonstrated ability to operate independently during grid disturbances while sustaining

(cont.) critical loads. The UCSD microgrid has been extensively studied as a real-world example of large campus DER integration and long-standing microgrid operation [3]. This project aims to recreate the UCSD microgrid architecture using MathWorks Simulink and evaluate its adaptation to meet the operational and resilience requirements of the University of Oklahoma.

**FYRE Poster  
Conference Room B**

*Preprocessing and Exploratory Analysis of Acute Respiratory Infection Data in Peru Using Python*  
**Arnav Dutta, Gopichandh Danala, Dodge Family College of Arts and Sciences**

Acute respiratory infections (ARI) represent a leading public health threat in Peru, placing substantial strain on healthcare systems and disproportionately affecting children under five. Despite national surveillance efforts, ARI datasets frequently suffer from missing values, structural inconsistencies, and limited accessibility for computational research. Can systematic Python-based preprocessing of Peru's ARI surveillance data yield a clean, analysis-ready dataset that reveals meaningful epidemiological patterns? Raw ARI case data, population records, and complementary datasets were imported and merged using Pandas and NumPy. Missing values were addressed through variable-appropriate imputation and exclusion strategies. Derived variables, including age-adjusted incidence rates and regional case proportions, were engineered to support deeper analysis. Exploratory visualizations constructed in Matplotlib revealed consistent seasonal spikes in ARI cases between May and September, corresponding with Peru's winter months. Regional disparities were also observed, with highland regions reporting a higher incidence than coastal areas. Preprocessing and exploratory analysis successfully transformed fragmented surveillance data into a structured, reproducible research-ready pipeline, confirming a climate-associated seasonal pattern in IRA transmission. This work advances data science capacity among emerging researchers, supports evidence-based public health planning in Latin America, and establishes a replicable framework for future epidemiological modeling of respiratory disease.

**FYRE Poster  
Conference Room B**

*Effects of Light Levels on Bird Call Onset in Norman, Oklahoma*  
**Janani Easwar, Jeffrey Kelly, Dodge Family College of Arts and Sciences**

Light pollution often has adverse effects on species, disrupting the light-dark cues they use to time daily activities. For birds specifically, studies show that light-polluted landscapes are associated with an earlier morning onset of calls (called a dawn chorus), which indicates earlier onset of bird activity. Some studies have shown that responses to light pollution are most pronounced in species with specific characteristics, including migratory habits, open nests, bigger eye sizes, etc. Other studies indicate that increases in body mass, when controlling for changes in eye size, lead to later dawn chorus onset in birds. A study of how

(cont.) light pollution affects dawn chorus onset in Norman, Oklahoma specifically is lacking. Through this study, we aim to provide an insight into how light levels in Norman, Oklahoma impact bird call onset. We used a Sky Quality Meter and Audio Moth recording device to collect data that we will analyze to assess how birds in Norman, Oklahoma respond to light pollution. We hypothesize that we will see a direct relationship between increasing light level and timing of dawn chorus onset. If we have sufficient data, we will also examine how bird body size specifically, after controlling for variations in eye size, impacts birds' response to light levels in their environment. Implications of this study include a better understanding of how light pollution affects bird activity, which improves our understanding of the drivers of animal behavior and the ecological consequences of artificial light at night which could translate into environmental policy.

**FYRE Poster  
Conference Room B**

*Understand Researching by Reflecting on Designing an Educational Green Wall*  
**Antwan Edwards, Farrokh Mistree, College of Atmospheric and Geographic Sciences**

Interdisciplinary work helps develop robust critical thinking skills; however, research shows many students continue to be engaged in work that is contained within their field of study, encouraging restrictive thinking. Our research project remedies this through the original design of an Educational Green Wall, a project outside our primary disciplines that provides insight into different schools of thought and allows us to reflect on our academic and professional careers. We followed a nine-step design process to satisfy the requirements for designing a green wall, focusing on identifying customer needs and requirements before any implementation. This allows us to expand our thinking without being constrained to immediate execution. This process integrated engineering, business, biology, and LLM (Large Language Model) use, allowing us to explore varied schools of thought. Through this process, we developed a clearer understanding of what research is and its role in personal and academic development, as experiencing research early enabled us to make the necessary realizations for our future career paths. The intersection of design and research also allowed us to understand the value of each process, revealing that using both processes in tandem with each other provides value in exploring potential solutions to unfamiliar problems. Our experience demonstrates that exploring interdisciplinary experiences early in one educational journey can help students develop critical thinking skills, reduce restrictive thinking, and foster their professional career important considerations to make as one prepares to navigate their academic and professional life.

**Oral Presentation  
Room A1**

*Distinguishing Active Pharmaceutical Ingredient (API) and Lactose Particles in Dry Powder Inhalers Using Raman Spectroscopy and Image Analysis*

**Maddox Ellis, Changjie Cai, Dodge Family College of Arts and Sciences**

Efficient pulmonary drug delivery depends on deposition of inhaled particles in the target region of the respiratory tract rather than in non-target regions. Dry powder inhaler formulations typically contain both active pharmaceutical ingredient (API) particles and lactose carrier particles. Accurate distinction and characterization of these particles and their emissions are therefore important for understanding inhaler performance and drug delivery efficiency. In this study, particles emitted from a dry powder inhaler will be collected using a Next Generation Impactor (NGI), which separates particles by aerodynamic size across multiple stages. Raman spectroscopy will be used to chemically identify individual particles based on their molecular vibrational spectra, enabling distinction between API and lactose particles collected on filters. Optical microscopy images of the collected particles will then be analyzed using ImageJ software to determine particle count and size of API and lactose, respectively. Combining chemical identification with image-based analysis will enable determination of particle composition and size distribution within the inhaler emissions. To support these experiments, several filter types were first evaluated for Raman compatibility and NGI performance. Results showed that silver filter produced lower background signals in Raman analysis than polycarbonate and glass microfiber filters and were therefore selected for subsequent particle collection. Impactor devices such as the NGI typically require greased filters to minimize particle loss caused by bouncing. However, when silver filters were greased with silicone oil, contamination interfered with Raman analysis and made the filters unsuitable for chemical identification. The next step is to evaluate the collection efficiency of ungreased silver filters before collecting real drug powders for Raman and image-based analysis.

**Non-FYRE Poster  
B2/4/6 Super Suite**

*Critical Consciousness and Mental Health Among LGBTQ+ Individuals: Divergent Effects for BIPOC and White Community Members*

**Isabella Encapera, Maruicio Carvalho, Dodge Family College of Arts and Sciences**

LGBTQ+ Black, Indigenous, and People of Color (BIPOC) hold intersecting identities that expose them to multiple systems of oppression that shape their lived experiences and psychological well-being. Previous research shows that LGBTQ+ individuals experience higher levels of depression, anxiety, and stress compared to heterosexual individuals. For BIPOC LGBTQ+ individuals, the combined effects of racism and heterosexism may further intensify these mental health disparities. At the same time, BIPOC LGBTQ+ communities often demonstrate resilience through collective forms of healing, resistance, and community building. However, relatively little research has examined how psychological processes such as critical consciousness and community connectedness contribute to these responses. The present study examined how critical consciousness, community connectedness,

(cont.) microaggressions, internalized stigma, and racial identity interact to predict psychological well-being among LGBTQ+ individuals. A total of 207 participants took part in the study, including 106 BIPOC LGBTQ+ individuals and 101 White LGBTQ+ individuals. Results indicated that critical consciousness functioned differently across racial groups. For BIPOC LGBTQ+ individuals, critical consciousness served as a protective factor against negative mental health outcomes when individuals experienced microaggressions and internalized stigma. In contrast, critical consciousness was associated with poorer mental health outcomes among White LGBTQ+ individuals. In addition, BIPOC LGBTQ+ individuals with lower levels of critical consciousness benefited from stronger community connectedness. Among those higher in critical consciousness, the impact of microaggressions on mental health depended on the degree of community connectedness. These findings highlight the complex role that critical awareness and community connection play in shaping mental health within diverse LGBTQ+ populations.

**Oral Presentation  
Room A3**

*Evaluating Brain Tumor Segmentation with nnU-Net*

**Jeff Engelman, Han Yuan, Dodge Family College of Arts and Sciences**

Automated segmentation of brain tumors is essential for clinical diagnosis and surgical planning; however, general-purpose deep learning models often struggle with domain-specific imaging protocols, leading to decreased accuracy and frequent false positives. This project evaluates the performance of the nnU-Net framework on brain tumor MRI data. While baseline nnU-Net models demonstrate proficiency in tumor identification, they frequently misclassify healthy tissue, such as those found in Human Connectome Project (HCP) control datasets, as pathological. Performance is quantified using the Dice similarity coefficient compared against expert-labeled manual segmentations. Results showed false positive findings of brain tumor in the healthy control MRI. These findings highlight the need for training data composition in medical image segmentation, suggesting that incorporating healthy controls into training sets may improve model specificity, a critical consideration for real-world clinical deployment.

**FYRE Poster  
Conference Room B**

*A Computer Vision Approach to Road Crack and Pothole Detection*

**Vanessa Essien, Bin Xu, Gallogly College of Engineering**

Road surface damage, such as cracks and potholes, presents significant challenges for transportation safety and infrastructure maintenance worldwide. Traditional inspection methods are often manual, time-consuming, and costly. This project explores a computer vision approach to automatically detect and classify road damage using image data. A publicly available dataset of road images is used to train a machine learning model capable of identifying common types of pavement distress. The methodology includes data preprocessing, model training, and evaluation using standard performance metrics. The model is then tested on unseen images to assess its ability to accurately detect road cracks and potholes. Results

(cont.) demonstrate that computer vision techniques can effectively identify visible road damage with promising accuracy. Visual outputs, including images with predicted bounding boxes, highlight the model's ability to locate and classify damage regions. This study provides an accessible introduction to the application of artificial intelligence in infrastructure monitoring. The findings suggest that image-based detection systems could support more efficient, low-cost methods for road condition assessment, especially when combined with widely available devices such as smartphones. Overall, this research highlights the potential of computer vision as a practical tool for improving road maintenance and safety.

**Non-FYRE Poster**  
**B2/4/6 Super Suite**

*Design and Evaluation of a Low-Cost Wearable ECG Monitoring System*

**Adji Fall, Yuye Ling, Gallogly College of Engineering**

Inspired by Raphael Carl Lee, who integrated engineering and clinical practice to advance medical solutions, I aim to combine my skills in electronics and data analysis with patient-centered research. My interest in electrophysiology stems from a fascination with how the human body generates and transmits electrical signals, particularly in the heart, and the potential for engineering innovations to enhance patient care and accessibility.

**Non-FYRE Poster**  
**B2/4/6 Super Suite**

*Missed Opportunities: Do Older Workers Take Advantage of AI to Change Their Jobs Differently Than Younger Workers?*

**Anae Fong-Yan, Eric Day, Dodge Family College of Arts and Sciences**

The widespread integration of Artificial Intelligence (AI) into workplaces raises concerns about job security and potential disparities between older and younger workers rooted in traditional beliefs. My poster is from the honors thesis I wrote that aimed to extend findings from Kooij et al. (2017), who showed older workers prioritize strengths crafting while younger workers prefer development crafting, by examining whether workers use AI to job craft toward strengths and development, and the possible moderating role of age. A three-wave lagged design was conducted via Prolific with 575 participants from the retail, finance, and insurance industries. Findings showed a positive relationship between AI use and job crafting towards both strengths and development. Unexpectedly, the moderating effect of age was not significant. Results are discussed, offering a new perspective on older workers that challenges past findings and traditional beliefs, suggesting that both older and younger workers use AI similarly as a resource for job crafting.

**FYRE Poster**  
**Conference Room B**

*Modeling Heat Transfer in Carbon Nanotube-Based Photothermal Cancer Therapy*  
**Raser Forth, Dimitrios Papavassiliou, Gallogly College of Engineering**

Photothermal therapy using carbon nanotubes is an emerging tactic to destroy cancer cells using localized heating. Carbon nanotubes are able to absorb vast amounts of infrared light when injected into cancerous tumors. However, the extent to which the localized heating via carbon nanotube can effectively transfer heat to the surrounding cancer cells is not yet understood. We are trying to find out how effective an infrared-heated carbon nanotube is at destroying local cancer cells. To investigate this, we modeled a single carbon nanotube embedded within a cancer cell and surrounded by a fluid environment representing biological tissue. The nanotube was exposed to infrared heating in order to simulate the photothermal therapy process and observe how the heat propagates through the surrounding cell. By analyzing the temperature distribution and heat transfer from the nanotube to the cell, we can determine how effectively the localized heating spreads throughout the cancerous tissue. Understanding how heat transfers from the nanotube to the surrounding cell is important because the goal of photothermal therapy is to raise the temperature of cancer cells to levels that can damage or destroy them without harming nearby healthy tissue. Through this model we can observe how quickly and how far the heat spreads, which helps determine whether carbon nanotubes can effectively produce the necessary temperature increase for cancer treatment. This analysis may provide insight into the potential of infrared-heated carbon nanotubes as a targeted method for cancer therapy.

**FYRE Poster  
Conference Room B**

*Functional imaging of the human brain using fMRI*

**Lilli Fowler, Han Yuan, Dodge Family College of Arts and Sciences**

Functional magnetic resonance imaging (fMRI) is widely used to study brain activity and functional connectivity between brain regions. However, analyzing fMRI data can be challenging because neuroimaging workflows require multiple preprocessing and analysis steps. This project focuses on developing practical skills in fMRI analysis while building a reproducible workflow for functional connectivity analysis. As part of this work, I have completed training in the AFNI software suite, where I learned the fundamental steps of fMRI preprocessing and analysis. Using example datasets, I practiced preparing imaging data, performing motion correction, spatial normalization, and conducting connectivity analyses. Figures and results from this training demonstrate key stages of the workflow and illustrate how AFNI tools are used to process neuroimaging data in a reproducible manner. Building on this training, I will apply the analysis pipeline to MRI data from both a healthy individual and a brain tumor patient. Comparing these datasets is important because brain tumors can alter normal functional organization and connectivity patterns. Recent research from our lab has shown that postoperative functional connectivity metrics derived from resting-state fMRI can predict neurological recovery and survival outcomes in glioma patients. By implementing a structured analysis pipeline, this project aims to establish a reproducible approach to fMRI analytics that supports future clinical applications, including predicting recovery trajectories in brain tumor patients.

**Oral Presentation  
Room B3**

*What do we stand to gain: Examining the Perceptions of Stakeholders of OU Study Abroad Programs to Africa*

**Damia Francis, Moses Olayemi, Dodge Family College of Arts and Sciences**

Study abroad programs (SAPs) have long been identified as a helpful avenue to help students gain global and intercultural competency, broaden their perspectives, and enhance their academic experience. While these benefits are obvious to students, employers, and higher-ed institutions, our research team is interested in addressing three consecutive objectives regarding SAPs: motivation, broadening participation, and impact measurement. There seems to be limited research done on the withdrawal of SAPs during the pre-departure stage. We investigate an unsuccessful SAP at the University of Oklahoma (OU). The unsuccessful SAP we are investigating was traveling to Ghana in 2024. There were 24 students who were

(cont.) projected to go. When it came time to collect the deposit, there was a lack of response from all 24 students. Utilizing Qualtrics as our survey instrument, we created two surveys. The first survey measured the impact of participation in SAPs, while the second survey helped us better understand barriers that might hinder students from going to African SAPs. We sent these surveys to the 24 students and 2 faculty who showed interest in attending the African SAP to Ghana. We received 2 responses: 1 student and 1 faculty member. Our team also conducted interviews with two participants. Data collection remains ongoing; some of our preliminary findings were affordability, marketing strategies for students with adventurous personalities, and unlearning stigmas propagated in the media regarding African countries. Our thematic analysis revealed immense value to other faculty and staff who are interested in conducting SAPs to African countries in the future.

**FYRE Poster  
Conference Room B**

*Low-Frequency to Infrasonic Noise and its Effect on Concentration in Educational Spaces*

**Ethan Friday, Kofi Asare, Gallogly College of Engineering**

My research focuses on low-frequency to infrasonic (<20 Hz) noise emitted by classroom air conditioning units and the effects they have on student concentration and health. Recent studies into the urban noise environment suggest acoustic scientists may be wading through the problem of noise with the wrong mindset, revealing that noise levels around 70 decibels are actually more conducive to creative activities than silent environments, meaning loudness itself is not the problem. With this in mind, I seek to find the cause of what gives certain noises an annoying or disruptive quality, not through its sound level, but its frequencies. Recent studies from the Netherlands and Iran have shown that near-infrasonic noise, between 0 and 30 Hz emitted by industrial machinery near residential neighborhoods causes sleep-related issues, headaches, and concentration difficulty. Coincidentally, the vibrations of HVAC components in classrooms such as fan blades and motors also radiate low-frequency noise. To determine the effects air conditioning noise has on student focus, I will test how proximity to sources of disturbance effect concentration levels with post-class surveys and will collect frequency data via the construction of an infrasonic sensor made from a drumhead and work bucket.

**Non-FYRE Poster  
B2/4/6 Super Suite**

*Signals of Civil War: Tracking Information Networks in the Vitellius Vespasian Transition through ORBIS*

**Ella Fried, Joey Williams, Gaylord College of Journalism and Mass Communication**

The political crisis known as Rome's Year of the Four Emperors in 69 CE culminated in the displacement of Vitellius, Governor of lower Germany, whose authority depended on slow mobilization western armies. Soon displaced by Vespasian, the eastern commander whose power lay in Egypt, Judea, and Syria. This paper argues that Vespasian's usurpation was achieved through communication networks. Using the Stanford Geospatial Network Model

(cont.) of the Roman World (ORBIS) grounded in archaeological research on Roman roads, shipping routes, travel speeds, and more alongside Tacitus Histories, three case studies are presented. The first two establish a methodological baseline, demonstrating that ORBIS can accurately reconstruct movements when the historical record preserves geographic clarity, and that its limitations align directly with narrative breakdown. This foundation enables the third case study, which shows that the eastern proclamations of Vespasian cannot be explained as a sequential reaction and instead reveal prior coordination across provincial power centers.

**Non-FYRE Poster  
B2/4/6 Super Suite**

*Hormones, the Microbiome, and Women's Menstrual Health: Exploring the Role of Menstrual Health Products*

**Agya Gaaro, Paul Lawson, Dodge Family College of Arts and Sciences**

Women's menstrual health is influenced by complex interactions between hormones, the reproductive tract microbiome, and the products used during menstruation. Under the mentorship of Paul Lawson, this independent research project explores the intersection of hormonal changes, microbial communities, and menstrual health products to better understand how these factors may influence vaginal health. Throughout the menstrual cycle, fluctuations in hormones such as estrogen and progesterone can alter the composition and stability of the vaginal microbiome. These microbial communities, often dominated by beneficial bacteria such as *Lactobacillus*, play a critical role in maintaining a healthy reproductive environment and protecting against infections. At the same time, menstrual health products including pads, tampons, and menstrual cups may interact with this microbial environment by affecting moisture levels, pH, and bacterial growth conditions. This project will review existing scientific literature to examine how hormonal fluctuations and different menstrual products may influence microbial diversity and balance in the reproductive tract. The research aims to identify potential gaps in knowledge and highlight implications for women's health, hygiene practices, and product design. By integrating perspectives from microbiology, women's health, and environmental factors, this project seeks to contribute to a deeper understanding of menstrual health and support more informed choices regarding menstrual care products and reproductive health management.

**FYRE Poster  
Conference Room B**

*How ATP binding and Hydrolysis Regulate MukB Function in Bacterial DNA Organization*  
**Nash Gandhi, Valentin Rybenkov, Dodge Family College of Arts and Sciences**

Structural maintenance of chromosomes (SMC) complexes are proteins that help organize and separate DNA in bacteria. In *Escherichia coli* (*E. coli*), the MukBEF complex composed of MukB, MukeE, and MukF, plays a key role in chromosome organization. MukB is an ATPase (an enzyme that binds and hydrolyzes ATP, cell's energy molecule) and has been shown to bind and reshape DNA; however, the distinct roles of ATP binding and ATP hydrolysis in regulating MukB function remain unclear. The research conducted constructed plasmids encoding three

(cont.) MukB mutants each representing distinct ATPase functional states: MukB-S1366R, defective in ATP binding and head engagement; MukB-D1406A, a Walker B mutant impaired in ATP hydrolysis; and MukB-E1407Q, which is hydrolysis-deficient and stabilizes the ATP-bound state. Polymerase chain reaction (PCR) was used to generate mutant DNA fragments, which were purified using GeneJET spin columns. Agarose gel electrophoresis was used to confirm the size of DNA fragments and integrity, and the concentrations of DNA were measured using a NanoDrop spectrophotometer. Recombinant plasmids were introduced into *E. coli* for propagation. These constructs provide functional tools to distinguish the roles of ATP binding versus ATP hydrolysis in MukB. By isolating specific ATPase states, this work advances the study of how ATP-dependent conformational changes regulate MukBEF-DNA interactions and contribute to bacterial chromosome organization.

**Oral Presentation  
Room A5**

*Within and Without the Frames: A Case Study of Leonardo da Vinci's Grotesque Head of an Old Woman*

**Ann Gao, Allison Palmer, Weitzenhoffer Family College of Fine Arts**

This case study of Leonardo da Vinci's small ink drawing, *Grotesque Head of an Old Woman*, reconsiders Petrarchan beauty standards featuring both deformity and conformity to societal ideologies framed around court portraiture. The personal agency of this dowager here is considered in the light of both the history of women and of beauty leading up to fifteenth-century Italy. She has a reclining forehead, an aquiline nose, a hunched back, and sagging breasts all bedecked in conventional garments and accessories. Scholars have primarily scrutinized Leonardo's male caricatures, offering distinct perspectives on their attribution and significance within his oeuvre. Building on formalism and drawing on multiple "period eyes" that integrate feminist critique and theories on humor, this study traces a single, female subject's divergence from beauty standards, finding that the incongruous elements introduce cognitive disruption and humor. This caricature serves as a device to poke light-heartedly at prevailing ideologies that reduced women to objectifying categories young brides, Platonic Beloveds, or paragons of beauty. In doing so, this mediating take on female portraiture also complicates the age-old dichotomy of beauty and ugliness, presenting Leonardo's innovative deformity as a critical turn towards what Friedrich Schlegel later theorized as the individual and the interest in an age of emerging humanism.

