1
3:30-4:15pm
2nd Floor Hall

Katelyn Vaassen (Political Science and International Relations)
Lojain Nasr (International Relations)
Mentor(s): Lai, Brian (Political Science)

More Than Water: A Case Study Countering Chinese Influence in Fiji

This project investigates strategies to counter Chinese influence in the Indo-Pacific through a focused case study on Fiji. As Beijing expands its presence via initiatives such as the Belt and Road, security agreements, and cultural diplomacy, Pacific Island nations have become arenas of geopolitical competition. Fiji—given its strategic importance to the U.S. —offers a critical lens for assessing both the mechanisms of Chinese influence and the responses available to regional and external actors. Drawing on diverse datasets, the study examines China's use of economic statecraft, diplomatic engagement, and cultural ties in Fiji, and it evaluates the effectiveness of counterstrategies pursued by the United States. The project aims to develop policy recommendations for fostering strong U.S.-Fijian relations.

2
3:30-4:15pm
2nd Floor Hall

Ava Craine (International Relations and Journalism and Mass Communication)
Dayanara Sanchez (International Relations, French)
Mentor(s): Lai, Brian (Political Science)

Competing Tides: Samoa in the Shifting Dynamics of Global Policy

This presentation examines how competing global policies impact Samoa's development as well as their stances on international and domestic issues. It highlights Samoa's responses to initiatives such as the GDI, GSI, and GCI, while analyzing how major powers, including the United States, influence Samoa's strategies to balance external pressures with local priorities in the Pacific.

3
3:30-4:15pm
2nd Floor Hall

Charles Silver (Political Science, Finance, and Economics)
Caden Shetler (Political Science)
Mentor(s): Lai, Brian (Political Science)

Between the Eagle and the Dragon: Palau at the Crossroads of Global Diplomacy

Palau, a strategically located island nation in the western Pacific, maintains a uniquely close relationship with the United States through the Compact of Free Association, which provides defense, economic aid, and migration privileges. While China has attempted to expand its influence in the region, Palau's

alignment with the U.S. remains strong, reinforced by shared democratic values and longstanding military cooperation. This project examines the critical factors behind the success of U.S. Diplomacy with Palau and how key practices can be used to counter Chinese influence elsewhere in the Pacific.

4
3:30-4:15pm
2nd Floor Hall

Connor DeGroote (Political Science, Philosophy)
Thomas Mayer (Political Science)
Mentor(s): Lai, Brian (Political Science)

Journey to the East: Nauruan Foreign Policy amidst U.S. - China Competition

This project investigates how small states navigate great power competition by examining Nauru's foreign policy in the context of U.S.–China rivalry. We analyze American and Chinese engagement with Nauru since 2000 and assess how their policies have shaped Nauru's alignment. We also consider Nauruan actions influenced by other countries to better understand the factors driving its foreign relations. Our findings suggest that Nauru's recent shift toward China is rooted in Beijing's provision of aid and investment to the island.

5
3:30-4:15pm
2nd Floor Hall

Josie Boyle (English (Publishing) and Communication Studies)
Mentor(s): Hooks, Adam (English)

Shakespeare in Iowa: Reading and Teaching in the Humanities

Shakespeare's works have long been read, studied, and performed at the University of Iowa. This project explored the variety of resources available at the University of Iowa that reveal the past in ways that will help shape teaching and research in the future.

Over the course of the summer, I explored the history of the department of English, in which Shakespeare has been taught since the 19th century.

The primary research for this project included a combination of the following activities: examining English 250+ department-affiliated records that outline the history of teaching Shakespeare and graduate degree theses; collaborating with Special Collections curators to find materials in archives; producing a finding aid to assist future researchers in searching for department-related materials; creating a summary of findings in the form of an essay.

I found that 20th century women were highly involved in Shakespeare studies, outnumbering men 56 to 41 (likely to meet teaching certification requirements). This ratio fluctuated as more men pursued postsecondary education with the

help of the WWII G.I. Bill. Most students (60 out of 97) chose to write their theses on specific Shakespearean plays focusing on the cultural historical lens, likely correlating to graduate seminar curriculum. While the number of Shakespeare courses has dwindled, many 20th century courses are similar to Shakespeare courses offered today.

6
3:30-4:15pm
2nd Floor Hall

Sarah Guilfoyle (Political Science)
Mentor(s): Lai, Brian (Political Science)

The Impact of Regime Type on the Effect of Sanctions on Income Inequality

This research examines the role of the regime type of the sanctioned country in the relationship between economic sanctions and the income inequality of that country. Previous research is inconclusive, with some studies finding that sanctions increase income inequality, while others find the opposite. However, they have identified that the effect varies across sanction instruments. I utilize data from the Standardized World Income Inequality Database (SWIID), the Global Sanctions Database, and the Polity5 dataset to examine 153 countries between the years 1970 and 2020 through three quantitative models. The results indicate that general sanctions, trade sanctions, and import sanctions decrease income inequality, though the significance varies by model specification. Regime type displayed a significant conditioning effect in some models, with income inequality decreasing more in autocratic countries.

Keywords: Economic sanctions, income inequality, polity

7
3:30-4:15pm
2nd Floor Hall

Grace Paxton (Physics, Astronomy)
Mentor(s): Nachtman, Jane (Physics & Astronomy)

Simulating Nuclear Sources in Lunar Environments using Eos and RATPAC

The Eos detector is a small-scale demonstrator neutrino detector built at the University of California, Berkeley. Eos is rather unique because it is a hybrid detector, meaning that it can detect particles via both scintillation and Cherenkov radiation using different types of photomultiplier tubes and filters, with its four-ton inner chamber filled with various scintillators, including a recently-developed water-based scintillator as well as a slower one developed to maximize detections of Cherenkov radiation. The University of Iowa's HEP group joined the project in 2023 and has since constructed the light distribution apparatus for the laser light calibration system, with fibers to distribute four wavelengths to points along the outer cylinder of the detector, and a single fiber

to a central Teflon diffuser ball. These advancements were pivotal to the calibration of the 242 PMTs along said outer cylinder, the diagram of which is shown below. Eos started taking data officially in March 2024.

The primary objective was to create simulations using both existing models of nuclear reactors used in the generation of electric power and of Eos-like systems of detectors These larger objects were to vary in relative location, the amount of detectors/total PMTs, and the surrounding media to both improve simulations of the detector already in use at Berkeley as well as highlight previously more unexplored applications and uses of the technology.

With the rapid acceleration of technological advancement and the renewed interest in manned missions to our closest neighbor with NASA's Artemis program, a clearer expectation of how data collected in a lunar environment may vary and a broader understanding of how these trends will shift will be invaluable in accurately surveying the output of nuclear sources, whether that be power generators in longer term missions or settlements or even clandestine weapons testing. Having this information ahead of time will both increase the preparedness of these missions. More specifically, the Eos detector is geared towards the detection of particles via the dual methods of scintillation and Cherenkov radiation, making RATPAC's extensive library and simulation ability invaluable. These factors combined will make it easier to expand our horizons and those of the technologies currently used by the Eos detector.

8
3:30-4:15pm
2nd Floor Hall

Abigail Zimmerman (Biology)
Mentor(s): Strack, Stefan (Neurosci & Pharmacology)

Investigating Neurodegeneration in Mouse Models of a Rare Neurodevelopmental Syndrome

Marbach-Shaaf Neurodevelopmental Syndrome (MASNS) is a rare neurodevelopmental disorder characterized by global developmental delay, intellectual disability, dyspraxia, Attention-Deficit Hyperactivity Disorder (ADHD) and autism spectrum disorder (ASD). MASNS is caused by a de novo mutation (p.R335W) in the RIß regulatory subunit of Protein Kinase A (PKA). A transgenic mouse model of MASNS was used to investigate whether MASNS increases the risk of neurodegeneration in older individuals. Brain samples were collected from mutant and wild type mice at 1-2 months old and 10-12 months old. Samples were probed with antibodies corresponding to Tau, pTau, NeuN, GFAP, and ß -amyloid. Samples were visualized by confocal microscopy. No significant

difference was observed in the ratio of pTau S409/Tau between the two genotypes at either age, suggesting that MASNS may not increase the risk of neurodegeneration in older individuals. These findings shed new light on the phenotypic expression of the mutation that causes MASNS, suggesting that the mutation does not have a significant impact on neurodegeneration as is the case in other disorders impacting intellectual ability.

9
3:30-4:15pm 2nd Floor Hall

Lucy Blissenbach (Education Studies and Human Relations)
Mentor(s): Mahatmya, Duhita (Psych & Quant Foundations)

Investigating the Association between Parent Work Stress and Child Academic Outcomes: A Scoping Review

One proposition of Bronfenbrenner's (1977, 1979) ecological theory of human development is that interactions among microsystems, such as the home and school, shape developmental outcomes. Existing literature on family-school engagement and child academic achievement primarily emphasizes intentional collaboration between these environments to support student success (Reschly & Christensen, 2019; Sheridan & Wheeler, 2017). Although economic stress (e.g., unemployment, financial strain) is recognized as a barrier to parental involvement in schools (Simons & Steele, 2020; Waanders et al., 2017), limited research has examined how work-related stress (e.g., job demands, burnout) influences the work-home-school mesosystem and child academic outcomes.

We conducted a comprehensive literature search and identified 652 unique studies related to parental work stress and child academic achievement. To date, 10 articles have met criteria for full-text review. Following Arksey and O'Malley's (2005) five-stage scoping review framework and the PRISMA-ScR guidelines (Tricco et al., 2018), we developed search terms and retrieved articles from multiple databases, including PsycINFO, Family Studies Abstracts, Social Work Abstracts, Scopus, and ERIC. We used Rayyan.ai to facilitate collaboration and ensure adherence to scoping review protocols.

Inclusion criteria for full-text review required studies to (a) use intervention, quantitative, qualitative, or mixed methods designs; (b) recruit both parents (or parental figures) and children; and (c) include variables related to both stress and academic outcomes. We excluded studies that (a) reported only parent or child outcomes; (b) relied solely on perceptions from one group without direct responses from the other; or (c) measured general socioeconomic stress without

specific work-related stress variables. Two team members independently screened all studies.

Preliminary findings suggest that many studies assess parental stress through socioeconomic indicators (e.g., education level, single-parent status, income, unemployment) without examining workplace performance or burnout. These results underscore the need for further research on parental work stress and its impact on children's academic achievement, particularly within the context of home-school interactions.

10
3:30-4:15pm
2nd Floor Hall

Ava Goettel (Exercise Science)
Mentor(s): Moon, Chooza (Nursing)

Rest activity rhythms and metabolic outcomes of midlife women before and after menopause in Midlife in the United States Study

Background: Changes in hormones and body composition during menopause are associated with increased metabolic and cardiovascular disease (CVD) risk. As individuals age, sleep and rest-activity rhythms also change. Menopause is particularly linked to sleep disruptions due to declining sex hormones and vasomotor symptoms, affecting approximately 16% to 42% of women. Additionally, physical activity tends to decline during the menopausal transition. Rest-activity rhythms (RAR) reflect the 24-hour patterns of sleep, physical activity, and rest. However, little is known about how these rhythms change after menopause and how they relate to cardiometabolic outcomes. Therefore, the purpose of this study was to examine the relationship between menopause and RAR, and to explore how these RAR influence cardiometabolic risk factors in combinations with menopause.

Methods: We utilized data from the MIDUS 2 study, a nationally representative dataset comprising 3,487 Americans, designed to investigate the role of behavioral, psychological, and social factors in health and aging. For this analysis, we used data from 515 women with available menopause status information (median age = 52; range = 34–84 years). We conducted multiple t-tests to compare RAR and cardiometabolic parameters between premenopausal and postmenopausal women and used multiple regression to understand the relationship between menopause, RAR, and metabolic outcomes using the interaction term.

Results: Our findings indicated that MESOR (mean = 249.13 vs 226.71, $p = 0.007$) and amplitude (mean = 180.61 vs 171.44, $p = 0.060$) were significantly higher in

perimenopausal women compared to postmenopausal women, while acrophase and R-squared values were similar across groups. Furthermore, we found perimenopausal women present lower HbA1c (mean = 5.74 vs 5.99, p = 0.031) and lower glucose levels (mean = 94.00 vs 97.00, p = 0.008), and lower systolic blood pressure (mean 121.50 vs 132.00, p = <0.001), compared to post-menopausal women. However, the other metabolic outcomes were similar between the two groups, including total cholesterol (mean = 172.00 vs 185.00, p = 0.030), LDL (mean = 96.50 vs 99.00, p = 0.451), CRP (mean = 2.06 vs 2.33, p = 0.406), IL6 (mean = 2.12 vs 2.96, p = 0.045), and diastolic blood pressure (mean = 72.00 vs 71.00, p= 0.840). We found systolic blood pressure was associated with RAR amplitude (ß = 0.23, p= 0.007841) as well as the interaction between menopause and amplitude (ß =-0.28, p= 0.021473) accounting for covariates. We also found menopause status along was significantly associated with glucose levels (ß = 74.67, p= 0.0376). However, RAR was not significantly associated with glucose levels, nor the interaction terms between menopause status and RAR.

Conclusion: In conclusion, physical activity levels and intensity appear to reduce and glucose, HbA1c, and blood pressure is higher in post-menopausal women compared to peri-menopausal women. We found that interaction between RAR amplitude and menopause status was associated with systolic blood pressure accounting for covariates. Future research should employ prospective study designs with comprehensive assessments of menopausal status and activity patterns to further elucidate these relationships.

11
3:30-4:15pm
2nd Floor Hall

Keegan Nissen (Speech and Hearing Science)
Mentor(s): Walker, Elizabeth (Communic Sci & Disorders)

Impact of Hearing Profiles on Developmental Outcomes: Comparing Children with Unilateral or Bilateral Hearing Loss and Normal Hearing

Over 5 million children in the United States are estimated to have unilateral hearing loss (UHL), which is defined as a mild to profound hearing loss in one ear and typical hearing in the opposite ear. Despite the prevalence of UHL, few studies have focused on this population, as it is often assumed that the presence of one typical hearing ear will lead to fewer challenges compared to bilateral hearing loss. The current study compared language outcomes in children with UHL to children with bilateral hearing loss and children with typical hearing. Data were collected in a prospective longitudinal design with

participating children recruited from Iowa, Nebraska, and North Carolina. The sample consisted of 14 children with UHL matched with 14 children with bilateral hearing loss. They were matched on age, sex, maternal education level, and pure-tone average. A sample of 117 typical hearing children was also included as local norms. The data generated in the current study will help to provide evidence to support individualized treatment options for children with UHL that are not currently feasible due to limited evidence.

12
3:30-4:15pm 2nd Floor Hall

Gabriel Postacchini (Computer Science and Mathematics)
Mentor(s): Jay, Laurent (Mathematics)

A New Error Prediction Algorithm for Fully Implicit Runge–Kutta Solvers

Differential equations are the language of our universe, modeling phenomena from animal populations to the orbital mechanics of spaceflight. However, with the exception of the simplest systems, these equations are often incredibly difficult to solve analytically. Numerical methods, such as the Runge–Kutta (RK) family of solvers, provide accurate approximations, but greater precision typically comes at a higher computational cost. We propose a new error prediction algorithm designed to reduce this cost in fully implicit Runge–Kutta solvers. Our approach leverages information extracted from local error behavior to predict and mitigate redundant computations, significantly improving efficiency. Unlike other approaches that rely on explicit methods, our use of implicit RK formulations allows for global error estimation and deeper insight into system dynamics. By combining implicit stability with predictive error modeling, this method offers a path toward faster, more informative numerical simulations, saving both time and computational resources while enhancing our understanding of the systems we study.

13
3:30-4:15pm 2nd Floor Hall

Tate Steig (Interdepartmental Studies)
Mentor(s): Rothenberg, Katheryn (Biology)

Understanding the Signs, epithelial cancer cell metastasis tags and migration processes

Cells need to move, or migrate, in order to develop tissues and organisms, heal wounds, or spread cancer. However, we still know remarkably little about how cells move, especially together in groups during collective cell migration. We know that cells create adhesions, or attachments, to other cells

or to the extracellular matrix (ECM), and that cells use the actomyosin cytoskeleton to generate forces through adhesions that drive migration. We do not fully understand how these structures are dynamically regulated to drive and control collective cell migration. This project's goal is to better understand those driving mechanisms and the effects on cell adhesions and the cytoskeleton.We must be able to view these actions and structures in real time to gain a full understanding. We selected five proteins of interest specifically ACTB and MYH10 (actin and myosin - make up the actomyosin cytoskeleton), PXN (paxillin - a scaffolding protein that anchors cells to the extracellular matrix), CTNNB1 and CDH1 (E-cadherin and beta-catenin - structural components that link cells to other cells) to tag with the fluorescent protein eGFP using CRISPR-Cas9 gene editing in human epidermoid carcinoma cells. Briefly, cells were transfected with crRNA, donor DNA, and Cas9 expression plasmids to induce gene editing. Cells were sorted to obtain GFP+ cell lines. Edited cells will be visualized during collective migration to understand the dynamic remodeling that occurs during cell movement. If we can learn more about how cell adhesions and the cytoskeleton contribute to collective migration, it could potentially lead to advances in wound healing or cancer metastasis.

14
3:30-4:15pm
2nd Floor Hall

Connor Baggot (Computer Science/Pre-Med)
Mentor(s): Hoth, Karin (Psychiatry) | **Chooza Moon** (Nursing)

Dim Light Melatonin Onset and Functional Connectivity in Later Life Adults

Background: Disruptions in resting state functional connectivity (rs-fMRI) reflect impaired communication between brain regions often associated with memory impairment and cognitive decline. The sleep and wake cycle influences the body's natural circadian rhythm, and altered circadian rhythms are linked to various adverse outcomes, including an increased risk for chronic neurodegenerative diseases. Circadian rhythms are primarily regulated by light–dark cues that travel through the retina to the suprachiasmatic nucleus in the anterior hypothalamus to regulate sleep and wake cycles. Circadian rhythm can be measured using Dim Light Melatonin Onset (DLMO), which is considered the gold standard. DLMO measures saliva melatonin concentrations every 30 minutes while exposed to low-light levels (<50 lux) to estimate individuals' circadian timing. However, there is a lack of research looking at the association of DLMO with functional connectivity and neurodegenerative disease due to the high burden of collecting comprehensive brain and circadian rhythm data. This study examined how circadian timing using DLMO is associated with alterations

in functional connectivity in hippocampal networks and within the Default Mode Network (DMN) and Salience Network (SN).

Method: We analyzed data from 50 later-life adults (mean age ± SD = 68 ± 6.50, female [n = 25 (52%)]). All the participants completed DLMO sessions as well as underwent 3.0 T MRI to obtain T1-weighted anatomical images and resting-state Blood Oxygenation Level Dependent (BOLD) images. Correlation maps were generated by extracting the residual BOLD signal from the regions of interest (ROIs) and calculating Pearson correlation coefficients between that signal and the signals from all other voxels. These correlation values were then transformed into z-scores using Fisher's transformation to ensure a normal distribution. The mean hippocampal DMN score was the mean z-score for connectivity between the hippocampus and all the other nodes of the DMN, and similarly for the SN. The average strength of the DMN and SN was defined as the mean z-score across all DMN and SN nodes. We used a t-test and Pearson's correlation to examine the associations between DLMO and functional connectivity.

Results: We found later DLMO was associated with higher strengths in SN B ($r = 0.37$, $p = 0.0079$). The relationship between later DLMO and SN A ($r = 0.26$, $p = 0.063$) trended towards higher strengths but was not statistically significant. Also, later DLMO was associated with higher strengths in DMN A ($r = 0.26$, $p = 0.072$), B ($r = 0.13$, $p = 0.36$), and C ($r = 0.0059$, $p= 0.68$), but the results were not statistically significant. Our findings indicate DLMO was not significantly associated with the functional connectivity between the hippocampus and DMN as well as the hippocampus and SN.

Conclusion: We found later circadian timing was associated with higher strengths in SN B, suggesting that delayed circadian rhythms may influence how the brain directs attention to internal and external stimuli. The SN B consists of brain regions, which are crucial for coordinating a response to interoceptive signals and switching between the DN and Executive Control Networks. Stronger hippocampal to SN B connectivity in later circadian timings may exhibit a compensatory adaptation where hippocampal regions help coordinate attention and emotional processing alongside SN B. However, we could observe some trends towards the positive association between circadian timing and hippocampal networks with DMN and SN, as well as within DMN and SN. Circadian timing may impact functional connectivity, which, in turn, may contribute to neural changes underlying neurodegenerative diseases. Future

studies using larger sample sizes, comprehensive covariates, and prospective designs are warranted to further investigate this relationship.

15
3:30-4:15pm
2nd Floor Hall

Eva Singh (Computer Science and Engineering)
Mentor(s): Reinhardt, Joe (Biomedical Engineering) | **Seyed Soheil Hosseini** (Radiology)

Investigating Wasserstein Generative Adversarial Networks (W-GANs) in Learning 2D Probability Distributions

Medical images are inherently complex. A single 100×100×100 scan contains one million values, corresponding to a point in a million-dimensional space. However, these data are not independent; the true information often lies on a much lower-dimensional structure within that high-dimensional space. Understanding and modeling such structures in real-world settings is challenging, computationally demanding, and difficult to visualize.

To build intuition about generative models in a simpler setting, this project studies how Generative Adversarial Networks (GANs), particularly the Wasserstein GAN (W-GAN), learn known two-dimensional probability distributions. We begin with toy distributions, such as mixtures of 2D Gaussian functions, generate large numbers of samples, train W-GANs to learn these distributions, and then evaluate the model's ability to reproduce them.

This work systematically investigates how various parameters affect W-GAN performance, including learning rate, relative frequency of critic versus generator updates, network architecture complexity, training sample size, and ablation analyses, such as removing the critic component.

Model performance is quantitatively assessed using Kullback–Leibler (KL) divergence, Jensen–Shannon (JS) divergence, and Wasserstein distance, alongside direct visual inspection of generated samples and generator vector fields, which is possible only in this low-dimensional setup.

Preliminary results indicate that the trajectories of critic and generator losses vary with the number of training samples, while extended training did not destabilize learning, likely due to the simplicity of the 2D setting. Overall, the W-GAN effectively captured the multimodal structure of the target distributions, demonstrating its ability to learn fine-grained details. Studying W-GANs on low-dimensional distributions allows us to systematically explore how training

choices affect performance. These insights can guide more effective and stable training of generative models on real-world medical imaging datasets.

16
3:30-4:15pm 2nd Floor Hall

Madelyn Grueter (Neuroscience)
Mentor(s): Stevens, Hanna (Psychiatry)

Comparison of Striatal Neuron Density Across Different Routes of CHPG Administration

Prior studies have identified morphological, stereological, and behavioral abnormalities in the striatum across developmental stages, including striatal enlargement in some individuals with autism spectrum disorder (ASD). Metabotropic glutamate receptor 5 (mGluR5) regulates glutamate transmission and inhibits GABA signaling, and increased striatal expression of mGluR5 has been observed in adults with ASD. 2-chloro-5-hydroxyphenylglycine (CHPG), a mGluR5 agonist, has been shown to influence ventral forebrain neurogenesis during development.

This study aimed to examine the effects of CHPG administration on striatal neuron density in adult mice by comparing different routes of administration. Pregnant dams received CHPG either via intraperitoneal (IP) injection or intracerebroventricular (ICV) injection on embryonic day 13, with saline injections serving as controls. Striatal neuron counts in adult offspring were quantified using unbiased stereology following DAPI and NeuN staining in GFP-positive mice.