**FYRE Poster  
Conference Room B**

*Fabrication of Colloidal Quantum Dot Films Using Spin Coating Methods*  
**Logan Gavit, Dong Yitong, Gallogly College of Engineering**

Colloidal quantum dots are a type of semiconducting nanocrystal that show great promise in a wide range of different technologies. While the synthesis of these colloidal quantum dots is usually done using wet chemical methods, any real application in technology requires them to be in a solid state. There are various methods that can be used to achieve this; however, the

primary method used during this research was spin coating. Spin coating is a process in which the quantum dot solution is drop cast onto a substrate, in this case glass, to create a thin film. These films can then be analyzed to determine the quality of the dots and what their potential applications could be: LEDs, lasers, solar concentrators, and much more. During this research two different methods of spin coating were used: the first involved using a concentrated stock solution of quantum dots and drop casting them onto the substrate to get films that can be used in LEDs; the second method involved spin coating a diluted solution of quantum dots so that individual quantum dots are more dispersed and easier to analyze. Analysis has shown that in particular, the size of a quantum dot can be altered to change its emission and absorbance spectra, which has a wide use in many different electronic applications.

**FYRE Poster**  
**Conference Room B**

*Synthesis of a Small Molecule to Investigate Cellular Nucleotide Signaling*  
**Harper Gibbs, Shikha Chaudan, Gallogly College of Engineering**

3, 5 nucleotides in cellular signaling have been studied extensively. However, 2, 3 nucleotides have been studied far less extensively. The role of these nucleotides as signaling molecules that regulate protein production through messenger proteins is less well-known than 3, 5 nucleotides. Certain substitutions of 2, 3 nucleotides remain unknown in their effects on signaling and protein inhibition. Testing and synthesizing these compounds with different substitutions at different positions is necessary to understand how 2, 3 nucleotides influence signaling pathways. Specifically, this study examines how substitution on 2, 3 cyclic monophosphate nucleotides affects the inhibition of protein production. A nucleotide will be synthesized with a substitution and then interact with a messenger protein. By observing changes in protein production through luminescence compared to other 2, 3 nucleotides, we can determine how these substitutions influence signaling. This study will reveal whether certain substitutions are beneficial for inhibition and provide insight into nucleotide signaling pathways.

**Non-FYRE Poster**  
**B2/4/6 Super Suite**

*A Logistical Crevasse: How Challenges in the Arctic Call for Improved Technology and Cooperation Between Actors in the Region*

**Sofia Givens, Robert Andrews, Dodge Family College of Arts and Sciences**

The Arctic is not the average theater of operations that comes to mind for a majority of Americans when thinking about conflict, but it is increasingly important as the passageways of the north open up due to melting and shifting sea ice. With a race against the world to secure a foothold in the north for security, resources, and shipping lanes, broadening our knowledge of the Arctic and its environment is imperative.

Fairbanks, Alaska has no shortage of information when it comes to the history of warfare in the area, as it holds a number of historical sites including Ladd Field on Fort Wainwright, the Museum of the North, the Arctic and Polar Collections at the UAF Library, the Pioneer Air Museum, and the Lend Lease Monument. These sites allow visitors to gain a better understanding of the challenges the US faces when it comes to planning and operating in the Arctic and also shows how far we have come throughout history.

One of the other ways the US can increase its ability to operate in the region is through knowledge sharing. One of the most important of those being the Arctic METOC (Meteorology and Oceanography) Partnership Summit, held in Fairbanks, Alaska in March of 2026. This gathering is unique, as it encompasses not only the scientific interactions within the region, but the tactical and operational interactions as well. Meetings like these will allow the US to share important information with our own groups and entities, but also other NATO allies.

**Oral Presentation  
Room B3**

*Gamification in Java Programming Education: A Decade of Research from a Scholarly Review*  
**Elizabeth Glass, Javeed Kittur, Gallogly College of Engineering**

This review examines a decade of research on gamification in Java programming education, highlighting growing interest alongside technological advancements in technologies such as artificial intelligence and mobile platforms. Across twenty-four studies, gamified environments have been shown to enhance users' engagement, programming skills, and problem-solving abilities, especially for beginners. Effective game designs include supportive challenges, formative feedback, and adaptive learning features. Assessment methods for gathering feedback range from automated quizzes to peer feedback, contributing to supporting motivation. However, implementation challenges persist, including balancing engagement with instructional rigor, avoiding oversimplification of complex content, and addressing platform limitations. While gamification demonstrates strong potential as a pedagogical strategy in programming education, further research is needed to better explore adaptive designs, long term impacts, and inclusive approaches that meet diverse learner needs.

**Non-FYRE Poster  
B2/4/6 Super Suite**

*Synthesis and Biological Evaluation of Heterocyclic Cannabigerol Derivatives*  
**Avery Glinsmann, Shanteri Singh, Dodge Family College of Arts and Sciences**

Cannabigerol (CBG), a non-psychoactive cannabinoid, shows promise for neuroprotection, pain management, and antibacterial therapy, yet its strong hydrophobicity and poor solubility limit its translational potential. To address this barrier, this project will integrate heterocyclic design with chemoenzymatic synthesis to generate next-generation CBG analogs with improved drug-like properties. The central objectives are: (1) to synthesize a heterocyclic scaffold that functions as a prenyl acceptor, and (2) to diversify this scaffold with multiple prenyl groups to afford a focused library of CBG-inspired derivatives. I will first prepare 2-3 prenyl pyrophosphate donors, then use malonic ester synthesis and cyclization to construct the key heterocycle, 2-(butylthio)pyrimidine-4,6-diol. The resulting intermediates and final analogs will be purified by column chromatography and characterized via Nuclear Magnetic Resonance (NMR) spectroscopy. Leveraging prior expertise in the Singh lab, I will utilize the prenyltransferase NphB to catalyze selective prenylation reactions on the heterocyclic acceptor at an analytical scale. This work is expected to furnish heterocyclic cannabinoid derivatives with enhanced solubility and membrane permeability, providing improved leads for future pharmacological evaluation.

**Non-FYRE Poster  
B2/4/6 Super Suite**

*Cultural Beliefs About Self-Reliance and Attitudes Toward Mental Health Care Among African Americans*  
**John Graven, Mauricio Carvalho, Dodge Family College of Arts and Sciences**

Although African Americans experience mental health problems at rates comparable to White Americans, they are significantly less likely to seek professional mental health care (Lukachko et al., 2015). Prior research has identified several barriers to care, including limited access to services, mistrust of health systems, and cultural stigma surrounding mental illness. The present study examines self-stigma as a psychological barrier that discourages help seeking among African Americans. We propose that cultural beliefs emphasizing resilience, strength, and self-reliance within the African American community may increase internalized stigma toward mental health treatment, particularly among individuals who strongly identify with their ethnic group.

We hypothesized that African Americans who believe their ethnic group places strong importance on self-reliance would report more negative attitudes toward seeking professional mental health care, and that this relationship would be mediated by higher levels of stigma toward mental health treatment. We also expected this effect to be moderated by ethnic identification.

A total of 296 African American participants (176 women) took part in the study. Participants were exposed to information emphasizing either a high or low importance of self-reliance within the African American community. Consistent with predictions, the mediational pathway was significant only in the high self-reliance condition, and the effect was moderated by ethnic identity. By identifying how culturally shaped beliefs contribute to self-stigma, this study aims to improve understanding of disparities in mental health service utilization and inform efforts to reduce barriers to care within African American communities.

**Non-FYRE Poster  
B2/4/6 Super Suite**

*Cultural Beliefs About Self-Reliance and Attitudes Toward Mental Health Care Among African Americans*  
**Marguerite Hall, Daniel Becker, Dodge Family College of Arts and Sciences**

Bats host a wide range of viruses, yet the factors that influence viral presence throughout their annual life cycle remain unclear. This study compares herpesviruses and coronaviruses detected in *Tadarida brasiliensis* (TABR), *Molossus alvarezi* (MOAL), and *Molossus nigricans* (MONI) using PCR screening of oral and rectal swabs. Samples were collected during monthly field trips in Oklahoma and during a one-month sampling period in Belize, allowing for comparison between temperate and tropical environments. A central goal of this project is to explore how viral load may vary during key biological periods, including pregnancy, postpartum, and mating seasons. Because herpesviruses are known to persist in hosts and often reactivate during physiologically stressful periods, we expect higher detection during

(cont.) reproductive stages. In contrast, coronaviruses may follow more acute, seasonal patterns influenced by colony density and social behavior. These comparisons aim to improve our understanding of viral dynamics in bat populations and support future bio-surveillance efforts.

**FYRE Poster  
Conference Room B**

*Glycated Chitosan and its effects on autoimmune response*  
**Charles Hall, Wei Chen, Gallogly College of Engineering**

Glycated Chitosan is an immunological stimulant which can be used to activate the sting pathway which leads to improved viral and cancer treatment. This drug was developed by Dr. Chen and is widely used in studies in our lab. My research focuses on the potential autoimmune effects that Glycated Chitosan (GC) might cause. The poster that I will present will mainly focus on the current in vitro studies that I've been doing, in the future this project will be explored in an extended mouse study using 3 doses of GC per week for 7 weeks. This extended GC stimulation hasn't been done in the lab yet and will provide an interesting background for the other researchers in the lab. Also, a collaboration with another lab which focuses on MS will be explored in order to see if GC affects mice that are compromised to autoimmune diseases. Since I am just beginning in research, the in vitro studies are what I am mainly going to be presenting data from and the potential future directions that I will take will be explored in my poster.

**Oral Presentation  
Room B3**

*Digital Twin Technology In Engineering Education*  
**Hudson Harris, Javeed Kittur, Gallogly College of Engineering**

Background: Digital twin (DT) technology is widely adopted in engineering practice but remains inconsistently defined and unevenly implemented in engineering education. Prior studies frequently conflate digital models, digital shadows, and bidirectionally synchronized digital twins, limiting conceptual clarity and cross-study comparability. As DTs expand into cyber-physical learning environments, clearer educational framing and evidence of learning impact are needed.

Purpose: This review characterizes how DT technologies are conceptualized, implemented, and evaluated in engineering education and identifies gaps in technical fidelity, pedagogical alignment, and assessment rigor.

Scope/Method: A systematic literature review was conducted following PRISMA 2020 guidelines. Peer-reviewed studies published between 2017 and 2025 were identified using structured database searches and screened using predefined inclusion and exclusion criteria.

The final corpus of 101 studies was analyzed for disciplinary context, DT taxonomy level, synchronization architecture, pedagogical function, and learning assessment approach.

Results: DT-related publications in engineering education increased sharply after 2021, with most implementations situated in manufacturing, mechanical, and civil engineering.

(cont.) The majority of studies employed partial or unidirectional DT architectures rather than fully synchronized twins. Instructional uses focused primarily on visualization, monitoring, and system exploration. Few studies employed validated instruments to measure learning outcomes, and most designs remained case-based or exploratory. Recurrent barriers included infrastructure constraints, limited faculty expertise, interoperability challenges, and ethical and governance concerns.

Conclusions

Current educational DT implementations exhibit rapid growth but limited methodological maturity. A unified DT classification framework that aligns technical fidelity with instructional intent is needed to support rigorous design, evaluation, and scaling of DT-enabled learning environments in engineering education.

Keywords: Cyber-Physical Systems, Digital Twins, Digital Twin Technology, Remote Laboratories

**Non-FYRE Poster  
B2/4/6 Super Suite**

*Airborne Observations of the Chemical Composition of Deep Overshooting Convection-Impacted Lower Stratosphere Air*

**Jadon Harrison, Cameron Homeyer, College of Atmospheric and Geographic Sciences**

During the North American (NA) summer, intense overshooting convection is capable of rapidly transporting lower tropospheric trace gases into the upper troposphere/lower stratosphere (UTLS) region. As a result of this exchange, convectively impacted air in the UTLS can harbor various pollutants which impact Earth's radiation budget. During the 2021-2022 Dynamics and Chemistry of the Summer Stratosphere (DCOTSS) field campaign, NASA ER-2 aircraft equipped with the Advanced Whole Air Sampler (AWAS) instrument intensively sampled convectively impacted air in the UTLS region to comprehensively characterize the chemical composition of the air. Samples were categorized based on their age and analyzed to quantify the magnitude of this stratospheric exchange mechanism.

**Non-FYRE Poster  
B2/4/6 Super Suite**

*Cult, Memory, and Power: Tomb Cult from Messenia to Cyprus*

**Adi Hawk, Joey Williams, Dodge Family College of Arts and Sciences**

Tomb cult in Messenia through material display and maintenance of tombs worked to legitimize wealthy elites, reinforce local identity in both everyday life and periods of upheaval, sustain civic memory, and uphold existing social hierarchies in ways that ultimately benefited the living (Alcock, *Tomb Cult* 44748; Antonaccio 39599). Moreover, a compelling juxtaposition emerges when we contrast relatively clear cases of tomb cult, such as those in Messenia, with cases of ritual activity in Cyprus (Antonaccio 39599). Though these practices lack the scale and material richness associated with some mainland examples, they nonetheless indicate patterns

(cont.) of kin-based ritual activity centered on familial tombs (Keswani, Mortuary Practices 31516). Previously, this activity has been characterized as tendance, emphasizing ongoing care for the dead rather than formalized cult worship; however, tendance itself constitutes a form of ritualized interaction with the deceased and may therefore be understood as operating along a cultic spectrum (Keswani, Mortuary Practices 316; Antonaccio 40103).

**Non-FYRE Poster  
B2/4/6 Super Suite**

*Equality of Sun Belt Sprawl: The Intersection Between Land Cover, Air Pollution, and Demographics in Phoenix and Houston*

**Noah Holderbaum, Scott Greene, College of Atmospheric and Geographic Sciences**

Air pollution exposure can have severe health impacts. Being able to predict air pollution concentrations and identify high-risk areas can be beneficial for public policy, community health, and air pollution mitigation planning. This research examines the relationship between air pollution, demographics, and urbanization in the cities of Phoenix, Arizona and Houston, Texas between 2000 and 2020. Air pollution data was obtained from the Washington University's Atmospheric Composition Analysis Group's SATPM2.5 V5.NA.05 model, while demographic data was acquired from the 2000, 2010, and 2020 decennial censuses through IPUMS NHGIS. Urbanization metrics were derived from the National Land Cover Database Land Cover and Percent Impervious Surface products. Composite air pollution indices were created using principal component analysis to provide a comprehensive view of air quality at the census tract level in 2020. Regression analysis was used to find demographic and urbanization variables that have the most significant influence on air quality patterns. Results highlight differences between the two cities while also determining characteristics that consistently contribute to increased air pollution exposure. The findings of this research can inform future environmental planning work and help to create more equitable pollution strategies.

**FYRE Poster  
Conference Room B**

*Expression and purification of sensor protein NifL for structure determination by Cryo-EM*

**Lavang Huynh, John Peters, Dodge Family College of Arts and Sciences**

The purpose of this study is to report the progress of protein expression and purification for structure determination, specifically NifL from *Azotobacter vinelandii*. NifL is a sensor protein that is responsible for regulating the expression of genes needed for biological nitrogen fixation. The pETDuet vector containing the nifL gene was transformed into BL21 (DE3) *E. coli*. Cells were grown under optimized conditions, and protein expression was induced using IPTG. Protein expression was confirmed by SDS-PAGE gels (Sodium Dodecyl Sulfate-Polyacrylamide Gel Electrophoresis) and further validated using Western blot. The proteins were then purified using affinity chromatography and size exclusion chromatography. Successful purification was verified using SDS-PAGE gels. The concentration of the sample was then determined using the Bradford assay. Purified protein was then used to prepare cryogenic

(cont.) electron microscopy (cryo-EM) grids. Grids were later screened to determine the suitability for high-resolution data collection. These results demonstrate a successful production of the NifL protein for structural studies. Understanding the structure of NifL will provide insights into biological nitrogen fixation regulation and identify possible modifications to increase nitrogen fixation for agricultural benefit.

**FYRE Poster  
Conference Room B**

*Transportation Network Overlap: Integrating Extreme Weather and Traffic Dynamics to Predict Bridge Deck Deterioration and Enhance Infrastructure Resilience*

**Chifumnanya Ibekew, Aikaterini Kyprioti, Gallogly College of Engineering**

This project focuses on improving how roadway networks are represented for transportation network analysis under hazard conditions. Roadway shapefile data from the Oklahoma Department of Transportation contains over 84,000 segmented features, each with associated AADT (Average Annual Daily Traffic) values. However, this highly fragmented structure makes it difficult to accurately model connectivity and traffic flow. The goal of this study is to restructure the roadway data while preserving intersections, since they are essential for maintaining realistic network connections and AADT values. Python scripts using GeoPandas were developed to manipulate shapefile geometries and test different ways of merging roadway segments. Initial dissolve operations combined all segments into a single feature, which removed important intersection points. To fix this, a revised method was used to keep intersections intact while reducing unnecessary fragmentation. QGIS was used to visualize and check the results. The final dataset better represents the roadway network and supports more accurate analysis of traffic flow, disruptions, and infrastructure vulnerability.

**Non-FYRE Poster  
B2/4/6 Super Suite**

*Investigating Antagonistic Roles of Cell Proliferation and Melanin in Melanoma Development*

**Ankit Jallipalli, Vivek Bajpai, Gallogly College of Engineering**

Melanoma is the deadliest and most invasive forms of skin cancer, with an estimated 8,340 annual deaths in the United States. Melanoma stems from the uncontrolled proliferation of melanocytes, the cells responsible for producing the pigment of melanin, which gives skin, hair, and eyes color. The Bajpai lab has documented that melanin levels within melanocytes influence their proliferation rates, with lower melanin being associated with increased proliferation while high melanin with reduced proliferative capacity. The high proliferation of lighter-pigmented melanocytes in the presence of acquired melanoma-specific DNA mutations may promote accelerated tumor formation in individuals with lower melanin. However, how the inverse relationship between melanocyte proliferation rate and their melanin content is established remains unclear. Thus, we hypothesize that proliferation related genes are expressed at different levels in dark and light melanocytes and affect melanocyte's proliferation as well as melanin content. To test this hypothesis, sequenced RNA data will be

analyzed in order to quantify differentially expressed genes (DEGs). The identified DEGs will be cross-referenced with related genes curated from literature to identify DEGs that may be involved in proliferation in dark and light melanocytes. To validate the role of these DEGs, CRISPR mediated editing will be used to modulate gene expression levels in melanocytes as well as the quantification of proliferation and melanin content post CRISPR editing. The results will provide insight into the genes governing melanocyte's proliferation and melanin production with implication for human melanoma studies and further education.

**FYRE Poster  
Conference Room B**

*Formation of Water-in-Oil Nanoemulsions Using Ternary Phase Diagram and Low Energy Emulsification*

**Joseph Jas, Reza Foudazi, Dodge Family College of Arts and Sciences**

Water-in-oil nanoemulsion has significant applications in diverse fields such as pharmaceuticals, cosmetics, and polymer synthesis. Nanoemulsions are of particular interest due to their high kinetic stability. The challenge, however, is creating a stable nanoemulsion with a low-energy emulsification method. This is due to the system's stability and its sensitivity to formulation parameters. This study investigates the formation of nanoemulsions from 2-ethylhexyl acrylate, Span 80 (S80), Tween 80 (T80), and water by magnetic stirring as a low-energy emulsification technique. Various compositions were formulated by manipulating the ratios of oil, water, and surfactants, and adjusting the hydrophilic-lipophilic (HLB) of the surfactant mixture. Afterwards, the samples were analyzed for visual stability and phase behavior. Although several formulations followed the expected HLB range for a stable water-in-oil nanoemulsion formation, the systems presented instability through phase separation, flocculation, and coalescence. These findings presented that achieving a stable nanoemulsion system depends not only on the HLB value, but also the ratio between the continuous and dispersed phase, and the limitations of an emulsification method. The findings provide a broader picture into formulation challenges and present guidance for future nanomemulsion systems.

**FYRE Poster  
Conference Room B**

*Spatial Analysis of Acute Respiratory Infection in Peru Using Tableau*

**Alaina Jawed, Gopichandh Danala, Dodge Family College of Arts and Sciences**

Pneumonia, a key contributor to Acute Respiratory Infections (ARIs), represents a significant public health concern, particularly among vulnerable populations such as children under five and adults over sixty. Understanding its spread across regions and over time is essential for effective monitoring and response; however, this requires structured analysis and accessible tools to interpret complex health data.

This study investigates the spatiotemporal patterns and spread of ARIs, specifically pneumonia, to support public health monitoring in Arequipa, Peru. Using Tableau, we analyzed publicly available datasets including weekly pneumonia measures across multiple geographic

levels in Peru, including departments, provinces, and districts. The ARI datasets capture multiple measures such as weekly cases, hospitalizations, and deaths, with a specific focus on vulnerable demographic populations. Population data were used to calculate annualized incidence rates, which were then integrated with spatial data to generate geographic visualizations. Additional metrics, including hospitalization and mortality rates, were derived to provide a more comprehensive view of disease burden. The resulting dashboard integrates temporal trends, geographic patterns, and population-adjusted metrics into a single interactive platform. This tool enables users to explore the spatial distribution of ARIs and identify regions with consistently high disease burden.

This work demonstrates how interactive data visualization tools can serve as powerful resources for disease spread monitoring and enhanced public health surveillance. By making complex data more accessible and interpretable, such dashboards can support the early detection of trends, the identification of high-risk areas and vulnerable populations, and provide insights that may inform more targeted public health responses.

**FYRE Poster  
Conference Room B**

*Supramolecular Antenna Effect on Fluorescent Cyclophanes*

**Adrienne Johnson, Yuanning Feng, Gallogly College of Engineering**

Artificial light-harvesting systems have become a key area of research, mimicking the process of photosynthesis and the capture of light. Supramolecular antennas are one such system, fostering research in its effect on fluorescent dyes through donor-acceptor relationships. Our research investigates the fluorescent capabilities of cyclophanes using the principle of the supramolecular antenna effect. Through the process of Suzuki-Miyaura coupling, SN2 reaction, cyclocondensation, and macrocyclization, components of the cyclophane are synthesized before being paired to complete a molecular box. The resulting dyes will have a symmetrical box-like structure, allowing the dyes to interact with other molecules through host-guest complexes. Asymmetrical box-shaped analogs will be synthesized to further explore the interactions by two-dimensional electron spectroscopy. The products will contain a symmetrical box-like structure, allowing them to interact with other molecules through host-guest complexes. We anticipate that the intermolecular charge transfer between the host and the guest will enhance fluorescence. More broadly, the research of artificial light-harvesting systems could be used in fields such as optoelectronics and continued research of sustainable energy sources.

**Non-FYRE Poster  
B2/4/6 Super Suite**

*Thermal profiling provides insights into binding interactions in a label-free, accessible format*  
**Esther Jung, Christina Bourne, Dodge Family College of Arts and Sciences**

Oxysterol-binding protein (OSBP) and related proteins (ORPs) are lipid-binding proteins conserved from yeast to humans, instrumental in cellular processes such as lipid transport and membrane contact site signaling. These proteins contain an OSBP-related domain (ORD) with a hydrophobic pocket that binds sterols and other lipid ligands. Experimentally, these proteins can be difficult to study. These domains often require dyes, tags, or complex assays to monitor stability and ligand interactions. Determining the thermal stability of the protein provides a useful way to characterize its folding and ligand interactions. By establishing the melting temperature of the ORD of OSBP, it can be thermally profiled in the presence and absence of ligands. Protein samples were exposed to increasing temperatures, and the soluble fraction of OSBP remaining after heating was analyzed using SDS-PAGE. Changes in the band intensity across temperatures were used to estimate the temperature at which the protein begins to denature and loses solubility. The hydrophobic pocket in the OSBP ORD is where sterols or other lipids bind. The ligand binding pocket may affect how strongly VapA binds and interacts with its partner motif (the FFAT motif) on OSBP. Determining the baseline thermal stability of the OSBP ORD provides insight into how ligand and protein interactions influence additional protein interactions. Importantly, this gel-based thermal profiling approach provides a simple and scalable method for studying protein stability and binding interactions without the need for specialized instrumentation.

**FYRE Poster  
Conference Room B**

*Photophysical Effects of Para-Substituted Benzene Derivatives in Layered Perovskites: Influences of Electron Donating and Withdrawing Groups*  
**Sinengums Kamara, Bayran Saparov, Gallogly College of Engineering**

This study examines how para-substituted functional groups on a benzene ring affect photophysical behavior, with a focus on light emission efficiency and photolytic stability in hybrid perovskite materials. These organic-inorganic hybrids have strong potential for light emitting and energy applications, for which precise control of optical properties is essential. During this project, I investigate a specific hybrid system formed between para-substituted benzene salts and cadmium and zinc chlorides. The new target materials are synthesized using solution methods and are subsequently characterized using powder X ray diffraction (PXRD), single crystal X ray diffraction (SCXRD), and optical spectroscopy measurements. These methods allow correlation of structural features with optical (light absorption and emission) characteristics. By comparing derivatives containing electron donating and electron withdrawing para substituents, the project aims to define clear substituent dependent trends in optical properties such as fluorescence efficiency. Electron withdrawing groups are hypothesized to decrease quantum yield by promoting non-radiative recombination pathways, whereas electron donating groups are expected to enhance emission. The findings will clarify structure property relationships in layered hybrids containing aromatic organics and inform the design of more efficient light emitting materials.

**FYRE Poster  
Conference Room B**

*Investigating the Photoluminescent Properties of 18-Crown-6 Ether-Assisted Alkali Metal Copper(I) Halides*  
**Jyothika Kanagala, Bayran Saparov, Dodge Family College of Arts and Sciences**

Copper(I) halides have emerged as promising photoluminescent materials due to their earth abundance, low cost, and reduced toxicity compared to conventional alternatives. Supported by NSF DMR-2045490, this work focuses on synthesizing novel hybrid organic inorganic copper(I) halide compounds and characterizing their structural and optical properties for optoelectronic applications such as solar cells. A solvent-based approach was employed to combine copper(I) halides with 18-crown-6 ether and alkali metal halides (NaX, RbX, CsX; X = Cl, Br, I), producing highly luminescent crystalline materials after solvent evaporation. Solvents such as acetonitrile (MeCN) and acetone were predominantly utilized during experimentation. The results show that incorporating 18-crown-6 ether significantly enhances photoluminescent behavior across multiple systems, as evidenced by strong emission under UV light. These findings highlight the potential of 18-crown-6-assisted alkali metal copper(I) halide materials for applications in light-emitting diodes (LEDs), photodetectors, and anti-counterfeiting technologies, while also providing a foundation for further exploration of structure property relationships.

**FYRE Poster  
Conference Room B**

*The Impact of Recombination Signal Sequence mutations on V(D)J Recombination Efficiency*  
**Nathan Kist, Karla Rodgers, Dodge Family College of Arts and Sciences**

Every day, the body faces attacks from viruses and bacteria, each with unique antigens that the immune system uses to recognize them. The strongest point of defense against these invaders is the adaptive immune system, the segment of the immune system that learns to recognize specific threats, which produces antibodies tailored for each antigen. V(D)J recombination, the process of rearranging gene segments, is indispensable for the development of antibodies. RAG1/RAG2 proteins perform V(D)J recombination by recognizing specific DNA sequences called recombination signal sequences (RSS). RSSs can vary between individuals, leading to differences in gene usage and antibody production. RAG1/2 can also cause genomic instability by acting on an RSS-like sequence elsewhere in the genome, which can contribute to cancer development. Research in the topic is, therefore, paramount to learn more about possible causes of cancers like leukemia.

To test mutant RSSs, we employed cellular assays combining downstream next-generation sequencing and flow cytometry to quantify the effects of various mutations on recombination efficiency. To further validate these findings, we confirmed our results with an in vitro assay using purified protein and DNA substrates. Our results indicate that different parts of the RSS sequence are unable to compensate for mutations in another part. Interestingly, some mutations in one part, when combined with mutations in another, improved recombination efficiency. Understanding the effects of mutations in RSSs and RSS-like sequences will improve predictions of antibody changes and cancers like lymphoma and leukemia.

**FYRE Poster  
Conference Room B**

*Zwitterionic Nanogels for Macrophage Immunotherapy*  
**Sylvana Knapp, John Clegg, Gallogly College of Engineering**

Inflammation is a key part of many diseases, such as cancer and autoimmune diseases. Specialized nanoparticles can potentially be used for targeted drug delivery to decrease inflammation in the future. They target macrophages, important immune cells responsible for controlling inflammation. Macrophages can adopt pro-inflammatory or anti-inflammatory phenotypes (often simplified as M1/M2). We aim to control macrophage polarization using nanogels, which are nanoscale three-dimensional crosslinked polymer networks, to decrease inflammation in targeted areas. Zwitterionic monomers carry both positive and negative charges in the same repeat unit, creating a strong hydration layer that reduces nonspecific protein adsorption. We synthesized zwitterionic nanogels via reflux precipitation polymerization (RPP) in acetonitrile under nitrogen at 100 degrees Celsius for one hour, combining the CBMA (carboxybetaine), BAC, and AIBN. We then washed using acetonitrile and dialyzed to remove solvent-soluble impurities and unreacted monomers. We used dynamic light scattering to assess the size of our nanoparticles and ensure they were properly synthesized and purified, and used the zetasizer to analyze the zeta potential. We then used FTIR spectroscopy and NMR to analyze the molecular structure and composition of our nanogels. These data confirm the successful formation and purification of zwitterionic nanogels and motivate upcoming macrophage uptake/phenotype studies.

**FYRE Poster  
Conference Room B**

*Do Microphysical Properties Vary with Location in Tropical Clouds?*  
**Chris Knowles, Greg McFarquhar, College of Atmospheric and Geographic Sciences**

Cloud microphysical properties strongly influence precipitation formation, and cloud evolution in the tropics. In particular, particle size distributions play a key role in determining cloud processes that affect cloud development and rainfall. However, it remains unclear how these distributions vary across different environmental conditions and geographical regions. This study investigates whether cloud microphysical properties vary systematically with location in tropical clouds by comparing observations collected by probes installed on aircrafts during two tropical field campaigns conducted in Darwin, Australia and Cayenne, French Guiana during the 2015/2016 High Altitude Ice Crystal/High Ice Water Content (HAIC/HIWC) campaign. Using measurements from the 2DStereo Probe(2DS) and Precipitation Imaging Probe (PIP), we examine the dependence of particle size distributions and total concentrations on environmental variables like atmospheric temperature. The analysis aims to identify regional differences and explore environmental factors that influence particle size distributions. Because in-situ cloud observations are expensive to obtain, these results will also inform future studies that use radar and satellite observations to better represent cloud microphysical processes in atmospheric models.

**FYRE Poster  
Conference Room B**

*Effect of GLP1 agonist on pancreatic cancer cells growth and proliferation*  
**Srinidhi Kompella, Surendra Shukla, Dodge Family College of Arts and Sciences**

Pancreatic cancer is one of the most aggressive and fatal types of cancer, with limited treatment options. Its five-year survival rate is approximately 12%. Key reasons for high mortality include late diagnosis, early metastasis, and therapy resistance. Treatment options include systemic chemotherapy, surgeries, and adjuvant/neoadjuvant therapies, which work to improve patient outcomes and provide symptom relief. This study investigates the impact of metabolic drug semaglutide on pancreatic and liver cancer cells. To evaluate this impact, two pancreatic cancer cell lines, KPC 1245 and S2013, were cultured and maintained. The cell lines were regularly split and treated with semaglutide. Using Alamar Blue staining, cell survival was measured, while crystal violet assays were used to evaluate cell proliferation. We observed that semaglutide treatment leads to reduced proliferation of pancreatic cancer cells. We will be further evaluating the molecular mechanism of semaglutide-mediated growth inhibition of pancreatic cancer cells, utilizing different molecular and biochemical techniques.

**Oral Presentation  
Room A3**

*Genetic Overexpression and Characterization of the Protease BfsG in Desulfovibrio vulgaris Biofilm Detachment*  
**Dala T Korkoyah, Kara DeLen, Dodge Family College of Arts and Sciences**

Bacteria can attach to surfaces and form biofilms, which can contribute to the development of human disease. Biofilms formed by sulfate-reducing bacteria of the genus *Desulfovibrio* have been associated with several gastrointestinal disorders. In other bacterial systems, including *Pseudomonas*, biofilm detachment is mediated by the cysteine protease LapG. *Desulfovibrio vulgaris* Hildenborough (DvH) harbors the gene *bfsG*, which encodes a transglutaminase-like cysteine protease predicted to function similarly to LapG, as suggested by synteny with the *Pseudomonas* system. Additionally, previous research has shown that this protease targets the biofilm adhesins BfsA and BfsF in DvH. Therefore, this project aims to characterize the protein we have designated BfsG (biofilm formation system subunit G) and to evaluate whether *bfsG* overexpression mediates biofilm detachment in DvH. Understanding this protease's role could inform strategies to control SRB-associated bacterial overgrowth in biofilms. Our experimental workflow included overexpressing *bfsG* in DvH using a stable plasmid constructed via Sequence- and Ligation-Independent Cloning in *Escherichia coli*. Through electroporation, we introduced this plasmid into two DvH strains JWT700, which has both biofilm adhesins BfsA and BfsF, and JWT706, which has only BfsA. We plan to conduct a growth study to measure biofilm biomass under *bfsG* overexpression and to determine whether biofilm detachment differs when both adhesins are present compared to when only BfsA is present. Understanding how BfsG regulates biofilm detachment may inform strategies to control sulfate-reducing bacterial biofilms relevant to surface corrosion and gastrointestinal health.

**FYRE Poster  
Conference Room B**

*Regional Variability in Tropical Cloud Particle Size Distributions from Aircraft Data Collections*  
**Carson Kotlarz, Greg McFarquhar, College of Atmospheric and Geographic Sciences**

This research project focuses on comparing size distributions from field campaigns and analyzes how they vary depending on where the data were obtained. Clouds are one of the most critical components of the atmosphere and impact weather, yet significant uncertainties still remain in understanding their properties. Previous studies have given insight into cloud particle size distributions and concentrations, but it is still unclear whether systematic differences exist between different regions. My overall goal in this research project is to find out if cloud microphysical properties vary with location for tropical cloud data. To complete this project, I will look at data from the High Ice Water Content field campaigns in Darwin, Australia and Cayenne, French Guiana. During these field campaigns, researchers flew aircraft into clouds for multiple flights and collected cloud property measurements using multiple probes attached to the aircraft. The data will be analyzed by creating graphs of the size distributions and concentrations using Python code. Understanding how these properties vary with temperature has the possibility to improve cloud modeling and weather forecasting. By identifying any similarities or differences, we hope to determine if there are any location-dependent variables in cloud microphysics. Also, it is very difficult and expensive to collect data using aircraft, so looking for other ways to use these data to evaluate retrievals from other instruments, like radar and satellite instruments, could be very useful.

**FYRE Poster  
Conference Room B**

*Synthesization and Characterization of a Tetracationic Cyclophane “Baja Box”*  
**Avinash Kumar, Yuanning Feng, Dodge Family College of Arts and Sciences**

Tetracationic cyclophanes are useful in supramolecular chemistry due to their high positive charge, which can selectively bind to electron rich guests. This enables it to interact with other molecules and alters its fluorescent properties, making it a useful factor in bioimaging and organic light emitting devices (OLEDs).

This project will focus on the synthesization and characterization of a rationally designed tetracationic cyclophane, so called “Baja Box.” The box will be constructed through first creating intermediates named Baja 1, 2, and 3. Baja 1 is synthesized using a Suzuki -Miyaura coupling reaction where the aryl-aryl bonds are formed between the two aromatic rings. Baja 2 and 3 are synthesized using an SN2 reaction where Baja 1 is combined with two 1,4 bis(bromomethyl)benzene two from  $\frac{1}{4}$  of the tetracationic cyclophane. Finally, Baja 4 is created by a SN2 reaction between Baja 1 and Baja 3. This project involves the usage of multiple machines such as column chromatography, rotary evaporator, spectrophotometer, proton and carbon NMR, mass spectrometry, and a microwave synthesizer.

So far, Baja 1 has been synthesized which exhibited a bright purple fluorescence under a UV light. It exhibited a bright turquoise fluorescence after dissolving in solvent chloroform. We will complete the full tetracationic cyclophane (Baja Box) in the next couple weeks and keep studying the application as we gain a better understanding of our macromolecule.

**Non-FYRE Poster  
B2/4/6 Super Suite**

*Cloning of Mutant and Wild Type ttcA Gene to Analyze Resistance of E.Coli to PAMA*  
**Isabella Kunnath, Valentin Rybenkov, Dodge Family College of Arts and Sciences**

Currently, there is an urgent need for new drugs. PAMA is a new potential antibacterial agent. We have found a combination of gene mutations that are super resistant to PAMA; ttcA is one of the genes where some of the mutations are found (Zhao et al.). ttcA is a tRNA thiolating enzyme requiring Fe-S clusters for catalytic activity (Bouvier et. al). First, clones of wild type and mutant ttcA will be constructed; then ttcA interactions will be tested with PAMA by conducting an MIC assay. MIC results will enable us to determine if the mutations itself can alter PAMA susceptibility.

**FYRE Poster  
Conference Room B**

*Bidirectional Relationships Between Social Media Use and Youth Mental Health: A Systematic Review*  
**Alisha Kurian, Dan Li, Dodge Family College of Arts and Sciences**

This study investigated the bidirectional relationship between social media and youth mental health. By creating a systematic review manuscript, we will be able to identify and share the general trends in this complex relationship. Guided by the Differential Susceptibility to Media Effects Model (DSSM), we refined our coding categories and coding values. We began by creating a list of inclusion and exclusion criteria to organize our research. A comprehensive search was conducted which initially yielded over 5,000 studies. We redefined the term “mental health” in our search and narrowed focus to specifically include suicidal ideation, depression, and anxiety. We focused on research designs that allow us to detect bidirectional relationships. We gathered over 300 articles over the span of 6 databases for our first screening. Using tools such as Zotero and Covidence, we intend to further organize various studies into our review. This review aims to identify bidirectional patterns between social media engagement among youth and their mental health reflected by current literature.

**FYRE Poster  
Conference Room B**

*Formation of Water-in-Oil Nanoemulsions Using Ternary Phase Diagram and Low Energy Emulsification*

**Quyen Le, Reza Foudazi, Gallogly College of Engineering**

This study investigated the bidirectional relationship between social media and youth mental health. By creating a systematic review manuscript, we will be able to identify and share the general trends in this complex relationship. Guided by the Differential Susceptibility to Media Effects Model (DSSM), we refined our coding categories and coding values. We began by creating a list of inclusion and exclusion criteria to organize our research. A comprehensive

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**FYRE Poster  
Conference Room B**

*Understanding the Effects of Multidrug-Resistant Exosomes On Ovarian Cancer Cells*  
**Vincent Le, Dongin Kim, Gallogly College of Engineering**

A major challenge addressed in chemotherapy is the development of multidrug resistance (MDR) after treatment among various cancer cells. This resistance stems from the high levels of P-glycoprotein (P-gp). P-gp as one of membrane proteins is involved in pumping out foreign substances, thereby reducing the drug’s efficacy. Exosomes sized as 10-150 nm are small extracellular vesicles released from the cell. Since they play a big role in cell-to-cell communication and contain information from the cell’s origin, exosomes from MDR cells could transfer P-gp to sensitive or non-MDR cancer cells. Recent studies have observed this P-gp transfer through MDR cell exosomes. This study is to show the proof-of-concept about the transfer of multidrug-resistance (MDR) property through exosomes to sensitive or non-MDR cancer cells by observing P-gp levels on the cells before and after MDR cell exosome treatment. In our previous study, exosomes were isolated and characterized from an ovarian cancer cell line called MDR Kuramochi (KU) where their MDR property was established through treatment of doxorubicin. In this study, we used MES-SA, a type of ovarian cancer cell line, and its MDR derivative MES-SA/MX2 cell line are used to investigate MDR (or P-gp) transfer through exosomes. The previous study with KU cells suggests that exosomes derived from drug-resistant cancer cells increase the level of P-gp and introducing resistance to sensitive cancer cells. For MES-SA, we have concluded a significant P-gp expression through immunocytochemistry, and further research needs to be conducted to confirm that the cell used is mediating resistance.

**Non-FYRE Poster  
B2/4/6 Super Suite**

*Evaluating LLMs to Identify Interdisciplinary Topics in ETDs*  
**Tam Le, Manika Lamba, Gallogly College of Engineering**

Current academic classification systems fail to capture the reality of modern interdisciplinary scholarship. The ProQuest Dissertations and Theses (PQDT) database, like many institutional taxonomies, relies on rigid disciplinary categories established decades ago that systematically misclassify or entirely overlook emerging interdisciplinary fields. This taxonomic inadequacy creates significant barriers to research discovery, interdisciplinary collaboration, and understanding of how academic knowledge actually evolves. This research

(cont.) project employs computational methods to reveal the gap between how academic knowledge is formally categorized and how it actually develops across disciplinary boundaries. Through comprehensive analysis of electronic theses and dissertations (ETDs) in the PQDT database using large language models, advanced natural language processing and machine learning techniques, we identify systematically misclassified research areas, discover emerging interdisciplinary fields and subfields not recognized by traditional taxonomies, and quantify how classification inconsistencies affect research discoverability.

**FYRE Poster  
Conference Room B**

*Understand Researching by Reflecting On Designing an Educational Green Wall*  
**Andy Le, Farrokh Mistree, Gallogly College of Engineering**

Interdisciplinary work helps develop robust critical thinking skills; however, research shows many students continue to be engaged in work that is contained within their field of study, encouraging restrictive thinking. Our research project remedies this through the original design of an Educational Green Wall, a project outside our primary disciplines that provides insight into different schools of thought and allows us to reflect on our academic and professional careers.

We followed a nine-step design process to satisfy the requirements for designing a green wall, focusing on identifying customer needs and requirements before any implementation. This allows us to expand our thinking without being constrained to immediate execution. This process integrated engineering, business, biology, and LLM use, allowing us to explore varied schools of thought.

Through this process, we developed a clearer understanding of what research is and its role in personal and academic development, as experiencing research early enabled us to make the necessary realizations for our future career paths. The intersection of design and research also allowed us to understand the value of each process, revealing that using both processes in tandem with each other provides value in exploring potential solutions to unfamiliar problems. Our experience demonstrates that exploring interdisciplinary experiences early in one’s educational journey can help students develop critical thinking skills, reduce restrictive thinking, and foster their professional career an important consideration to make as one prepares to navigate their academic and professional life.