No significant differences in striatal neuron density were found between CHPG-treated and control groups. Ongoing behavioral analyses from these litters may further elucidate mechanisms underlying striatal overgrowth and contribute to modeling ASD-related neurodevelopmental processes.

17
3:30-4:15pm 2nd Floor Hall

Nathan Fassett (Neuroscience)
Mentor(s): Stewart, Adele (Neurosci & Pharmacology)

Investigating sex differences in the dopamine-insulin system

Introduction: Obesity affects over 70% of U.S adults over the age of 20. Weight gain in obesity results from maladaptive food consumption irrespective of homeostatic needs. Obesity has been linked to altered activity in brain circuits regulated by the neurotransmitter dopamine (DA), which plays a key role in motivation and habit formation. The dopamine transporter (DAT) is the chief

determinant of DA synaptic bioavailability and exposure to diets high in fat and sugar has been shown to impair DA clearance in the nucleus accumbens (NAc), a key target of mesolimbic DA projections. Notably, we have shown that high fat diet (HFD) feeding does not alter DAT activity, pointing to sugar consumption as a factor that may influence DA clearance. Insulin is endogenously released as blood glucose rises following eating events and is known to cross the blood-brain barrier. The insulin receptor is expressed in key DA projection regions including the dorsal striatum (dStr), NAc, and prefrontal cortex (PFC) and has been shown to regulate DAT in vitro. Thus, changes in insulin activity and/or regulation of DAT may contribute to DA circuit dysfunction in obesity. However, previous studies investigating this topic lack proper diet controls and have excluded female subjects despite the prevalence of severe obesity in women.

Methods: Here, we investigated the uptake of [3H] DA in isolated brain slices containing DA projection regions at baseline and following the addition of physiologically relevant concentrations of insulin in the brain. The mice were fasted overnight to ensure insulin levels were low prior to slice experiments.

Results: These data indicate sex- and region- specific differences in the insulin receptor's regulation of DAT activity previously ignored in the literature. Males mice showed an increase in uptake in the dStr, NAc, and PFC while this effect is blunted in female mice.

Conclusions: These data demonstrate sex-biased and region-specific modulation of DA clearance in response to physiologically relevant insulin concentrations. To further investigate these phenomena, we next plan to assess how exposure to an obesogenic diet high in sugar influences DA dynamics in mice of both sexes. Given the role of DA in hedonic food seeking and consumption, it is vital to understand underlying mechanisms by which diet impacts the dopaminergic system.

18
3:30-4:15pm
2nd Floor Hall

Rebecca Flint (Biomedical Engineering)
Maanit Sheth (Biomedical Engineering)
Mentor(s): Sander, Edward (Biomedical Engineering) | **James Ankrum** (Biomedical Engineering)

Influence of Media Composition and Fibroblast Co-Culture on Morphological and Adipogenic features in Heterotypic Adipose Spheroids

Adipose tissues consist of a heterogeneous distribution of different cell types, each essential to tissue function and health. Conventional two-dimensional (2D)

culture systems do not replicate the complexity of the tissue, which limits their ability to model adipose tissue function accurately. Three- dimensional (3D) human adipocyte spheroid culture provides a better representation of adipose tissue, but these systems, which are made by differentiating preadipocytes (NPADs) into adipocytes, lack other cells types, such as fibroblasts, present in the tissue. The goal of this work was to investigate how incorporating human dermal fibroblasts (HDFs) into adipocyte spheroids impacts adipose function. We varied the NPAD:HDF ratio to see how HDFs affect spheroid size under different media conditions, as issues related to media suitability and cost considerations in heterogeneous spheroids remain unclear. Our findings suggest that fibroblasts contract in size and when mixed with NPADS may help preserve adipogenic features when media containing differentiation cues are replaced with less expensive media formulations. Further analysis is focused on quantifying spheroid area changes, assessing lipid accumulation through lipid staining, and confocal microscopy.

19
3:30-4:15pm
2nd Floor Hall

Katia Janik (Neuroscience)
Mentor(s): Joachim-Lehmler, Hans (Occup & Environ Health) | **Laura Dean** (Occup & Environ Health)

Analysis of 2,2',5,5'-Tetrachlorobiphenyl-4-ol (4-OH-PCB52) in Liver Tissue of Female Adolescent Rats Exposed via Polymeric Implants

Polychlorinated biphenyls (PCBs) are synthetic, persistent organic pollutants that remain widespread in the environment despite production ban. PCBs accumulate in lipid-rich tissues and are metabolized by hepatic cytochrome P450 enzymes. 2,2',5,5'-Tetrachlorobiphenyl-4-ol (4-OH-PCB52), a human-relevant hydroxylated metabolite of 2,2',5,5'-tetrachlorobiphenyl (PCB52), may alter hepatic metabolism and endocrine signaling pathways. Understanding how PCB metabolites modulate these biochemical pathways is essential for assessing vulnerability to chemical exposures. To investigate 4-OH-PCB52 disposition and its potential metabolic effects, a sustained-release polymeric implant system was used to deliver controlled doses of 4-OH-PCB52 to female postnatal day 28 rats for 28 days. Implants contained either 0%, 1%, 5%, or 10% 4-OH-PCB52 by weight. Liver tissues were flash-frozen and analyzed using liquid–liquid extraction followed by GC–MS/MS. Internal (PCB30, PCB204) and surrogate (4-OH-PCB25) standards were incorporated to evaluate method precision and recovery. All standards and analytes demonstrated recoveries within the acceptable 70–120% range. 4-OH-PCB52 was detected in all exposure

groups, with concentrations ranging from 1.9 to 36 ng/g liver tissue, confirming hepatic uptake following subcutaneous delivery using subcutaneous implants. Future work will employ multi-omics approaches, including proteomics, to elucidate molecular mechanisms linking PCB metabolite accumulation to metabolic dysregulation in the liver.

20
3:30-4:15pm
2nd Floor Hall

Emma Demuth (Neuroscience)
Mentor(s): Tung, Moonley (Pediatrics)

Clinical utility of long-read nanopore-based whole genome sequencing

Background: Long-read nanopore-based whole genome sequencing using the Oxford Nanopore technology (ONT) is a robust platform for gene discovery and resolution of variants of uncertain significance (VUS) in inherited bone marrow failure syndromes (IBMFS), including Telomere Biology Disorders (TBD). Rare germline variants in RTEL1 (OMIM#: 608833) have been associated with both the autosomal dominant (AD) and autosomal recessive (AR) form of telomere biology disorders (TBD). RTEL1-related disorders include the prototypical TBD, dyskeratosis congenita (DC) with is a rare inherited bone marrow failure (BMF) and cancer predisposition syndrome and a subset of patients with idiopathy pulmonary fibrosis (IPF). Early and accurate diagnosis of TBD is important to understand the underlying disease mechanism and appropriate therapy and cancer screening recommendations.

Objectives: This study aims to examine the clinical utility of long-read nanopore-based whole genome sequencing to resolve RTEL1 variants of unclear significance (VUS) in a patient with TBD.

Methods: A 12-year-old male presented with pancytopenia attributed to bone marrow failure syndrome. He also had a distant history of an esophageal web which was diagnosed at the age of three and required multiple dilatation procedures. Genetic testing was performed through a targeted next generation sequencing (NGS) panel for 61 genes known to be associated with BMF with deletion and duplication analysis. Three heterozygous variants of unknown significance (VUS) were detected on this testing in these two genes: RTEL1 (NM_001283009.2): c.1720C>T, p.Arg574Trp and c.1909A>G, p.Asn637Asp, and FANCM (NM_020937.4): c.808C>T, p.Arg270Cys. Given that RTEL1 variants are associated with TBD, telomere length was performed using the flow-FISH methodology and returned very short (less than the first percentile). Family history was significant for esophageal web in his nine-year-old sister who was

also diagnosed at the age of three and required multiple dilatation procedures. Both parents and older sister were reported to be healthy with no history of any blood counts. Complete blood counts (CBC) were sent for both parents and sisters which were all within normal limits except for mild eosinophil counts in his father and mild leukopenia in his youngest sister. Telomere lengths were very short (below the first percentile) for his younger sister and short (at the first percentile) for his father and older sister.

We extracted DNA from peripheral blood and performed long-read, nanopore based whole genome sequencing in all 5 individuals of this family to help determine the phase of these two RTEL1 variants.

Results: We were able to demonstrate that these two RTEL1 variants were in trans using long-read nanopore-based whole genome sequencing. Variant 1 (RTEL1 (NM_001283009.2): c.1720C>T, p.Arg574Trp) was found in his mother and younger sister. Variant 2 (RTEL1 (NM_001283009.2): c.1909A>G, p.Asn637Asp) was found in his father and older sister. This was also confirmed on clinical grade genetic testing and demonstrates familial segregation of these variants.

Conclusion: Given that the proband and his youngest sister are both compound heterozygous for these two RTEL1 variants, have very short telomeres and present clinically with esophageal webs and/or BMF, it is likely that they both have the autosomal recessive form of TBD. His dad and older sister are likely to have the autosomal dominant form of TBD given that they are heterozygous for the RTEL1 variant 2 and present with short telomere lengths.

21
3:30-4:15pm
2nd Floor Hall

Arissa Khan (Physics, Chemistry)
Mentor(s): Feltman, Connor (Physics & Astronomy) | **Allison Jaynes** (Physics & Astronomy)

OCHRE Rocket: Langmuir Probe to Analyze Plasma in the Magnetosphere

The OCHRE (Observing Cusp High-Altitude Reconnection and Electrodynamics) Mission is a student-led sounding rocket mission tandem off of the TRACERS mission, whose goal is to better understand magnetic reconnection in Earth's magnetosphere. The Langmuir Probe is one instrument on the suite, which will collect data pertaining to plasma density and temperature as a function of altitude.

22
3:30-4:15pm
2nd Floor Hall

Megan Miskovic (Neuroscience)
Mentor(s): Lalumiere, Ryan (Psychological Brain Sci) | **Alexa Cohill-Milanick** (Psychological Brain Sci)

Investigating Rodent Sex Differences in the Self-administration of Cocaine

Previous work examining whether, and under what conditions, sex influences cocaine self-administration in rodents is conflicting. Prior reported differences may be due to low group sizes and higher variability in females or moderated by session length. In the present experiment, rats underwent at least 12 sessions of 2-hour cocaine self-administration. The results indicate that male rats consumed a larger body weight-adjusted amount of cocaine, although males and females pressed active and inactive levers the same number of times. Possible underlying factors of observed sex differences across studies are likely the result of experimental differences rather than physiological differences in response to cocaine.

23
3:30-4:15pm
2nd Floor Hall

Isaac O'Toole (Biochemistry and Molecular Biology)
Mentor(s): Kenny, Colin (Surgery)

Defining the Role of PAX Paralogs in Uveal Melanoma

Uveal melanoma (UM) is the most common intra-ocular malignancy, driven by oncogenic mutations in GNAQ or its paralog GNA11 in 95% of cases. Metastasis occurs in 50% of patients, for which no effective treatment exists. PAX3 and PAX7 are upstream transcription factors observed in the neural crest, melanocyte development, and cutaneous melanoma. We have shown that PAX-expressing melanocyte progenitors are uniquely susceptible to malignant transformation, and hypothesize that uveal melanoma initiation and progression is dependent on PAX expression. To test this, we have created sgRNAs targeting the zebrafish genome which are co-delivered with oncogenes via plasmid injection and electroporation. Using in vivo fluorescent imaging, DNA extraction, indel analysis, and survival studies we evaluated knockout efficiency and functional consequences of PAX loss during UM tumorigenesis.

24
3:30-4:15pm
2nd

Avery Norman (Geoscience)
Mentor(s): Honings, Joseph (IIHR Hydroscience Eng)

Geologic Hydrogen Potential of the Midcontinent Rift System in Iowa, USA: Background and Preliminary Research Efforts Using Legacy Data

Floor Hall

The 1.1 billion year-old Midcontinent Rift System (MRS) that extends through much of the midwestern United States has recently become of great interest for exploration of geologic hydrogen. When in contact with water within a specific pressure-temperature regime, mafic and ultramafic source rocks associated with the MRS at depth would serpentinize to release hydrogen gas. In Iowa, subsurface data of the MRS are sparse, due mainly to all water wells being drilled in overlying Paleozoic or younger strata and the lack of oil and gas industry activity, the latter which effectively ceased in the 1980s. Because data at depth of the MRS is sparse, subsurface hydrogen system source rock, migration pathways, and trap components are poorly understood. The Iowa Geological Survey (IGS) has begun modernizing and analyzing legacy data from energy exploration and natural gas storage fields to facilitate research efforts in this domestic energy industry. Synthesis of high-resolution lithologic logs with wireline borehole surveys and seismic reflection data in the new context of hydrogen exploration may reveal important features or relationships that were missed in the original exploration for hydrocarbons. Particularly, the neutron borehole log has been shown as a proxy for proven subsurface hydrogen reserves (Maiga et al 2023) in the Bourakebougou, Mali system. The IGS is analyzing neutron and other wireline surveys from an abandoned natural gas storage field in north-central Iowa for possible hydrogen gas shows in different formations.

25
3:30-4:15pm
2nd Floor Hall

Braden Carne (Physics, Astronomy, Math)
Mentor(s): Halekas, Jasper (Physics & Astronomy)

Electron Behavior Across the Alfvén Surface: Recent Findings from Parker Solar Probe

N/A

26
3:30-4:15pm
2nd Floor Hall

Ava Hunt (Neuroscience)
Mentor(s): Voss, Michelle (Psychological Brain Sci) | **Jessica Frame** (Psychological Brain Sci)

Exploring the Associations Between White Matter Hyperintensities and Spatial Navigation Performance in Non-Demented Older Adults

Various forms of cognitive decline of unknown origin are seen in our aging population today, specifically in correlation with white matter hyperintensities (WMHs) which are bright spots on MRI scans that indicate the presence of lesions in white matter connecting different brain regions. In particular, deficits

in spatial navigation can have profound effects on a person's daily functioning and quality of life, contributing to issues such as decreased mobility and social withdrawal. However, existing MRI studies have not sufficiently mapped the relationship between these lesions and their effects on spatial navigation deficits. Therefore, the purpose of this research project is to explore whether there is an association between the prevalence of WMHs and allocentric spatial navigation. Using automated segmentation and MRI processing pipelines to analyze the volume of lesion observed within the medial temporal lobe and the corresponding participant's performance in a wayfinding navigation task, this study aims to determine whether there are any patterns in cognitive performance that appear with more or less lesion burden in this brain region. Although results are pending, this research shows potential in identifying underlying correlations between behavioral output of cognitive processes relating to spatial navigation and the distribution of white matter hyperintensities in the brain regions responsible for these functions. Results supporting our predictions would provide evidence that increased white matter lesion burden is a mediator of impaired cognitive performance underlying spatial navigation, which is critical for the study of the aging brain.

27
3:30-4:15pm
2nd Floor Hall

Hana Burkart (Computer Science and Engineering)
Mentor(s): Reinhardt, Joe (Biomedical Engineering) | **Seyed Soheil Hosseini** (Radiology)

Investigating Variational Autoencoders (VAEs) in Learning One-Dimensional Manifolds Embedded in Two-Dimensional Space

High-dimensional medical images can contain millions of voxel values, yet much of their information lies on lower-dimensional manifolds—structured subspaces that capture the true variability in the data. Understanding how generative models learn and represent such manifolds is key to advancing medical imaging AI.

In this project, we explore the Variational Autoencoder (VAE) in a simplified toy setting designed to visualize how low-dimensional representations emerge. Rather than modeling full two-dimensional probability distributions, we construct datasets where samples lie along one-dimensional manifolds—specifically, the perimeters of three circles in the 2D plane. The VAE is trained to encode these structures into a compressed latent space and to reconstruct them faithfully from that representation.

We systematically examine parameters that influence performance, including network depth and width, learning rate, number of training samples, and regularization strength (ß-VAE variation). Model quality is evaluated using Kullback–Leibler and Jensen–Shannon divergences, Wasserstein distance, and latent-space visualization to assess manifold continuity and separation.

Preliminary results show that the VAE successfully learns a smooth one-dimensional latent representation corresponding to the circular manifolds and reconstructs the original structures, albeit with distortion that warrants further experimentation. These findings highlight how VAEs capture intrinsic geometric structure, offering an intuitive window into how generative models compress and reconstruct complex data.

28
3:30-4:15pm
2nd Floor Hall

Emma Pickett (Biology)
Mentor(s): Santillan, Donna (Obstetrics/Gynecology)

Maternal and Fetal Liver Gene Expression Responses to Perfluorooctane Sulfonic Acid (PFOS) Exposure in Mice.

Perfluorooctane sulfonic acid (PFOS), a persistent environmental contaminant, is linked to metabolic and reproductive disorders. This study investigates how PFOS exposure affects liver metabolism in pregnant mice (dams) and their fetuses. Mice were exposed to PFOS (2 mg/L) or water (control), and liver tissues were collected from both dams and pups for RNA analysis and followed by qPCR. PFOS exposure altered expression of genes involved in glycolysis and oxidative stress. These results suggest PFOS disrupts liver metabolism and mitochondrial function in both dams and pups.

29
3:30-4:15pm
2nd Floor Hall

Landon Moran (Mathematics)
Mentor(s): Nachtman, Jane (Physics & Astronomy)

Developing Technical and Engineering Skills for DUNE

My project was conducted under the collaboration of the international Deep Underground Neutrino Experiment (DUNE) and focused on developing the technical and engineering skills required for building and testing cryogenic detector components. The original objective was to design and assemble a liquid argon test stand for evaluating neutrino detector electronics; however, due to scheduling and funding conflicts, the project shifted toward laboratory preparation and skill development. Over the course of the summer, I gained hands-on experience in soldering, circuit troubleshooting, and instrumentation

setup, as well as computer and monitor testing for lab organization. I also learned to use Autodesk Fusion (CAD) to design components that will support future testing procedures. Additional work included sharing soldering and electronics debugging techniques with other students as well as commissioning a cosmic ray detector. These experiences provided practical exposure to experimental techniques and problem-solving approaches that make up large-scale particle physics projects such as DUNE.

30
3:30-4:15pm
2nd Floor Hall

Landen Freeman (Physics, Math)
Mentor(s): Hostert, Matheus (Physics & Astronomy)

Neutrino Oscillation and the Mass Ordering Problem at JUNO

The neutrino provides a unique window into physics beyond the Standard Model. Because of its special quantum mechanical nature, the flavor of a neutrino oscillates as it propagates through spacetime. One question that remains open is the ordering of the neutrino mass eigenstates, often referred to as the mass ordering problem. This project reviews the theoretical framework of neutrino oscillation and highlights how reactor antineutrino experiments such as JUNO can work to solve the mass ordering problem through precise interference measurements.

31
3:30-4:15pm
2nd Floor Hall

Vincent Ruiz (Neuroscience)
Mentor(s): Gumusoglu, Serena (Obstetrics/Gynecology) | **Robert Taylor** (Psychiatry)

Prenatal Exposure to PFOS Alters Behavior, Vasculature and Myelination in Mouse Offspring

PFAS, or per- and polyfluoroalkyl substances, are very stable chemicals known as “forever chemicals” due to the fact that they can last in the body for decades, and can be easily absorbed into the human body. Recently, they have been linked to defects in many aspects of health, including hormonal and immune changes. The effects of these chemicals have been well-documented in the adult body, but the effects of PFAS on neurodevelopment is thus far largely unexplored. Our lab looks at the effects of PFOS, or perfluorooctane sulfonic acid, which is one of those forever chemicals, on the neurodevelopment of mice. To evaluate the effects of PFOS, we ran various behavioral tests on the mice. We also performed quantitative polymerase chain reaction (qPCR) to examine various gene expressions of vasculature and myelination in these mice. Our

genetic analyses revealed differences in the levels of expression of several related genes. These results have important implications for pediatric health and the future accepted levels of PFAS.

32
3:30-4:15pm
2nd Floor Hall

Abdul Quraishi (Chemistry BA)
Mentor(s): Thompson, Darrin (Ctr Hlth Effect Of Enviro) | **David Cwiertny** (Civil-Environmental Engin)

Assessing Fluoride Concentrations in Iowa's Groundwater and Drinking Water: Implications for Public Health and Water Management

This study examines fluoride distribution in Iowa's groundwater and drinking water. While fluoride helps prevent dental caries, excessive levels pose health risks. The U.S. Public Health Service recommends 0.7 mg L^{-1}, with EPA limits of 2 mg L^{-1} (secondary) and 4 mg L^{-1} (maximum). Using data from the Iowa DNR and USGS, the study analyzed 9,011 groundwater samples (1931–2017) and 26,280 treated water samples (1934–2021). Groundwater fluoride ranged from <0.1 to 11.2 mg L^{-1} (mean 0.65 mg L^{-1}; median 0.35 mg L^{-1}); 69% were below 0.7 mg L^{-1} and 7% exceeded 2 mg L^{-1}. Elevated concentrations occurred in deeper wells and aquifers such as the Cambrian–Ordovician and Mississippian. Treated water averaged 0.87 mg L^{-1}, about 0.24 mg L^{-1} higher than untreated sources due to fluoridation. Levels peaked between 1980–1999 and declined after 2015 following new federal recommendations. Results show strong regional variability linked to geology, well depth, and anthropogenic influences. These findings support targeted management to maintain safe, effective fluoride levels in Iowa's drinking water.

33
3:30-4:15pm
2nd Floor Hall

Olivia Sassman (Neuroscience)
Mentor(s): Wemmie, John (Psychiatry)

Role of acid-sensing ion channel 1A (ASIC1A) in stress-induced mechanisms of opioid tolerance

Opioid use disorder is characterized by compulsive opioid use, commonly resulting in a significant degree of tolerance. Opioid tolerance is when increased doses of opioids are required to achieve the desired effects of the drug, and this tolerance is a major driver of opioid overdose deaths. Previous studies from our lab suggest a role for acid-sending ion channel 1A (ASIC1A), a cation channel activated by extracellular pH expressed broadly in the brain, in responses to opioid exposure. Mice lacking ASIC1A (Asic1a-/-) show increased locomotor

activity following high dose oxycodone after 8 days of chronic exposure, suggesting a potential role for ASIC1A in neuroadaptations to chronic opioid exposure. This observation led us to investigate whether ASIC1A influences tolerance to the analgesic effects of oxycodone. Nociceptive responses were assessed using the hot plate test before and after acute oxycodone (8mg/kg s.c.). On day 1, baseline (BL) latencies did not differ between genotypes. Mice of each genotype were randomly split and adjusted to have equivalent BL hot plate response. The mice received either saline or escalating oxycodone injections (10-40 mg/kg, s.c., twice daily for 8 days). On day 10, post-injections, all groups received 8mg/kg oxycodone and were retested on the hot plate. All groups exhibited increased latency following oxycodone. However, Asic1a+/+ mice treated with oxycodone showed reduced latency compared to day 1, consistent with tolerance development. Unexpectedly, Asic1a+/+ saline treated mice also showed reduced latency as compared to day 1, suggestive of stress-induced tolerance, a known phenomenon dependent on μ-opioid signaling in which repeated stress exposure enhances the development of opioid tolerance. In contrast, Asic1a-/- saline treated mice did not show this latency reduction, this suggests that ASIC1A could play a role in stress-induced mechanisms that produce tolerance independently of repeated opioid exposure. Future studies could investigate the role of ASIC1A in stress-induced tolerance using alternative administration methods such as implanted oxycodone pellets or fewer injections to minimize handling stress, and could test whether pharmacologically enhancing ASIC1A activity allows lower opioid doses to maintain analgesic effects.