**FYRE Poster  
Conference Room B**

*Cross-analysis of lon-2 and lon-3 Mutants to Study Growth Regulation in C. elegans*  
**Isabella Lenhoff, Gavin Woodruff, Dodge Family College of Arts and Sciences**

Body size and shape are critical for organismal fitness, and understanding the genes and developmental processes that regulate these traits remains an outstanding goal of evolutionary and developmental biology. The nematode *Caenorhabditis elegans* is a widely used model system because of its quick maturation, short lifespan, and high brood sizes. The nematode *C. inopinata* exhibits a much longer body size than its sister species, *C. elegans*. Numerous

(cont.) genes are known to regulate body size in *C. elegans*, including *lon-1*, *lon-2*, and *dbl-1*. Moreover, *C. inopinata* reveals higher numbers of collagen-encoding genes and higher transcription of collagen genes in comparison to *C. elegans*. Here, we seek to address the impact of elongated body shapes on collagen expression and cuticle structure in *C. elegans*. We aim to cross *lon-1(lf)* males and *dbl-1(gf)* hermaphrodites, as well as between *lon-2(lf)* males and *dbl-1(gf)* hermaphrodites. Highly elongated double mutants will be crossed into a COL-81::nMG background to reveal the impact of body shape change on collagen expression and cuticle structure. The hypothesized result of the project is that the progeny will have increased spacing between rings, known as annuli, and will have higher *col-81* expression. Research on cuticle structure and collagen genes serves to aid in projects related to analyzing organism growth and advancing studies on lengthening or shortening body length.

**FYRE Poster**  
**Conference Room B**

*Zero-Shot vs. Supervised Instrument Detection: A Comparative Study of Language-Audio and Audio Tagging Model*

**Santiago Leon Garavito, Jie Cao, Dodge Family College of Arts and Sciences**

Automatic musical instrument detection from audio remains a challenging and important problem in music information retrieval. Supervised models trained on large-scale datasets such as AudioSet achieve strong performance but require extensive annotation and operate within fixed label spaces. In contrast, language-audio models trained with contrastive audio-text objectives enable zero-shot classification with flexible label specification. However, their effectiveness for fine-grained instrument detection, particularly for rare and culture-specific instruments, remains underexplored.

This study presents a comparison of zero-shot and supervised approaches to multi-label instrument detection in real-world audio. We evaluate CLAP, a contrastive audio-text model, in a zero-shot setting using structured prompt engineering to assess sensitivity to label phrasing and semantic representation. We compare this against PANNs, a supervised audio tagging model trained on AudioSet that predicts over-fixed acoustic categories. Experiments use instrument-labeled subsets of AudioSet, enabling a controlled comparison between flexible language-based inference and fixed-label classification. To ensure comparability, we map fine-grained annotations to a unified instrument taxonomy and construct a representative sample. Performance is evaluated using Mean Average Precision (mAP; ranking quality), Recall K (top-K correctness), and Macro-F1 (balanced precision-recall).

Evaluation extends beyond accuracy to include multi-label robustness, generalization of rare instruments, label granularity, and error patterns. We analyze semantic mismatches, sensitivity to prompt formulation, and biases toward frequently represented Western instruments. Results indicate that zero-shot models exhibit lower mAP (weaker global ranking) but greater label flexibility, while supervised models achieve higher mAP and Macro-F1 (stronger label discrimination and balance) but limited generalization beyond their training ontology. Rare and culture-specific instruments remain challenging across paradigms.

**FYRE Poster**  
**Conference Room B**

*Honor, Moral Outrage, and Punishment: Explaining Regional Differences in U.S. Incarceration Rates*  
**Jemay Leow, Mauricio Carvalho, Dodge Family College of Arts and Sciences**

States in the South and Midwest have higher incarceration rates than those in other regions of the United States. Prior research has attributed these differences to factors such as demographics, religiosity, political ideology, poverty, and education. One factor that has received less attention, however, is the role of a culture of honor in shaping attitudes toward punishment and incarceration.

Using statistical analyses, we found that a state's culture of honor status predicts incarceration rates even after accounting for these established factors. We also examined whether individuals who endorse honor-related values are more sensitive to injustice and more likely to experience moral outrage in response to wrongdoing. We hypothesize that individuals with stronger honor orientations are more attuned to violations of justice and more inclined to support punitive responses. In turn, this tendency may help sustain policies that contribute to higher incarceration rates in states characterized by a culture of honor compared to those without such cultural norms.

**Non-FYRE Poster**  
**B2/4/6 Super Suite**

*Developing a Liquid-Liquid Interface Growth Strategy for Alkoxy-Substituted Quadrupolar Fluorescent Dye 2D Thin Films*

**Jaiwen Lin, Madalina Furis, Gallogly College of Engineering**

Alkoxy-substituted quadrupolar fluorescent dyes show tunable absorption and photoluminescence linked to molecular packing, which is relevant to photonics and flexible optoelectronics. Reliable optical measurements require uniform, ultrathin films with controlled thickness and morphology. Building on one year of research experience in Dr. Furis's lab and the Spring URECA concentration-screening workflow, this Summer URECA project will continue the liquid-liquid interface (LLI) growth approach but shift the primary focus to the alkoxy-substituted quadrupolar fluorescent dye system rather than a model precursor. The project will apply previously optimized growth conditions to the dye thin-film system and evaluate whether continuous 2D ultrathin films can be reproducibly achieved at a toluene/aqueous boundary. Optical microscopy and polarized imaging will be used to quantify morphology (coverage, domain size, edge definition, and continuity). Photoluminescence (PL) scanning will then be performed under temperature control from 4K to 270K to probe structure-photophysics relationships, including spectral shifts and emission stability. The expected outcome is a reproducible LLI protocol for dye thin films and a morphology-photophysics dataset that, if sufficiently consistent, can support preparation of a research manuscript.

**FYRE Poster  
Conference Room B**

*Evaluating Filter Materials for Particle Collection Efficiency in a Next Generation Impactor*  
**Judy Liu, Changjie Cai, Dodge Family College of Arts and Sciences**

Dry powder inhalers generate aerosol particles that must be collected in a way that preserves their suitability for spectroscopic analysis. In this study, a Next Generation Impactor (NGI) is used to examine how collection substrate choice influences particle collection efficiency across particle size ranges. Three filter conditions are being compared including (1) the TSI default glass microfiber filter, (2) ungreased silver filters, and (3) greased silver filters. Silver filters are of particular interest because our preliminary observations suggest that silver filters may offer advantages for Raman spectroscopic applications, but their suitability for NGI measurements depends on whether they can collect particles as effectively as the standard glass microfiber filters. Differences in surface properties and the presence or absence of grease may affect particle retention, particle bounce, and stage-by-stage collection behavior. To evaluate these effects, particles collected on each filter type will be analyzed according to their size distribution across NGI stages using lab-generated stable testing particles. Greased silver filters may improve retention by reducing particle bounce, although the grease may also introduce complications for later spectroscopic analysis. This work will establish a Raman-compatible collection protocol to determine which filter condition provides the best balance between efficient particle collection and compatibility with future Raman-based characterization.

**FYRE Poster  
Conference Room B**

*Variability in stomata and trichome characteristics of Quercus macrocarpa in populations across its latitudinal distribution*

**Audrey Longwell, Heather McCarthy, Dodge Family College of Arts and Sciences**

As global warming becomes an increasingly dangerous threat to forests, it is important to recognize what traits make trees better able to withstand conditions such as drought and heat waves. Certain characteristics of stomata (leaf pores) and trichomes (leaf hairs) may be linked to higher tolerance of these conditions. This study is part of a reciprocal transplant experiment in which acorns from across the latitudinal distribution of *Quercus macrocarpa* (bur oak) were planted in common gardens in Oklahoma, Illinois, and Minnesota in order to determine the effects of a changing climate on populations adapted to varying climatic conditions. Previous studies have found a difference in survival between the three populations in the Oklahoma garden, with the Oklahoma population having greater success in its native climate. Consequently, this study seeks to determine whether there is a difference in stomata/trichome characteristics between populations that may play a role in adaptation to heat and drought. The sample consisted of 21 trees, 7 from each population. Images were taken of leaves using a scanning electron microscope and assessed using ImageJ. Stomatal density, pore length, guard cell length/width, and trichome types/density were recorded. Preliminary results show higher

(cont.) stomatal density and lower trichome density in the Oklahoma population. These traits may contribute to the survival of Oklahoma trees by allowing for more precise control of water loss and lower leaf temperatures. Further results, and future research, can be used to assess which populations may be candidates for assisted migration as global temperatures rise.

**Non-FYRE Poster  
B2/4/6 Super Suite**

*Transcutaneous Spinal Direct Current Stimulation and Cortical Spinal Excitability*  
**Karla Lopez, Hugo Pereira, Dodge Family College of Arts and Sciences**

Motor function is essential for performing daily activities that maintain independence. Impairments in motor function can result from injury, aging, or neurological conditions that significantly affect the quality of life. This project aims to investigate whether Transcutaneous Spinal Direct Current Stimulation (TSDCS) can alter motor performance in healthy individuals. TSDCS is a non-invasive technique that delivers a comfortable direct current (1 to 5 mA of intensity) through electrodes over the spine. This technique aims to modulate spinal cord activity through an induced electrical field that has the potential to improve the loss of motor performance. However, the effects of different stimulation polarities (i.e., anodal versus cathodal) remain unclear. Differences in polarity, contraction type, and task duration are likely to contribute to the conflicting results examined in TSDCS effects. The expected outcome is that TSDCS will enhance motor performance, providing insight into TSDCS as a potential tool for improving motor function. These findings could inform future research on using TSDCS in clinical populations with motor impairments that can benefit from the technique. Improved understanding of stimulation parameters could lead to effective rehabilitation approaches contributing to efficient application of TSDCS.

**Non-FYRE Poster  
B2/4/6 Super Suite**

*Review of Literature to Understand the Polycystin-Wnt-9B Complex*  
**Lake Luessenhop, Christina Bourne, Dodge Family College of Arts and Sciences**

Polycystic kidney disease is typically autosomal dominant genetic disease with varying degrees of penetration. The underlying molecular basis resulting in clinical pathologies remains unclear, but mutations in the genes *pkd1* and *pkd2* are causative. The *pkd1* gene encodes a transmembrane protein known as polycystin 1, which forms a protein complex with Wnt-9B. When this complex forms, an autoproteolytic activity within the extracellular N-terminal fragment of polycystin 1 is induced. This cleavage generates a conformational change that recruits signaling complexes thought to lead to clinical phenotypes. Therefore, to better understand the recognition and potentially the conformational change post-cleavage, the structures of polycystin 1 and Wnt-9B were visualized and computational methods were used to evaluate potential recognition elements. We anticipate that a better understanding of these critical interactions may contribute to the development of clinical interventions that directly target the underlying molecular basis for disease.

**Non-FYRE Poster  
B2/4/6 Super Suite**

*Tuning Foam Hydrogels via Pluronic F68 Concentration*

**Apphia Lugunda, Reza Foudazi, Gallogly College of Engineering**

Foam-templated hydrogels are attractive for porous materials because of their rapid water absorption and highly interconnected structures. Prior work demonstrated that varying sodium dodecyl sulfate (SDS) concentration in Pluronic F68 diacrylate (PF68-DA) systems enables control over foam stability, pore interconnectivity, and thermosensitive behavior. Building on these findings, the present study investigates how polymer concentration influences foam evolution after formation, with a focus on time-dependent bubble growth. Hydrogel foams prepared at different polymer weight fractions were monitored using optical microscopy to quantify changes in bubble diameter during the early stages of aging. To determine the mechanism responsible for bubble enlargement, the experimental data were fitted to a power-law model. The resulting exponent ( $n \approx 0.5$ ) indicates that growth is primarily governed by film rupture and merging events characteristic of Bubble Coalescence rather than diffusion-driven processes such as Ostwald Ripening. Higher polymer concentrations produced smaller initial bubbles and slower growth rates, suggesting enhanced stabilization of the liquid films separating neighboring bubbles. By complementing earlier SDS-focused studies, these results provide additional insight into how composition governs foam stability and structural evolution during hydrogel fabrication. This work advances the ability to design porous hydrogels with controlled architecture and transport properties for applications such as tissue engineering, filtration, and controlled drug delivery.

**FYRE Poster  
Conference Room B**

*Bidirectional Relationships Between Social Media Use and Youth Mental Health: A Systematic Review*

**Parker Mahar, Dan Li, Dodge Family College of Arts and Sciences**

The rapid rise of social media has transformed how young people communicate, prompting increasing concern about its effects on youth mental health. While much of the existing research treats this relationship as one-directional, emerging studies suggest a more complex, bidirectional dynamic in which social media use and mental health outcomes influence one another. The purpose of this study is to systematically review current literature to better understand this reciprocal relationship. Using the databases Scopus, PubMed, MEDLINE, PsycINFO, Communication Source, ERIC, and ProQuest, articles, papers, and dissertations were identified. These will be first screened based on titles and abstracts, to be followed by a full-text review to determine relevance to the study. Selected sources will be analyzed to identify patterns in methodology, key themes, and trends within the literature. This review highlights the complexity of the relationship between social media and youth mental health and emphasizes the importance of considering both the effects of social media on mental health and how mental health may shape online behavior. These findings provide valuable insight for those seeking to support youth's well-being in an increasingly digital world.

**FYRE Poster  
Conference Room B**

*The process of using a nuclear impactor to divert an asteroid*

**Gerald Marilla, Diogo Sanchez, Gallogly College of Engineering**

The use of Nuclear Impactors is the next big idea to divert potentially hazardous Asteroids (PHAs) away from a direct collision with Earth by exerting energy where it has the greatest influence on the asteroid's trajectory. The use of a nuclear impactor is important because of its ability to detonate any time before it impacts, allowing for a range in its ability in the deviation of an asteroid's orbit. Research usually focuses on the detonation on impact, which has proven not to cause a substantially large enough deviation in the trajectory of an asteroid. This research focuses on everything leading up to the approach (planetary rendezvous) of the nuclear impactor and finding the best range to detonate the device to cause the greatest change in trajectory. Through the simulation of meticulously researched asteroids, Python programs, and a foundation in orbital mechanics, the process of launching a nuclear impactor will be simulated.

The process of gaining this knowledge and the experience of researching is huge in the development of Undergraduate students, allowing for the familiarization with new complex topics, building new skills like data analysis, and renewing old ones like teamwork.

**Oral Presentation  
Room B1**

*Simulating laser-pulse induced helium trimer dynamics*

**Aubrey McNeil, Doerte Blume, Gallogly College of Engineering**

Previous quantum simulations of helium trimer wave-packet dynamics for relative orbital angular momentum  $L = 0$ , which use an additive pairwise two-body van der Waals potential model, reveal preferred linear and T-shaped configurations. This motivates us to investigate the extent to which a classical model can capture this quantum behavior. If the delocalized helium trimer can, after the application of an external laser pulse, be modeled classically, it would clarify when classical structure persists in weakly-bound few-body systems and motivate exploring how broadly this notion extends to related systems. We perform classical simulations of helium trimer dynamics using a Runge-Kutta integrator for the same potential model as used in the quantum calculations and analyze the resulting geometries in both Cartesian and Jacobi hyper-spherical coordinates. Preliminary testing investigates whether trajectories near the classical dissociation threshold contribute preferentially to emergent geometric configurations. These findings will help identify the broader class of few-body systems for which this classical framework remains valid.

**FYRE Poster  
Conference Room B**

*Identifying Active Factors Affecting the Size of RNA Crystals*

**Ishaa Mehta, Blaine Mooers, Dodge Family College of Arts and Sciences**

RNA molecules are crystallized in the presence of multiple charged chemicals designed to reduce RNA solubility while also facilitating a closer approach to the negatively charged backbones within the crystal lattice. The workflow in RNA crystallization, as in protein crystallization, begins with a sparse matrix screen and then selects solutions that yield promising crystallization results. The concentrations of chemicals in these crystallization leads are varied to optimize crystal size because larger crystals generally yield higher-resolution data. There is an intermediate step that is often skipped: distinguishing between chemical components that are active factors affecting crystal size and those that are inactive and have no effect. If the active and inactive factors can be identified early in the optimization process, only the active factors need to be varied in subsequent optimization experiments. The resulting experiments will be smaller, and this will conserve material and labor. There are several experimental designs available for screening factors: traditional vary-one-factor-at-a-time (OFAT), D-optimal computer-generated designs, and Fast Flexible Filling (FFF) designs from machine learning. Our goal was to compare these designs in terms of their effectiveness at identifying active factors. We selected a known RNA with eight chemical components present in the published crystallization solution. Prior work by our lab with this RNA had shown that high-quality crystals could be obtained from crystallization solutions containing only four factors. These results suggest that several of the chemicals in the published crystallization condition are likely inactive. The published conditions provided an ideal test case for comparing the ability of the three experimental designs to identify active factors. Our final results will guide crystal growers in making more effective use of their purified RNA and proteins when optimizing crystal size.

**FYRE Poster  
Conference Room B**

*Additively Manufactured Composite Materials*

**Alec Miller, Arif Abdullah, Gallogly College of Engineering**

Carbon fiber reinforced composite materials play an important role in industries that require lightweight components capable of enduring high amounts of stress, such as space exploration and vehicle production. However, the traditional methods used in manufacturing these materials limit the geometric complexity of the final part, often relying on folding sheets of carbon fiber to form a simple shape. Structures like trusses, frames with sharp internal corners, frames with sharp external corners, drastic undercuts, and concave surfaces pose a significant challenge to the current non-additive manufacturing process. These geometries can cause wrinkling, voids, porosity, and other structural defects when they are produced with simple folded sheets. To allow for stronger geometry and cheaper production, the additive manufacturing of composite materials may replace some instances of traditional manufacturing. In this poster, the structural influences of different resins, shapes, filler materials, and material concentrations on composite material additive manufacturing will be analyzed.

**FYRE Poster  
Conference Room B**

*Assessment of Mast Cell Phenotypic Shifts in Pancreatic Ductal Adenocarcinoma Microenvironment via qPCR Analysis*

**Gabriela Miller, Kamiya Mehla, Dodge Family College of Arts and Sciences**

Pancreatic ductal adenocarcinoma, a carcinoma arising from pancreatic duct cells, is the fourth leading cause of cancer deaths, with survival rates in the United States ranging from 5% to 15%. The development of more targeted treatments stemming from a comprehensive understanding of the body's immune response is necessary to increase survival rates further. Mast cells are crucial to the immune response, as they release cytokine mediators upon recognition of a foreign substance in the body. In addition to this release of cytokines, such as histamine and other lipid-based mediators, pro-inflammatory effects recruit additional immune cells and promote the growth of new blood vessels. In a cancerous environment, however, mast cells may continue their traditional role in promoting inflammation or adopt an anti-inflammatory phenotype, releasing cytotoxic mediators that induce cancer cell apoptosis. Distinguishing whether mast cells become pro- or anti-inflammatory in a cancerous environment allows for the determination of whether a proposed treatment should include further mast cell activation or, conversely, mast cell inhibition. In this experiment, MC/9 cells, derived from the fetal liver of a mouse, will be cultured in tumor-conditioned media in order to evaluate their response to this new environment. Subsequently, RNA from TCM-cultured MC/9 cells will be isolated, from which complementary DNA will be synthesized; qPCR will be performed to evaluate gene expression and determine which mediators are released by mast cells. Analysis of gene expression will reveal whether mast cell splay a pro-tumorigenic or an antitumorigenic role in the tumor microenvironment.

**Non-FYRE Poster**  
**B2/4/6 Super Suite**

*Epidemiologic Impact of a Wearable Breast Ultrasound Device for Early Detection*

**Ekaram Mohamadain Musa Mohamad, Moses Oklayemi, Dodge Family College of Arts and Sciences**

Breast cancer remains the most commonly diagnosed cancer among women worldwide, and survival outcomes are strongly associated with stage at diagnosis. Large, randomized screening trials and national screening programs have demonstrated that early detection through screening can reduce breast cancer mortality by shifting diagnoses toward earlier stages. However, screening adherence remains uneven, particularly among younger women, women with dense breast tissue, and populations facing logistical, cultural, or socioeconomic barriers. Conventional screening modalities such as mammography and clinical ultrasound require in-person visits and specialized equipment, which may limit accessibility. Recent advances in biomedical engineering have introduced wearable breast ultrasound technologies designed to enable more frequent, convenient, and potentially at-home breast imaging. This study evaluates the potential epidemiologic impact of a wearable bra-shaped ultrasound device by examining user perceptions, acceptability, and adoption-related behavioral factors.

**Methods:** A mixed-methods epidemiologic study was conducted integrating a cross-sectional survey and secondary evidence of synthesis from established breast cancer screening literature.

Women aged 18 years or older from the University of Oklahoma community were recruited through institutional email lists. Participants completed an anonymous online questionnaire assessing physical comfort with a wearable ultrasound device, privacy and modesty concerns, cultural attitudes toward breast health, emotional responses to device use, willingness to adopt the technology, and willingness to pay. Survey responses were collected using Likert-scale and categorical measures. Descriptive statistics were used to summarize participant characteristics and responses, while regression analyses evaluated predictors of adoption intention. Because the device remains experimental, an indirect epidemiologic inference framework was used to interpret findings, linking improved screening adherence and early detection to established reductions in breast cancer mortality.

**Results:** At the time of analysis, 113 participants had completed the survey. Respondents represented undergraduate students, graduate students, and faculty/staff across multiple age groups at OU. Overall perceptions of the wearable device were favorable, with high reported comfort for both clinical and potential at-home use. Privacy and modesty concerns were generally low to moderate, and most participants did not report strong cultural barriers to device use. Adoption intention was strongly positive, with participants indicating high willingness to use the device if recommended by a physician and if it could reduce late-stage breast cancer risk. Approximately three-quarters of respondents reported they would be more likely to maintain regular screening if wearable ultrasound were available. Concerns raised by participants primarily related to device accuracy, potential false positives, emotional anxiety associated with abnormal results, and affordability.

**In Conclusions,** preliminary findings suggest that wearable breast ultrasound technology may be highly acceptable to users and could increase screening participation by reducing barriers related to convenience, comfort, and access. Through an epidemiologic inference framework, improved screening adherence and earlier detection represent plausible pathways toward reduced breast cancer mortality. Further clinical evaluation and implementation research are needed to assess real-world adoption, diagnostic performance, and population-level public health impact.

**FYRE Poster**  
**Conference Room B**

*Nanogel-Based Cytokine Delivery for Immunomodulation in Preeclampsia*

**Juliana Moore, John Clegg, Dodge Family College of Arts and Sciences**

Preeclampsia affects 5-8% of pregnant and postpartum women in the United States, identified by the onset of hypertension and impaired function of key maternal organs. Although many women recover and deliver healthy infants, risks for developmental delays, death, or preterm birth of the fetus remain. Preeclampsia is thought to involve a dysfunction in the uterine immune cells, initiating an immune response against fetal cells. These uterine immune cells are a potential target for immunotherapy. Nanoparticle-based delivery systems have been studied to regulate inflammation through cytokine conjugation and delivery. Here, we studied hydrogel nanoparticles, or nanogels, as a nanoparticle platform for future applications in targeted drug delivery to uterine immune cells. Nanogels were synthesized through reverse emulsion. This procedure involves separate aqueous and organic phases, with the organic phase ultimately dispersed in the aqueous phase, followed by nitrogen purging, washing, and dialysis. Once synthesized, the nanogels were characterized using dynamic light scattering (DLS) to assess particle size and surface charge and Fourier-transform infrared spectroscopy (FTIR) to confirm chemical composition. Ongoing studies are focused on optimizing cytokine conjugation and evaluating their potential to regulate immune responses in preeclampsia. Support is gratefully acknowledged by the National Institute of General Medical Sciences (NIGMS) of NIH under award R35GM150970 (to JRC). Juliana Moore was supported by FYRE, an OU Honors College Program.

**FYRE Poster  
Conference Room B**

*Morphing Toward Stability: Designing a Flow Control System for Reliable Mobile Measurements of Atmospheric Trace Gases*

**Ignacio Mora Brenes, Wesley Honeycutt, Gallogly College of Engineering**

Mobile measurements of atmospheric trace gases are affected by changing airflow and pressure conditions in a moving system, which distorts the measured concentrations. This study investigates methods for developing an airflow control system for a LI-COR LI-7810 Trace Gas Analyzer that maintains stable sampling conditions to collect accurate measurements of CH<sub>4</sub> and CO<sub>2</sub> concentrations in the environment. A design process was performed to assess how different airflow control strategies can maintain controlled sampling conditions in mobile measurements. Prior research suggests that both passive and active control methods can be used to regulate airflow and achieve laminar flow. Prospective designs were evaluated on their ability to perform key flow control functions, including intake, stabilization, transfer, throttling, and outtake. Aerodynamic simulations were used to estimate airflow velocities in the candidate designs, and computational analysis was performed to assess how varying tubing dimensions affected the Reynolds number and the resulting flow regime in the system. It was determined that an arrangement combining flow-stabilizing geometries with an actuator-controlled needle valve whose flow rate is adjusted using GPS data transmitted via NMEA sentences can maintain consistent sampling conditions during mobile sensing operations. The development of this design enables future field studies to identify gas-concentration hotspots more effectively and supports initiatives aiming to identify the underlying causes of elevated CH<sub>4</sub> and CO<sub>2</sub> in an area.

**Non-FYRE Poster  
B2/4/6 Super Suite**

*The Influence of Stoicism on Pain Tolerance in Young Adults*

**Damilola Morodulu, Christopher Black, Dodge Family College of Arts and Sciences**

Stoicism, a philosophy emphasizing emotional restraint and endurance in the face of discomfort, has been associated with altered pain reporting in older clinical populations, yet its influence on pain perception in young adults remains largely unexplored. The purpose of this study is to examine the relationship between stoic beliefs and pain tolerance in healthy individuals aged 18-25. Participants completed four laboratory visits consisting of informed consent, questionnaires (including the Pain Attitudes Questionnaire and 2023 PAR-Q+), and randomized experimental conditions involving isokinetic, isometric, and passive knee extension protocols performed on a KinCom dynamometer. Pain pressure thresholds were assessed using a pressure algometer applied to the vastus lateralis and brachioradialis at pre-exercise, immediately post-exercise, and 10 minutes post-exercise time points. This study aims to determine whether stoic belief systems are associated with differences in pain threshold and tolerance.

**Non-FYRE Poster  
B2/4/6 Super Suite**

*From Vision to Action: Strengthening Educational Policy for Equitable Development*

**Swelihle Mtshali, Moses Olayemi, Dodge Family College of Arts and Sciences**

As countries strive towards becoming more developed, the significance of education and investment in its citizens becomes more apparent in strategies towards attaining the global standard of development. Stemming from the context of the Kingdom of Eswatini, this paper is a critique on the educational policies and frameworks made over time to achieve His Majesty the King Mswati III's Vision 2022 and the consequent effects on the development of STEM education in the country. A 2021 educational sector analysis report from the World Bank highlights limited access to tertiary education and even lower enrollment for STEM subjects at a tertiary level. This critique examines the disconnect between a national vision for first-world status and the underdeveloped educational policies meant to support it. This will be examined primarily through the Context Led Model of Education Quality. Findings from the analysis of budget speeches dating back to 2011 reveal that education has been a priority in national expenditure distribution as it typically receives about 15 percent of the budget each year. This further makes the policies and systems more important because there is a considerable investment in the educational sector. The proposed research question is: How do the educational policies align with the goals of Vision 2022 for human development and the consequent effects on the progress of STEM education in Eswatini? This paper explores the complexities behind the strategies, and it also seeks to investigate alternative frameworks that shape educational policies and practices towards better societal outcomes and more tangible progress.

**Non-FYRE Poster  
B2/4/6 Super Suite**

*Quantitative Framework of Examining Functional Connectivity Disruptions In Autism*

**Lillian Mukaneza, Zamani Esfahlani, Gallogly College of Engineering**

Autism Spectrum Disorder (ASD) is increasingly conceptualized as a disorder of large-scale brain network organization rather than isolated regional abnormalities. However, neuroimaging studies report conflicting patterns of hyperconnectivity and hypoconnectivity, suggesting that inter-individual variability in functional connectivity (FC) may underlie these inconsistencies. This study proposes a quantitative network-level framework to examine how variability in resting-state FC relates to cognitive performance in individuals with ASD. Using preprocessed data from the Autism Brain Imaging Data Exchange (ABIDE), subject-

(cont.) specific FC matrices are constructed from region-of-interest time series. Graph theory metrics, including degree centrality, modularity, and global efficiency, are computed to characterize regional connectivity strength, network segregation, and global integration. General linear models controlling for age and sex evaluate associations between these network measures and cognitive indices, including Full-Scale IQ (FIQ), Verbal IQ (VIQ), and Performance IQ (PIQ).

We hypothesize that increased local connectivity within sensory and language-related regions is associated with reduced global efficiency and lower IQ performance, reflecting diminished large-scale communication efficiency. By identifying connectivity signatures linked to cognitive variability, this work advances a data-driven framework for understanding neural heterogeneity in ASD and informs the development of network-based biomarkers for more precise characterization of the autism spectrum.

**Oral Presentation  
Room B5**

*The Dynamics of Settlement in the ancient the Alentejo Region: Least Cost Path Analysis in a Colonial Landscape*

**Eli Muller, Joey Williams, Dodge Family College of Arts and Sciences**

This project examines the patterns of Roman and indigenous settlement in the region of Redondo in the central Alentejo, Portugal. Understudied archaeologically, this region is the home of hundreds of identified sites. Indigenous Iron Age populations were first colonized by the Romans in the 2nd century BC. The Roman presence in the region increased over time, both in size and quantity of the sites. Indigenous urban settlements, known as oppida, were often depopulated or merged into larger Roman settlements. However, smaller indigenous settlements, like villages and farmsteads, often persisted outside spheres of Roman influence. In order to examine this archaeological landscape, site and topographic data was compiled from the Portuguese Center of Data and the Cultural Heritage Public Institute in geographic information systems (GIS) software, in order to perform a least-cost path analysis. This analysis models movement, trade, connectivity, and administrative connection, thus demonstrating the dynamic social, political, and economic relations between settlements at different scales in the region. This paper examines these isolated settlements as evidence of indigenous self-governance and resistance to Roman imperialism.

**Non-FYRE Poster  
B2/4/6 Super Suite**

*A Radical Discussion of Equity for Black Women in Engineering Education*

**Gino Ndiko, Moses Olayemi, Gallogly College of Engineering**

Several environmental and institutional factors contribute to the low retention rates of women from underrepresented communities in engineering programs. Although universities have made efforts to increase diversity in STEM, certain groups remain underrepresented as they face unique barriers that affect their persistence. Previous research has shown that while more than half of the undergraduate degrees are acquired by women, less than 20% of engineering degrees are acquired by them. This research explores systemic factors, such as financial and

(cont.) racial background, as well as institutional factors, such as classroom climate, academic support networks, and peer collaboration, that contribute to the retention rate. Using a mixed-methods approach, the study will combine qualitative and quantitative data to better understand these challenges. Semi-structured interviews will be conducted with people in engineering to determine their experiences, awareness, and perception of barriers to retention in engineering. The study determines key institutional factors and makes recommendations for reforms to support inclusivity in engineering programs.

**Oral Presentation  
Room B3**

*AI and Job Security in the University of Oklahoma Conference/Research Paper*

**Wonga Nogwanya, Moses Olayemi, Gallogly College of Engineering**

The rapid expansion of generative artificial intelligence (AI) tools such as ChatGPT has significantly influenced higher education, particularly in how students complete coursework and interact with faculty. While AI provides new opportunities for independent learning and academic assistance, its widespread use also raises questions about the evolving role of professors and the implications for their professional responsibilities and job security. This study examines how the growing reliance on AI among students influences professors' perceptions of their job security at the University of Oklahoma. Using a mixed-methods approach, data was collected through surveys administered to engineering faculty at the Gallogly College of Engineering, alongside planned qualitative interviews. The survey examined professors' comfort with student AI use, the extent to which AI may reduce direct student-faculty interaction, and concerns regarding long-term job stability. Preliminary results from faculty responses indicate that while professors generally remain confident in their overall job security, they express moderate concern regarding the effects of AI on students' learning processes and the potential disruption of traditional student-faculty engagement. Findings suggest that AI may challenge aspects of professors' perceived task significance by reducing opportunities to develop students' critical thinking skills. However, most respondents do not believe AI will fully replace core aspects of their roles as humanity is necessary in education. This study leaves room for further study about AI integration in higher education.

**Non-FYRE Poster  
B2/4/6 Super Suite**

*Female Limia Mate Choice and Reproduction Isolation (L. nigrofasciata and L. islai)*

**Ishan Patel, Ingo Schlupp, Dodge Family College of Arts and Sciences**

We want to conduct a mate choice study to see if the two sister species would interbreed or not. This would be a great foundation for learning more about their ecology and gives more insight into their potential divergence. We want to compare female and male mate choice between two species from Lake Miragoane, *Limia nigrofasciata* and *Limia islai*. These two species differ in ornamentation but occur syntopically in the Lake. They are close relatives, but do not seem to hybridize. In this experiment, we want to explore the role of mate choice in reproductive isolation. Specifically, we want to determine whether females of the two species

(cont.) exhibit species recognition and prefer conspecific males. Similarly, we want to ask if males of the two species prefer conspecific females. Finally, we plan to use the same individuals tested for between-species preferences to test for within-species female and male choice. By conducting this experiment, we hope to find whether females prefer heterospecific males or conspecific males. We aim to determine whether males prefer heterospecific or conspecific females, and to compare between- and within-species mate choice to identify potential patterns in species recognition and attraction.

**FYRE Poster  
Conference Room B**

*Expansion Microscopy of HUVECs to Study Nanoparticle Uptake*

**Elina Patel, Stefan Wilhelm, Dodge Family College of Arts and Sciences**

This project uses magnify expansion microscopy to study how nanoparticles interact with human umbilical vein endothelial cells (HUVECs). The goal of expansion is to better understand how nanoparticles are absorbed by these cells and where they travel inside. This is important for making nanomedicine safer, more effective, and improving drug delivery. Expansion microscopy is a technique that physically enlarges cells by embedding them in a gel that expands, allowing the very small structures to be seen more clearly under a microscope. In this study, the process expands the samples up to 10 times their original size. Endothelial cells line the inside of blood vessels and act as a barrier between blood and surrounding tissue, controlling what enters and leaves the bloodstream, including particles like nanoparticles. Studying these cells is important because they are often the first point of contact for nanoparticles in the body. Overall, this project aims to help provide a clearer understanding of nanoparticle activity and delivery which supports the development of better treatments for diseases.

**FYRE Poster  
Conference Room B**

*The Synthesis and Characterization of Hexagonal Cyclophanes*

**Caiden Pendola, Yuanning Feng, Dodge Family College of Arts and Sciences**

Cyclophanes are a type of macrocycle containing aromatic rings with relevance in environmental and membrane applications. The synthesis of larger cavity bipyridinium-based cyclophanes while maintaining their electron-deficient nature poses synthetic difficulties, as previously used box expansion methods often compromise the strength of the viologen's positive charge. We report on the synthesis and characterization of novel Hexa6+ and Hexa8+ polycationic cyclophanes. These rings are synthesized in a stepwise fashion, starting from two commercially available reactants bipyridine and 4,4-Bis(bromomethyl)biphenyl potentially allowing for scalable synthesis. These cyclophanes exhibit the desired expanded cavity size while preserving the strength of the electron-deficient groups. While Hexa6+ and Hexa8+ share a common macrocyclic size, they differ in their overall charges, dictating their unique functionality. This synthetic expansion technique presents unique opportunities within host-guest chemistry. The increased cavity size and strong electron deficiency enable interactions between these cyclophanes and molecules like polycyclic aromatic hydrocarbons (PAHs) as

(cont.) well as potential integration into selective separation membranes. However, due to unintended intermediate interactions and large size of the ring, obtaining large, pure yields and crystalline structures remains an obstacle, prompting further synthetic optimization. By increasing the cavity size and maintaining the electron-deficiency strength of the cyclophanes, the synthesis of Hexa6+ and Hexa8+ offers promising advancements in supramolecular recognition, materials science, and molecular spintronics.

**FYRE Poster  
Conference Room B**

*Investigating Stacking Fault Energy in FCC AuAg Metal Alloys Using LAMMPS Simulations on OSCER*

**Annabel Pignataro, Iman Ghamarian, College of Atmospheric and Geographic Sciences**

This project investigates the chemical composition of FCC AuAg (gold-silver) metal alloys across 11 distinct samples with varying concentrations. Nine of these samples range from 10% gold to 90% gold in ten-percent increments. The final two samples capture the extremes, containing 5% gold and 95% gold. To conduct this research, I am using a molecular dynamics program called LAMMPS to run simulations on the supercomputer. Prior to starting the main research, I completed two smaller projects to get accustomed to this simulation workflow. The main goal for this semester is to find the difference in stacking fault energy among the various alloy combinations. Additionally, we aim to determine how that energy differs between a completely random atomic structure and a chemical short-range order (CSRO) structure.

**Non-FYRE Poster  
B2/4/6 Super Suite**

*Temperate Grassland Plant Community Response to Long Term Drought and Repeated Hay Harvest*

**Claire Plotts, Lara Souza, Dodge Family College of Arts and Sciences**

Global changes, including increasing precipitation variability and seasonality with more predominant drought events can alter the structure of plant communities. In temperate grassland ecosystems these seasonal precipitation shifts are expected to have a large impact on community dynamics with higher levels of water limited interactions. We used clipping of above ground biomass to mimic grazing or hay harvest in addition to water reduction. We have evaluated change in diversity through the lens of response from dominant, subdominant, and transient species based on relative abundance. We have a long-term precipitation study with seven different treatments of +50%, 0%, -20%, -40%, -60%, -80%, and -100% change from ambient precipitation replicated across twenty-one 4-meter subdivided plots. We found a consistent effect of clipping on dominant and subdominant species responses while the interactive effects of precipitation and clipping were inconstant. Clipping promoted dominant species on average by 37% (2018-2019, 2021-2022;  $p < 0.05$ ) when compared to unclipped plots. On the other hand, the effect of clipping hindered subdominant species

(cont.) (2018-2022;  $p < 0.05$ ) in the middle years when compared to unclipped plots. Resulting plant diversity was promoted in clipped rather than unclipped communities. Precipitation and clipping interacted to affect both dominant and subdominant species, scaling up to affect plant diversity. Transient species were not shown to be impacted by our treatments. Taken together, clipping has an immediate measurable impact on the community that was exacerbated by drought over time.

**Oral Presentation  
Room A5**

*Community Matters: Investigating the Role of Community Efficacy in Native Youths' Critical Consciousness Development*

**Hozshona Post, Robin Minthorn, Dodge Family College of Arts and Sciences**

Critical consciousness (CC) theory is a useful framework for understanding how youth become involved in social change. According to this theory, critical action (behaviors aimed at social change) is shaped by (1) critical reflection (recognizing structural injustice) and (2) personal efficacy (belief one can make a difference). However, when it comes to Native Peoples, we argue that CC theory is incomplete. Community is foundational to Native life and plays a central role in shaping Native Peoples' knowledge systems, relationships, and ceremonies, influencing how they see the world and how they respond to it. Thus, community efficacy (belief one's community can make a difference) may play a key role in connecting critical reflection to critical action. To test our hypothesis, we analyzed Native youth (18-25 years old,  $N = 1016$ ) from the Indigenous Futures Survey. As predicted, the relationship between critical reflection and critical action was significantly mediated by community efficacy. These findings highlight the role of community-based motivations in Native youths' CC development and provide a more culturally grounded understanding of Native youths' critical action engagement.

**FYRE Poster  
Conference Room B**

*Synthesis and Characterization of Geranyl Pyrophosphate for Prenyltransferase Applications*

**Dhathri Puttheti, Dhathri Puttheti, Dodge Family College of Arts and Sciences**

Geranyl pyrophosphate (GPP) is a key intermediate in isoprenoid biosynthesis and serves as an essential prenyl donor in enzyme-catalyzed transformations. The ability of prenyltransferases to utilize pyrophosphate substrates to generate structurally diverse molecules has significant implications for natural product diversification and drug discovery. In this study, GPP was synthesized and characterized to evaluate its potential as a chemoenzymatic tool.

Structural confirmation was achieved using proton and phosphorus nuclear magnetic resonance (NMR) spectroscopy. The Proton NMR spectrum displayed characteristic signals corresponding to methyl and allylic proton environments, while the Phosphorus NMR spectrum showed peaks consistent with a diphosphate functional group. Together, these data confirm the successful synthesis of GPP and validate its structural integrity.

This work supports the broader objective of the Singh lab to develop and characterize novel

(cont.) pyrophosphate compounds for use in studying prenyltransferase activity. Establishing GPP as a reliable prenyl donor provides a foundation for future chemoenzymatic studies aimed at generating new biologically active molecules with potential pharmaceutical applications.

**FYRE Poster  
Conference Room B**

*Effect of light pollution on diurnal birds' dawn chorus onset*

**Avery Radford, Jeffrey Kelly, Dodge Family College of Arts and Sciences**

Anthropogenic light pollution is known to negatively impact avian biodiversity. Previous studies have found that light pollution disrupts diurnal birds' circadian rhythms and sleep-wake cycles, and that one morphological trait influencing birds' susceptibility is eye size. Based on trends in previous research, we predict that larger-eyed birds in Norman, Oklahoma, will be more strongly affected by light pollution, resulting in an earlier dawn chorus onset. We don't yet know how the spatial scale of light pollution influences birdsong, nor whether specific physical attributes directly affect birds' susceptibility across this scale. Results are expected to show that the relationship between dawn chorus onset and nighttime light levels is directly proportional, with earlier onset in more heavily light-polluted areas. Eye size in the recorded species is inversely proportional to dawn chorus onset-time, consistent with previous research. Our findings in Norman align with broader Northern Hemisphere data, while highlighting nuanced, location-specific relationships among bird song, species, and light pollution across urban and remote environments. Our results demonstrate the impacts of anthropogenic activity on nature through birds' responses to light pollution: birds become active earlier in the morning in areas with greater light pollution and traffic.

Understanding avian activity in urban and residential areas can inform conservation strategies to mitigate human impacts on the environment. The effects of light pollution at smaller scales provide insight into species' ecological and spatiotemporal behaviors. While general analysis helps explain relationships between avian activity and avian behavior, variations across geographic landscapes and biota require a specialized approach.

**FYRE Poster  
Conference Room B**

*Assessing Genomic Diversity in Present-day Africa*

**Annie Reeder, Andre Campelo dos Santos, Dodge Family College of Arts and Sciences**

Africa harbors the greatest genomic diversity among human populations, reflecting the deep evolutionary roots on the continent. However, reliance on limited reference populations or conflating of geographically and linguistically distinct groups obscures the complex genomic relationships among present-day Africans. Despite its importance in understanding human population history and the global patterns of genetic variation, the fine-scale population structure of African populations is unresolved. We analyzed genome-wide data of 316,364 single-nucleotide polymorphisms from 44 individuals representing 19 African populations spanning major ethnolinguistic groups and geographic regions. We applied principal component analysis (PCA) to better understand the genomic relationships among populations and fastmixture for ancestry estimation across a range of ancestry components. The first principal component in the PCA analysis reveals an expected differentiation between Northern (Mozabite and Saharawi) and Sub-Saharan populations. Interestingly, the fastmixture results show that ethnically and linguistically distinct populations, such as Ju'hoan and Khomani, may present nearly identical genomic structures, indicating continuous or long-term gene flow between them. Conversely, the Bantu-speaking populations (Herero, Tswana, and Kenya) demonstrate relevant genomic differentiation, as suggested by the PCA result. Strikingly, in both analyses, the Somali population appears to be the most genomically distinct. Our results show that African populations can be highly differentiated at the genomic level, even within similar regions, highlighting differential ancestral landscapes for present-day populations. These findings provide a framework for future studies on African genomic diversity and ancestries, underscoring the importance of more granular investigations of African populations in genomic research.