35
3:30-4:15pm
2nd Floor Hall

Brandon Cole (Biomedical Sciences)
Mentor(s): Talbert, Erin (Health Sport & Human Phys)

TGF-beta Suppresses Expression of CoA Synthesis Enzymes

Cancer cachexia is a muscle and fat-wasting complication of cancer that causes 30% of cancer-related deaths. TGF-ß has been associated with cachexia and has been associated with down-regulation of Acetyl Coenzyme A (CoA) levels, which can be caused by low CoA availability. The rate-limiting step of CoA synthesis is Pantothenate Kinase (PanK) with isoforms 1, 2, and 3. The step before PanK involves Vanin 1, which takes Pantetheine and turns it into Pantothenate. There is little information about the effect TGF-ß has on PanK and Vanin expression. We found in C2C12 myotubes treated with TGF-ß, there was a moderate decrease in PanK1. We saw a statistically significant decrease in treated cells of PanK3.

Additionally, we found a statistically significant decrease in Vanin1. The results show that increased TGF-ß decreases the expression of PanK and Vanin in the cells, which likely decreases CoA synthesis and subsequently decreases energy output. Taken together, our data suggest TGF-ß may reduce CoA in cachectic muscle. Therefore, TGF-ß may cause decreases in CoA that explain the shift towards glycolytic metabolism known to occur in cachectic muscle.

35
3:30-4:15pm
2nd Floor Hall

Savannah Downing (Music Therapy and Psychology)
Mentor(s): Dvorak, Abbey (Music)

Music-Assisted Relaxation for Stress Management in Pediatric Oncology

Children in pediatric oncology settings experience high level of stress during hospitalization. Music therapy may assist with stress management due to overlapping neural systems involving music processing and stress-related biopsychosocial functioning. The purpose of this project was to synthesize the available literature and craft a music-assisted relaxation intervention to improve stress management for pediatric oncology patients. My research question included: How, if at all, can music characteristics be crafted for music-assisted relaxation for pediatric patients? I reviewed research articles and summarized information about music-assisted relaxation in music therapy and related professions. I completed a therapeutic function of music analysis to identify characteristics of the music and crafted a music-assisted relaxation intervention based on the research synthesis. I also created a written treatment plan and video recording of the intervention. Overall, music-assisted relaxation is a useful intervention for stress management in pediatric oncology settings. Implications for practice and suggestions for future research are discussed.

36
3:30-4:15pm
2nd Floor Hall

Ryan Dunn (Physics, Astronomy, Mathematics)
Mentor(s): Nachtman, Jane (Physics & Astronomy)

Study of Hybrid Neutrino Detector Deployment for Weapons Test Verification

Hybrid scintillation-Cherenkov neutrino detectors are capable of event reconstruction from photon time-of-flight information. These detectors use a combination of water-based liquid and slow scintillators (WBLS), which allows for source direction of the neutrino signal to be found. Neutrino detectors can observe antineutrinos from nuclear activity on Earth, which renders them critical to nuclear nonproliferation applications. To prove the efficacy of neutrino detectors for the above applications, I studied a simulated hybrid detector run

through the RATPAC2 simulation suite and examined its response to nuclear activity generated in CONFLUX. I observed the responses for various nuclear reactor source types and distances to determine the maximum effective range of detection above noise.

37
3:30-4:15pm
2nd Floor Hall

Parker Nicks (Chemistry, Math)
Mentor(s): Forbes, Tori (Chemistry) | **Nicholas Dahlen** (Chemistry)

Isolation of a Thorium Peroxide Complex to Model High Activity Speciation

Thorium is an inherently radioactive element that demonstrates potential for applications in nuclear energy and radiopharmacology. This radioactivity presents a challenge for developing these applications. The ionizing radiation it emits causes the radiolysis of water, the process of ionizing radiation interacting with water to form reactive oxygen species, one being hydrogen peroxide. Both applications of thorium will involve chemistry with thorium in the presence of water, but interactions between thorium and peroxide are poorly understood. The goal of this work was to synthesize thorium peroxide complexes by using the chelating ligand DTPA to prevent the precipitation of hydrolysis products. After extensive testing involving the optimization of numerous variables, single crystals were grown and characterized by single-crystal X-ray diffraction and Raman spectroscopy. Investigating this thorium peroxide complex will enable studies on the coordination chemistry, vibrational modes, and reactivity of this species. Ultimately, studying thorium peroxide will inform the safe development of aqueous thorium applications.

38
3:30-4:15pm
2nd Floor Hall

Marissa Majewski (Chemistry)
Mentor(s): Williams, Florence (Chemistry)

Tuning Florescence with Boron

Fluorophores are molecules that absorb light at specific wavelengths and then re-emit that light at longer, lower energy wavelengths in a process known as fluorescence. This process occurs when an electron absorbs a photon to become excited to a higher energy state. The electron then relaxes back to a lower energy state (ground state) and emits a new, lower-energy photon. This lower-energy photon is responsible for the glow that is commonly seen with fluorophores. Fluorescence is highly selective and sensitive, which makes it an effective process for detection of desired chemical processes. My research focuses on observing the effect of boron as a free agent on various fluorophores

by measuring changes in fluorescence emission. I am specifically looking to see how boron affects fluorescence as part of a larger project that is looking to use boron-doped metal organic frameworks (MOFs) to detect glucose in the blood. Chemistry is a field that is always growing, and in my case, glowing!

39
3:30-4:15pm
2nd Floor Hall

Nicholas Cory (Human Physiology)
Mentor(s): Mclendon, Jared (Pharm Sci & Exper Therap)

Identify and prioritize candidate cytoskeletal adapter proteins for heart therapy.

Heart failure research has revealed a surprising paradox: genes associated with centrosomes (cellular structures that organize cell division) are dysregulated in failing hearts—despite the fact that adult heart muscle cells (cardiomyocytes) no longer divide and lack typical centrosomes. Instead, these cells contain atypical centrosome-like structures rich in adapter proteins that regulate the cytoskeleton, but their functions in heart tissue remain largely unknown. Our long-term goal is to develop innovative therapies for heart failure by targeting these cytoskeletal adapter proteins (CAPs) in cardiomyocytes. This project aims to identify and prioritize the most promising CAP candidates for detailed investigation. We've developed a systematic approach to discover, prioritize, design, validate, and test candidate CAPs. Our focus is on the Cep and Ccdc protein families, which share distinctive structural features—extensive coiled-coil domains and disordered regions—that enable dynamic, context-specific protein interactions vital for cellular function. Through our research, we've identified two high-priority targets: Ccdc93, linked to myocardial infarction, and Cep68, associated with atrial fibrillation. We're now designing CRISPR guide RNAs to selectively eliminate these proteins in experimental models. During this fellowship, we will create multiple guide RNA pairs for each gene and evaluate their knockout efficiency through DNA sequencing. The most effective guide pairs will be packaged into adeno-associated virus (AAV) particles and delivered to mouse hearts expressing the Cas9 enzyme specifically in cardiomyocytes. After successful knockout of either Ccdc93 or Cep68, we will assess heart structure and function using our established cardiovascular research techniques.

40
3:30-4:15pm
2nd

Neil Manickam (Psychology)
Mentor(s): Williams, Aislinn (Psychiatry) | **Isaias Herring** (Psychiatry)

16p11.2dp/+: A Microduplication with Macro Implications

Floor Hall

Genetic copy number variants (CNVs) are mutations in which extra copies of a gene are created or lost. They affect the brain by altering gene expression, often leading to changes in the production of proteins that are critical for healthy neurological function. The CNV we study is the 16p11.2 microduplication (16p11.2dp/+), which is associated with neuropsychiatric disorders including schizophrenia, autism spectrum disorder, and attention deficit/hyperactivity disorder. These disorders show structural abnormalities in the cerebellum that are also observed in 16p11.2dp/+ mouse models; however, the precise morphology, localization, and functional implications of the affected cerebellar cell populations have not been thoroughly characterized. Previous work in the Williams Lab identified lobule VI–specific alterations in Purkinje cell localization and decreased parvalbumin expression within the apical two-thirds of the molecular layer, where interneurons that regulate these cells reside. These structural differences were initially observed in mutant mice aged 3.3–3.5 months, but earlier developmental timepoints have not been investigated and would provide insight into potential mechanisms contributing to the mislocalization of Purkinje cells and differential expression of parvalbumin. To establish a developmental timeline for the onset of these structural changes, we are using immunofluorescent microscopy to label these Purkinje cells and molecular layer interneurons, enabling both quantitative cell counts and qualitative assessment of structure. Similar to what we saw in the roughly 3-month-old mice, initial observations of Purkinje cell morphology in 1-month-old mice indicate structural differences in cell body size/shape and dendritic arbor complexity. Parvalbumin expression in molecular layer interneurons also seems dissimilar in mutant mice compared to those without the microduplication. Identifying the temporal sequence of these alterations will substantially advance our understanding of the 16p11.2 microduplication and its role in psychiatric disorders, potentially informing future therapeutic strategies.

41
3:30-4:15pm
2nd Floor Hall

Audrey Coleman (Biochemistry & Molecular Biology)
Mentor(s): Weigel, Ronald (Surgery)

The Role of TFAP2c in Tumorigenesis and Progression in HER2+ Breast Cancer

Human epidermal growth factor receptor 2 (HER2)-positive breast cancer accounts for 20% of all breast cancer diagnoses and is associated with poor outcomes and higher mortality rates compared to other subtypes of breast cancer. Transcription factor activator protein 2 gamma (TFAP2c) has been shown to act as a key transcriptional regulator in HER2-positive breast cancer driving

growth and invasiveness. Studying how TFAP2c loss influences tumor formation provides insight into the molecular pathways that promote HER2-positive breast cancer. We hypothesize TFAP2c, encoded by the Tfap2c gene, promotes tumorigenesis and knockout will result in delayed tumorigenesis. To investigate the role of TFAP2c in breast cancer, we treated MMTV-Neu TFAP2CFl cells with Ad-Cre or Ad-GFP-Cre to generate a TFAP2C KO and either Ad-EV or Ad-GFP as a control. The effect of Tfap2c KO on cellular proliferation was assessed in vitro using MTT assay. Furthermore, the effect of Tfap2c KO on tumorigenesis was studied in vivo through measurement of tumor formation and tumor volume progression from flank injections of both Ad-Cre and Ad-EV conditions in NOD/SCID (immunocompromised) and FVB (immunocompetent) mice. To further investigate transcriptional pathways associated with Tfap2c in breast cancer, RNA was extracted and analyzed through RNA-seq, which was utilized to perform gene set enrichment analysis (GSEA). Analysis of the MTT assay revealed significantly decreased cellular proliferation in TFAP2C KO cells compared to control ($p<0.0001$). Analyzing tumor free survival in the in vivo tumor formation experiment showed a significant decrease in both NOD/SCID ($p=0.006$) and FVB ($p=0.0007$) for Ad-Cre, with a 100% probability of tumor free survival for Ad-EV in both mouse strains. Results from RNA-seq analysis revealed 1495 genes were significantly different between cells treated with Ad-GFP and cells treated with Ad-GFP-Cre. Subsequent GSEA revealed cells treated with Ad-GFP-Cre were associated with upregulated genes involved in interferon gamma and interferon alpha that support immune response, as well as an upregulation of genes involved in the p53 pathway, which is important for tumor suppression. These experiments suggest Tfap2c plays a critical role in tumorigenesis and progression in HER2+ breast cancer. To further understand the role of Tfap2c in tumorigenesis, we plan to assess changes in chromatin binding/accessibility.

42
3:30-4:15pm
UCC-2520D

Isabella Holtze (Cinema)
Marisa Rodriguez (Theater Arts)
Mentor(s): Miracle, Stephanie (Dance) | **Daniel Fine** ()

FAKERS CLUB: Fanny and Calvin

The GCRU research builds on creative research by Professor Stephanie Miracle and Daniel Fine, for the international collaboration FAKERS CLUB: live cinema choreography for public spaces. ‘Live cinema’ allows audiences to view the world through the lens of cinematography and choreography. This research shifts audience perspectives through distance, vehicular movement, and

architecture—reframing the way that they view and interact with the spaces around them.

The project developed for our research is “The Fanny & Calvin Episodes”: a two-person buddy comedy experimenting with character, color, and camera-less cinema. The work is designed to be viewed by extremely intimate audiences of four people at a time, and operates as a three-part series passing in, around, and through the Chauncey building in downtown Iowa City.

43
3:30-4:15pm
UCC-2520D

William Sprengelmeyer (Biology)
Mentor(s): Adrain, Tiffany (Earth, Envir, Sustainblty) | **John Doershuk** (State Archaeologist)

3D Scanning and Publishing Paleontological Collections: Dolly the Mastodon

In August 2024, the first ever scientifically excavated mastodon skull was collected in Wayne County, Iowa, and transported to the University of Iowa Office of the State Archaeologist for stabilization/preparation for display in the Prairie Trails Museum. In order to document and make publicly accessible the preparation process, the skull and all other mastodon remains from the excavation site were 3D scanned using an Artec Leo 3D scanner and software to collect data and create digital reconstructions of the specimens. The data was published online to both academic and public forums including Morphosource – an online database for paleontological research administered by Duke University - and SketchFab – an online database for 3D models of any kind, available to anyone from the public to publish to or download from. The 3D models were satisfactory in most key areas, especially geometric accuracy, and their publication process was without issue. However, some scans required texture modifications that differ from the real specimen’s color. Most errors in collecting and creating accurate textures resulted from their substantial size and irregular shape in both well and poorly preserved areas. The skull was especially difficult to scan and model, as its size pushed the limits of the computer that ran the Artec software. This process revealed potential challenges for future scanning and publication of large paleontological specimens. Future scanning methods should focus on collecting as much data as possible while minimizing file size to create models accurate to their real-life counterparts in a more efficient manner to reduce the amount of time required to process each specimen.

44
3:30-4:15pm
UCC-2520D

Kristin To (Computer Science)
Calvin Czeschin (Cinema & Screenwriting)
Mentor(s): Olsen, Kaia (Cinematic Arts)

Using 3D Gaussian Splatting (3DGS) for Cultural Access at the Stanley Museum

Interacting with art is a deeply enriching experience. Additionally, the Stanley Art Museum's extensive collection in contemporary Western art and African art offers valuable cultural context. However, engaging with these works requires visiting the museum. While the Stanley Art Museum offers an online collection, viewing artworks as static photos on a website disregards important context that comes from experiencing the artworks in a physical space. The intentional design of the museum, the order in which pieces are arranged, and the thoughtful curation of each display is integral to understanding art as a whole. How can one fully experience a museum's artworks and atmosphere outside of the museum's setting?

Our research explores the use of Gaussian splatting, a 3D rendering technique that uses light rays to capture and reconstruct realistic images of objects/spaces. While Gaussian splatting technology is not new (invented in 2023), it remains costly and resource-intensive. Our goal is to make this process more accessible by developing a simplified capture pipeline.

Using Canon 7Ds that were sourced from the university's production unit in the Becker Communication Studies Building we were able to capture the Bell Gallery and the art pieces within it with only three cameras. We conceived a plan to capture the gallery without having to have a large and costly setup by doing orbits of specific areas of the room in order to capture the general layout of the room. However for the art pieces, outside of the center piece in the room, we would do half orbits around them. While doing these half orbits we would capture the pieces from five different angles. Two angles from a lower perspective, one at a medium height, and two from a higher perspective. The reason we needed to capture all of these angles is that so there would be coverage of as much of the art pieces and surrounding area as possible when putting the data into Postshot.

We use Postshot to process and visualize our Gaussian splats. Gaussian splats are 3D point clouds where each point is an ellipsoidal "splat" with position, covariance, color, and opacity properties. Splat properties are then adjusted over many iterations to accurately recreate the original scene from any viewpoint. Postshot also allows us to resize and delete unnecessary points in the Gaussian

splat. The Gaussian splat is then compiled into Unreal Engine. In Unreal Engine, we create an immersive experience that allows users to virtually explore the museum environment and interact with artworks, imitating a physical gallery space.

45
3:30-4:15pm
UCC-2520D

Mayra Gomez (Political Science)
Eric Newton (Computer Science, Music)
Mentor(s): Novak, Nicole (CommunityBehavioralHealth) | **Julianna Pacheco** (Political Science)

The Iowa Vital Voices Project: Participatory action research to promote Latino civic engagement, political voice, and community health

The Iowa Vital Voices Project is a community-driven research initiative that uplifts Latinx voices and collects data to advance civic engagement and public health in Iowa. Founded in 2023, the project is a partnership between the League of United Latin American Citizens (LULAC) of Iowa, researchers at the University of Iowa, a Community Advisory Board of LULAC leaders from throughout Iowa, and Students Advancing Latino Unity & Democracy (SALUD). Throughout the project's duration, we have been able to build trust continuously and further understand how communities utilize their civic power. It aligns with data analysis, storytelling, and community surveys, which empower communities to shape their own narratives, make informed decisions, and advocate for meaningful change. This exhibit will include a scientific poster along with banners, brochures, stickers, and t-shirts that our team uses while collecting surveys and representing the project at community events. This project has been supported by The Robert Wood Johnson Foundation, the Mid-Iowa Health Foundation, the University of Iowa Office of the Vice President for Research, and the Office of Undergraduate Research.

46
3:30-4:15pm
UCC-2520D

Kathit Patel (Biomedical Sciences)
Mentor(s): Resch, Jon (Neurosci & Pharmacology) | **Trevor Butler** (Biology)

Investigating Lateral Hypothalamic Area and Periventricular Hypothalamus Mediated Thirst.

Maintaining fluid balance is crucial for good health. When the body loses water, one way the brain responds is by driving thirst, a behavior that helps replenish fluids and restore balance. A structure in the anterior hypothalamus called the lamina terminalis (LT) is a crucial regulator of thirst within the brain. Within the

LT, there are three interconnected nuclei: the organum vasculosum of the lamina terminalis (OVLT), the subfornical organ (SFO), and the median preoptic nucleus (MnPO). The SFO and OVLT have a leaky blood-brain barrier, allowing them to detect signals of dehydration in the blood and send this information to the MnPO, which integrates thirst signals. However, the thirst circuitry downstream of the MnPO is poorly understood. Recently, optogenetic experiments have shown that stimulation of excitatory MnPO projections to the paraventricular thalamus (PVT), lateral hypothalamic area (LHA), and paraventricular hypothalamus (PVH) is sufficient to drive thirst. However, it is still unclear whether the PVT, LHA, and PVH are necessary for thirst. Using optogenetic silencing, we found that MnPO to LHA projections are necessary for thirst. To further characterize this circuit, we performed a real-time place preference (RTPP) to assess if inhibition of glutamatergic MnPO to LHA projections is rewarding in water deprived mice. Additionally, to assess patterns of neuronal activity during water deprivation, we performed Fos immunofluorescence and cell counting in the LHA of water-deprived and euhydrated mice. In parallel, we also performed chemogenetic inhibition of the PVH after overnight water deprivation to assess if the PVH is necessary for thirst. Together, these experiments aim to dissect the specific roles of the LHA and PVH in mediating thirst and fluid balance, providing insight into how distinct hypothalamic populations interact to maintain homeostatic control of hydration.

47
3:30-4:15pm
UCC-2520D

Erin Morrow (Health Studies)
Mentor(s): Souzatalarico, Juliana (Nursing)

Engaging Rural Communities to Understand Psychosocial Stress Impacting Brain Health in Latino Middle-Aged and Older Adults

This study aims to identify the psychosocial stressors and the stress biological responses associated with AÎ² and tau protein in rural middle-aged and older rural populations. The findings can inform a theoretical framework to guide a more extensive study, which is vital for achieving our long-term goal of elucidating the mechanisms linking psychosocial and environmental factors to AD risk in rural populations.

48
3:30-4:15pm

Samuel Buman (Political Science)
Mentor(s): Lai, Brian (Political Science)

Are Terrorists Using Generative AI to Spread Propaganda?

UCC-2520D

I used supervised machine learning to perform sentiment analysis for several hundred thousand Telegram posts discussing the Israeli-Hamas conflict to determine post sentiment on attitudes towards Israel. Based on this categorized data, I performed a series of quantitative tests to determine trends in post quantity and sentiment as indicators of terrorist or other extremist actors using generative AI for messaging. My research supports the argument that extremist actors are using generative AI tools for propaganda.

49
3:30-4:15pm
UCC-2520D

Riley Rosenmeyer (Neuroscience)
Mya Messenger (Health and Human Physiology)
Mentor(s): Yang, Shujie (Pathology)

Developing Novel Endometrial Cancer Drug Treatments using Patient-Derived Xenograft Models In-Vivo and In-Vitro

Over the last 40 years, endometrial cancer has been the only cancer type with declining survival rates among all the cancer types, highlighting the urgent need for improved treatment. In Iowa, there will be an estimated 700 new cases and 120 deaths in 2025, and 9,110 endometrial cancer survivors. The heterogeneous nature of EC contributes to varied outcomes with current treatments. As each patient is different, this project aims to establish reliable endometrial cancer models for characterizing each individual tumor, distinguish optimal drug treatment, and determine specific drug effect mechanisms for personalized therapy. Our lab has collected over 100 patient endometrial tumor samples and successfully established 53 patient-derived xenograft models (PDX) and 14 patient-derived primary cancer cell lines (PDC). Using these novel tumor models, we are able to screen approved anticancer drugs and discover more outstanding drugs than current standard chemotherapy. Our unique PDXs and PDCs are excellent models for representing various characteristics of EC and testing novel therapeutics. This research presents a promising direction for developing personalized therapy options for EC patients and provides a platform for further investigation of drug mechanisms and tumor development. This information will aid in the prevention, diagnosis, and prognosis of endometrial cancer.

50
4:20-5:05pm
2nd

Kassandra Sigafus (Biology)
Mentor(s): Phillips, Bryan (Biology)

Floor Hall

Is ABCF-1 the Missing Link in the RNA Processing Body Assembly Pathway in C. elegans?

Protein aggregation is a hallmark of neurodegenerative diseases such as Alzheimer's and ALS, where misfolded proteins form toxic amyloid aggregates. Interestingly, cells also use controlled protein aggregation to organize biochemical reactions—forming dynamic, reversible structures like RNA Processing bodies (P-bodies). Both amyloids and P-bodies rely on similar phase-separation principles, but while amyloids are harmful, P-bodies are essential for normal RNA regulation. Like membrane-bound organelles, membraneless organelles compartmentalize cellular processes without a surrounding membrane. These structures, made of proteins and nucleic acids, form through liquid–liquid phase separation. In Caenorhabditis elegans, P-body assembly depends on regulatory proteins PAB-1 (polyA-binding protein), CGH-1 (RNA helicase), and CAR-1 (RNA binding protein), and loss of any of these proteins causes abnormal aggregates and germline defects.

We hypothesize that ABCF-1 acts as a disaggregase that regulates P-body assembly and prevents excessive aggregation. ABCF-1 shares sequence similarity with the yeast disaggregase NEW1, which functions independently of HSP104. In C. elegans, loss of ABCF-1 leads to increased P-body aggregation marked by CAR-1, suggesting that ABCF-1 may regulate the P body assembly pathway or specifically interact with PAB-1, CGH-1, or CAR-1 to maintain P-body dynamics. To test this, we used RNA interference (RNAi) to reduce abcf-1 expression in CGH-1::GFP and PAB-1::GFP reporter strains. In both cases, ABCF-1 knockdown produced visible GFP-positive aggregates in the germline. These results suggest that ABCF-1 helps dissolve or prevent large P-body aggregates by individually regulating multiple P body components, linking normal protein quality control in worms to mechanisms relevant to human neurodegenerative disease.

51
4:20-5:05pm
2nd Floor Hall

Katie Noll (Music Therapy)
Mentor(s): Allen, Jonathan (Music)

The Role of the Pelvic Floor in Respiration: Considerations for Brass Pedagogy

Conventional trombone pedagogy has much to say on the way the diaphragm and abdominal muscles play a role in breathing. Emerging research in the physiology of breathing is now highlighting how the pelvic floor muscles also play a role in allowing the body to take a full, relaxed breath. From a respiratory

context the pelvic floor functions similarly in biological men and women but they will experience different challenges to pelvic floor function throughout their lives. Understanding the role of the pelvic floor in respiration from a physiological context can help provide insights from trombonists experiencing various pathologies of the pelvic floor. Urogynacological, kinesiological, and pedagogical literature that informs the connection between breathing and the pelvic floor will be presented. Practical applications, directions for future research, and implications for different pathologies of the pelvic floor will be discussed.

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4:20-5:05pm
2nd Floor Hall

Noura Ibrahim (Public Health)
Mentor(s): Nidey, Nichole (Epidemiology) | **Jonathan Platt** (Epidemiology)

Maternal Health in Migrant Communities (public health related)

I participated in a service-learning program in Costa Rica focused on maternal and child health. My role centered on evaluating how EBAIS, the country's community-based primary healthcare system, delivers maternal and child health services in underserved migrant and rural communities. This experience deepened my understanding of public health within a universal healthcare model, strengthened my commitment to equity, and underscored the importance of culturally competent care. I collaborated with my team to create an evaluation framework focusing on access, equity, patient satisfaction, and care coordination for marginalized populations.

53
4:20-5:05pm
2nd Floor Hall

Annika Ellis (Nursing)
Mentor(s): Ching Chi, Nai (Nursing) | **Kyuri Lee** (Nursing)

Profiling verbal interactions between persons with nursing home staff and persons with dementia

Effective communication is crucial to Person-Centered Care (PCC) for Persons with Dementia (PWD) during mealtimes as verbal interactions can influence engagement. This study analyzed 12,959 verbal behaviors in 245 full-mealtime videos in long-term care settings using the CUED coding scheme. Staff produced 9,176 positive verbalizations, including "Orientation/Giving Instruction" (24.80%) and "Giving Choices" (16.46%). Of staffs' 1,781 negative verbalizations, most involved side conversations (42.57%). Residents contributed 2,066 verbalizations in the dyadic conversations (86% positive, 14% negative). Notable resident unintelligible utterances were coded as "Unsure – positive" (30.66%). Additional common verbal resident behaviors included "Expressing personal

need or preference" (16.33%) and "Showing approval/agreement" (16.28%). Together, these dyadic interactions indicate an overall positive conversational tone with relatively infrequent negative themes, facilitating a deeper understanding of the context within dementia care communication. Pearson correlations revealed significant associations between staff and resident behaviors. Staff positive behaviors were positively correlated with both resident positive ($r = .288$, $p < .001$) and negative behaviors ($r = .275$, $p < .001$), suggesting that staff engagement prompted a range of resident responses. Staff negative behaviors were associated with resident negative behaviors ($r = .153$, $p = .016$). Additionally, longer durations of staff's negative side conversations were correlated to increased number of total negative staff behaviors ($r = .173$, $p = .007$). These associations indicate that while staff demonstrate many PCC behaviors, negative or off-topic conversations can still shape resident responses in unhelpful ways. Strengthening staff communication strategies to remain focused, positive, and inclusive may enhance mealtime engagement for PWD.

54
4:20-5:05pm
2nd Floor Hall

Kynan Renshaw (Human Physiology)
Mentor(s): Jennissen, Charles (Emergency Med)

Infant Safe Sleep Practices of Rural Iowa Adolescents

BACKGROUND

The number of infants <1 year of age that die of Sudden Unexpected Infant Death (SUID) in the U.S. each year is similar to that of the number of motor vehicle-related deaths in those <20 years. By following safe sleep practices, the risk of SUID can be decreased. Our study objectives were to: 1) determine the proportion of rural Iowa adolescents that take care of infants <1 year of age and in what capacity, and 2) identify the proportion that have placed infants <1 year of age to sleep and whether they always followed basic infant safe sleep practices.

METHODS :An anonymous survey was performed of 2025 Iowa FFA (formerly Future Farmers of America) Leadership Conference attendees at the University of Iowa Stead Family Children's Hospital safety booth. Surveys were completed either electronically on Qualtrics via phone or on paper which were later entered into Qualtrics. Data were exported and descriptive and bivariate (chi-square) analyses were performed using Excel and Vassarstats (http://vassarstats.net/).

RESULTS: 1641 adolescents 13-18 years of age completed the survey. Nearly three-fifths (59%) were 16-18 years old and over three-fifths (61%) were female.

Nearly half (48%) lived on a farm, 23% lived in the country, but not on a farm and 29% lived in a town. The vast majority (95%) were non-Hispanic White. Overall, nearly three-quarters (72%) had taken care of a child <1 year of age; of these, 55% had done so as a babysitter, 43% did so for a relative's infant (not a sibling) and 35% had taken care of a sibling <1 year of age. Overall, 57% stated they had placed a baby <1 year of age down for a nap or nighttime sleep. Of adolescents that had placed a baby <1 year of age down for sleep, 45% only reported places that would be considered safe (i.e., bassinet, baby's own crib, pack and play/portable crib). 55% stated places that would be considered unsafe (e.g., couch, recliner, car seat in the house, baby swing/bouncy seat, in bed with another child or adult). As far as the sleep position, 78% stated they only placed babies <1 year of age down to sleep on their back. There were no significant differences by sex regarding proportions that had taken care of a baby <1 year of age, that had babysat, taken care of a relative's child or had taken care of a sibling, that had placed a baby <1 year of age down to sleep, or that had reported always placing a baby in a safe place and a safe position to sleep.

CONCLUSIONS: Most rural adolescents in the study had placed a baby <1 year of age down to sleep with most having placed an infant in an unsafe place and one-fifth having placed infants not on their back. Adolescents should be targeted for infant safe sleep education, for example, in school and during babysitting classes.

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4:20-5:05pm
2nd Floor Hall

Jack Olson (Environmental Science (Hydrology))
Mentor(s): Swanson, Benjamin (Earth, Envir, Sustainblty)

Bank Erosion Evaluation of Camp Cardinal Creek

The University of Iowa established the Ashton Prairie Living Laboratory for students to explore environmental processes and trends. Camp Cardinal Creek flows adjacent to the constructed prairie at Ashton. The creek is incised into its floodplain and features numerous reaches with degraded channel banks. Some bank failures appear to be groundwater (pore pressure) controlled, rather than fluvial (stream flow shear stress) controlled, but it is unclear whether the changes in pore pressure are related to general groundwater flow or addition of water into the bank during high stream flow events followed by outflow when water levels recede. We intend to instrument a section of channel bank and monitor erosion, water table elevations, stream flow and stress, and the unsaturated zone hydrology to determine the primary erosion mechanism in the

reach and similar reaches of the Creek. The work will provide data for students, including Jack, to gain a better understanding of stream and hydrology dynamics, and provide data for class discussions in hydrology and associated courses.

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4:20-5:05pm
2nd Floor Hall

Taylor Lawrence (Microbiology)
Mentor(s): Kehl Fie, Thomas (Microbiology & Immunology) | **Riley McFarlane** (Microbiology & Immunology)

Identifying regulators of the S. aureus superoxide dismutases

Staphylococcus aureus faces two major threats from the immune system, metal limitation and oxidative stress. The host sequesters essential metals away from the site of infection, while also releasing a burst of harmful reactive oxygen species. To survive superoxide stress, S. aureus produces two superoxide dismutases (SODs). These enzymes detoxify superoxide by converting it into less harmful molecules. SODs sit at the intersection of oxidative stress defense and surviving metal starvation, as the SODs are necessary to resist superoxides, but their production increases the cellular demand for metals. The two SODs encoded by S. aureus are SodA, a manganese-dependent enzyme, and SodM, which can use either manganese or iron as a cofactor. How the conflicting demand of minimizing the use of metalloenzymes, maintaining a defense against oxidative stress and manganese starvation is resolved remains unknown. Discovering how S. aureus regulates its SODs is key for understanding the bacterium's ability to simultaneously manage these conflicting pressures. Understanding how pathogens evade the host immune system is critical to developing new strategies to fight infection. Despite the importance of SOD regulation, the regulators that control SodA and SodM expression remain unknown. A previous screen examined sodA and sodM transcription in a library of transposon insertions, identifying 18 transcription factors that influence SOD expression. These candidate regulators now require further investigation to determine how they control the expression of SodA and SodM in response to conditions varying in metal availability and oxidative stress.

57
4:20-5:05pm
2nd Floor Hall

Leah Aitchison (Health and Human Physiology)
Mentor(s): Carr, Lucas (Health Sport & Human Phys)

Patient and Provider's Perceived Acceptability of an Exercise is Medicine Protocol

Background: The American College of Sports Medicine's Exercise is Medicine (EIM) initiative calls for integrating physical activity into primary care by screening patients for inactivity and then counseling and/or referring inactive patients to local resources. However, patient and provider's acceptability of EIM programs are under researched. Purpose: To explore patient and provider's acceptability of an EIM initiative at a large midwestern hospital. Methods: Providers and patients from a large Family Medicine clinic exposed to an existing EIM program were recruited to complete online surveys assessing their perceived acceptability (e.g., understanding, like/dislike, perceived effort to participate, impact on quality of care, confidence in the process, satisfaction, thoughts on expansion to other patients/clinics) of an EIM program implemented in June 2023. Each item was assessed using a 5-point Likert scale. Descriptive statistics were used to analyze results. Results: Twenty-five providers (76% female, 43.3+8.2 years, 88% White, 15.6+9.1 years practicing, 76.4% physicians) and 380 patients (74% female, 43.1+12.4 years, 81% White) participated. Most providers "agreed or strongly agreed" that the EIM program improved patient care (74%), helped them manage their patient's health (68%), that they would continue using the EIM program (84%), and that the program should be expanded to other clinics (72%). Less than half of providers agreed/strongly agreed their patients understood the EIM process (48%). While most providers felt comfortable counseling patients on aerobic (96%) and muscle strengthening exercise (64%), few agreed they had sufficient time to counsel patients (36%). Most patients agreed or strongly agreed that they understood how to answer questions about their physical activity (89%) but fewer agreed that they understood how to connect with a health coach (40%). Most patients agreed/strongly agreed that other patients should be screened for inactivity (79%) and connected with a health coach (74%). Conclusion: These findings suggest both patients and providers support the implementation of an EIM program that screens patients for inactivity and connects patients to local health coaches for support. Additional research is needed to improve patients' understanding on how to connect with local health coaches.

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4:20-5:05pm
2nd

Samuel Lindgren (Neuroscience)
Mentor(s): Lalumiere, Ryan (Psychological Brain Sci) | **Aspen Holm** (Psychological Brain Sci)

The role of basolateral amygdala-medial entorhinal cortex pathway in memory strength and precision

Floor Hall

Memories exist along at least two axes: strength, or the degree of retention, and precision, or the degree of discrimination vs. generalization to other similar contexts. While it has long been established that the basolateral amygdala (BLA) plays a role in the consolidation of contextual memories, it is less understood what pathways from the BLA separately modulate memory strength or precision, particularly as memory strength and precision change across time. To address this, stereotactic surgeries were done on male Long-Evans rats wherein an inhibitory opsin (eNpHR3.0/Halorhodopsin) or a control vector (eYFP) was injected bilaterally into the BLA, with fiber optic probes implanted bilaterally above the medial-entorhinal cortex (mEC). This enables optogenetic inhibition, a temporally precise method of inhibiting specific neural pathways. After surgery, rats were trained on an inhibitory avoidance (IA) task wherein they were placed in a lit compartment and allowed to cross into a dark compartment where they were given a footshock. For 15 minutes following this training, the BLA-mEC pathway was optogenetically inhibited to target the post-training memory consolidation window. At both recent (2 days) and remote (28 days) timepoints after training, testing was done in the original chamber and a contextually modified chamber to determine the degree of both memory strength and precision. Results from 9 males showed that rats with BLA-mEC inhibition had greatly reduced memory strength compared to control rats when tested at the recent timepoint, and a similar reduction of memory strength at the remote timepoint, though this effect failed to reach significance. Given these results, the BLA-mEC pathway appears to be necessary for the consolidation of context-footshock association memories, especially the strength component of such memories. In the future, adding more rats to this experiment and possibly performing outlier analyses will increase statistical power and clarify any further effects on strength and precision, particularly at the remote timepoint.

59
4:20-5:05pm
2nd Floor Hall

Ava Nollen (Japanese, History)
Mentor(s): Young, Cory (History)

Beyond Banh Mi: Vietnamese Entrepreneurship in New Orleans from the Fall of Saigon through Hurricane Katrina, 1975-2011

This thesis examines the entrepreneurship in the food industry and community building of Vietnamese in New Orleans, as well as the racial inequities they faced, from 1975 to 2011. It argues that food—food business and food culture--helped bind together the Vietnamese diaspora who fled their home country, established a community in New Orleans East, and established what became

known as “Vietnamese New Orleanian cuisine”. The thesis examines their work in fishing and shrimping, backyard gardens, Saturday markets, food-based businesses such as restaurants and corner stores, and the community that was built within the Mary Queen of Vietnam Catholic Church. The thesis also highlights the roadblocks they faced in integrating into the city of New Orleans, including a lack of support from the municipal government and larger negative responses among mainstream Americans about the Vietnam War which had a negative impact on the perception of the New Orleanian Vietnamese community, painting them as ‘helpless’ or without agency. In the tragedy and aftermath of Hurricane Katrina, the Vietnamese community was underreported and used as a model minority juxtaposition to Black New Orleanians, when in reality they also faced significant issues after Katrina. However, in the wake of Katrina, the community organized and enacted grassroots movements. If you view the Vietnamese-New Orleanian experience through the timeline of their food culture, you can observe a narrative of how this community has grown, advocated, and worked together to form community projects and grassroots movements that define New Orleans history. This thesis draws from sources on New Orleans geography, American culinary history, various studies done on the residents of New Orleans East, and the primary sources of photographs by Mark Sindler and the Viet Chronicle Oral History Project.

60
4:20-5:05pm
2nd Floor Hall

Calla Brunkan (History and Social Studies Secondary Education)
Mentor(s): Gordon, Colin (History)

Letters from the Heart and Mind: The Vietnam War Correspondence Between Dick and Linda Kerber

This thesis examines the Vietnam War through the epistolary world of a mobile army unit doctor in the field and historian and mother at home in New York, Dick and Linda Kerber, in 1967-1968. Letters provide a personal and family perspective on the war, which is usually told through narratives of military strategies on the war front or anti-war protests on the home front. The letters give insight into what family life was like in New York City, where Linda is defending her dissertation while parenting their young son. They also provide the daily life as a mobile army surgical unit doctor at Bearcat Camp. Linda and Dick discuss the political and social climate, which interacts with their communication through censorship and shows the intense emotional aspect of their relationship while separated. Linda had to decipher the truth of what is happening through her husband’s letters, in which she questions if they are misrepresenting his

actual experience, and through the news. With the recent technological advancements, television provides 24/7 coverage of on-the-ground Vietnam War action, which Dick encourages her to ignore. Their anti-Vietnam War perspectives give insight on how citizens and military navigated life while being affected daily by a cause they do not believe in fighting for. By using the letters in Linda Kerber, Professor Emerita of History, University of Iowa's, personal collection, this thesis explores their relationship, reaction to historical events, and emotions.

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4:20-5:05pm
2nd Floor Hall

Delaney Sondgeroth (Biomedical Engineering)
Mentor(s): Gerard, Sarah (Biomedical Engineering)

Automated Analysis of Kidney Structure using Scanning Electron Microscopy and Deep Learning

Chronic kidney disease (CKD) remains a major global health burden, yet its diagnosis and assessment often rely on qualitative and subjective image interpretation. This project aimed to automate the analysis of kidney ultrastructure in scanning electron microscopy (SEM) images using deep learning techniques. This work developed and trained two convolutional neural network (CNN) models for biomedical image segmentation.

The first model utilized a U-Net++ architecture to automatically segment regions of interest in both healthy and diseased kidney samples, optimizing segmentation performance through adjustments in loss functions and hyperparameters. The second model, built using a standard U-Net architecture, focused on segmenting the filtration slits between podocyte foot processes, key structures in the kidney's filtration and indication of kidney disease. Quantitative analysis of these segmentation outputs enabled the measurement of slit density and the identification of pathological effacement associated with disease.

Together, these models demonstrate the potential of AI-driven image segmentation to objectively quantify structural changes in kidney tissue, reduce diagnostic variability, and enhance understanding of renal disease progression through computational imaging.

62
4:20-5:05pm
2nd

Sophia Heim (Environmental Science)
Mentor(s): Joachim-Lehmler, Hans (Occup & Environ Health) | **Nicole Breese** (Graduate College-Admin)

Floor Hall

Voluntary Oral Dosing of Polychlorinated Biphenyls in Mice: A Refinement of Traditional Gavage Techniques

Polychlorinated biphenyls (PCBs) are known to have an influence on the gut microbiome, which makes oral administration necessary to model environmental exposure and ensure gastrointestinal interaction. Traditional oral gavage techniques involve a feeding needle to administer the substance being studied to mice, which can be forceful and stressful to them. To mitigate these issues, we developed a voluntary oral method to dose 24 male and female APP/PS1 mice with PCBs. We started by providing individually calculated doses of peanut butter, based on body weight, on a weigh boat into the cage. For a one-week training period, mice were given a control dose to consume within a one-hour time window. A cage divider was used to minimize distractions and promote efficient consumption. After the training period, the divider was removed, and PCB exposure began. Following the training period, mice voluntarily consumed their full dose in under five minutes. After a 7-week PCB study, where mice were weighed daily, tissue weights were collected. Preliminary results showed a measurable biological effect: PCB-dosed mice exhibited a significant increase in liver-to-body-weight ratio than controls in both sexes. The efficient dosing of usually under five minutes supports the voluntary method's efficacy and practicality. Along with efficiency, this method reduces the potential stress induced by excessive handling and traditional techniques. The findings show that the voluntary approach is an effective and refined approach to oral gavage over traditional methods. To build on these findings, future directions include microbiome analyses, liver transcriptomics, and evaluating tissue PCB levels.

63
4:20-5:05pm
2nd Floor Hall

Alexandra Gutierrez (Public Health)
Mentor(s): Joachim-Lehmler, Hans (Occup & Environ Health) | **Laura Dean** (Occup & Environ Health)

Counting Astrocytes: A Flow Cytometry Screen for Culture Purity

Astrocytes are a subtype of glial cells, the most abundant cell type in the brain, that perform various roles within the nervous system. These roles include structural support, metabolic regulation, neuroprotection, growth, and homeostatic maintenance. To obtain a purified culture of rat primary astrocytes, a method was previously developed and confirmed through flow cytometry, a laboratory technique used to analyze and detect differences in cells or particles. In this study, we employed flow cytometry to test the hypothesis that our

cultures of primary rat astrocytes were pure astrocyte cultures. To test this hypothesis, 3x106 cells were labeled with anti-Iba1 and anti-GFAP primary antibodies and goat-anti-rabbit 488 and donkey-anti-mouse 647 secondary antibodies. Once labeled, cells were analyzed on a BD Accuri C6 flow cytometer with accompanying software. After gating for single cells labeled with either Iba1 or GFAP, we determined that our primary rat astrocyte cultures were >99% pure astrocytes (GFAP+ cells). Due to the expression of many xenobiotic metabolizing enzymes, such as P450s, SULTs, UGTs, and sulfatases in astrocytes, these pure primary astrocytes will be used to study the mechanisms driving the effects of polychlorinated biphenyls (PCBs) exposures in the future.

64
4:20-5:05pm
2nd Floor Hall

Piper Sandage (History)
Mentor(s): Bobrycki, Shane (History)

John Paston and His Sons: Knighthood

I argue that the two eldest Paston brothers, John Paston II and III, benefited from becoming knights in the 15th century. I draw on the famous Paston Letters, specifically transcribed by Davis Norman, to form the basis of my argument while drawing on secondary scholarly resources. I use a variety of secondary resources about knighthood, chivalry, medieval England, the gentry class, and so on. Each brother has their own reasons for becoming knights, whether by force or not, and I also compare and contrast their fathers relationship with knighthood. John Paston is the exception of his family by refusing knighthood and I use his experience, as seen through his letters, to further reinforce my argument for the brothers becoming knights being a positive. Additionally, I also discuss the fundamental changes and transformation of knighthood happening from the 13th to the 15th century when my Pastons are living. Overall, knighthood in 15th century England had lots of drawbacks like costs, rising obligations, and civil war. However, knighthood also offered substantial benefits like notoriety, legal status, military experience, and more. I believe that the risk of becoming a knight in 15th century England paid off beneficially for the two eldest John Paston brothers.

65
4:20-5:05pm
2nd

Justin Weber (History)
Mentor(s): Yale, Elizabeth (History)

Floor Hall

Virgin Troops, Maiden Cities, Monstrous Men: Gender, Siege Conduct & Rhetoric During the English Civil Wars

This thesis examines the perceptions of masculinity and femininity in seventeenth-century England and how they influenced siege warfare during the civil wars between king and Parliament from 1642 to 1648. It contributes to scholarship on gender in seventeenth-century English society, where the connection between gender, the civil wars and military action has received less attention from historians than the impact of gender on peacetime relationships and participation in English society and politics. I argue that preconceptions about gender and gendered roles were integral to informing siege involvement and heavily influenced decision-making during sieges as well as the discourse that spawned from them. Soldiers and civilians carried their preconceptions of gender into civil conflict, where ideal images of womanhood and manhood were tested and fractured by the realities of war. Masculine and feminine expectations were employed by women and men in relation to sieges to achieve objectives, be they as simple as the defense of one's personal honor or as significant as determining the outcome of an entire engagement. This thesis makes use of a variety of period newsbooks, broadsides and other pamphlets, as well as letters, articles of war, memoirs and sermons.

66
4:20-5:05pm
2nd Floor Hall

Grace Tesene (Biomedical Engineering)
Mentor(s): Offer, Steven (Pathology)

Partial alternative splicing of dihydropyrimidine dehydrogenase in carriers of rs75017182 explains modest association between the variant and severe toxicity to 5-FU relative to other biomarkers

Dihydropyrimidine dehydrogenase (DPD, encoded by the DPYD gene) is the rate limiting enzyme in the catabolism of the widely used chemotherapeutic drug 5-fluorouraicl (5-FU). Genetic variations in DPYD are predictive biomarkers of toxicity to 5-FU toxicity. One such biomarker rs75017182 (the causal allele linked to the "HapB3" haplotype) has been suggested to promote alternative splicing of DPYD leading to expression of an inactive proteoform. However, carriers of rs71501782 have only moderately increased risk of 5-FU toxicity and decreased ex vivo measurements of DPD function compared to another, well-studied, DPYD splice variant rs3918290 (commonly called *2A). We hypothesized that, unlike *2A, the variant allele of rs75017182 does not cause obligate alternative splicing and instead promotes only partial alternative splicing. To test our hypothesis, we

measured splicing in carriers of the rs75017182 variant allele and generated dual-fluorescent labeled minigene reporter constructs containing either the G (wildtype) or C (variant) alleles. In our minigene reporter system, alternative splicing was elevated in cells transfected with C-containing vectors via flow cytometry; however, the levels were lower than those seen in a parallel minigene modelling *2A. Within human samples, carriers of the G allele only showed canonical DPYD splicing, whereas transcripts consistent with both canonical and mis-splicing were detected in carriers of the variant C allele. Splice-specific quantitative RT-PCR showed a 30% reduction in canonical DPYD activity, which was consistent with the 35% decrease in DPD enzyme activity measured in subjects' cells. Overall, our findings demonstrate that the rs75017182-C allele promotes only partial alternative splicing, which elicits a modest decrease in DPD enzyme activity, explaining the comparatively week association between the variant and severe 5-FU-induced toxicity. It was noted that carriers of rs75017182-C exhibited marked variablility in splicing and enzyme function. Therefore, in future studies we will expand minigene reporter and human-specimen studies to investigate the potential contribution of other variants in linkage disequilibrium with rs75017182.