**FYRE Poster  
Conference Room B**

*Logic Circuit Discovery for Mechanistic Interpretability*

**Brendan Richards, Jie Cao, Gallogly College of Engineering**

Despite the growing popularity of AI, no one is exactly sure what goes on behind the scenes or how AI models draw conclusions. This study aims to try and shine a light on some of the inner workings of neural networks. Previous research on logic circuit discovery used activation patching, a method based on running the model on a “clean” input and a “corrupted” input and comparing the results, to test model accuracy on a dataset consisting of syllogistic schemes. The main issue with this was that the results were often inconsistent and disrupted by information learned during pre-training. This study applies a Sparse Autoencoder (SAE) to a neural network, in this case Pythia-70M, in order to reduce the number of activated neurons in the network to simplify the process of highlighting discoverable features. After SAE training is complete, the syllogistic schemes are passed through the model. Finally, various parts of the network are manually ablated, and the experiment is run again to figure out which parts of the model most directly contribute to increasing its accuracy on the given task. In comparison to activation patching that only identifies which neurons are most affected by a change in input, SAEs also allow for narrowing down what information each neuron is processing. The end result of this study is that the set of neurons responsible for logical decision making within the model has been identified.

**Oral Presentation  
Room B5**

*Fitness and Fecundity Benefits of Copper Resistance in a Wild-Derived Population of *Drosophila melanogaster**

**Christina Rodriguez, Elizabeth Everman, Dodge Family College of Arts and Sciences**

Copper is a trace metal which is required for many biological functions; however, large quantities are toxic. This study uses a population of flies that were originally caught from a fruit farm, Mercier Orchards (MO) in Georgia. We selected for copper resistance and found that it drastically increased over 24 generations. Interestingly, we also found that copper resistance was correlated with an increased lifespan. To further understand the relationship between copper resistance and fitness, we focused on fecundity to investigate the influence of copper selection on the reproductive component of fitness. We exposed females from MO to control or copper conditions and measured total number of eggs laid, egg viability, and egg quality in addition to lifespan. Once again, we found that the two MO populations differed in longevity. While controlling for lifespan, the copper-resistant MO females initially laid fewer eggs but ultimately laid more and had higher total fecundity. Overall, copper exposure negatively affected egg quality, but we found no difference between the copper-resistant and control populations. Despite similarities in egg quality, we found that egg viability was significantly higher in copper-resistant MO flies. Overall, we determined that copper resistant MO flies experienced a fitness benefit through both lifespan and fecundity. The copper-resistant MO flies produced eggs of similar quality compared to the control flies, but the eggs were more likely to hatch under copper stress. Although over exposure to copper can have negative effects, evolved resistance to an energetically taxing toxin may not always come with a fitness cost.

**FYRE Poster**  
**Conference Room B**

*Investigating the Role of the ATGL Gene in Adipose Lipolysis During Calorie Restriction in Visceral Fat*  
**Kaydn Ros, Priya Balasabrumanian, Dodge Family College of Arts and Sciences**

Calorie restriction (CR), which involves reducing calorie intake without causing malnutrition, has been shown to improve health and extend the lifespan of many animal models by delaying the onset of age-related diseases. One of the primary tissues affected by CR is white adipose tissue (WAT), which is responsible for storing and releasing energy in the body. During CR, WAT shifts toward breaking down stored fats through a process called lipolysis. This process is primarily driven by adipose triglyceride lipase (ATGL), an enzyme that helps convert stored triglycerides into free fatty acids that can be used for energy. This project focuses on understanding how lipolysis due to calorie restriction affects white adipose tissue in wild type mice vs mice that have been genetically modified to not express the ATGL gene. By examining these differences, this research will help clarify how lipolysis contributes to changes in adipose tissue and overall metabolism. Understanding these mechanisms could provide insight into how CR supports better health and may help guide future strategies for treating metabolic and age-related diseases.

**FYRE Poster**  
**Conference Room B**

*Investigation of the Effect of Storm Characteristics on Rain Garden Design and Implementation*  
**Evan Rosen, Jason Vogel, College of Atmospheric and Geographic Sciences**

Rain gardens are forms of green stormwater infrastructure (GSI) used to collect and filter rainwater runoff. They are sized using stormwater volume (SWV) estimated as the runoff volume from impervious surfaces for a specific size storm. The peak flow from this storm is calculated using a hypothetical storm with a very short-lived high rainfall event with one large peak, which does not account for the variability of real-life rain events. This project sought to determine how unique storm characteristics affect both the necessity and function of rain gardens within a watershed. We utilized a mixed-use suburban watershed in McClain County, Oklahoma with 25% impervious area. We simulated rain events in this watershed using spreadsheets and the Iterative NRCS Curve Number Method to estimate the runoff volume and peak flow for several actual rain events. The rain events were obtained from both daily and 15-minute interval rainfall data from 1/1/1994 to 12/31/2025 from the Oklahoma Mesonet. A spreadsheet model was used to determine the peak flowrate and volume of the watershed for soil type A, B, C, and D for both pervious and impervious surfaces. From this investigation, we determined that for type A soil in most rain events, a rain garden was not necessary for our chosen watershed characteristics. We also discovered that a range of effective curve numbers for the watershed exist for rain garden implementation without an underdrain. These findings facilitate new strategies for implementing future rain gardens in areas with different soil types and impervious surface coverage.

**FYRE Poster**  
**Conference Room B**

*Environmental Contaminants and DNA Damage in Tadarida brasiliensis Bats: A Micronucleus Analysis*  
**Ava Sachdev, Daniel Becker, Dodge Family College of Arts and Sciences**

Environmental contamination from pesticides, heavy metals, and other pollutants is an increasing threat to wildlife health and ecosystem stability. In insectivorous bats, exposure to these contaminants can cause sublethal effects such as DNA damage, immune disruption, and altered metabolism. These physiological changes may increase susceptibility to infection and influence the transmission dynamics of pathogens carried by bats. This study investigates whether populations of Mexican free-tailed bats (*Tadarida brasiliensis*), one of the most abundant bat species in Oklahoma and an important provider of agricultural pest control, show evidence of genotoxic damage associated with contaminant exposure. To address this question, we analyze blood smears collected monthly from bats in 2022, between their spring migratory arrival into Oklahoma and their fall departure back to Mexico, to quantify the frequency of micronuclei as an indicator of DNA damage. The micronucleus assay is a sensitive biomarker widely used to detect exposure to genotoxic contaminants such as pesticides. Blood samples are examined microscopically, and micronuclei counts are recorded to assess variation in DNA damage among individuals. By comparing micronuclei frequencies across months, we evaluate seasonal patterns in contaminant exposure and potential environmental stressors affecting bat populations. These analyses provide insight into how contaminant exposure and migration-related physiological stress may influence bat health and immune function. Understanding how environmental contaminants affect bat health is critical because compromised immunity may increase pathogen replication and transmission, potentially influencing zoonotic disease dynamics and the risk of pathogen spillover to humans.

**FYRE Poster  
Conference Room B**

*Exploring DUS1L and TRMT112 Expression Patterns in Liver Cancer*

**Bella Samuel, Surendra Shukla, Dodge Family College of Arts and Sciences**

Liver cancer remains a significant global health challenge and third leading cause of cancer related death worldwide. Understanding gene expression patterns is critical for improving diagnosis and treatment strategies. By utilizing the Insilco approaches, we investigated the effect of tRNA modifying enzymes on liver cancer patient survival. We observed increased DUS1L and TRMT112 expression in liver cancer leads to poor prognosis of the patients. Using bioinformatic tools like UALCAN, gene expression levels and survivability trends were examined, alongside training in laboratory techniques such as SDS-PAGE, electrophoresis, and cell culture techniques. Results indicate that variations in the DUS1L and TRMT112 expression are associated with observable differences in patient survival. We also observed increased expression of these enzymes at protein levels in the liver tumor tissues in comparison to the normal liver. These findings suggest that DUS1L and TRMT112 may serve as potential biomarkers and demonstrate the importance of integrating laboratory techniques with data analysis in cancer research.

**FYRE Poster  
Conference Room B**

*Glass Slipper or Glass Ceiling? Feminine Norms and Academic Disengagement*

**Hafsa Sel, Mauricio Carvallo, Dodge Family College of Arts and Sciences**

This study examines how conformity to feminine norms relates to psychological disengagement, self-efficacy, and self-worth contingencies among female undergraduate students. Prior research suggests that gender norms shape academic motivation and identity by influencing how students interpret success, belonging, and evaluation. We propose that conformity to feminine norms—such as emphasizing relational orientation, modesty, and appearance—may increase vulnerability to psychological disengagement, a process in which individuals detach their self-worth from academic outcomes when those outcomes feel threatening. Using a cross-sectional survey design, participants will complete validated self-report measures of conformity to feminine norms, psychological disengagement, academic and appearance-based contingent self-worth, and general self-efficacy. The proposed model tests whether conformity to feminine norms predicts greater psychological disengagement through dual pathways: increasing appearance-based self-worth while decreasing academic self-worth. In turn, both pathways are expected to undermine self-efficacy and promote disengagement from academic outcomes. By focusing specifically on feminine norm conformity, this study aims to clarify how internalized gender expectations influence academic engagement and performance. Findings may inform interventions designed to strengthen self-efficacy and reduce disengagement, ultimately supporting persistence and academic success among women in higher education.

**Oral Presentation  
Room A5**

*Cross-Cultural Exchange through Art: The Impact of Post-Impressionist Art on Japan*

**Samantha Seratte, Allison Palmer, Weitzenhoffer Family College of Fine Arts**

The study of cross-cultural exchange through art has been a topic of discussion in the art world since the late 20th century, and I will continue this research through the lens of the cross-cultural interactions demonstrated by Japanese woodblock prints and their influence on Vincent Van Gogh's artwork, as well as discuss the impact that Van Gogh [1853-1890] and other Post-Impressionist European artists had on Japanese artists. This shows that art is not simply a reflection of an artist's own culture but also the other cultures that they are inspired by. This project will involve formal and contextual analyses of several works by Van Gogh and the Japanese art that inspired him, and an exploration of the artworks as evidence for the impact of cross-cultural exchange through art. However, that cross-cultural exchange is not a one-way street, so an analysis of the other side of this exchange will be done as well. This project's goals are to further both the art historical study of Vincent Van Gogh's work and the anthropological study of cross-cultural exchange and its products. Van Gogh wrote many letters discussing his perceptions of Japan and the inspiration he drew from it, making him a great case study of cross-cultural exchange between Asia and Europe during the 19th century, and studying the cultural context in which this exchange took place.

**FYRE Poster  
Conference Room B**

*Assessing the prevalence of genomic mutations associated with Type 2 Diabetes in South Asian populations.*

**Anika Shah, Andre Campelo dos Santos, Dodge Family College of Arts and Sciences**

Type 2 diabetes (T2D) is an increasing problem for individuals around the world, often resulting in long-term issues such as kidney failure, nerve damage, and other high risks. While T2D prevalence is rising across all regions, South Asian populations have been shown to be largely affected by the condition in comparison to their counterparts around the globe. Despite this concerning scenario, the genomic landscape underlying T2D susceptibility in South Asian populations remains insufficiently characterized. To address this gap, we investigate the prevalence of T2D-associated genomic mutations across South Asian populations. We curated a list of 28 single-nucleotide polymorphisms (SNPs) with established links to T2D susceptibility and searched for their presence in genomic data representing 38 individuals from 19 distinct South Asian populations. Using bioinformatics, we identified that 23 of the 28 SNPs were carried by at least one individual in the dataset. All 38 individuals analyzed also harbored at least one T2D-associated variant, suggesting a widespread genomic risk to developing T2D across the subcontinent. Notably, the implicated SNPs are associated with distinct biological mechanisms underlying T2D development, including disruptions to insulin sensitivity, beta-cell function, and risk factors such as obesity. Given this diversity of risk-associated variants, we hypothesize that South Asian individuals may carry distinct risk factors for T2D onset, which could help explain the population's susceptibility to the condition. Our findings thus provide an initial genomic survey of T2D risk factors in South Asia and lay the foundations for future research into population-specific biological factors underlying T2D onset.

**Oral Presentation  
Room B5**

*The Irony of the Romantic Egoist in Fitzgerald's This Side of Paradise*

**Daniel Shamsee, Catherine Mintler, Dodge Family College of Arts and Sciences**

After its publication in 1920, F. Scott Fitzgerald's first novel, *This Side of Paradise*, became widely read by a new generation and simultaneously criticized by older generations for its portrayal of youth. In contrast to the reputation Fitzgerald's writing gained as juvenilia that had a corrupting influence upon youth, the text itself offers no celebration of rebellion, collegiate glamour, or debauchery. The novel's protagonist, Amory Blaine, is a young man on a path towards becoming a "Romantic Egoist"—an identity which is inseparable from his yearning for something greater. His aimlessness in reaching what amount to ill-defined goals produces a dissatisfaction that ultimately leads to a recurring sense of purposelessness, which drives him to despair. *This Side of Paradise* ends up locating the intensity of youthful experience not in achievement or fulfillment; however, in unfulfilled yearning for grandeur Amory's attempts to follow societal expectations results in his despair. Given the novel's outcome, it is odd that Amory Blaine became such a popular literary figure young men aspired to imitate.

**FYRE Poster  
Conference Room B**

*Optimization of Azotobacter vinelandii (Av) FixAB Protein Expression*

**Jaylie Sharp, John Peters, Dodge Family College of Arts and Sciences**

*Azobacter vinelandii*, generates high-energy electrons that are vital for cellular reactions such as nitrogen fixation. High-energy electrons are generated from a process called flavin-based electron bifurcation. This process is carried out in a complex enzyme called FixABCX, which uses electrons from coenzyme NADH to carry out exergonic and endergonic processes. This results in reduced flavodoxin (Fld), an important electron carrier for nitrogen fixation. In this study, we worked to express and optimize subcomplex enzyme, FixAB, in *E. coli* bacteria. Studying and expressing FixAB can help us better understand how this enzyme transfers electrons from NADH to flavodoxin via FixAB. Using two different plasmids, PETDuet-1 and pASK-IBA7C, we tested to see which one would optimize protein expression and yield. Our results show that the pASK-IBA7C plasmid is the better expression system for FixAB. However, this construct results in insoluble protein expression. We optimized the concentration of anhydrotetracycline (AHTC) that induces FixAB gene expression in the pASK-IBA7C plasmid. The concentration range of AHTC that is required to express FixAB is .2 mg/L to 2 mg/L. Currently, we are optimizing temperature conditions to enhance the soluble protein expression.

**Non-FYRE Poster  
B2/4/6 Super Suite**

*Trust and Cognitive Shifts: How AI Reliance Reshapes Human Thinking and Decision-Making*

**AbdulMalik Shodunke, Moses Olayemi, Gallogly College of Engineering**

Artificial intelligence (AI) tools are increasingly embedded in academic and professional environments, offering speed and convenience while raising concerns about their potential effects on independent reasoning. This study examines how exposure to AI-generated suggestions from familiar AI tools influences students' decision-making during open-ended critical thinking tasks. Drawing on prior work in trust, cognition, and human AI interaction, the study focuses on behavioral indicators of reliance rather than self-reported trust alone. Nine undergraduate engineering students at a large public university completed an online survey consisting of five open-ended critical thinking questions. Participants first responded independently and were then shown AI-generated responses or approaches from the AI tool they personally trust and use most frequently, with the option to revise their original answers. Reliance on AI was assessed behaviorally through patterns of revision and alignment between participants' initial responses, AI-generated content, and final responses. Self-report measures of perceived task difficulty, helpfulness, and AI influence were collected to contextualize observed behavior.

Results showed that participants overwhelmingly retained their original responses after viewing AI-generated suggestions, with only two revisions observed across forty-five opportunities. When revisions did occur, they varied in character, including both strong alignment with AI-generated reasoning and independent reconsideration. Self-reported perceptions of AI influence did not consistently correspond to behavioral measures of reliance. These findings suggest that exposure to familiar AI tools does not uniformly reduce cognitive independence but may selectively influence reasoning in ways that are not always reflected in users' subjective impressions. The study highlights the value of behavioral measures for understanding how AI shapes reasoning processes in engineering education.

**Non-FYRE Poster  
B2/4/6 Super Suite**

*Size Dependent Heterogeneity of Mitochondrial Biogenesis in PhMNs of Sprague Dawley Rats*

**Lucy Sieck, Stefan Wilhelm, Gallogly College of Engineering**

Neuromotor control of the diaphragm muscle (DIAM) involves size-dependent recruitment of phrenic motor neurons (PhMNs). In the DIAM, motor unit types can be identified based on speed of muscle contraction (slow and fast) and resistance to fatigue. Small PhMNs are recruited with lower-force activities (e.g., breathing,) and larger PhMNs are recruited for higher-force activities (e.g., coughing or sneezing.) Because small PhMNs are recruited more often and thus are more active, this is reflected by a higher mitochondrial volume density (MVD) in smaller PhMNs. On the molecular level, signaling pathways for mitochondrial biogenesis of PhMNs are identified. CREB is phosphorylated at serine residue 133, which binds to the PGC1 $\alpha$  promoter region, increasing the transcription of PGC1 $\alpha$  which then increases expression of transcription factor A, mitochondrial (TFAM), mediating mitochondrial biogenesis. We hypothesize that concentrations of mitochondrial biogenesis markers pCREBs133, PGC1 $\alpha$ , and TFAM are higher in smaller

**Non-FYRE Poster**  
**B2/4/6 Super Suite**

*Campus Complexity Index: A Framework for Context-Aware Gun Detection in University Environments*

**Fabrice Simpo, Moses Olayemi, Gallogly College of Engineering**

Gun detection systems deployed in university environments face significant challenges from dynamic scene complexity, fluctuating crowd density, variable lighting, diverse camera quality, and temporal activity patterns. Existing deep learning detectors achieve high accuracy on curated datasets but suffer from elevated false positive rates when confronted with the complex, uncontrolled conditions characteristic of real campus surveillance. This paper introduces the Campus Complexity Index (CCI), a novel quantitative framework that models scene complexity through five interpretable components: Crowd Index (CrI), Camera Quality Index (CqI), Motion Randomness Index (MoI), Luminance Variability Index (LvI), and Temporal Outlier Deviation Index (ToDI). We demonstrate through proof-of-concept validation that CCI-based adaptive thresholding achieves 13.1% Mean Average Precision improvement and 64.2% false positive reduction in high-complexity scenarios while maintaining 94.1% recall in low-complexity scenarios, compared to static threshold baselines. Our validation on the CCTV-Gun dataset shows that multi-factor CCI outperforms single-factor heuristics by 10.6 percentage points and provides a training-free, deployable solution compatible with existing detectors. The framework addresses a critical gap in weapon detection literature where no unified complexity metric exists for adaptive decision-making in security applications.

Keywords: weapon detection, scene complexity, adaptive thresholding, campus security, computer vision

**FYRE Poster**  
**Conference Room B**

*Effect of adipose triglyceride lipase on subcutaneous fat during calorie restriction.*

**Mehar Singh, Priya Balasubramanian, Dodge Family College of Arts and Sciences**

Calorie restriction is a well-known anti-aging practice. In our experiment both male and female mice have been tested with and without the adipose triglyceride lipase gene while going through calorie restriction. Adipose triglyceride lipase is an enzyme that breaks up the fat tissue when fasting. In the experiment, we want to see the effect that this enzyme has during calorie restriction, and whether this gene is needed to enhance the anti-aging benefits. We hypothesize that this gene has a large effect on adipose sites during calorie restriction.

**FYRE Poster**  
**Conference Room B**

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**Oral Presentation**  
**Room A1**

*Multimodal Imaging for Autobiographic Memory Function*

**Slade Smelser, Han Yuan, Gallogly College of Engineering**

Major Depressive Disorder affects millions of individuals and is associated with dysfunction in large-scale brain networks; this includes networks such as the Default Mode Network (DMN), Salience Network, and Central Executive Network. Transcranial Magnetic Stimulation (TMS) has been an emerging and promising non-invasive treatment for medication-resistant depression, typically used by targeting the left dorsolateral prefrontal cortex. However, conventional targeting approaches rely on generalized anatomical rules that do not account for individual differences in brain function. This study investigates the use of functional near-infrared spectroscopy (fNIRS) during an autobiographical memory (ABM) task to identify individualized neural activation patterns that may improve TMS targeting. Simultaneous fNIRS and peripheral physiological data were collected from a group of healthy participants performing ABM tasks involving immersing and distancing themselves from a variety of emotional memories. Data was processed through a multi-stage pipeline including NIRSLab preprocessing, PCA-GLM artifact correction, and statistical mapping using NIRS\_SPM. Individual-level analyses from participants demonstrate task-evoked activation in the dorsolateral prefrontal cortex and regions associated with the DMN, consistent with patterns previously observed in fMRI studies of autobiographical memory. These findings suggest that fNIRS can capture network-level activity relevant to depression and may provide a practical tool for identifying functional hotspots for personalized TMS targeting.