67
4:20-5:05pm
2nd Floor Hall

Ellie Felderman (History and Ancient Civilizations)
Mentor(s): Yablon, Nick (History)

Politics and the City: The New Yorker's Editorial Response to the Rise of Political Consciousness Among Audiences.

The celebration of the New Yorker's centennial has allowed for a unique examination of the iconic institution's rich evolution towards a more political tone, developing in accordance with some of America's most politically charged and historically impactful eras throughout the last one hundred years. Despite the initial intentions for the magazine to be a tabloid for the elite socialites of New York society, the New Yorker has spent the last century evolving into a spearhead for political and social commentary within American media. However, it was not just the magazine's content evolving, but also its audience. Although the periodical was initially characterized as New York-centric, events such as WWII, the Civil Rights Movement, the Cold War, the Vietnam War, the Feminist Movement, led the magazine's New York based audience to desire content that was not solely focused on the city itself, but pieces that emphasized the city's national and global intrigue in cultural, social, and political affairs as an involved metropolis. Over the years, the politics of America, both foreign and domestic,

compelled a greater sense of political consciousness among the American masses. This change in the consumer market demanded that media outlets, such as the New Yorker, adapt to cater to this intrigue. More specifically, the rise in political consciousness of audiences necessitated a response from the editors shaping the content these audiences consumed. However, while the content and mission of the New Yorker have evolved over the years, the organization has always prioritized a sophisticated tone for its magazine. The editors of the New Yorker, having insisted on maintaining a standard of quality while evolving their content, have allowed them to further their success among a growing audience throughout their run.

68
4:20-5:05pm 2nd Floor Hall

Fiona Holmes (Astronomy, Applied physics)
Mentor(s): Payre, Valerie (Earth, Envir, Sustainblty)

Effects of Grain Size On Visible/Near Infrared Signals In Feldspar-Bearing Terrains On Mars.

The Compact Reconnaissance Imaging Spectrometer for Mars (CRISM) has detected feldspar-bearing terrains with >30–60% feldspar in ancient Martian regions. However, the rock types hosting these feldspars—whether granitic, anorthositic, or basaltic—remain uncertain due to the lack of sub-millimeter scale compositional data. Because CRISM's reflectance measurements are influenced by grain size, this study investigates how feldspar grain size affects visible/near-infrared (VNIR) spectra in terrestrial analog samples. Basalt, gabbro, andesite, and diorite samples were analyzed using a Nicolet 6700 FTIR microscope in the 0.9–2.5 μm range for both bulk rocks and powders with grain sizes <70 μm, 70–125 μm, and 125–250 μm. Results show that as feldspar grain size decreases, the characteristic absorption band near 1.20–1.30 μm shifts toward shorter wavelengths (~1.10 μm) and becomes shallower. Andesitic and dioritic samples also display distinct absorption shapes (V- vs U-shaped), potentially enabling their remote differentiation. These findings highlight the importance of grain-size effects in interpreting CRISM data and contribute to constraining the petrology of feldspar-rich terrains on Mars.

69
4:20-5:05pm 2nd

Leah Stringer (History, Religious Studies)
Mentor(s): Yale, Elizabeth (History)

"A perfect pattern of Christianity": Good, Christian Wives and Women in Late Medieval and Early Modern Britain

Floor Hall

This essay argues that, contrary to prevailing beliefs that the English Reformation represented an expansion of British women's religious agency, the movement did not provide women with more individual power and, in fact, often imposed harsher, more complicated and contradictory standards of behavior upon laywomen. The English Reformation integrated liberal Protestant ideas from the continent into British culture, such as the Protestant ethic of marriage, vernacular Bibles, and increased lay participation in Christianity; all of these concepts seemingly provided women with equal opportunities to develop their personal spirituality. However, this promise of Protestant religious power for women was a mirage. Using texts produced between 1400 and 1600, including John Foxe's seminal Acts and Monuments and household guidebooks written by male thinkers, I demonstrate that although Protestantism afforded women more means of engaging with their religion, preexisting hierarchies–such as the inherent holiness of virgins as opposed to married women–were reinforced. Moreover, discourse surrounding the notion of a, "good, Christian wife" that emerged during this period further constricted and confused expectations of women's behavior, and significantly more so than some late medieval texts. These concepts laid the foundation for debates surrounding women's roles in the church and in the household that are pervasive in European and North American Protestantism up to the present day.

71
4:20-5:05pm
2nd Floor Hall

Tobias Wood (History / Secondary Education)
Mentor(s): Rouphail, Robert (History)

Lost in Translation: The Peace Corps and Postcolonial Language Politics in Indonesia

The Peace Corps English Language Program in Indonesia was born from the optimism of President Kennedy's New Frontier and the broader faith from the Third World Movement that technical expertise and education could leapfrog developing nations into the competitive Cold War world. Initial negotiations between Peace Corps director Sargent Shriver and Indonesia's Foreign Minister asked for nearly seven hundred volunteers. Access to the English language was a necessary for the development of these two objectives, and the Peace Corps English language program situated itself nicely to fulfill these goals. Yet, as negotiations between Shriver and Subandrio unfolded in 1962, the Indonesian government's initial enthusiasm for the shape and scale of the program diminished to seventeen physical education instructors.

This thesis argues that Sukarno's policy of linguistic nationalism, centered on the use of Bahasa Indonesia as the lingua franca of sprawling archipelago, President Johnson's deterioration of U.S.-Indonesian relations, and the passive agency of the Peace Corps as a program caused the deterioration both of the Peace Corps English language Program in Indonesia both conceptually and until its premature pullout in 1965. Through archival research in the John F. Kennedy Presidential Library and comparative analysis with the Peace Corps programs in the Philippines, Malaya, and Thailand, this thesis also situates Indonesia's uniquely small prgoram within the wider context of Southeast Asian developmentalism. Whereas its neighbors institutionalized English instruction within their education systems, Indonesia's linguistic and political priorities rendered such collaboration untenable.

72
4:20-5:05pm
2nd Floor Hall

Michael Danos (History, Philosophy, Ethics and Public Policy)
Mentor(s): Howard, Ashley (History)

Oh Kinsmen!: Federal Surveillance and the Search for Black Radical Unity, 1918-1924

"Oh Kinsmen!: Federal Surveillance and the Search for Black Radical Unity, 1918-1924" argues that the rapid expansion of government surveillance led to the destabilization of radical Black organizations. By investigating the leaders, publications, and rank-and-file membership of the African Blood Brotherhood (ABB) and Universal Negro Improvement Association (UNIA) I demonstrate how the infiltration of Black special agents subverted the aims of the organizations and deepened ideological divisions. Utilizing federal surveillance records, hundreds of Black-authored editorials and an array of correspondences between Black intellectuals, this project registers the sweeping rise of federal surveillance, the nuanced ideologies of the ABB and UNIA, and the disastrous impact of federal interventions on Black liberation efforts in four sections. Section One details how federal surveillance arose and first developed its strategies against the ABB and UNIA. Section Two builds on this documenting the effect of federal surveillance on inter-organizational unity and their ideologies. Section Three details how federal surveillance fostered a years-long legal and political battle between the organizations. Section Four displays the aftermath of federal intervention and how it destabilized the ABB and UNIA. In so doing, my argument registers three distinct interventions. First, federal surveillance was an essential component of interwar Black radical history which influenced the ideas and movements of the time. Second, that the United States

engaged in an imperialist collaboration with the British and French Empires to explicitly suppress self-determined movements by Black people internationally. Third, the destruction of Black radical unity efforts through federal surveillance created a more stratified political order in the US.

73
4:20-5:05pm
2nd Floor Hall

Brett Wasick (Physics)
Mentor(s): Uppu, Ravitej (Physics & Astronomy)

Erbium Doped PbWO4 Thin Films for Applications in Quantum Repeaters

Quantum communication technology relies on the availability of repeater networks to act as memories and emitters within the system. Here we use Erbium ions deposited in PbWO4 thin films grown by pulsed laser deposition on GaAs and TiO2. We demonstrate the optical properties of these thin films by photoluminescence excitation spectroscopy and film quality with atomic force microscopy. These properties demonstrate the potential for Erbium doped PbWO4 to be used as a quantum memory in repeater networks alongside quantum dots.

74
4:20-5:05pm
2nd Floor Hall

Disha Chawla (Biology)
Mentor(s): Stevens, Hanna (Psychiatry)

16p11.2 Deletion in Male Mice leads to Impaired Placentation Detrimental to Fetal Growth

The 16p11.2 microdeletion is the loss of a small segment on chromosome 16, impacting approximately 20 genes. This deletion is strongly associated with neurodevelopmental disorders in people, particularly autism spectrum disorder (ASD) particularly in males. As the 16p11.2 microdeletion is present in all tissues it may lead to disruptions in placental structure and function that may alter neurodevelopmental outcomes. The placenta has a critical role in the delivery of hormones and nutrients to the fetal brain development. Structural changes as well as changes to key cell populations, including glycogen storing energy cells, can alter placental function. Understanding how the 16p11.2 microdeletion affects placental morphology is important for discovering potential mechanisms linking placental function to neurodevelopmental disorders like ASD. The placenta is fully matured by embryonic day (E14) but peak activity is not until E16 in mice. These timepoints are incredibly important for neurodevelopment in mice as brain regions involved in ASD are developed at this time. We hypothesize that there are time and sex specific defects in placentation of 16p11.2 mice at

timepoints highly relevant for brain development. Mice are able to model human 16p11.2 phenotypes when this microdeletion is introduced, making them a suitable model to study this question. In this study mid-gestation (E14) and late gestation (E16) mouse embryos and placentas were collected and weighed. Placentas were fixed in formalin and sectioned for histological analysis followed by hematoxylin & eosin (H&E) or PAS (glycogen) staining to assess morphological and cell differences on the microscope. 16p11.2 deletion males and females exhibit decreased body mass. Only in males, there is an increase in E16 placental mass. At both E14 and E16, females show no changes in placental morphology and glycogen cells. While 16p11.2 deletion males show different structural defects at each time point, both defects at E14 and E16 are likely to negatively impact fetal growth. At E16, there is a clear increase in glycogen, suggesting delayed glycogen migration and release. Preliminary results at E14 show similar patterns. 16p11.2 deletion in male mice causes defects in placentation that are evident across multiple timepoints, likely adversely impacting fetal development. 16p11.2 deletion male placental abnormalities may exacerbate adverse neurodevelopmental outcomes due to reduced placental support.

75
4:20-5:05pm
2nd Floor Hall

Minou Emmad (Physics, CS, Math)
Mentor(s): Schnieders, Michael (Biomedical Engineering)

Protonation Coupling in Zinc Finger–DNA Recognition Explored by Polarizable CpHMD

We employ polarizable constant pH molecular dynamics to probe how protonation changes in Zn^{2+}-coordinating cysteines modulate zinc finger–DNA binding. The results highlight the essential role of correct protonation and polarization in capturing transcription factor specificity.

76
4:20-5:05pm
2nd Floor Hall

Caden Noeller (Mechanical Engineering & Mathematics)
Mentor(s): Xiao, Shaoping (Mechanical Engineering) | **Jiefeng Jiang** (Psychological Brain Sci)

Evolution of Human Trust in Artificial Intelligence

This project investigates how human trust in artificial intelligence (AI) evolves throughout a simple decision-making task. We used a version of the multi-armed bandit problem, where a person and an AI agent work together to choose between five slot machines over 200 trials. Each round, the AI recommends the

machine with the highest expected reward, sometimes explaining its reasoning, and the participant decides whether to follow the suggestion. Every few rounds, participants report how likely they are to follow the AI's advice.

To study changes in trust, we modeled participant behavior using reinforcement learning with two states: one for making independent choices and one for following the AI. The model updates these state values based on rewards and predicts the probability of trusting the AI. Early results show that the model can capture how trust changes over time and often matches participants' self-reported trust levels. This approach helps us better understand how humans and AI systems can learn to work together effectively.

77
4:20-5:05pm
2nd Floor Hall

Vivian Odubasa (Microbiology and Global Health)
Mentor(s): Santillan, Mark (Obstetrics/Gynecology)

The role of PFAS exposure in male partners in pregnancy outcomes.

The projects investigates the risk of adverse pregnancy outcomes among a cohort of pregnant women and their male partners in Iowa. The study tracks exposure through drinking water, diet, urine, blood, and toenails. A retrospective study will be conducted using stored biologica samples from couples enrolled in the Perinatal Family Tissue Bank, testing for both long and short chain PFAS.

78
4:20-5:05pm
2nd Floor Hall

Bailey Newberry (Health Promotion)
Mentor(s): Gumusoglu, Serena (Obstetrics/Gynecology)

Maternal Brain and Behavior in a Model of Chronic Gestational IL-17

Increased risk for neurodevelopmental disorders is linked to chronic inflammation during pregnancy. A potential mediator is pro-inflammatory cytokine interleukin-17 (IL-17) which is implicated in neurodevelopmental disorders and gestational disease. However, it remains unclear whether alterations in offspring neurodevelopment are in part mediated by alterations in maternal behavior. To test the maternal effects of IL-17, behavioral tests related to stress and anxiety were ran, along with quantitative polymerase chain reaction (qPCR) for gene expression. Additionally, the neocortex and hippocampal regions of maternal brains were contoured and microglial counts and morphology assessments were conducted in the neocortex.

79
4:20-

Chiara Dusanek (Music Therapy)
Mentor(s): Dvorak, Abbey (Music)

5:05pm
2nd Floor Hall

Legacy Project Songwriting for Families Grieving Loss from Substance Use Disorder

The stigma surrounding drug-related deaths adds additional pain for family members grieving individuals lost to substance use disorders. Music therapy interventions, specifically legacy project songwriting, provides a meaningful way for family members to remember and honor their loved one. The purpose of this project was to create legacy songs for families of individuals who died from substance use in the state of Iowa, as identified by the INTO LIGHT project. I reviewed portraits and narratives of individuals in the INTO LIGHT exhibit on campus. I used specific information from their narrative to create a unique and original song for that person and their family. I created a songwriting committee with students, faculty, and staff in music therapy, composition, and recording studio. Together, we composed and professionally recorded nine legacy songs (i.e., projects created with the intention of remembrance). I shared my first song in an INTO LIGHT webinar with Theresa Clower and Barbara Francois, founders and executives of the program where the feedback was overwhelmingly positive and meaningful from family members. Overall, legacy songs provide a way for music therapists to support families grieving due to drug-related deaths, recognize and honor the individuals and their shared humanity, and decrease stigma to provide greater access to services, resources, and treatment for more people experiencing substance use disorder.

80
4:20-5:05pm
2nd Floor Hall

Emily Formella (Biomedical Engineering)
Mentor(s): Worthington, Kristan (Biomedical Engineering) | **Richard Cliver** (Biomedical Engineering)

The role of mechanotransduction pathways in chorioretinal cell response to simulated microgravity

Spaceflight-associated neuro-ocular syndrome (SANS) is a condition seen in long-duration astronauts that is characterized by increased intracranial pressure, retina structural changes, and visual impairment. Exposure to microgravity has been identified as a primary risk factor of SANS, but the underlying cellular mechanisms are not fully understood. Microgravity is known to disrupt the biomechanical signaling in many human cell types, and comparable disruptions are associated with pathological changes in retinal pigmented epithelial (RPE) cells and potentially choroidal vascular endothelial cells (ChECs) in other ocular diseases.

This study aims to characterize the impact of simulated microgravity on the cell fate of RPE cells and investigate the role of epithelial to mesenchymal transition in this response.

ARPE-19 cells were cultured on Cytodex3 microcarrier beads and suspended within a rotating wall vessel bioreactor to simulate microgravity. Cell viability was assessed via fluorescent staining with Calcein AM and Ethidium Homodimer. Gene expression analysis by quantitative PCR targeted epithelial and mesenchymal markers of interest, namely ACTA2, CDH2, CDH3, SNAI1, VIM, TJP1, RPE65, and KRT18.

RPE cells remained viable when grown on microcarrier beads under simulated microgravity conditions. Preliminary qPCR results suggest differences in genetic expression between RPE cells in Earth gravity and simulated microgravity groups across seven days of culture.

Thus, our studies support a continued investigation into gene expression changes in simulated microgravity conditions over time and the extension of these studies to ChECs and induced pluripotent stem cell-derived chorioretinal cells.

81
4:20-5:05pm
2nd Floor Hall

Matieis Mayes (Double major: Biochemistry & Molecular Biology and Human Physiology)
Mentor(s): Pathmanathan, Aparna (Anatomy & Cell Biology) | **Amy Ryan** (Anatomy & Cell Biology)

Generation of a novel iPSC tool to understand the club-cell specific role of CFTR in the airway epithelium

Cystic fibrosis (CF) is a life-shortening genetic disease caused by mutations in the Cystic Fibrosis Transmembrane Conductance Regulator (CFTR) gene, which encodes an ion channel responsible for secretion of chloride and bicarbonate across epithelial cells. Defective CFTR function leads to accumulation of dehydrated mucus, impaired mucociliary clearance, and recurrent chronic airway infections. In the lung, CFTR localizes to the apical surface of the pseudostratified airway epithelial cells composed of multiciliated, basal, and secretory cells that serve distinct roles in protecting the airways against inhaled pathogens and debris and maintenance of overall airway function. Early cellular models assumed uniform expression of CFTR across airway epithelial cell-types. However, recent advances in single-cell RNA sequencing (scRNA-seq) have demonstrated differential CFTR expression among the various cell-types of the

airway. These studies identified ionocytes as a rare but highly CFTR-enriched epithelial subtype, serving as a CFTR "hub." Outside of these, secretory club cells are the most dominant CFTR-expressing cell type within the airway epithelium. However, the precise function of CFTR within these cell types remains unclear. We hypothesize that restoring CFTR expression in club cells will restore chloride efflux leading to increased air surface liquid hydration thereby supporting effective mucociliary clearance. To test this hypothesis, we will generate an endogenous cell-specific, Cre-inducible CFTR reconstitution model using CF induced pluripotent stem cells to selectively reconstitute CFTR expression in the club cells. We chose the SCGB1A1 gene locus as it is unique to club cells and designed a CRISPR-Homology directed repair (HDR) donor plasmid carrying the SCGB1A1-CreERT2 cassette, to integrate into the 3' untranslated region of SCGB1A1 locus. The construct was assembled using Gibson Assembly and transformed into competent bacterial cells. Colonies were grown on ampicillin-resistant LB agar plates screened by colony PCR, DNA sequencing, gel electrophoresis, and verified for construct accuracy. Confirmed plasmids were then scaled up through maxiprep purification, followed by restriction digest analysis and a second round of Sanger sequencing to confirm sequence accuracy. In conjunction with an invert loxP-flanked CFTR inversion virus, this system will enable Cre-mediated inversion and activation of CFTR from its endogenous locus specifically in club cells. By allowing precise restoration of CFTR activity in individual epithelial subtypes, this model will allow us to precisely quantify CFTR expression and function in Club cells and its role in maintenance of airway function.

82
4:20-5:05pm
2nd Floor Hall

Nina Osborne (Geographical and Sustainability Science; Environmental Policy and Planning)
Mentor(s): Meerdink, Susan (Earth, Envir, Sustainblty)

Effects of Elevated Atmospheric CO2 and Temperature on Leaf Spectral Reflectance in Quercus macrocarpa

Climate change alters tree physiology in ways that can be detected through shifts in spectral reflectance. This study examines how Quercus macrocarpa (Bur oak) saplings respond to elevated temperature and carbon dioxide over a 10-week growth period. Saplings were grown in six controlled growth chambers, each representing distinct climate scenarios combining ambient or elevated temperature (+3 °C from ambient, +6 °C from ambient) and carbon dioxide (ambient 425 ppm or 800 ppm). Leaf-level spectral reflectance (350–2500 nm)

was measured, and Weeks 2, 5, and 9 were analyzed to represent early-, mid-, and late-stage physiology, capturing both temporal and treatment-based responses.

a. Reflectance data were analyzed to assess treatment effects. Mean reflectance increased in near-infrared wavelengths under combined heat and carbon dioxide stress, suggesting altered leaf structure and internal scattering. In contrast, visible-band reflectance declined, indicating changes in pigment concentration or chlorophyll content. An ANOVA revealed significant differences among chambers over the course of the experiment, and a Dunnett's test further identified which chambers differed significantly from the ambient control. The strongest differences were observed in the Leia chamber (+3 °C, 800 ppm) within the shortwave infrared range during Week 2, the Chewie chamber (+3 °C, 425 ppm) in the visible range during Week 5, and both the Artoo chamber (+6 °C, 800 ppm) in the near-infrared and the Luke chamber (+6 °C, 425 ppm) in the visible range during Week 9.

These results demonstrate that spectral reflectance provides a non-destructive indicator of climate stress in young oak trees. This highlights the value of remote-sensing approaches for monitoring ecosystem adaptation to climate change, and contributes to understanding how forest species may internally adjust under future warming and carbon enrichment.

83
4:20-5:05pm
2nd Floor Hall

Liberty Nyberg (Microbiology, pre-pharmacy)
Mentor(s): Tucker, Jessica (Microbiology & Immunology) | **Kyle Rapchak** (Microbiology & Immunology)

Knockdown of Brf1 dependent RNA polymerase III activity causes differential expression of transcripts during MHV68 infection

RNA polymerase III, which transcribes many important non-coding RNAs, is known to be upregulated during gammaherpesvirus infection. How increased RNA polymerase III activity impacts infection is not known. To understand whether RNA polymerase III upregulation is important for the host or virus during infection, we used siRNA to knock down an essential transcription factor for RNA polymerase III, Brf1, and observed increased viral titers during an MHV68 infection compared to control cells. There are three distinct promoter types that RNA polymerase III uses to make transcripts. Type I and type II promoters depend on Brf1 to recruit RNA polymerase III, and so we hypothesized that transcript levels for type I and type II promoters would be diminished by Brf1

knockdown. Type III promoters do not use Brf1 and thus transcript levels should be unaffected by Brf1 knockdown. As predicted, we saw decreased expression of type I and II transcripts as measured by RT-qPCR of 5S and pre-tRNA-Leu. Surprisingly, type III transcripts, including 7SK and U6, were found to have increased expression levels over the course of murine gammaherpesvirus (MHV68) infection, which was unexpected since these transcripts do not utilize Brf1 for RNA polymerase III recruitment. To further investigate how different RNA polymerase III transcripts impact MHV68 replication, we will overexpress individual noncoding RNAs and measure their impact on MHV68 viral titer. Understanding the role that RNA polymerase III transcripts play in gammaherpesvirus infection may help us to appreciate why viral infection results in an upregulation of RNA polymerase III activity, and how non-coding RNAs play a role in host-viral interactions.

84
4:20-5:05pm
2nd Floor Hall

Emily Roberts (Microbiology and Music performance)
Mentor(s): Johnson, Jeremiah (Microbiology & Immunology) | **Lincoln Lewerke** (Microbiology & Immunology)

The Role of Calprotectin in Nutritional Immunity: Inflammatory Dynamics During Campylobacter Infection

Campylobacter jejuni is a Gram-negative, intracellular bacterium that infects the intestinal epithelium. C. jejuni cleaves tight junctions between epithelial cells to invade basolaterally. This cleavage and invasion causes the intestinal epithelial cells to secrete IL-8, which recruits neutrophils to the site of infection. Neutrophils are equipped with various mechanisms to kill bacteria, such as reactive oxygen species production and degranulation of antimicrobial proteins, including the release of proteins that sequester nutrients essential to bacterial growth. One example of these nutrient-sequestering proteins is calprotectin. Calprotectin is a calcium-dependent, heterodimeric protein (S100A8 and S100A9) that facilitates nutritional immunity as well as immune signaling. In the extracellular space, calprotectin binds transition metals like zinc and manganese, starving the bacteria of these essential nutrients. During bacterial infection and inflammatory bowel disease, calprotectin is detected in feces and serves as a clinical marker of disease. This project aims to determine how calprotectin impacts Campylobacter growth and quantify calprotectin abundance during infection. We have conducted growth inhibition assays on wild-type Campylobacter, along with a mutant lacking a functional domain of a zinc ABC transporter. When subjected to Calprotectin treatment, this mutant will

experience enhanced stress because it lacks a high-affinity zinc uptake system that is crucial during nutrient deprivation. We have shown that at 48 hours, growth of the ZnuA mutant is almost completely inhibited by calprotectin treatment at concentrations as low as 125 ug/mL. We have also found that the inhibitory dose for Wildtype Campylobacter growth is within the range of 93.75 uL and 187.5 uL. Additionally, a mouse S100A9 ELISA was used to quantify calprotectin in uninfected and wild-type infected cecal and colonic tissue samples, providing a trend of increased calprotectin detection in wild-type infected mice. Western Blots were used to detect calprotectin in neutrophil lysates and tissue samples. We are currently investigating which transition metal is sequestered by calprotectin and is essential for C. jejuni growth, as well as immunohistochemical staining of infected tissue to explore the physiological distribution of calprotectin in the intestinal epithelium. In the future, we will use SPR to compare calprotectin's binding affinity with different proposed inflammatory receptors, including RAGE. Calprotectin is a highly abundant, neutrophil-associated protein that plays a crucial role in nutritional immunity during Campylobacter infection. Pathological outcomes are uniquely tied to the host immune response rather than bacterial effectors/toxins, validating the exploration of key host antimicrobial proteins in inflammation-mediated clearance during Campylobacter infection.

85
4:20-5:05pm
2nd Floor Hall

Nikolas Vinovich (Physics, Statistics, Mathematics)
Mentor(s): Nachtman, Jane (Physics & Astronomy)

Timing Calibration in the Eos Hybrid Neutrino Detector

Research surrounding neutrinos and their interactions is the primary focus of modern high energy particle physics. Owing to certain parities with the charged leptons and holes in our understanding of them, neutrinos offer a promising gateway to potential new physics. However, they are also nearly inert particles, only participating in the weak interaction, which makes detecting neutrinos no small task. The Eos hybrid neutrino detector based out of Lawrence Berkeley National Laboratory (LBNL) aims to benchmark several both well-established and novel methods of detection, analysis and simulation to help develop reliable detection methods for future neutrino research. The University of Iowa's High Energy Particle Physics group joined the collaboration in 2023, and has assisted in design, construction and analysis.

Due to the immense precision required to observe and analyze the interactions of these particles, calibrations must be made thoroughly and accurately. Eos is currently in the later stages of these calibrations, and the analysis I participated in this summer centered around determining and understanding observed timing error within test runs of different phases of calibration and helping to develop appropriate timing corrections while introducing as little bias as possible.

86
4:20-5:05pm
2nd Floor Hall

Darren Timmerman (Applied Physics)
Mentor(s): Uppu, Ravitej (Physics & Astronomy)

Large-Scale Multi-Emitter Tracking for Temperature-Dependent Photoluminescence

We developed an automated method to detect and track thousands of individual light-emitting quantum dots across temperature-dependent microscope images. By tracking each dot over the full sweep, we can measure how its brightness changes with temperature and group dots that behave similarly. This lets us identify different physical emission behaviors and determine activation energies directly from wide-field image data. The result is a faster, more scalable way to study how quantum emitters respond to their environment, without needing tedious single-dot measurements.

87
4:20-5:05pm
2nd Floor Hall

Nancy Nahra (Computer Science, Mathematics)
Mentor(s): Reinhardt, Joe (Biomedical Engineering) | **Seyed Soheil Hosseini** (Radiology)

Investigating Diffusion Models in Learning and Reconstructing Two-Dimensional Probability Distributions

Diffusion models have recently emerged as one of the most powerful classes of generative models, capable of producing realistic images. This project explores diffusion in a 2D setting with known target distributions. The model learns to reverse a fixed, noise-adding forward process by predicting the noise at each step. The learned reverse process then generates samples by iteratively denoising pure noise. We systematically investigate performance based on key parameters, including time steps, noise schedule, and network complexity. Beyond quantitative metrics (reconstruction fidelity, Wasserstein distance), we visualize reverse process trajectories from identical noise seeds, aligning them with gradients of the blurred target distribution. Preliminary findings show the models recover the 2D distribution's shape and reveal meaningful geometric

structure in their trajectories, offering visual insight into the generative denoising process.

88
4:20-5:05pm 2nd Floor Hall

Paige Liebrecht (Environmental Science)
Mentor(s): Dannenberg, Matthew (Earth, Envir, Sustainblty)

Effects of elevated atmospheric CO2 and temperature on photosynthetic capacity in bur oak (Quercus macrocarpa)

Average yearly temperatures are increasing, with 2024 being the hottest year on record. As temperatures increase, vapor pressure deficit (VPD) increases, intensifying plant water stress. Water stress reduces photosynthesis and increases the risk of mortality because stomata (microscopic openings on the underside of leaves) must either close to conserve water (at the cost of taking up carbon) or stay open to continue carbohydrate production (but risking desiccation). Atmospheric CO_2 concentration is also increasing, which could reduce the stomatal conductance needed to acquire sufficient CO_2, which could mitigate negative impacts of warming. Tree photosynthetic response to a changing climate will affect species survival, but the interactive effects of elevated CO_2 and temperature on leaf-scale photosynthesis remain poorly understood.

To address this need, we conducted a growth-chamber experiment using 48 bur oak (*Quercus macrocarpa* Michx.) saplings in a factorial design with three temperature treatments (ambient, +3°C, +6°C) and two CO_2 levels (425 ppm and 800 ppm), simulating plausible end-of-century climate scenarios. Using a LI-COR LI-6800 Portable Photosynthesis System, we measured one leaf per tree weekly from June 9 to August 14, 2025. We estimated the maximum rates of carboxylation (V_{cmax}) and electron transport (J_{max}) of the photosynthetic system using CO_2 response curves and the maximum photosynthetic rate under saturating light (A_{sat}) using light response curves.

We found that A_{sat} and J_{max} showed no significant response to elevated CO_2, while V_{cmax} decreased with increasing CO_2 across all temperature treatments (p = 0.017). These results indicate that bur oak photosynthetic processes acclimate to higher CO_2 via downregulation of Rubisco and suggest that bur oak may be favored under elevated CO_2 conditions.

89
4:20-

Abby McLeod (Neuroscience)
Mentor(s): Dabrowski, Anna (Pediatrics)

5:05pm 2nd Floor Hall

Effects of viral and genetic strategies on synaptic microcircuitry

Childhood epilepsy is a significant public health problem and advancing therapies requires better fundamental understanding of underlying brain circuit development. An understudied question is how genes associated with epilepsy affect the development of synaptic microcircuitry, the connections between neurons. In these experiments, we use a combined viral and genetic strategy together with immunohistochemistry to visualize synaptic boutons specific to inhibitory parvalbumin-expressing neurons. Our goal is to compare synapses in Scn1a haploinsufficient mice (a model for Dravet epilepsy syndrome) with wild-type controls. We acquired images using super-resolution microscopy and performed 3-dimensional analysis of the synaptic puncta. We quantified area, volume, fluorescence intensity, and overlap of synaptic markers. We found a trend towards smaller and sparser presynaptic boutons in Dravet mice.

90

5:10-5:55pm 2nd Floor Hall

Augustin Heitman (Physics, Astronomy, Math)
Mentor(s): Nachtman, Jane (Physics & Astronomy) | **Yasar Onel** (Physics & Astronomy)

A Comparative Analysis of Timing Data from a Hybrid Neutrino Detector Between Two Media

This poster gives a comparative analysis between timing data taken with an isotropic laser diffusion source (laserball) from inside a scintillation and Cherenkov radiation hybrid neutrino detector filled with one of two media: a water-based liquid scintillator (WbLS) and distilled water (water2).

91

5:10-5:55pm 2nd Floor Hall

Kelsey Klassen (Speech and Hearing Science)
Mentor(s): Walker, Elizabeth (Communic Sci & Disorders)

Reading Motivation and Reading Comprehension in Adolescents with Hearing Loss and Typical Hearing

Reading motivation consists of several aspects, including intrinsic motivation, extrinsic motivation, and competence and self-efficacy but there is limited data on reading motivation in adolescents who are hard of hearing (HH). The aim of the current study was twofold: 1) to compare reading motivation as a function of grade, hearing status, sex, and maternal educational level, and 2) to determine how reading motivation accounts for variance in reading comprehension skills in adolescents who are HH or have typical hearing (TH). We used the Motivation for Reading Questionnaire (MRQ) to assess reading motivation in 169 adolescents

with mild to profound bilateral hearing loss and 87 adolescents with typical hearing, ranging in age from 12-19 years. Participants were also tested on a full battery of standardized reading and language measures. Females had significantly higher scores in all three aspects of reading motivation compared to males. There were no statistically significant differences in reading motivation for grade, maternal educational level, or hearing status. There was a significant interaction between maternal educational level and hearing status in reading competency and self-efficacy, in that adolescents who were HH who had mothers with post-grad education showed lower scores in perceived reading competency compared to adolescents with TH who had mothers with post-grad education. Intrinsic and competence in reading motivation significantly contributed unique variance to overall reading comprehension scores in adolescents who were HH but not adolescents with TH. Thus, certain aspects of motivation to read may have a larger effect on reading comprehension in adolescents who are HH relative to their hearing peers, which has implications for intervention with this population.

92
5:10-5:55pm
2nd Floor Hall

Seighin McElderry (Biology)
Mentor(s): Dvorak, Abbey (Music) | **Livia Umeda** (Music)

Music and Mild Cognitive Impairment: A Scoping Review

Mild Cognitive Impairment (MCI) is a neurodegenerative condition characterized by memory disturbances, but preserved cognitive skills and activities of daily living, with no existing dementia. In individuals with MCI, music-based interventions may affect biopsychosocial functioning due to overlap in systems of the brain involved in music processing. The purpose of this scoping review was to summarize and describe the extant literature about music-based interventions with individuals with MCI. We searched eight databases for peer-reviewed articles in English and reviewed 3,665 articles in the initial phrase. In the second phase, we reviewed 86 articles, resulting in 19 articles for inclusion in the scoping review. Most articles were quantitative, involved music listening, and focused on cognitive outcomes. Out of 16 experimental studies, 10 included statistically significant outcomes. Interventions ranged from one day to nine months, with a frequency range of one hour daily to once a week. Across studies, researchers used over 50 different measurement tools. These scoping review findings provide a summary of available literature to support evidence-based practice in music therapy and related professions. This review also highlights the

benefits of music as a non-pharmacological approach for supporting cognitive health in individuals with MCI.

93
5:10-5:55pm
2nd Floor Hall

Heidi Du (Biomedical Sciences)
Carolyn McCann (Psychology)
Mentor(s): Kochanska, Grazyna (Psychological Brain Sci) | **Haley Herbert** (Psychological Brain Sci)

Parents' Trait Anger and Mental Health Symptoms Predict Hostile Representations of Their Children

Contributing to research on the effects of parent personality and mental health, we examined pathways toward parents' internal hostile representations of their children, widely known to impact parenting and child outcomes. We employed self-report and interview measures in a 200 two-parent community sample. For both mothers and fathers, higher parental trait anger at 8 months and mental health symptoms at 16 months (depression, anxiety, and somatization) predicted more hostile representations of their children at 38 months. We will discuss the potential mechanisms that account for these effects.

94
5:10-5:55pm
2nd Floor Hall

Rachel Preves (Psychology)
Arely Ramirez (Psychology, Political Science)
Mentor(s): Kochanska, Grazyna (Psychological Brain Sci) | **Haley Herbert** (Psychological Brain Sci)

Early Parental Affect, Child Responsiveness, and Toddler Internalization

We hypothesized that the early positive parent-child relationship can set the stage for future adaptive child development, including children's successful internalization of parental rules. We employed behavioral observations in a 200 two-parent community sample. For mothers, higher positive affect toward the child at 8 months predicted more child responsiveness to the mother at 16 months. We replicated these results for fathers. Furthermore, more child responsiveness to the mother at 16 months predicted more child internalization of rules at 38 months. However, this was not true for fathers. We will discuss potential explanations for differences between mother- and father-child dyads, as well as potential mechanisms that account for these effects.

95
5:10-5:55pm

Sean Strand (Biology)
Mentor(s): Tootle, Tina (Biology) | **Ashley Goll** (Anatomy & Cell Biology)

2nd Floor Hall

Implications of Fascin During Drosophila Oogenesis

Fascin is a protein involved in many functions of the cell however specifically it acts as an adapter protein to the cytoskeleton and LINC complex, which connects to the inner nucleoskeleton lamina proteins via KASH and SUN domain proteins. Because of this Fascin is key in communicating extracellular force to the inner nucleoskeleton through mechanotransduction; this allows inner nuclear lamina proteins to respond in their expression levels to promote cluster cell migration through narrow spaces. Cluster cell migration is the form in which cancer cells metastasize, highlighting the importance of these studies. Using CRISPR genomic editing tools we have removed the Fascin encoding gene to understand it's importance in timely cell migration, using Drosophila ovaries as our model organism.

96

5:10-5:55pm

2nd Floor Hall

Grace Gutzman (Microbiology)
Mentor(s): Wilson, Mary (Internal Medicine) | **Natalie Jarvis** (Microbiology & Immunology)

Dietary intake is a determinant of the course of disease and the inflammatory response in a murine model of visceral leishmaniasis

Leishmaniasis is a spectrum of diseases caused by Leishmania spp parasites. The most common forms are cutaneous (CL), characterized by chronic skin ulcers, and visceral (VL), which infects reticuloendothelial organs and is fatal when untreated. Our Brazilian collaborators reported that obesity/overweight classifications in naturally infected Brazilians leads to a form of CL refractory to treatment, whereas protein malnutrition is a known risk for human VL. A recent shift in dietary habits has increased the prevalence of obesity in Brazil. The pathogenic host immune responses to CL and VL are different. We hypothesized that diet-induced changes in host inflammatory profiles are determinants of VL outcome, possibly by a different mechanism from CL. Using a murine model of VL, mice were maintained on a control, high-fat high-cholesterol (HFHC) or protein calorie malnutrition (LP) diet. After 4 weeks, half of the mice were infected i.v. with 106 Leishmania infantum, the cause of Brazilian VL. PCR and histological analysis of tissue samples demonstrated an increase in parasite loads caused by LP diet, whereas parasites bypassed liver and grew only in the spleens of HFHC mice. Histologic studies showed granulomas formed in control mice as expected. LP mice also formed mature granulomas, but HFHC mice did not. Flow cytometry verified different ratios of myeloid cells in the livers of mice

on different diets. Nanostring transcriptome analysis identified differentially expressed genes associated with the inflammation and metabolic status of each group. Furthermore, using 16S qPCR we were able to show that both LP and HFHC diets increased bacterial quantities in the livers, and that bacteria were further augmented during L. infantum. infection. We hypothesize that the HFHC and LP diets could induce a leaky gut syndrome, and that this is augmented by infection itself. This data may improve the understanding of the influence of diet-induced metabolic and immune changes on the course of VL and other infectious diseases.

97
5:10-5:55pm
2nd Floor Hall

Abigail Edwards (Biomedical Engineering)
Mentor(s): Thomas, Geb (Industrial Engineering)

Assessing Skill from Behaviors Analyzed in Videos of Knee Arthroscopy

Authors: Abigail Edwards, Geb Thomas, Evan Williams, Steven Long, Richard VanTienderen, Donald D. Anderson

Introduction

Each year, approximately 750,000 arthroscopic knee procedures are performed in the U.S. [1]; a substantial number are performed by orthopedic residents. Immediate feedback for residents is beneficial following a procedure, but tools to enable this are lacking. This study analyzes videos from arthroscopic knee procedures performed by experts and novices to differentiate skill based on tool and camera behaviors observed during the diagnostic portion of the procedure.

Methods

Videos collected from four experts and nine novices over eleven months included the diagnostic portions of 92 knee arthroscopies. We evaluated two metrics involving the time spent: (1) creating the medial portal, beginning when the camera viewpoint stops moving and ending when a surgical tool becomes visible, and (2) navigating into medial and lateral compartments of the tibiofemoral joint, beginning when the camera viewpoint stops moving and the joint opens and ending when the posterior meniscus is visible. The analyst was blind to the experience of the surgeon. Data were normalized by z-score and plotted for comparison.

Preliminary Results

The experts completed these sub-procedures significantly faster than novices (Figure 1), suggesting these times may be useful in quantifying the surgeon's skill. Novices had significantly larger summed scores than the experts, Welch's $t(6.86) = -4.28$, $p = 0.0038$, with a large effect size (Cohen's $d = 2.4$).

Next Steps

Preliminary analysis indicates that experts create the medial portal and navigate into the compartments faster than novices, consistent with the original hypothesis. Further analysis and a second analyst will confirm generalizability. Next, arthroscope angulation (rotation of the off-axis view angle) will be analyzed as a potential indicator of surgical skill. The long-term goal of the research is to automate analysis to provide objective, quantitative, immediate feedback to residents and their staff supervisors.

98
5:10-5:55pm
2nd Floor Hall

Riley Rosenmeyer (Neuroscience)
Mya Messenger (Health and Human Physiology)
Mentor(s): Yang, Shujie (Pathology)

Developing Novel Endometrial Cancer Drug Treatments using Patient-Derived Xenograft Models In-Vivo and In-Vitro

Over the last 40 years, endometrial cancer has been the only cancer type with declining survival rates among all the cancer types, highlighting the urgent need for improved treatment. In Iowa, there will be an estimated 700 new cases and 120 deaths in 2025, and 9,110 endometrial cancer survivors. The heterogeneous nature of EC contributes to varied outcomes with current treatments. As each patient is different, this project aims to establish reliable endometrial cancer models for characterizing each individual tumor, distinguish optimal drug treatment, and determine specific drug effect mechanisms for personalized therapy. Our lab has collected over 100 patient endometrial tumor samples and successfully established 53 patient-derived xenograft models (PDX) and 14 patient-derived primary cancer cell lines (PDC). Using these novel tumor models, we are able to screen approved anticancer drugs and discover more outstanding drugs than current standard chemotherapy. Our unique PDXs and PDCs are excellent models for representing various characteristics of EC and testing novel therapeutics. This research presents a promising direction for developing personalized therapy options for EC patients and provides a platform for further investigation of drug mechanisms and tumor development. This

information will aid in the prevention, diagnosis, and prognosis of endometrial cancer.

99
5:10-5:55pm 2nd Floor Hall

Jamison Stone (History)
Mentor(s): Rouphail, Robert (History)

The Palm Sunday Tornado Outbreak 1965 and the Critical Turning Point in Disaster Legislation.

This thesis argues that the Palm Sunday Tornado Outbreak in 1965 was a major turning point in how the government reacts to disasters. These tornadoes killed 271 people as it rampaged through the Midwest, as Indiana was the worst hit. It pushed President Lyndon B. Johnson to travel to the disaster-stricken area with representatives from Congress who worked for the areas affected. The trip was monumental: not only was it the first recorded time a president visited a larger disaster site, but it was the catalyst for Indiana senator Birch Bayh to introduce legislation to change disaster aid. Previously, disaster aid was given out after every disaster, only at the behest of Congress. Congress would eventually pass the Stafford Act in 1988, which is in effect today. Prior to this from 1965 to 1970, Senator Bayh initiated and helped pass legislation that streamline the process of aid distribution and gave the executive branch authority to speed up relief. This legislation would be the groundwork for the later Stafford Act The tornado watches and warning system and invention of The Weather Channel were also outcomes of this act. The thesis makes use of contemporary newspapers, journal articles, and various primary sources from the Bayh collection.

100
5:10-5:55pm 2nd Floor Hall

Ryley Blake (Biology)
Madeline Roberts (Neuroscience)
Mentor(s): Fassler, Jan (Biology)

Impact of Heat on Physical and Physiological Characteristics of Candida albicans Biofilms

Implant-associated infections are difficult to treat and result in significant patient morbidity and mortality. These infections arise from the formation of polymicrobial biofilms on the implant surface that change the character of the cells within and protect them from antibiotics and host immune cells. The goal of this work is to better understand the relationships between biofilm mechanics and composition, heat treatment, and microorganism viability/virulence in a microbial biofilm to advance technologies concerned with eliminating implant-

associated medical infections. Our hypothesis is that heat treatment delivered directly via electromagnetic induction to a specially coated implant surface may be an effective method of eradicating biofilms within the body. To better understand the effect of heat on biofilms we implemented a method for growing Candida albicans biofilms of dimensions sufficient for rheological (mechanical) measurements and tested mechanical strength as well as viability and gene expression after a short exposure to high temperatures. Heat-treated biofilms exhibited a significant decrease in mechanical properties compared to control biofilms, indicative of mechanical weakening. Viability within the biofilm and among the cells dispersed from the biofilm was substantially reduced. We are currently investigating the ability of heated biofilms to form a secondary biofilm, and using RNA-Sequencing to investigate heat-specific changes in biofilm gene expression. This information will prove valuable for improving current strategies for eliminating implant associated infections.

101
5:10-5:55pm
2nd Floor Hall

Madeline Broghammer (Microbiology and Biochemistry and Molecular Biology)
Mentor(s): Haim, Hillel (Microbiology & Immunology)

Deep mutational scanning of the HIV-1 capsid protein

Lenacapavir (GS-6207, LEN) is an FDA-approved therapeutic that targets the HIV-1 capsid protein. This long-acting injectable is administered every six months and prevents infection by HIV-1 as well as reduces viral loads in infected individuals. Mutations in capsid that increase resistance to LEN are not common; however, they have been detected on treatment. Of these, K70R/H/N and Q67H are frequently observed. To better understand the escape paths of HIV-1 from LEN, and those that may emerge, we used deep mutational scanning (DMS). The approach is based on production of virus libraries that contain all possible amino acids at sites of interest and assessing their effects on virus fitness and resistance to therapeutics. Our experiments focused on capsid position 70, which we examined in the absence or presence of Q67H. We discovered that LEN preferentially inhibits the K70 form (relative to other amino acid variants). However, the Q67H mutation altered the fitness profile of position 70, and increased the fitness of 70K in the presence of LEN. We also found that Arg, His and Asn are highly fit in the absence of LEN. In contrast to 70K, the fitness profiles of 70R/H/N were unchanged by LEN or by Q67H. Taken together, these findings suggest that the wild-type K70 is uniquely sensitive to LEN and that its fitness can be restored by mutations at other positions of capsid. We

propose the use of DMS to characterize the mutational escape paths from LEN as well as the epistatic interactions across this protein.