**Oral Presentation  
Room B5**

*Investigating the role of calcium in biofilm formation by the corrosive bacterium *Desulfovibrio vulgaris**

**Bethany Gloria Sseruwagi, Kara De De León, Dodge Family College of Arts and Sciences**

Sulfate-reducing bacteria (SRB) are present in the gut microbiome and have been associated with dysbiosis, but they are also abundant in marine and industrial environments where they contribute to biofilm formation and infrastructure corrosion. Previous studies with the model SRB *Desulfovibrio vulgaris* Hildenborough showed that biofilm formation is essential for colonization of the rat colon. A strain deficient in localizing two surface adhesins failed to colonize the rat colon or form biofilm. Both adhesins contain calcium-binding domains, leading us to hypothesize that calcium plays a role in cell-to-surface attachment and biofilm development. In this study, *D. vulgaris* grown in calcium-free medium failed to develop biofilms, demonstrating that calcium is required for biofilm formation. Calcium addition stimulated visible aggregation and surface attachment in a dose-dependent manner across tested concentrations (0.3, 6.0 mM). Notably, natural seawater contains approximately 10.5 mM  $\text{Ca}^{2+}$ , indicating that the elevated calcium concentrations tested here approach environmentally relevant conditions. To examine whether calcium also alters biofilm resilience, biofilms were grown for 120 hours in CDC biofilm reactors under two stirring conditions: 90 rpm (standard shear) and 180 rpm (high shear). At 90 rpm, increasing calcium from 0.6 to 6.0 mM resulted in a 3.4-fold increase in biofilm biomass; however, this effect was not observed at 180 rpm, suggesting calcium does not enhance resistance to elevated shear stress. Analysis of the biofilm composition showed that while protein increases in the biofilm matrix with higher calcium, the carbohydrate concentration remains the same. Proteomics of the biofilms is underway. These findings highlight the combined roles of chemical signals and physical forces in shaping SRB biofilm development.

**FYRE Poster  
Conference Room B**

*E. coli* Accumulation in Urban Culverts: Implications for Public Health and Water Quality

**Savian Sullivan, Jason Vogel, Gallogly College of Engineering**

Culverts are essential components of urban drainage systems, yet little is known about their role in accumulating fecal indicator bacteria such as *E. coli*. High concentrations of *E. coli* strongly suggest the presence of pathogenic bacteria capable of causing severe illness even in low doses. Do culverts harbor sufficient fecal indicator bacteria, such as *E. coli*, to pose a risk to public health by contaminating water systems? To address this question, a survey was conducted to identify culverts with sufficient sediment for sampling. Potential sites were located using satellite maps, focusing on culverts near likely contamination sources such as park trails frequented by dogs or areas downstream of large populations of geese. These sources are more likely to contain fecal indicator bacteria such as *E. coli*. Each site was then inspected in person to confirm sediment presence, and samples were collected within the culverts. *E. coli* concentrations were estimated in the laboratory using Idexx

QuantiTray methods. The intended outcomes of this research will be an estimation of the total concentration of *E. coli* in soil samples from various culverts around Norman. The results of this study will help determine whether culverts accumulate fecal indicator pathogenic bacteria at levels that could be indicative of an elevated risk to public health.

**FYRE Poster  
Conference Room B**

*The Synthesis and Characterization of Hexacationic Cyclophanes*

**David Sun, Yuanning Feng, Dodge Family College of Arts and Sciences**

Cyclophanes are a type of macrocycle composed of bridged aromatic compounds with tunable cavity sizes. Through the incorporation of electron-deficient units in the ring, these cyclophanes can participate in host-guest interactions. Previously used box expansion methods often compromise the strength of the viologen's positive charge, causing the synthesis of larger cavity viologen-based cyclophanes while maintaining their electron-deficient nature to pose synthetic difficulties. This poster focuses on the synthesis and characterization of the Penta6+ polycationic cyclophanes. The rings are synthesized from two reactants, 4,4'-bipyridine and 4,4'-dibromomethyl biphenyl, allowing for scalable synthesis. Comparison of this ring to other cyclophanes possessing differing characteristics enables a systematic study of structure-property relationships. For instance, Penta6+ and Hexa6+ cyclophanes possess identical charge but different cavity sizes, allowing for observation of varying structural characteristics. The increased cavity size and strong electron deficiency enable interactions between these cyclophanes and molecules like polycyclic aromatic hydrocarbons (PAHs), as well as potential integration into selective separation membranes. Since the angles and the distances between six charges are different in Penta6+ and Hexa6+ cyclophanes, we anticipate characterizing the spin frustration under the reduced condition in those two systems. By breaking the symmetry, Penta6+ could have different magnetic exchange couplings than the Hexa6+ ring. Working on the synthesis and conformation of these cyclophanes will allow for the future application of these macrocycles in the field of environmental science and chemical engineering using their host-guest capabilities.

**FYRE Poster  
Conference Room B**

*A century of Aquatic Invertebrate Records in Oklahoma: What museum collections tell us about stream biodiversity*

**Melinda Szundy, Gustavo Silva de Miranda, Dodge Family College of Arts and Sciences**

Aquatic invertebrates are critical to indicating ecosystem health, yet their population trends in Oklahoma remain poorly understood. This study uses a century of museum records to characterize the biodiversity of multiple streams across the state of Oklahoma. This data comes from 11 taxonomic orders; these include Coleoptera (beetles), Plecoptera (stoneflies), and Ephemeroptera (mayflies). This data was compiled from the Global Biodiversity Information Facility as well as the Sam Noble Museum. Diversity metrics were calculated at

both the stream and ecoregion levels using rarefied species richness to correct for uneven sampling in the past.

Spatial analysis revealed that the Cross Timbers ecoregion has the highest record of density and richness, while biodiversity spots like Ouachita Mountains and Ozark Highlands showed high levels of diversity consistent with their habitat complexity. On the other hand, the Southwestern Tablelands showed the lowest diversity.

Additionally, correlations between water quality and land-use data suggest that an increasing water temperature significantly decreases freshwater biodiversity. Furthermore, while forest cover had a positive influence on family richness, agricultural land use showed a complex relationship with diversity in certain watersheds. These findings show the value of museum collections in documenting environmental change and help to further research on aquatic invertebrates.

**Non-FYRE Poster  
B2/4/6 Super Suite**

*Developing high-throughput microplastic identification via integrated fluorescence microscopy imaging and data analysis*

**Keianna Taheri, Tingting Gu, Dodge Family College of Arts and Sciences**

Microplastic (MP) contamination is positioned as an alarming threat to human and environmental health; current standard detection methods are limited by cost, time, and additional technical complexities. This project investigates Nile Red (NR) fluorescence microscopy with integrated image analysis as a rapid, cost-effective approach for the detection and classification of environmental MPs. NR is a solvatochromic dye that emits distinct fluorescence spectra based on the polymer polarity. This creates an opportunity to classify and differentiate plastics based on their spectral color and intensity. Building on previous work in Dr. Gu's lab, indicating NR-stained MPs exhibit unique emission spectra under 3 excitation wavelengths, green, blue, and violet. This study tests whether NR staining techniques can reliably detect and classify MPs in environmental contexts, specifically in USGS samples from the Tulsa River and Galveston Beach. Raman spectroscopy will be utilized to validate the fluorescence-based polymer classifications. The goal of this work is to develop a high-throughput standard detection method that allows for both effective and accessible MP classification.

**FYRE Poster  
Conference Room B**

*DFT Study of Catalyst Activity for Competing Propylene Epoxidation and Oxygen Evolution Reactions on Metals and Metal Oxides*

**Daryl Yi Jin, Sasun Gunasooriya, Mewbourne College of Earth and Energy, Dodge College of Arts and Sciences**

Propylene oxide (PO) is one of the key propylene-based chemical intermediates for producing important chemicals, such as polyurethane plastics, polyglycol esters, and surfactants, representing a high commercial value with a \$10.5 billion market and annual

(cont.) production exceeding 10 million tons. However, conventional synthesis methods, including the chlorohydrin process and indirect oxidation routes, are energy-intensive and operate under extreme temperatures and pressures, generating toxic chlorinated waste and stoichiometric co-products that pose significant environmental hazards. Electrochemical propylene epoxidation represents a more sustainable alternative by utilizing water as an oxygen source under milder operating conditions, yet its efficiency is limited by the competing oxygen evolution reaction (OER), which consumes reactive oxygen intermediates ( $O^*$ ,  $OH^*$ ,  $OOH^*$ ) and reduces catalyst activity toward propylene oxide formation. In this study, density functional theory (DFT) is used to investigate the catalytic activity of Pt(111), Pd(111), PtO<sub>2</sub>(110), and PdO<sub>2</sub>(110) surfaces, as well as bimetallic oxide systems including Pd single-atom-doped PtO<sub>2</sub> and Pt single-atom-doped PdO<sub>2</sub>, for both propylene epoxidation and OER. Adsorption energies of key intermediates, including C<sub>3</sub>H<sub>6</sub>, C<sub>3</sub>H<sub>6</sub>O,  $O^*$ ,  $OH^*$ , and  $OOH^*$ , are calculated to evaluate catalyst activity, and free energy diagrams for both OER ( $H_2O \rightarrow OH^* \rightarrow O^* \rightarrow OOH^* \rightarrow O_2$ ) and propylene epoxidation are constructed to identify the potential-determining step and the most favorable active sites on each surface. Additionally, Bader charge analysis is performed to elucidate structure–electronic property relationships across the catalyst series. By linking surface structure to catalytic activity, this study provides deeper insight into catalyst design and contributes to the development of more efficient and sustainable electrocatalytic oxidation processes.

**FYRE Poster  
Conference Room B**

*Intratumoral Immune Responses in B16-F10 Melanoma Following Therapeutic Intervention Using Multiplex ELISA*

**Brody Taylor, Wei Chen, Gallogly College of Engineering**

Melanoma is one of the most resistant and immunologically complex cancers. The tumor's immune evasion proves to be a crucial barrier in finding effective treatment. With melanoma's aggressive and metastatic nature, it is critical to find such treatment. Understanding how the tumor microenvironment evolves in response to various treatments is key to optimizing therapeutic strategies. This study examines the immune responses in B16-F10 melanoma tumors removed at various points in time post-treatment. Specifically, a combination of phototherapy, an immune adjuvant (glycosylated chitosan), and immune checkpoint inhibitors are used on the tumors when they reach a certain size. These tumors are then collected at specific time intervals following the treatment and analyzed using a multiplex ELISA. The multiplex simultaneously quantifies a broad spectrum of analytes present in the samples. Identifying these immune signatures will help highlight the peak immune responsiveness unique to each therapy. Through these findings, a more comprehensive understanding of how different immunotherapies affect the tumor microenvironment will be known, helping in the development of optimized treatments for melanoma.

**Non-FYRE Poster  
B2/4/6 Super Suite**

*Developing Fluorescent Probes to Study Cyclic Nucleotide Enzymes*

**Ryan Thomas, Shikha Chauhan, Dodge Family College of Arts and Sciences**

Nucleotides are fundamental building blocks in life. In addition to providing the structural framework of genetic material, they are involved with many metabolic and signaling processes. In particular, Cyclic Nucleotide Monophosphates (cNMPs) have been shown to be a major signaling molecule in various cells. Current research has shown that they have a strong role in physiological processes and stress responses in diverse cell types. Research progression in this field will require precise tools to measure their interaction with enzymes of interest. This research focuses on the esterification of fluorescently labeled cNMPs as a probing tool. Fluorescent probes are core to biochemical research, by enabling precise, quantitative testing of cNMP derivatives for binding and inhibitory potential. Since cNMPs are commonly substrates of the aforementioned pathways, this fluorescently labeled derivative undergoes a significant change in fluorescence upon cleavage, providing a numerical determination of hydrolysis using fluorescence detection. In addition, they facilitate fluorescence imaging techniques for visualization in cells. Key aspects of this study include explanations on synthesis strategies, purification methods, and reagent selection. These probes will facilitate studies on other cNMP derivatives, providing a solid screening baseline. Dr. Chauhan's research team focuses on understanding of nucleotide signaling pathways, cellular communication, and intervention targets in cNMP-mediated processes. This probe played a key part in the team's investigation of the aforementioned topics with compound assays and imaging.

**FYRE Poster  
Conference Room B**

*Optimizing chemotherapeutic dose for future application in glioblastoma treatment with hydrogel depots*

**Zachary Thomas, John Clegg, Gallogly College of Engineering**

Glioblastoma (GBM) is the most common type of malignant brain cancer. Various anti-tumor therapeutics can be used to treat GBM, but it is essential to understand their respective effective concentrations to properly load drug carriers. Five different drugs were tested against GL261 murine GBM cells and G55 human GBM cells: Doxorubicin, Temozolomide, Carmustine, Fasudil, and IFNg. Each drug was administered at five concentrations centered around what was previously found to be effective on similar cell lines. GL261 cells were selected as a commonly used representative in vitro model for future translation of these findings to in vivo treatment of murine gliomas using chemotherapeutic-eluting hydrogel depots. AlamarBlue and lactate dehydrogenase (LDH) assays were used to quantify cell viability. AlamarBlue, a metabolic fluorescent stain, detects live cell activity, and an LDH assay detects LDH levels, which cells release as their membranes become compromised, measuring cell death. For Doxorubicin, Temozolomide, Carmustine, and Fasudil, it was found that as drug concentration

increased, cell viability decreased; however, no such correlation was seen for IFNg. The results of the drugs that did induce cell death were found to be similar to literature values, providing the basis for future studies investigating the efficacy of combined drug treatments on these cell lines. Support is gratefully acknowledged by the US EDA (via OKBioStart, to JRC) and the National Science Foundation under ART award #2331409 (to J. Klier, JRC is a translational research project leader). During this research, ZT was supported by FYRE, an OU Honors College program.

**Oral Presentation  
Room A5**

*Quantum Physics with Spinor Bose-Einstein Condensates*

**Reagan Thompson, Doerte Blume, Dodge Family College of Arts and Sciences**

Spinor Bose' Einstein condensates provide a useful platform for studying interacting many-body quantum systems, with potential applications in quantum sensing, quantum simulation, and quantum information processing. Previous theoretical studies based on mean-field descriptions have shown that periodic modulation of the trapping potential can provide control over the spinor dynamics of such systems. In this work, we investigate this mechanism using an ab initio approach by considering a small ensemble of interacting spin-1 bosons confined in a one-dimensional harmonic trap. Using a configuration interaction scheme, we numerically solve the time-dependent Schrodinger equation to obtain the correlated many-body dynamics of the system. In contrast to previous mean-field treatments, this approach captures the full quantum correlations between particles and enables the exploration of regimes beyond the validity of mean-field approximations. By analyzing the population dynamics of the spin components across a range of drive and interaction parameters, we examine how modulation of the potential may influence spin-mixing and search for signatures of correlated dynamics not captured by mean-field theory. This framework also provides a means to explore the connections between few-body quantum dynamics and the collective behavior predicted for many-body spinor condensates.

**Non-FYRE Poster  
B2/4/6 Super Suite**

*How Studying the Circumgalactic Medium Shapes Our Understanding of Galaxy Evolution*

**Emily Thrun, Nikki Nielsen, Dodge Family College of Arts and Sciences**

In order to better understand galaxy evolution across the universe, it is important to familiarize ourselves with the properties that influence a galaxy's composition. The circumgalactic medium (CGM) refers to the gas surrounding a galaxy that contains the fuel required for star formation. The CGM's characteristics are determined by the color, halo, and luminosity of the galaxy it surrounds, and this project compiles and analyzes a specific sample of galaxy parameters from Bouchac et al. 's (2025) Muse Gas Flow and Wind (MEGAFLOW) publications. Using the measurements provided by MEGAFLOW, we create plots showcasing the galaxy's equivalent width versus distance to confirm the anti-correlation between the two and covering fraction versus impact parameter for insights about the CGM's configuration. Data corresponding to the MEGAFLOW sample will eventually be integrated into my research advisor Dr. Nikki Nielsen's MgII Absorber-Galaxy Catalogue (MAGIICAT). By expanding the range of galaxies MAGIICAT contains, we make the data necessary for these calculations standardized and widely accessible for further research in the field.

**FYRE Poster  
Conference Room B**

*Digging Into Data: Estimating Soil Material Properties from Prior Lab Results*

**Savannah Timmermeyer, Kianoosh Hatami, Gallogly College of Engineering**

This research investigates whether soil material properties, specifically California Bearing Ratio (CBR), can be predicted using previously collected laboratory data and existing soil databases. Soil behavior is inherently variable, making it difficult to quickly and accurately determine engineering properties for construction projects. The hypothesis of this study is that analyzing prior lab results and compiled datasets can provide reasonably accurate predictions of soil properties, reducing the need for extensive new testing.

To explore this, existing soil data was organized into a structured and workable database using tools such as Excel, along with information from past lab reports and the Web Soil Survey.

The study evaluates how well-known soil classifications and previously measured properties correlate with CBR values and other key parameters. By comparing predicted values to known test results, the reliability of data-driven estimation methods is assessed.

The results of this research aim to demonstrate that using existing soil data can improve efficiency in geotechnical analysis by saving time and reducing costs, while still maintaining acceptable accuracy for engineering applications.

**FYRE Poster  
Conference Room B**

*Utilization of the rpoB gene as a marker for detecting and tracking zoonotic Bartonella species in bats and their ectoparasites.*

**John Tindalle, Daniel Becker, Dodge Family College of Arts and Sciences**

Bartonella is a genus of gram-negative bacteria, with species responsible for a multitude of zoonotic diseases such as Carrion's disease and cat-scratch fever. This study aims to track *B. rochalimae* infections in North American bats by using the genes *gltA* and *rpoB*. In this study, we aimed to confirm infection in bats and bat fleas that were potentially infected with *B. rochalimae*. We first diagnosed a *B. rochalimae* infection by amplifying and sequencing the *gltA* gene and then amplified and sequenced the *rpoB* gene. This has implications in the medical and veterinary field, as current Bartonella tests are notoriously susceptible to false negatives.

**FYRE Poster  
Conference Room B**

*Architectural Proportion through the Lenses of Psychophysics*

**Richard To, Tiziana Proietti, Gallogly College of Engineering**

Proportion is a key aspect in architectural design, but when realistic spatial conditions like perspective and movement are involved, it lacks a concrete definition and is described theoretically and speculatively in many cases. At the Sense|Base Laboratory under Professor Tiziana Proietti, this study explores how architectural proportion is viewed and experienced in humans. Specifically, this study analyzes the point at which proportion is differentiable, how

(cont.) this perception is affected by distortion, and how this perception impacts human behavior. Implementing established scientific work using methods of sensory psychophysics helps to develop an understanding of architectural proportion while keeping the perspective of an observer in motion in mind. The Sense|Base lab research currently consists of three types of experiments. One experiment is External Observation, where participants compare 3D objects under controlled conditions using a fixed-viewing apparatus and response scale. Another is Proportional Series, where participants judge alternating rectangles with incremental changes in aspect ratio to reveal perceptual thresholds of proportional discrimination. This presentation focuses on the Immersive Observation experiment, where participants perform similar tasks in a dark room featuring a grid and projected stimuli with perspective distortion and depth cues introduced. The objective of the research is to clear up the speculative reasoning behind architectural proportion and establish solid data to propose an empirical understanding of perception of architectural proportion. The results will expound on whether architectural proportion noticeably affects perception and behavior, and if it does, what conditions cause this effect.

**Non-FYRE Poster  
B2/4/6 Super Suite**

*Synthesizing Ionizable Lipids Using Ugi-4 Component Reaction for the formulation of Lipid Nanoparticle for Drug Delivery*

**De'William Togba, Idris Raji, Dodge Family College of Arts and Sciences**

Ionizable lipids are essential components of lipid nanoparticle (LNP) systems used in the delivery of nucleic acid therapeutics, including mRNA- and siRNA-based treatments. The development of structurally diverse ionizable lipids remains a critical step in improving delivery efficiency, stability, and biocompatibility. This project explores the use of the Ugi four-component reaction (Ugi-4CR) as a modular and efficient synthetic strategy for generating novel ionizable lipid candidates.

The Ugi-4CR enables the one-pot coupling of an amine, aldehyde, carboxylic acid, and isocyanide to rapidly produce  $\alpha$ -acylamino amide products with structural diversity. By strategically selecting hydrophobic and ionizable building blocks, we synthesized a series of lipid-like molecules designed for potential LNP formulation. Reactions were performed under mild conditions and purified via column chromatography. Products were characterized using thin-layer chromatography (TLC) and infrared spectroscopy (IR) to confirm formation of the desired functional groups.

This approach demonstrates the versatility of multicomponent reactions in accelerating lipid library generation for drug delivery applications. The modularity and efficiency of the Ugi reaction provide a promising platform for rapid synthesis and future optimization of ionizable lipids for therapeutic delivery systems.

**Oral Presentation  
Room A5**

*Commuter Rail and the Denver Economy: An Event Study Analysis of RTD Transit Expansion*  
**Samuel Tompkins, Nghiem Huynh, Dodge Family College of Arts and Sciences**

This study examines the short-run economic impacts of the Regional Transportation District's (RTD) commuter rail expansion in the Denver area between 2016 and 2020. Using a proximity-based staggered adoption event study, the analysis estimates the causal effects of new rail service on firm location, employment, and housing supply at the block group level. The sample includes block groups within RTD's service area and near major highways, with treatment defined by proximity to newly opened commuter rail stations. Data is drawn from U.S. Census Bureau LODES, ACS, and BDS datasets.

Early results indicate no statistically significant short-run effects on jobs per resident or overall firm activity relative to control areas. However, the analysis finds a statistically significant increase in housing supply near new stations, with average treatment effects implying roughly a 20 percent rise relative to control locations. These findings suggest that Denver's commuter rail investments have primarily influenced residential development patterns rather than immediate labor market outcomes, highlighting the importance of land-use responses in evaluating the economic impacts of transit infrastructure.