102
5:10-5:55pm
2nd Floor Hall

Mia Zdionica (Human Physiology)
Mentor(s): Dunnwald, Martine (Anatomy & Cell Biology) | **Lindsey Rhea** (Anatomy & Cell Biology)

Interferon Regulatory Factor 6 Influences Epidermal Differentiation

Interferon Regulatory Factor 6 (IRF6) is a transcription factor required for epidermal development. The absence of IRF6 disrupts epidermal differentiation during embryonic development. In this project, we asked whether the expression of Vimentin and Stratifin were affected by the loss of IRF6 in murine embryos. We hypothesized that the loss of IRF6 would result in an increase in Vimentin and Stratifin expression. To test our hypothesis, we harvested embryos between embryonic (E) days 12.5 and 17.5, fixed them in paraformaldehyde and embedded them in paraffin. Transverse sections of embryos were stained by immunofluorescence and confocal microscopy was used to capture images. Two different embryos for each genotype and time point were analyzed. Our data shows that Vimentin expression was detected along the superficial layer in wildtype epidermis at E12.5 and that this expression gradually decreased during embryonic development. In contrast, Vimentin expression increased in IRF6 mutant samples in later timepoints, suggesting a disrupted differentiation of the epidermis. In addition, Stratifin expression was detected along the superficial layer in wildtype epidermis and increased to the suprabasal layers during embryonic development. In IRF6 mutant samples, this expression was increased in later timepoints, potentially as a result of abnormal stratification. In conclusion, our results show that Vimentin and Stratifin expression was altered in IRF6 mutant skin, further demonstrating disrupted epidermal differentiation in absence of IRF6.

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5:10-5:55pm
2nd Floor Hall

Vamsi Challa (Biomedical Sciences and Physics)
Mentor(s): Pereira, Renata (Internal Medicine) | **Ayushi Sood** (Internal Medicine)

GDF15 Signaling Through GFRAL Mediates Metabolic Improvements in Response to Mitochondrial Stress

Authors: Vamsi Challa, Ayushi Sood, Jayashree Jena, Joshua Peterson, and Renata O. Pereira

Introduction: Growth differentiation factor 15 (GDF15) is a distant member of the transforming growth factor-ß (TGFß) superfamily that can be induced and secreted by several tissues in response to stress. GDF15 has been shown to mediate resistance to diet-induced obesity (DIO) and to increase energy expenditure via its actions on the glial-derived neurotrophic factor receptor α family-like specific receptor (GFRAL) located in the hindbrain. Nevertheless, recent studies suggest GDF15 may exert GFRAL-independent effects to promote metabolic health. We recently showed that deletion of the mitochondrial fusion protein optic atrophy 1 (OPA1) specifically in brown adipocytes (OPA1 BKO mice) leads to local mitochondrial stress and induction of GDF15 secretion, which contributes to promote resistance to DIO, improve glucose homeostasis and promote thermoregulation in this mouse model. In the present study, we investigated whether GDF15 signaling through GFRAL is necessary to mediate these metabolic effects.

Methods: We generated mice lacking OPA1 in brown adipocytes, while also lacking GFRAL expression globally, by crossing OPA1 BKO mice with Gfral -/- mice (DKO). We then subjected OPA1 BKO mice, DKO mice and their wild type (WT) littermate controls to 12 weeks of high-fat diet (HFD) feeding, after which we assessed changes in body weight, body composition, glucose homeostasis and insulin sensitivity.

Results: Under isocaloric conditions, the DKO mice displayed body weights comparable to the control mice while also expressing compensatory browning of white adipose tissue (WAT). Furthermore, DKO mice lacked resistance to diet-induced obesity and the improvements in glucose homeostasis observed in OPA1 BKO mice. Under a high-fat diet, DKO mice exhibited body weights comparable to their WT counterparts but significantly greater than those of OPA1 BKO mice. Finally, DKO mice were cold intolerant due to lack of cold-induced activation of thermogenic genes.

Conclusions: Together, our data indicate that GFRAL is required to mediate GDF15's effects on weight gain resistance, improved glucose homeostasis and thermoregulation in OPA1 BKO mice.

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5:10-5:55pm
2nd

Allison Stolte (Microbiology)
Mentor(s): Maury, Wendy (Microbiology & Immunology) | **Paige Richards** (Microbiology & Immunology)

Floor Hall *Investigating Novel Entry Inhibitor Efficacy During Filovirus Glycoprotein-mediated Infection*

Upon internalization of the endosomal compartment, the full-length EBOV glycoprotein (GP) is proteolytically processed by low pH dependent proteases, such as cathepsin B and L. The proteolytically processed viral GP then binds to endosomal membrane bound NPC1, mediating viral/cellular membrane fusion events and releasing the viral genome into the cytoplasm. We hypothesize that by inhibiting cathepsins, these compounds cause EBOV to remain within the endosome and be degraded. The broad, irreversible cysteine protease inhibitor, E-64, is an effective cathepsin inhibitor that may cause off-target effects and are non-specific to cathepsins. This series of related compounds developed by Dr. Kevin Pinney at Baylor University may serve as reversible inhibitors, possibly functioning as effective antivirals.

To investigate inhibition of EBOV in cell culture, we have generated dose response curves by treating Vero E6 cells with increasing concentrations and infecting them with rVSV/EBOV GP. We then measured infectivity by flow cytometry and calculated percent GFP positivity.

In addition to the dose response curves against EBOV GP currently being generated, mechanistic studies to define the mode of action of these compounds will be performed over the next year. These studies include western blots to assess the proteolytically processing kinetics of EBOV GP, and determining the efficiency of the compounds to block virus membrane/host membrane fusion events. Cytotoxicity assays in immortalized and primary cell lines as well as skin explants will be performed to assess the toxicity of the compounds. The inhibition efficacy of these compounds will also be assessed against viruses that bear the glycoprotein of other filoviruses, Marburgvirus GP and Sudan GP. Others have shown that cathepsins are not required for productive entry of these viruses and we may find that these compounds are highly effective inhibitors of EBOV GP dependent entry, but not entry mediated by other filovirus GPs. In addition to studies with monolayers of cells, we will test the antiviral efficacy of these compounds against our surrogate filoviruses on human skin explants. Skin explants are a highly relevant model system to investigate the effectiveness of antivirals in a complex tissue composed of multiple cell types that support filovirus infection. Preliminary studies suggest that at least one of these cathepsin inhibitors blocks rVSV/EBOV-GP infection of the skin explants. In the future, I plan to conduct fusion assays, drug inhibitor

studies in primary cell lines like murine macrophages, Kupffer cells, peritoneal cells, and keratinocytes, and continue investigating the efficacy of antivirals in skin explants, and test if these drugs can prevent disease with Marburg virus.

105
5:10-5:55pm
2nd Floor Hall

Blake Etringer (Economics, Political Science)
Josie Hartman (Political Science, Environmental Policy/Planning)
Mentor(s): Mitchell, Sara (Political Science) | **Elise Pizzi** (Political Science)

Disasters, Migration, and Violence Lab: Disaster Response in Asian Nations

Natural disasters threaten to displace as many as one billion people by 2050. The DMV Lab is working to create a new dataset on government responses to disasters by aggregating news stories and coding instances of government and third-party responses. This poster details our current findings for two Asian nations: Japan and Indonesia.

106
5:10-5:55pm
2nd Floor Hall

Brendyn Little (Astronomy and Physics)
Fiona Holmes (Astronomy, Physics, and Geoscience)
Mentor(s): Nataf, David (Physics & Astronomy)

Revisiting Stellar Populations of Low-Extinction Fields in the Galactic Bulge

In the field of galactic archaeology--the study of the Milky Way's structure and evolution--the Galactic Bulge remains a region of high interest. While astronomers have a general understanding of its structure and composition, its exact evolution has been long debated due to complications such as distance, stellar crowding, and interstellar extinction (Babusiaux 2010). TOPCAT (Taylor 2011) and Isochrones (Morton, 2015) combined with newer data from telescopes such as Gaia allow us to study previously observed regions in the Galactic Bulge and compare results. At this moment, we are revisiting four "low-extinction windows" of the WFC3 Galactic Bulge Treasury Program (Brown 2009). While definite conclusions haven't been made about our sample of Bulge stars, significant progress has been made for the photometric and astrometric criteria.

107
5:10-5:55pm
2nd Floor Hall

Lauren Smith (Neuroscience, Anthropology)
Mentor(s): Buchanan, Gordon (Neurology)

Lack of Central Serotonin Neurons Alters Respiratory Responses to CO_2 in a Mouse Model of Epilepsy

One in 26 people will be diagnosed with epilepsy in their lifetime, and about 30% of these people will have refractory epilepsy, meaning that their seizures cannot

be controlled by medication. Refractory epilepsy is a known risk factor for sudden unexpected death in epilepsy (SUDEP), the leading cause of death in patients with epilepsy. SUDEP often happens after a generalized tonic-clonic seizure, which can cause hypercapnia and acidosis. Seizures are known to reduce the hypercapnic ventilatory response (HCVR) in mice. Serotonin (5-HT) plays a key role in respiratory regulation, as well as in seizures and arousal. Therefore, we hypothesize that the lack of central 5-HT neurons in the brain will further worsen the respiratory response to CO2 in epileptic mice.

To test our hypothesis, we recorded EEG, EMG, plethysmography, and CO2 levels in mice under seizure naive and epilepsy conditions. A pilocarpine-induced temporal lobe epilepsy model (piloTLE) was used. To create the piloTLE model, we induced status epilepticus in both Lmx1bf/f/p 5-HT KO mice (5-HT KO mice) and their wild-type littermates (Lmx1bf/f mice or 5-HT WT mice) using pilocarpine. After prolonged status epilepticus, a seizure lasting at least 60 minutes, the surviving animals could develop spontaneous seizures. Upon the detection of sleep, either room air or 7% CO2 was delivered to the mice. Respiratory parameters: breathing frequency (*f*), tidal volume (VT), and minute ventilation (VE) were extracted from plethysmography recordings and analyzed.

CO2 exposure increased *f*, VT, and VE amongst all animals. However, this response was reduced in epileptic animals following a seizure, and in 5-HT KO mice. Additionally, in these groups the hypercapnic ventilatory response was decreased. However, there is a large variation in breathing frequency between animals and trials. Impaired hypercapnic ventilatory response suggests that seizures blunt the body's ability to properly compensate after being exposed to CO2, and the ability to oxygenate after a seizure, increasing vulnerability to SUDEP. In future experiments we hope to further explore the connection between serotonin, seizures, and breathing.

108
5:10-5:55pm 2nd Floor Hall

Seren Castellano (Biology and Anthropology)
Mentor(s): Neiman, Maurine (Biology)

Unraveling Ribbon Worm Diversity: Biodiversity and Systematics of Antarctic Nemertea

Antarctica is one of the most understudied regions in the world for biodiversity, leading to challenges in understanding and classifying species. The phylum Nemertea, also known as ribbon worms, is an understudied phylum in the animal kingdom with most specimens not identified to species or other

taxonomic ranks due to their cryptic nature. While some estimate nemertean diversity to include 6,500 to over 13,000 species, only 1,350 have been formally described.

Nemerteans are prevalent across marine habitats, but have not been widely studied in Antarctica, posing a barrier to understanding the biodiversity in the region. In this project, we have collected 32 ribbon worm specimens from Antarctica to better understand the biodiversity and biogeography of the region. Here we use Sanger sequencing of mitochondrial genes, COI and 16S rRNA, to assess their placement in the nemertean phylogeny. From maximum likelihood analysis of 16S data, we have identified several specimens from our sample set closely related to the genus Lineus in Heteronemertea. This differs from the placement of other well-known Antarctic nemerteans in Hoplonemertea. Through further phylogenetic analyses, we can develop a more enriched understanding of the range of species located both in shallow and deep waters across the Southern Ocean. Additionally, we hope to further use genetic barcoding to classify unidentified specimens at the genus or species level and may possibly find new putative species. This work aims to elucidate the phylum Nemertea, recognize the extensive biodiversity across Antarctica, and emphasize the importance of genetics for classifying cryptic species.

109
5:10-5:55pm
2nd Floor Hall

Jacqueline Ott (Health and Human Physiology)
Mentor(s): Talbert, Erin (Health Sport & Human Phys)

Understanding the mechanistic pathway in which TGF-b drives metabolic dysfunction

Weight loss in people with cancer, called cancer cachexia, involves skeletal muscle wasting and an overall decrease in one's quality of life and survival. Muscle wasting can also make it difficult to withstand the effects of cancer treatments, and there is no approved therapy to prevent muscle wasting. One significant symptom of cancer cachexia is metabolic dysfunction. Our recent work has demonstrated increased activation of TGF-b in muscle of cachectic people and animals. Much is known about the ability of transforming growth factor-beta (TGF-b) superfamily members to induce muscle atrophy but less is known about the mechanism in which TGF-b is causing metabolic dysfunction. We sought to understand the impact of TGF-b treatment on a system of cultured muscle fibers, in which we have previously shown that TGF-b1 increased glucose disappearance and lactate production, suggesting

increased glycolytic metabolism. We cultured C2C12 cells and differentiated them into muscle fiber-like cells called myotubes. After 5 days of differentiation, we treated the cells with 10 ng/mL recombinant TGF-b1. RNA-sequencing identified that TGF-b1 downregulates NRK2 gene expression, which we confirmed by real-time PCR. Nicotinamide Adenine Dinucleotide (NAD) is a key factor in supporting the production of ATP by oxidative phosphorylation, and NRK2 is an important enzyme in the production of NAD. The downregulation of NRK2 by TGF-b1 leads us to believe TGF-b may be a driving factor in the metabolic shift seen in cachectic skeletal muscle. Although NRK2 is downregulated, multiple NAD precursors which bypass NRK2 mechanism have been explored. A promising NAD rescue mechanism is increasing levels of the NAD precursor, Nicotinic Acid (NA). An increase in NA is shown to work in mouse models, NA and other NAD precursors are believed to bypass TGF-b's effect on metabolic dysfunction, including in successfully improving cancer-induced muscle wasting.

110
5:10-5:55pm
2nd Floor Hall

Abdul Quraishi (Chemistry BA)
Mentor(s): Cole, Renee (Chemistry) | **Vinay Bapu Ramesh** (Chemistry)

Exploring How Undergraduate Chemistry Labs Foster Science Practice Competencies

This study examines how undergraduate laboratory courses provide opportunities for students to develop competencies in science practices. By analyzing course syllabi and student lab manuals, we identified how these courses engage students in key scientific practices such as data analysis, experimental design, and scientific reasoning. In addition, we investigated the alignment between lab tasks, assessments, and intended learning objectives to evaluate how effectively students can achieve these goals. Findings indicate that the current lab materials support students' engagement with scientific practices by offering multiple opportunities for practice, assessment, and feedback. We also discuss strategies instructors can use to further enhance student engagement with science practices in the chemistry laboratory courses.

111
5:10-5:55pm
2nd

Tyler Draayer (Biology (Genetics and Biotechnology), Pre-Medicine)
Mentor(s): Cyndari, Karen (Emergency Med) | **Mitchell Coleman** (Orthopaedics and Rehab)

Floor Hall *Does Oxidative Stress Cause Immune Cell Degranulation in Osteoarthritic Synovium*

Introduction: This project aims to find how mitochondrial redox function of degranulating cells such as mast cells and basophils may be implicated in osteoarthritis (OA) development. Given arthritis is a leading cause of disability, it is essential to uncover new potential therapeutic targets that may benefit those at risk of OA. Work by others indicates that increasing mast cells directly correlates with OA severity. Additionally, depleting mast cell significantly attenuated OA symptoms in mice. Basophils have not been well evaluated. Degranulation is also likely dependent on mitochondrial function. Our goal is to prevent or attenuate by establishing a link between degranulation, oxidative stress, and OA. Here we present our histomorphometry, immunofluorescence (IF) quantification, and ELISA results evaluating electron transport chain inhibitor Oligomycin (OMY), anti-histamine Cromolyn Sulfate (CRO), anti-oxidant N-Acetyl Cysteine (NAC), in 2 patients to determine optimal dosing of agents, and optimal incubation conditions (21% oxygen vs. 5% oxygen).

Methods: Synovium was acquired from joint surgery patients (n =2; 51M, 49F) and sectioned into biopsy cores. These sections were placed into an ex vivo system, the Joint Space Analysis System (JSAS) and treated with Cromolyn (CRO, 10 uM), Oligomycin (OMY, 10 uM), and N-acetyl cysteine (NAC, 10uM). Cytokines from JSAS supernatant were analyzed with ELISA for MMP-9 and laminin (markers of Synovitis), as well as histamine. H&E slides were analyzed by histomorphometry to evaluate the integrity of intimal lining structure of the synovium.

Results: Histamine ELISA demonstrated synovial tissue secretes histamine in all groups except those treated with CRO + NAC, where it was undetectable at 24 hours. MMP-9 ELISA showed no difference in any group at 24 hours. Laminin was undetectable in ELISA at any time point. H&E demonstrated no difference in the structure of synovium in untreated tissue at 21% vs. 5% oxygen. OMY treatment resulted in complete destruction of the intimal lining in 21% oxygen, and near complete destruction at 5% oxygen. This was attenuated by co-treatment with NAC or CRO. Vehicle treatment groups did not display the OMY phenotype. Fibroblasts were unaffected by OMY based on H&E. IF shows a decrease in degranulating cells in the intimal lining of tissue treated with CRO. Other IF results are pending.

Conclusions: The loss of intimal lining macrophages with OMY at 10 uM indicates a need to decrease this dose for future experiments. That the phenotype is not observed with co-treatment of NAC or CRO indicates likely unmanageable oxidative stress that is worsened in high oxygen environments compared to low oxygen. The decrease in histamine in the CRO+NAC group indicates oxidative stress is likely involved in histamine release, but that both processes (anti-histamine and anti-oxidant) must be affected to inhibit degranulation. IF analysis will continue, and we will extend analysis into the sub-lining of the tissues. We will next formalize the 5% oxygen conditions, extend the time in culture, optimize the dosing, and test these treatments in settings of inflammation.

112
5:10-5:55pm
2nd Floor Hall

Elleri Herman (Human Physiology)
Mentor(s): Buchanan, Gordon (Neurology)

Time-of-Day Influences on Seizure Severity and Mortality in Bmal1 Knockout Mice

Epilepsy is a neurological disorder marked by recurrent spontaneous seizures, with one-third of patients experiencing drug-resistant epilepsy, which increases their risk of sudden unexpected death in epilepsy (SUDEP). SUDEP occurs more frequently at night in both diurnal humans and nocturnal mice, suggesting a circadian component to seizure-related death. The clock gene Bmal1 regulates circadian rhythms in both species, and its deletion results in an absent biological rhythm, eliminating normal sleep–wake patterns. To investigate the influence of time of day on SUDEP, we utilized Bmal1 knockout (KO) mice and their wild-type littermates. Maximal electroshock was used to induce seizures resulting in full hindlimb extension. Seizures were induced at different times of day to assess how mortality rate, seizure duration, and seizure severity vary across the circadian cycle. This study aims to elucidate how disruptions in circadian regulation contribute to time-of-day differences in seizure outcomes and SUDEP vulnerability. So far, we have observed a higher survival rate for mice lacking a circadian rhythm during the day.

113
5:10-5:55pm
2nd

Josephine Norris (Psychology)
Mentor(s): Treat, Teresa (Psychological Brain Sci) | **Solange Bolger** (Psychological Brain Sci)

Floor Hall

College Students Underperceive Same-Sex Peers' Use of Cannabis-Related Protective Behavioral Strategies

Cannabis is the most commonly used illicit drug among college students, and its use is associated with negative outcomes, including poorer academic performance and adverse mental health problems. Greater use of cannabis-related Protective Behavioral Strategies (C-PBS), which are cognitive-behavioral harm-reduction strategies, is associated with fewer negative outcomes. Students often underestimate the extent to which their peers engage in PBS in other domains, such as alcohol use and sexual activity, and these underestimations are associated with lower personal use of PBS. Thus, the current work evaluated whether similar underestimations of peers' C-PBS use emerge in the domain of cannabis use and whether these underestimations relate to personal cannabis use. Undergraduates (N = 1,342, 53.3% women) completed measures of hazardous cannabis use, their own use of C-PBS, and their perceptions of the typical same-sex peer's use of C-PBS. Students significantly underestimated their same-sex peers' use of C-PBS, with large effects emerging for men and moderate-to-strong effects for women. Women who reported more hazardous cannabis use also reported markedly less personal use of C-PBS than women who did not report hazardous use, with a similar moderate-to-strong effect observed for men. Across genders, hazardous cannabis use was associated with somewhat greater underestimation of same-sex peers' C-PBS use. Findings suggest that underestimations of peers' C-PBS may contribute to hazardous cannabis use, highlighting the potential utility of interventions that correct these misperceptions.

114
5:10-5:55pm
2nd Floor Hall

Ella Schlueter (Chemistry, Sociology)
Mentor(s): Santillan, Donna (Obstetrics/Gynecology)

Decreased Fetal Movement Association with Adverse Maternal and Child Outcomes

The objective of this research is to determine if symptoms of decreased fetal movement (DFM) during pregnancy are associated with adverse health outcomes for both mothers and children. Using a retrospective cohort study, this research will collect data from pregnant mothers with any DFM diagnoses and use descriptive statistics to compare their outcomes against mothers with no DFM diagnoses. By comparing the amount of diagnosed adverse outcomes for

both mother and child (such as hypertension, respiratory distress, etc.) we can determine if there is a connection between DFM and adverse health outcomes.

115
5:10-5:55pm 2nd Floor Hall

Maxwell Shumaker (Biochemistry and Molecular Biology BS, Chemistry BA)
Mentor(s): Wallrath, Lori (Biochem & Molecular Bio)

Identification of mis-regulated genes in a fruit fly model of the vision disorder Retinitis Pigmentosa

Retinitis Pigmentosa (RP) is an inherited retinal degenerative disorder affecting approximately 1 in 4,000 individuals worldwide. RP is associated with the loss of rod photoreceptors that are responsible for peripheral and nighttime vision. Loss of the rods is followed by death of the cone photoreceptors that are responsible for visual acuity and daytime vision. Dominant mutations in approximately 60 genes cause RP. Our studies are focused on mutations in the SNRNP200 gene encoding an essential component of the spliceosome, a macromolecular complex that processes pre-mRNAs to mature mRNAs. How mutations in the SNRNP200 gene cause photoreceptor degeneration remains poorly understood. To investigate changes in gene expression that might cause disease, we used a Drosophila melanogaster (fruit fly) model in which a dominant patient-based mutation was introduced into the fruit fly orthologue of SNRNP200. This mutation is homozygous lethal. However, heterozygotes are viable and show abnormal photoreceptors with altered mitochondria. Using RNA-seq, we analyzed changes in gene expression in RNA isolated from heads (enriched with eye tissue) of mutants and compared the results to that of controls. Over 2,250 differentially expressed genes were identified using an adjusted p-value threshold of ≤ 0.05. Pathway analysis revealed dysregulation of mRNA splicing processes via spliceosome complex components, protein folding pathways with accumulation of misfolded proteins, along with mitochondrial dysfunction and oxidative stress response. These findings provide insights into the molecular changes linked to spliceosome dysfunction caused by mutations in SNRNP200 and identify potential pathogenic mechanisms underlying the associated RP.