**FYRE Poster  
Conference Room B**

*Energy-Level Alignment to Enable Efficient Inorganic to Organic Energy Transfer in Hybrid Light Emitting Materials*

**Leo Ton, Bayram Saparov, Dodge Family College of Arts and Sciences**

Hybrid materials composed of both organic and inorganic structural components have attracted considerable attention due to their remarkable light-emission properties. In most reported systems, the optical response is dominated by the inorganic framework, while the organic component primarily plays a structural role. Recent studies, however, have demonstrated that deliberate molecular design can enable hybrid materials in which the optical properties originate from the organic structural unit. Despite this progress, the photoluminescence quantum yield (PLQY) of such systems remains limited, typically around 50%. This limitation arises because a large fraction of the excitation energy is initially absorbed by the inorganic component. In this work, we redesign the hybrid architecture by aligning the electronic energy levels of the organic and inorganic components to promote efficient energy transfer from the inorganic absorber to the organic emitter. This rational design strategy enhances radiative recombination in the organic component, leading to improved photoluminescence efficiency. Our results demonstrate that careful tuning of the energetic coupling between the inorganic framework and the organic chromophore provides a viable pathway toward highly efficient hybrid emitters.

**Oral Presentation  
Room B3**

*The Role of Architectural Acoustics in Concert Halls*  
**Paloma Torres, Amanda Minks, Weitzenhoffer Family College of Fine Arts**

Classical music concert hall acoustics present a persistent challenge in architectural design. Achieving an ideal sonic environment requires balancing complex physical properties, as well as accounting for the perceptual experiences of performers and audiences within a given space. Sound within a performance space is not solely determined by measurable acoustic parameters; it is also shaped by human perception, cultural expectations, and the social practices surrounding musical performance. Understanding concert hall architecture therefore requires examining how built environments mediate listening and performance in ways that extend beyond purely technical measurements. This research explores the intersection of architectural acoustics and classical music performance through a comparative analysis of Sharp Hall and Pitman Hall on the University of Oklahoma campus. Building upon an extensive review of existing literature, this research combines quantitative acoustic measurements with qualitative ethnographic data to develop a more holistic understanding of concert hall sound environments. Acoustic profiles of Sharp and Pitman Hall are established through interviews with musicians, participant-observation, analysis of physical features, and a recorded violin performance test designed to assess resonance, projection, and clarity. The findings contribute to broader discussions about how architectural design influences musical communication, offering insight into the relationship between spatial design, performer experience, and audience perception in classical music settings.

**Oral Presentation  
Room B5**

*The Impact of Language Barriers on Healthcare Access for Spanish-Speaking Communities in Oklahoma*

**Julina Tran, Gracie Percy, Dodge Family College of Arts and Sciences**

Language barriers continue to limit access to quality healthcare for many Spanish-speaking communities in Oklahoma. Patients with limited English proficiency often struggle to fully understand medical information, communicate their concerns, and navigate healthcare systems, which can lead to confusion, frustration, and poorer health outcomes. While interpreter services and language access policies exist, they are not always used consistently or effectively in real clinical settings.

This project explores how language barriers shape healthcare access and communication for Spanish-speaking patients in Oklahoma. Using a qualitative approach, the research will draw on existing literature, observations of healthcare training environments, and summer shadowing of professional medical interpreters in clinical settings. Through reflective field notes and thematic analysis, the study will examine how communication unfolds during interpreter-mediated encounters and identify both challenges and effective practices. Rather than viewing language differences as individual shortcomings, this research focuses on

(cont.) language access as a shared responsibility of healthcare institutions and providers. The goal is to better understand how healthcare systems can support clearer communication, improve patient trust, and reduce barriers to care for Spanish-speaking communities. Findings from this project aim to inform healthcare training and contribute to ongoing efforts to promote more equitable and inclusive healthcare access in Oklahoma.

### **Oral Presentation Room B1**

*Measuring Brain Network Activation by Noninvasive Brain Stimulation via Concurrent Imaging and Stimulation*

**Thao Tran, Han Yuan, Gallogly College of Engineering**

Transcranial magnetic stimulation (TMS) is a noninvasive therapy that delivers magnetic pulses to the brain. It is often used as a therapy to treat major depressive disorder, which affects more than 300 million people worldwide. Specifically, TMS targets the left dorsolateral prefrontal cortex, an area known to be underactive in depressed patients; stimulating this region with high-frequency pulses has been associated with improvements in treatment-resistant depressive symptoms. Despite its success, responses to TMS vary between subjects (intersubject) and within the same subject (intrasubject), which reduces the reliability of the treatment. Because of this variability, it is important to evaluate test/retest reliability to determine whether TMS can produce consistent results when repeated over time. To accomplish this goal, my study uses simultaneous functional near-infrared spectroscopy (fNIRS), electroencephalography (EEG), and TMS to record neural responses during single pulses in healthy subjects. fNIRS can measure cortical hemodynamic activity, while EEG records electrical activity in the brain during TMS pulses. I have already acquired individual results; however, group level reliability remains unclear. Thus, the objective of this proposal is to examine group-level single pulse TMS reliability; I expect similar activation patterns across different subjects at the group level. These results are important because it may improve understanding of the underlying neural mechanisms and encourage individual targeting or stimulation parameters to increase reliability of TMS in clinical applications.

### **FYRE Poster Conference Room B**

*Exploring Polysaccharide-Lipid Hybrid Nanoparticles for mRNA Delivery*

**Allison Turner, Stefan Wilhelm, Gallogly College of Engineering**

Lipid nanoparticles (LNPs) enable mRNA delivery in the clinic and are used for preclinical research in various types of vaccine and gene editing applications. Here, we explored how formulating lipid nanoparticles with polysaccharide payloads affects mRNA delivery to human embryonic kidney (HEK) cells. The hybrid LNPs were formulated with identical core lipid compositions while systematically varying the polysaccharide amounts. Physicochemical characterization, including particle size, polydispersity index, and encapsulation efficiency, confirmed comparable nanoparticle formation across the tested conditions. Functional

(cont.) delivery was assessed in vitro using luciferase mRNA transfection assays in HEK cells, with luminescence intensity as a quantitative readout used for comparison of transfection efficiency. Our findings have the potential to inform the design of alternative LNP formulations for safe and effective mRNA delivery.

### **Oral Presentation Room A3**

*Plasmid Assembly for Two Step Recombination Cas9 Knockout in S. Pyogenes*

**Luke VanDalsem, Rakhi Rajan, N/A**

CRISPR-Cas systems are used by bacteria to create breaks in DNA at specific, configurable sequences. Though it is more often thought of as a way for bacteria to destroy viral DNA as an adaptive immune response, studies have shown that CRISPR associated (Cas) proteins are involved in the regulation of genes related to virulence. This experiment aims to test the extent to which CRISPR-Cas systems contribute to the virulence of pathogens. To study the effect of Cas9 in bacterial pathogenesis, we aim to create a Cas9 knockout mutant strain of *S. pyogenes* M49 serotype. For this, a plasmid was assembled consisting of two inserts that share sequences with regions straddling the *S. pyogenes* Cas9 gene, with a vector that harbors a kanamycin resistance gene. The upstream and downstream sequences were amplified and assembled with the vector via Gibson assembly. The assembled plasmid was transformed into competent DH5a (*Escherichia Coli*) cells, and positive clones were selected on LBA plates supplemented with the antibiotic kanamycin. Colonies that appeared in about 24 hours were subjected to plasmid isolation to confirm the assembled product by sequencing. This will be followed by transforming the assembled product into electrocompetent *S. pyogenes* to generate a Cas9 knockout mutant via a two-step homologous recombination. By studying the relationship between CRISPR-Cas systems and virulence, future experiments may aid in curtailing the ability of bacteria to express pathogenic traits.

### **Non-FYRE Poster B2/4/6 Super Suite**

*Auditory Biomechanics: Hearing and Blast Exposure Testin*

**Caitlin Varghese, Yijie Jiang, Gallogly College of Engineering**

This research examines how blast exposure that mimics gunshot-level noise affects hearing thresholds using chinchilla models. The study measures auditory thresholds before and after controlled blast tests to observe changes in hearing sensitivity across different frequencies. Chinchillas are used in auditory research because their hearing range and inner ear structure closely resemble those of humans, which makes them a strong model for studying noise-induced hearing loss. By comparing hearing thresholds before and after blast exposure, this research identifies frequency specific patterns of auditory damage caused by high intensity sound. These findings are particularly applicable for military populations, since repeated exposure to weapons fire and explosions can lead to long term hearing impairment. The goal of this work is to better understand how blast-related sound affects the mechanics of hearing and to support the development of improved hearing protection options for veterans and active-duty service members.

**Oral Presentation  
Room A3**

*Finding Magic Wavelengths in Strontium*

**Christian Vaz, Doerte Blume, Dodge Family College of Arts and Sciences**

Support from the W.M. Keck Foundation and OU's HRAP program, &nbsp; This project aims to identify magic wavelengths in strontium by computing the dynamic polarizabilities of two-electron states and scanning frequency-dependent crossing between ground and excited states. Strontium, an alkaline-earth atom with two valence electrons, is especially useful because its metastable excited states have narrow linewidths, making them attractive for precision measurements and optical trapping. Our work uses an effective two-electron Hamiltonian built from one-electron model-potential solutions, anti-symmetrized jj-coupled basis states, and Coulomb matrix elements evaluated through multipole expansion and angular momentum algebra.&nbsp;&nbsp;&nbsp;We present our progress toward calculating reduced dipole matrix elements and evaluating polarizability sums over opposite-parity states.&nbsp;&nbsp;

**Non-FYRE Poster  
B2/4/6 Super Suite**

*C3PEU: Concrete 3D Printing Experience for Undergraduates*

**Brandon Vu, Shreya Vemuganti, Gallogly College of Engineering**

Become involved in concrete 3D printing, learn how to 3D print using concrete, and experience professional development.

**AM Non-FYRE Poster  
B2/4/6 Super Suite**

*Expression and Activity Analysis of E. coli Topoisomerase I*

**Alexis Walters, Christina Bourne, Dodge Family College of Arts and Sciences**

DNA topology has an essential influence on critical processes such as DNA replication and RNA transcription. Topoisomerases are essential enzymes that regulate the topology of DNA by relieving torsional stress caused. Understanding the process and activity of these enzymes is important for studying modes of inhibition to further development of antimicrobial methods that may combat growing antibiotic resistance.

This study followed literature reported methods for the expression and purification of Escherichia coli Topoisomerase I, resulting in an active form capable of "relaxing" supercoiled plasmid DNA. Our on-going studies require this "relaxed" plasmid DNA for in vitro assays, but the commercially available forms are prohibitively expensive. This study addresses this limitation by producing the needed reagents in-house, thereby reducing the cost per assay to mere pennies.

We transformed E coli cells with a plasmid obtained from the Addgene repository encoding Topoisomerase I. These were cultured and protein expression induced, then TopoI was purified using three column chromatography techniques: Nickel NTA, Heparin, and Size

(cont.) Exclusion Chromatography. To test and establish the specific activity of the recombinant enzyme, an in vitro assay was performed with varying concentrations of the TopoI enzyme and supercoiled DNA. The results were monitored using electrophoretic techniques.

The results confirmed the successful expression and purification of the TopoI enzyme. The specific unit activity, defined as the amount of TopoI needed to complete relax 500 ng of DNA in 15 min at 37C, was determined as 0.004 Åµg. These results demonstrate the feasibility of generating badly needed expensive reagents in-house.

**FYRE Poster  
Conference Room B**

*AUF1 Phosphorylation Regulates miRNA Expression in the MST1 Signaling Pathway*

**Yuxuan Wang, Je-Hyun Yoon, Dodge Family College of Arts and Sciences**

As ethanol enters the body, cytochrome P450-2E1 (CYP2E1) plays a role in ethanol oxidation into acetaldehyde while producing reactive oxygen species (ROS) as a byproduct. This byproduct causes the activation of the MST1 kinases, which phosphorylate a key protein: AUF1. These miRNAs, let-7b, miR-132, miR-212, and miR-378, are bound to AUF1 and correlate with repression of CYP2E1 and contribute to intestinal injury. Thus, the goal of this experiment is to determine whether AUF1 phosphorylation affects miRNA expression and supports the MST1-AUF1 signaling pathway. Mutations at amino acid position T127 were introduced to different phosphorylation states. T127D and T127E substitutions mimic phosphorylation by introducing negatively charged residues, while T127A prevents phosphorylation at the site. To quantify the expression level of these miRNAs, immunoprecipitation was used to isolate the AUF1 protein. RT-qPCR will then determine the concentration of these miRNAs using the Ct (cycle threshold) values; values between the phosphorylated AUF1 samples will be compared to the control samples. We hypothesize that the phosphorylation of AUF1 will result in an increase in detectable miRNA levels from RT-qPCR, since phosphorylation may cause a conformational change that releases bound miRNAs. Our results supported the hypothesis; cycle numbers for sample AUF1 ranged between 15 and 18 cycles, compared to the wildtype, which increased significantly. Increased levels of these miRNAs may contribute to intestinal inflammation and cause injury to other organs, such as the liver. These findings may improve understanding of how ethanol-induced oxidative stress alters RNA-protein interactions and contributes to intestinal inflammation and injury.

**Non-FYRE Poster  
B2/4/6 Super Suite**

*George Gershwin's Music and the Inclusion of Women's Rights*

**Brianna Warren, Christina Giacona, Weitzenhoffer Family College of Fine Arts**

My research project is about gendered implications of George Gershwin's music from 1898-1937. Gershwin is a composer known for breaking social boundaries through music by blending genres associated with specific social groups. Current scholars address this through studies of race and class but notably neglect social gender divisions. My research will fill this gap by

(cont.) answering the question: “To what extent did Gershwin’s philosophy of music equality include women’s rights through 1920-1937?” My research connects the actions of Gershwin during the birth of jazz to the societal impact genres have on women today. By exploring how Gershwin’s philosophy of musical equality can be applied to women’s rights in jazz, my research not only contributes a more holistic understanding of historical gendered experiences but also highlights how music can be used as a tool for unity. This perspective will strengthen our OU community by demonstrating the value of including various gendered perspectives in artistic collaborations on campus.

**Non-FYRE Poster  
B2/4/6 Super Suite**

*Tick-ing Away Time: The Impact of Adult Amblyomma mixtum Post-Molt Age on In-Vitro Vertical Bioassay DEET Repellency Studies*

**Icy White, Heather Ketchum, Dodge Family College of Arts and Sciences**

Ticks pose a significant public health risk as vectors of pathogens, emphasizing the need to investigate tick repellents that can reduce exposure. Numerous in-vitro and in-vivo bioassays have evaluated the efficacy of synthetic and natural chemicals to repel ticks; however, the effect of post-molt tick age on responses to repellents is largely unstudied. In this study, three adult *Amblyomma mixtum* cohorts, 18-, 21-, and 25-months post-molt were sourced from Texas A&M University, Department of Entomology Tick Laboratory to evaluate repellency activity to a known synthetic repellent, N,N-diethyl-meta-toluamide (DEET). Fifty males (?) and 50 females (?) from each cohort were tested on a vertical bioassay. Individual ticks were placed at the bottom of a wooden dowel rod and allowed to climb toward an affixed filter paper treated with ethanol (negative control) or DEET. Ticks that crossed the treated filter paper were considered not repelled while ticks that did not cross the filter paper were considered repelled. Males and females from each cohort were significantly repelled by DEET (18 months post-molt:  $\chi^2=171.13$ ,  $p<0.00001$ ; 21 months post-molt:  $\chi^2=102.4$ ,  $p<0.00001$ ; 25 months post-molt:  $\chi^2=90.75$ ,  $p<0.00001$ ; 21 months post-molt:  $\chi^2=266.67$ ,  $p<0.00001$ ; 25 months post-molt:  $\chi^2=47.45$ ,  $p<0.00001$ ; 21 months post-molt:  $\chi^2=49.02$ ,  $p<0.00001$ ). There were no statistical differences in the number of ticks repelled among the different cohorts ( $\chi^2=0.16$ ,  $p=0.9242$ ;  $\chi^2=1.57$ ,  $p=0.4568$ ). This study will be repeated in February 2026 when the cohorts have reached 23-, 26-, and 30-months post-molt.

**Oral Presentation  
Room B5**

*Interplay Between Innate and Adaptive Immunity in Organ Transplant Rejection: A Review*

**Maddie Whynot, Thayer Hallidayschult, Dodge Family College of Arts and Sciences**

Organ transplantation provides life-saving treatment for end-stage organ failure and saves thousands of lives each year. However, the supply of donor organs is drastically smaller than the demand. Thus, it is essential that we make the most effective and responsible use of every organ available. To do so, we must overcome one major challenge: organ rejection. According to our current understanding of immunology, organ rejection occurs because the recipient’s

(cont.) immune system identifies the transplanted organ as foreign due to mismatched proteins and antigens. The recipient’s body then attacks the organ, which leads to tissue damage and can ultimately result in transplant failure. Organ rejection involves both innate and adaptive immune responses. This research provides a basic overview of organ rejection and explores how the innate and adaptive branches of the immune system interact after transplantation in ways that are not yet fully understood. It also discusses the limitations of current transplant treatments and highlights how much about the immune system remains unknown. By understanding the current state of the field, researchers and physicians can set realistic goals and help shape public understanding of the future of organ transplantation and the development of treatments to prevent rejection.

**FYRE Poster  
Conference Room B**

*Intersectional Microaggressions and Depressive Symptoms among AAPI LGBTQ+ adults*

**Anika Yalamanchili, Hyemin Lee, Dodge Family College of Arts and Sciences**

Individuals who identify as both Asian American and Pacific Islander (AAPI) and lesbian, gay, bisexual, transgender, queer/questioning, and others (LGBTQ+) are exposed to stressors based on their intersecting identities that disproportionately burden their mental and physical health. These stressors, rooted in institutionalized barriers, encompass experiences of discrimination, social exclusion, and cultural stigma surrounding sexual and gender identity (Ching et al., 2018). Previous studies have established associations between experiences of discrimination and poorer mental health outcomes among both AAPI (Zhou et al. 2021) and LGBTQ+ populations broadly (Bostwick et al., 2014). However, these studies have examined AAPI and LGBTQ+ populations separately, resulting in limited knowledge concerning how these stressors interact to shape health outcomes among those who hold both identities. A cross-sectional online-based survey will be conducted among AAPI LGBTQ+ adults living in the Washington, D.C., Maryland, and Virginia area. Using the survey data, we will explore how intersectional microaggressions (measured using LGBTQ+ People of Color Microaggressions Scale-2; Huynh et al., 2025) are associated with depressive symptoms (measured using Patient Health Questionnaire-9) in this population, hypothesizing that intersectional microaggressions will be positively associated with depressive symptoms among AAPI LGBTQ+ adults. As an undergraduate assistant, my role includes contributing to the literature review, survey setup in Qualtrics (codebook/display logic), recruiting participants, and learning how to conduct statistical analyses in R. We anticipate that findings will clarify how intersectional stressors impact mental health among AAPI LGBTQ+ adults, with implications for policies designed to address institutional barriers and mental health disparities.

**Non-FYRE Poster  
B2/4/6 Super Suite**

*Allergenic Potential and Food Safety Evaluation of North American Freshwater Panfish Species*  
**Anayat Yousuf, Nagib Ahsan, Dodge Family College of Arts and Sciences**

Freshwater panfish such as bluegill (*Lepomis macrochirus*) and crappie (*Pomoxis annularis*) are important to recreational fisheries due to their wide distribution, ease of capture, and popularity among youth and family anglers. According to the USDA nutrient database, these species are valuable sources of high-quality animal protein and contribute meaningfully to human diets. However, fish consumption also presents public-health concerns, as IgE-mediated fish allergy can cause reactions ranging from mild symptoms to life-threatening anaphylaxis. Currently, information on major heat-stable allergen proteins and their abundance in panfish is lacking.

In this study, by using LC-MS/MS based proteomic analysis, we successfully identified a total of 713 and 680 proteins from muscle tissues of bluegill and crappie, respectively, while 1,245 and 1,084 proteins were identified from their skin tissues. This depth of coverage is sufficient to evaluate major thermostable fish allergens in both edible and consumer-exposed tissues. Multiple clinically established fish allergen families, including parvalbumin, tropomyosin, collagen, and myosin were identified, along with several isoforms exhibiting high sequence coverage. Interestingly, both fish species exhibited a similar tissue-specific distribution of allergens. Skin tissue displayed a broader allergen profile, with relatively higher representations of some known heat stable allergen proteins like tropomyosin, collagen, and myosin isoforms, reflecting the structural protein composition of the skin.

Collectively, these preliminary results establish the first proteomics-driven allergen profile of bluegill and crappie muscle and skin tissues and provide a foundation for future allergenicity assessments.

**FYRE Poster  
Conference Room B**

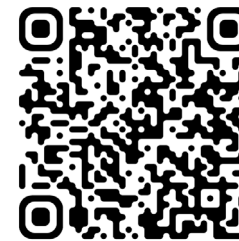
*A Multidisciplinary Concept Analysis of Respite Care*  
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Respite care is commonly used to support caregivers of individuals with various needs. Despite its frequent use in literature, the definition of respite care is inconsistent and vague. This multidisciplinary concept analysis aims to clearly define respite care and improve understanding of the concept by using the Annotated Bibliography of Respite and Crisis Care Studies, 6th edition. The articles in the VI Literature reviews/ Meta analyses of Respite Care studies section were reviewed to find definitions and surrogate terms associated with respite care. Key definitions and concepts across the literature were compared and synthesized to clarify how respite care is described and applied. Respite care is most consistently characterized as a planned temporary break from the caregivers' responsibilities with the goal of improving the wellbeing of the caregiver and/or care recipient. Overall, this concept analysis clarifies the defining attributes of respite care across disciplines. A clearer definition of respite care can improve communication among disciplines and support the development of more effective caregiver support services.

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