116
5:10-5:55pm 2nd Floor Hall

Amya Saxena (Biochemistry and Molecular Biology (Pre-Med track))
Mentor(s): Wallrath, Lori (Biochem & Molecular Bio)

Treating a Fruit Fly Model of Muscular Dystrophy with TGFbeta Pathway Inhibitors

Mutations in the LMNA gene cause rare types of muscular dystrophy. The LMNA gene encodes lamins, filamentous proteins that form a meshwork lining the

inner side of the nucleus. Our laboratory has discovered that mutations in LMNA activate the TFGbeta pathway in fruit fly models of lamin-associated muscular dystrophy and muscle biopsy tissue from patients with LMNA mutations. Activation of this pathway is known to be deleterious to muscle health. The goal of my research is to use the fruit fly models to test drugs that block the TGFbeta signaling pathway and determine if they improve muscle function. A larval motility assay was used to quantify larval motility as a measure of muscle function. We found that when larvae with muscle-specific expression of mutant lamin were fed Halofuginone Hydrobromide (25 nM and 50 mM), and Vectocertib (25 and 50 nM), they exhibited a statistically significant increase in larval motility compared to control larvae treated with vehicle alone. Whereas feeding the larvae Losartan (5μM, 10μM, and 20μM), Vectrosertib (100nM), and Halofuginone Hydrobromide (100nM), did not result in statistically significant increase in larval motility compared to controls. These results suggest that TGFbeta inhibitors might be a treatment for individuals with lamin-associated muscular dystrophy.

117
5:10-5:55pm
2nd Floor Hall

Noah Beem (Environmental Bioscience and Geoscience)
Mentor(s): Swanson, Benjamin (Earth, Envir, Sustainblty)

Avian Abundance and Diversity in Ashton Prairie

Since its establishment and planting in 2019, the Ashton Experimental Prairie has served as a site for a range of environmental studies. In recent years, bird diversity at the prairie has shifted noticeably as additional acreage has been planted. This project aims to characterize patterns of bird diversity and seasonal abundance across the site and to evaluate how these trends might serve as indicators of prairie health. Data were collected using a combination of acoustic monitoring and traditional point counts conducted at multiple locations within the prairie. Preliminary results indicate a decline in overall bird diversity compared to previous years. It remains unclear whether this change reflects methodological factors, such as species misidentification, or natural ecological stabilization as the prairie matures. Ongoing monitoring will provide valuable long-term data to assess biodiversity and ecological resilience at the Ashton Experimental Prairie.

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5:10-5:55pm
2nd

Alex Bock (Biochemistry and Molecular Biology BS)
Mentor(s): Baker, Sheila (Biochem & Molecular Bio)

Quantification of photoreceptor loss in mouse models of KCNV2 retinopathy

Floor Hall

In this study we investigate two variations of the Kv8.2 knock-out (KO) mouse which is a model for the inherited retinal disease known as Cone Dystrophy with Supernormal Rod Response (CDSRR). Loss of vision in CDSRR comes from reduced and delayed photoreceptor responses to light. For an unknown reason some photoreceptors degenerate in this disease. The Kv8.2 KO mouse mimics the major phenotypes of the human disease, which provides an opportunity to test how various factors might influence photoreceptor degeneration. In the first set of experiments, we tested if the absence of rods would increase cone damage in a line of Kv8.2 KO mice without rod photoreceptors. In the second set of experiments, we tested for decreased retinal degeneration in a line of Kv8.2 KO mice with a functional copy of the Nnt gene. NNT functions in metabolism by protecting mitochondria from oxidative damage. To measure mouse retinal degeneration the photoreceptor layer of the retina was analyzed from histology preparations of the retina viewed with a THUNDER microscope or analyzed from optical coherence tomography (OCT) images obtained from living mice. Qualitatively, histological analysis of the cone only Kv8.2 KO retina at 4 months showed disorganization the retina, including many gaps within the outer retina, particularly near the outer plexiform layer. Quantification of the cone only retina is in progress. The Nnt KO model was assessed using OCT. At 3 months, the Nnt KO mice (n=2) did not show a significant difference in outer nuclear layer (ONL) thickness from the Nnt heterozygous controls (n=3) ($p > 0.05$). Similarly, at 5 months, no significant change in ONL thickness was observed between the Nnt KO (n=3) and heterozygous mice (n=3) ($p > 0.05$). The disfigurement of the cone only retina in Kv8.2 KO suggests there may be abnormal retinal remodeling in the absence of rods during degeneration. In the Nnt KO mice, the data suggests that NNT dependent oxidative stress pathways might not play a major role in the retinal thinning associated with Kv8.2.

119
5:10-5:55pm
2nd Floor Hall

Na'lLa Clarkson (Therapeutic Recreation and African American Studies)
Mentor(s): Young, Cory (History)

Returns and Registrations: An Analysis of Gradual Abolition Paperwork in Cumberland County

Dr. Cory J. Young, Assistant Professor of History at the University of Iowa has initiated the creation of a digital database that compiles Pennsylvania's surviving county slave registries. Due to this I received a summer fellowship which consisted of creating Markdown transcriptions of digital scans of Cumberland

County's lifetime slave registries and returns over the course of gradual abolition. From conducting this research over the span of 11 weeks, I found that differences between the returns and registrations arose because of a myriad of reasons that can intersect within each other. Such as administrative needs, the editing of events, and acts of colonization.

120
5:10-5:55pm
2nd Floor Hall

Jiya Patel (Neuroscience)
Mentor(s): Gudenkauf, Julie (Neurology)

ABO Blood Types and Patterns in Acute Stroke Population: Preliminary Analyses

Introduction: Stroke is a leading cause of death and long-term disability worldwide. Many strokes, whether ischemic or hemorrhagic, are broadly associated with disorders of coagulation and endothelial dysfunction. The ABO blood system includes four main blood types consisting of A, B, AB, and O, defined by the presence of a specific carbohydrate antigen on the extracellular surface of red blood cells and other important components of coagulation. There is increasing evidence that blood type may be associated with cardiovascular events, including stroke, and that blood types with A or B antigens may be associated with ischemic events, while type O blood types may be associated with hemorrhage. This study is a preliminary analysis of a larger study which aims to investigate the association between ABO blood type and stroke types in a large patient population. The primary aim of this study is to characterize the association between ABO blood types (Types A, B, and AB versus Type O) and stroke types (ischemic versus hemorrhagic). We hypothesize that non-O blood types (Types A, B, and AB) will have higher rates of ischemic stroke compared to Type O blood type.

Methods: The parent study is a retrospective chart review of all stroke admissions between 2016 and 2024 at a comprehensive stroke center in the United States. At the time of this preliminary study, 665 patients were included. Stroke types are identified using International Classification of Diseases (ICD-10) codes corresponding to ischemic and hemorrhagic stroke diagnoses. Data extracted from electronic medical records includes demographics, comorbidities, stroke subtypes, severity measures (e.g., length of stay, discharge disposition), coagulation factors, and ABO and Rh blood types. We compare groups with non-O blood types (Types A, B, AB) to Type O blood type. The prevalence of ischemic stroke within each group will be calculated and compared.

Results: Of the 665 total stroke patients, 394 patients had documented ABO blood types and were included in this preliminary analysis. The blood type distribution in our total stroke population was as follows: 42% had blood Type A, 10% had blood Type B, 3% had blood Type AB, and 45% had blood Type O, which is similar to the US general population. The non-O types (A, B, AB) were combined to represent 55% of the group (Type "Non-O"), and were compared to the 45% with Type O. These two groups were similar in age, sex, and race, coagulation studies, Rh status, and stroke severity overall. 60% of the Non-O group had an ischemic stroke, while 57% of Type O group had an ischemic stroke. This difference was not significant.

Discussion: In this preliminary analysis, we found that patients with Non-O blood types had a higher proportion of ischemic strokes compared to those with Type O, but the difference was not statistically significant. Therefore, our hypothesis was not supported. This may be due to the small sample size, which limited our abilities to make a significant finding. Future analyses with the full dataset will include a larger sample size to better assess the relationship between ABO blood type and stroke.

121
5:10-5:55pm
2nd Floor Hall

Nathan Barlow (Biomedical Science)
Mentor(s): Pierce, Gary (Health Sport & Human Phys)

Smoking Contributes to the Structural Component of Higher Aortic Stiffness Independent of COPD Status Among Older Adults

Introduction: Cardiovascular disease (CVD) is the leading cause of death in the U.S. and is a major cause of death in individuals with chronic obstructive pulmonary disease (COPD). COPD is strongly associated with CVD, partly as a result of accelerated vascular aging characterized by arterial wall stiffening and remodeling. Carotid-femoral pulse wave velocity (CFPWV), the reference standard for measuring total aortic stiffness, is elevated in COPD and predicts CVD risk. It is unclear whether aortic stiffness in COPD is driven by structural alterations to the arterial wall (structural aortic stiffness, SPWV) or increased load on the arterial wall from elevated blood pressure (load-dependent aortic stiffness, LDPWV). In addition, it is unknown whether aortic stiffness in COPD is a result of smoking or the disease state itself. Therefore, we aimed to determine the contribution of smoking and/or COPD to total, structural, and load-dependent arterial stiffness in three groups: healthy age-matched non-smokers, smokers without COPD, and smokers with COPD.

Methods: CFPWV was measured in 184 individuals (age 70 ± 4 yrs; 90M/94F), including healthy aged (n=69), smokers without COPD (n=61), and smokers with COPD (n=54). All CFPWV measurements were standardized to a reference mean arterial pressure of 90 mmHg, which was used to calculate SPWV. LDPWV was calculated as the difference between total CFPWV and SPWV. Arterial remodeling was characterized by carotid intima-media thickness (IMT).

Results: CFPWV and SPWV were higher in both smoking groups compared with healthy non-smokers ($p < 0.05$), with no difference between smokers with and without COPD (see Table 1). LDPWV did not differ among groups. After adjusting for age, significance persisted for CFPWV and SPWV, but was lost after further adjustment for antihypertensive use and pack-years. Carotid IMT was also elevated in both smoking groups compared with the healthy group.

Conclusion: Smoking is associated with increased aortic stiffness and carotid artery remodeling, independent of COPD status. This association is driven by structural rather than load-dependent components of aortic stiffness. These data suggest that smoking history, rather than the COPD itself, underlies the arterial damage. However, adjustments for pack-years attenuated these associations. These findings highlight the importance of smoking cessation to mitigate accelerated vascular aging and CVD risk in those with or without COPD.

122
5:10-5:55pm 2nd Floor Hall

Sophia Friton (German, Global Health)
Mentor(s): Liebzeit, Daniel (Nursing)

Exploring Transportation for Older Adults in Johnson County through the JCLC 2024 Survey

This project explores community perspectives on aging and livability in Johnson County, Iowa, with a focus on transportation access for older adults. Using data from the 2024 Johnson County Livable Community (JCLC) survey, this study examines how transportation relates to independence and quality of life, particularly for aging residents. Accessibility, safety, and mobility emerged as central issues in discussions of aging well. The project describes older adults' transportation needs, preferences, and barriers within Johnson County. By identifying patterns in community perspectives and demographic influences, this work highlights where transportation challenges exist. The ultimate goal is to translate community input into actionable recommendations that promote age-friendly transportation planning and equitable access to resources for all residents of Johnson County.

123
5:10-5:55pm
2nd Floor Hall

Saina Narsian (Neuroscience)
Mentor(s): Buchanan, Gordon (Neurology)

Impact of Seizures on the Arousal Response to CO2

Epilepsy affects approximately one in 26 people during their lifetime, and about 30% of those individuals experience refractory epilepsy, in which seizures are resistant to medication. Refractory epilepsy is a major risk factor for sudden unexpected death in epilepsy (SUDEP). SUDEP often happens after a generalized tonic-clonic seizure, which can cause hypercapnia and acidosis. The arousal response to CO2 is regulated by serotonin (5-HT), since mice lacking central 5-HT neurons (Lmx1bf/f/p mice, 5-HT KO mice) do not wake up to CO2. 5-HT is also involved in seizure regulation. Therefore, we hypothesized that arousal latency to CO2 will be increased in epileptic mice.

To test our hypothesis, we recorded EEG, EMG, and CO2 levels using a custom written MATLAB script to detect sleep and deliver either room air or 7% CO2. A pilocarpine-induced temporal lobe epilepsy (piloTLE) model was used. Briefly, we induced status epilepticus in both Lmx1bf/f/p 5-HT KO mice (5-HT KO mice) and their wild-type littermates (Lmx1bf/f mice or 5-HT WT mice) using pilocarpine. After prolonged seizure, at least 60 minutes, the surviving animals can develop spontaneous seizures. The time between the gas delivery and the animal waking up, the arousal latency to CO2, was analyzed.

Through our data, we found that among epileptic animals, CO2 exposure lengthened arousal latency in 5-HT WT mice but not in 5-HT KO mice. Additionally, the arousal latency immediately after a seizure increased even more in 5-HT WT mice. Prolonged arousal latency suggests that seizures affect the hypercapnic response, and the ability to oxygenate after a seizure, increasing vulnerability to SUDEP. In future experiments we hope to further explore the connection between serotonin, seizures, and arousal latency.

124
5:10-5:55pm
2nd Floor Hall

Jacob Bowen (Psychology)
Mentor(s): Wasserman, Ed (Psychological Brain Sci)

Pigeons' behavior in contingent and non-contingent reinforcement schedules: Do they understand the difference?

Prior studies have shown that pigeons can detect when a reward is contingent or non-contingent on their behavior. However, the factors underlying this ability are still unclear. In the present study, four pigeons were trained to peck at a blue

square in exchange for food. The pigeons began in the contingent phase, where food was made available after a variable amount of time. To obtain the reward, the pigeons had to peck after the variable interval had passed. After a birds' response rate stabilized, it was switched to the non-contingent phase. In this phase, food was delivered after the same variable interval as the contingent phase, but regardless of whether pigeons pecked the blue square. We found that pigeons understood the difference between the contingent and non-contingent phases, decreasing their response rate during the non-contingent phase. We further evaluated whether this decrease in pigeons' response rates was the result of the incidental delays between their response and the reward.

125
5:10-5:55pm
2nd Floor Hall

Caleb Powers (Psychology)
Mentor(s): Castroruiz, Leyre (Psychological Brain Sci)

The role of action-outcome contingency in pigeons' understanding of agency

Actions and their consequences have been heavily pondered over centuries. To know and be aware of one's own ability to generate actions that can, in turn, influence consequences, is known as agency. Do pigeons have this ability? Can they discriminate between what they can and cannot influence? In order to explore this question, we trained four pigeons to peck a stimulus that would be followed by food reinforcement. The pigeons began on a variable interval (response contingent) schedule, so that their pecks generated the food delivery. The stimulus was on the screen for a relatively short amount of time. Once they were pecking at a stable rate, they were moved to a variable time (response non-contingent) schedule. If the pigeons could understand the relationship between their pecks and the obtention of food, then they should peck during the contingent phase, but stop pecking during the non-contingent phase. Indeed, that is what we observed. Thus, pigeons seemed to understand whether or not their actions generated the food reinforcement.

126
5:10-5:55pm
2nd Floor Hall

Olivia Heller (Biochemistry)
Mentor(s): Tucker, Jessica (Microbiology & Immunology) | **Sheila Gonzalez** (Microbiology & Immunology)

Roles of tRNA splicing enzymes in Infection

Murine gammaherpesvirus (MHV68) is a large double-stranded DNA virus genetically related to human Kaposi sarcoma-associated herpesvirus (KSHV) and Epstein-Barr virus (EBV). Our previous research found significant

dysregulation of transfer RNA (tRNA) expression in response to MHV68, suggesting that tRNA control plays an important role during infection. Specifically, host pre-tRNAs are significantly upregulated in their expression during an MHV68 infection. Furthermore, we demonstrated that several of these upregulated pre-tRNAs undergo cleavage, resulting in the formation of tRNA fragments (tRFs).The presence of these tRFs suggest that MHV68 not only influences tRNA transcription but also alters tRNA processing pathways within the host cell. We have explored the role of two host proteins that participate in tRNA processing, Tsen2 and Clp1. Tsen2 is an endonuclease that cleaves at the 5' splice site of the pre-tRNA introns, and Clp1 is an RNA kinase with a poorly defined role in tRNA processing. We found that siRNA-mediated knockdown of Tsen2 and Clp1 have differential effects on both tRF accumulation and viral replication. While Clp1 knockdown shows an increase in tRFaccumulation and a decrease in overall viral titers, Tsen2 knockdown shows decreased tRF accumulation and increased titers at a low MOI. Overall, we hypothesize the proviral effect of Clp1 and the antiviral effect of Tsen2 is linked to their roles in tRNA processing. To substantiate our findings that Tsen2 and Clp1 modulate infection, we will perform rescue experiments to rule out off-targeting effects of siRNAs used to knockdown endogenous Tsen2 or Clp1. We are currently producing overexpression cell lines by transducing NIH3T3 cells with FLAG-tagged, siRNA-resistant versions of Tsen2 or Clp1. We will validate exogenous expression of Tsen2 or Clp1 by probing with FLAG antibodies via a western blot. We expect that siRNA-treated cell lines rescued with siRNA-resistant Tsen2 or Clp1 should perform similarly to a wild type cell line during infection. Future work is aimed at mechanistically determining how Tsen2 and Clp1 influence MHV68 replication, and whether canonical tRNA processing is required for these effects.

127
5:10-5:55pm
2nd Floor Hall

Bailey Vergara (Journalism and Mass Communication)
Mentor(s): Zhang, Bingbing (Journalism & Mass Communi) | **Yasar Onel** (Physics & Astronomy)

Attitudes and Beliefs Regarding Generative AI Usage in Newsrooms Among College Journalism Students

Within the past decade, generative AI has cemented itself as a watershed development in the realm of modern journalism. Media professionals have expressed both hope and concern towards potential generative AI integration in the newsroom. However, the existing research on perceptions of generative AI

news mainly centers on professional journalists, with very little focus on the perspectives of journalism students. These students are the journalists of the future, whose views on generative AI will inevitably shape how it is seen and used within the field in years to come. This study aims to be among the first to examine the attitudes and beliefs of college journalism students in regards to generative AI's place in the newsroom. Twenty semi-structured interviews were conducted with student journalists working with institutions within the University of Iowa, including the Daily Iowan, DITV, and KRUI, allowing us to identify the major factors that may play a role in student journalists' decisions whether or not to adopt generative AI into their news reporting routines. This research will provide media professionals with in-depth insights into how future journalists might handle generative AI-related issues in the newsroom, thus laying a foundation for a possible framework to guide emerging journalists in their usage of generative AI.

128
5:10-5:55pm
2nd Floor Hall

Khushi Patel (Public Health)
Mentor(s): Baran, Bengi (Psychological Brain Sci) | **Hazal Arpaci Atmacaoglu** (Psychological Brain Sci)

Sleep Dependent Consolidation of Visuospatial memory

Metamemory is the awareness and evaluation of one's own memory abilities, and it plays a key role in how individuals monitor and regulate learning and recall. Although the effects of sleep on memory consolidation, including visuospatial memory, have been widely investigated, less is known about how individuals' metamemory judgments correspond to their actual memory outcomes after periods of sleep versus wakefulness. This pilot study examines whether metamemory is differentially related to memory performance across sleep and wake conditions. Participants are randomly assigned to either a Sleep group, which completes a learning session in the evening, and a memory test the following morning after a night of sleep, or a Wake group, which learns in the morning and is tested in the evening after a day of wakefulness. All participants also complete questionnaires assessing metamemory, anxiety and mood. We plan to recruit approximately 80 participants through an Elementary Psychology course. Participants are given 2 course credits for their participation. Data collection is ongoing, with 30 participants enrolled to date. Preliminary analyses will be available at the time of the presentation. We expect that while sleep will enhance visuospatial memory performance relative to wakefulness, the relationship between metamemory accuracy and objective memory outcomes

will differ across groups. Findings from this pilot will help establish the feasibility of the study protocol and inform the design of a larger scale project investigating how acute stress affects sleep microstructure and sleep-dependent memory consolidation.

129
5:10-5:55pm
UCC-2520D

Adriana Castellano (Marketing, Pre-Law)
Alexis Collins (Neuroscience)
Peter Nitsche (Biology)
Tae Shaun Presswood (Exercise Science)
Katherine Prichard (Biology)
Mentor(s): Neiman, Maurine (Biology)

"Tentacle Tales: How Genome Architecture and Nutrient Availability Shape Tissue Regeneration in a Freshwater Snail"

Some organisms, tissues, and organs grow and heal much more rapidly than others. While the rate at which growth at whichever level of biological organization occurs is a fundamental biological question, we still know very little about what drives variation in the rate of growth and regeneration. Here, we address potential roles for genome copy number ("ploidy") and nutrient availability as important factors in tissue regeneration in our snail model system. This work is of broad interest from the perspective of connecting the evolution of genome structure to growth rate, regeneration, and resource availability. Our in-progress experiment involves measuring tentacle regeneration rate across snails differing only in genome copy number and food availability. We are testing the hypothesis that extra genome copies facilitate healing but only when resources are adequate. We will assess whether this hypothesis is supported by evaluating whether results meet our prediction that snail tentacle regeneration will be most rapid in snails with more genome copies when food is available and slowest in these high genome-copy snails when access to food is limited. Regardless of specific outcome, this work will provide new insights into whether and how genome structure and resource availability might influence healing and regeneration.

130
5:10-5:55pm

Bahaaaldin Mohammad (Biomedical Engineering, Electrical & Computer Engineering)
Mentor(s): Lingala, Sajangoud (Biomedical Engineering)

UCC-2520D

A Computational Pipeline for Reconstructing and Visualizing Advanced MRI Data Using BART

Magnetic Resonance Imaging (MRI) is a powerful diagnostic tool, but scans can be slow. Advanced methods like compressed sensing can accelerate scans but require complex computational processing. This project's goal is to build a complete computational pipeline to reconstruct and visualize advanced MRI data. The pipeline is built on the University of Iowa's Argon HPC cluster, using the BART (A Toolbox for Computational MRI) software. The toolbox was successfully compiled from source after installing all dependencies, including fftw3 and lapacke libraries. A key challenge is that BART's .mat file outputs are not viewable in standard medical software. To solve this, a Python script was developed to convert the 3D .mat data volumes into a series of 2D DICOM files. The script embeds essential metadata to group all slices into a single, cohesive series, which is critical for 3D stacking This pipeline was successfully validated by loading the converted DICOM series into 3D Slicer for interactive 3D visualization. This functional pipeline is now being used to process full reconstructions, establishing a robust method for analyzing complex MRI data in a clinically relevant 3D environment

131
5:10-5:55pm
UCC-2520D

Kylen Phillips (Theatre Arts, Screenwriting Arts)
Mentor(s): Clay, Caroline (Theatre Arts)

Duality, a short film by Kylen Phillips

This process is intended to educate myself and other University of Iowa students on what it takes to put together a short film. Skills like time/money management, communication, collaboration, and creativity are all needed. Every part of the process is brought to you from student minds and hard work. This film explores the common phrase "the duality of a man" by showing, in its own abstract way, two people masculine and feminine living together in one house. The feminine side is locked in and made to clean while the masculine side can venture out into the real world and work. They come into disagreement about which job is most important.

132
5:10-5:55pm

Julia Correia (3D Design)
Mentor(s): Correia, Monica (Art, Art History & Design)

Indigenous Brazilian Weaving: Colors and Materials

UCC-2520D Indigenous Brazil has a rich history in weaving, particularly basket weaving. I am interested in translating this to traditional weaving on a loom by deriving from Indigenous Brazilian colors, materials, and shapes. I am working on making a pillow and curtain inspired off of basket shapes and colors. Weaving has a rich history and tells many stories. With Brazil being a mixed culture hub, I want to mix traditional weaving techniques with basket weaving.

133 **Tara Joiner** (3D Design)
5:10-5:55pm **Mentor(s): Correia, Monica** (Art, Art History & Design)
UCC-2520D

Exploring Geometric Forms through Weaving

As part of the new Introduction to weaving class, I am designing a woven pillow and wall hanging. The textiles will be made with cotton and silk thread. I am interested in creating contrast between the hardness of the shapes and the softness of the materials, and creating a dimensional surface with a medium that is usually seen as flat. To do this, I am using a technique that allows me to selectively raise and lower threads to create completely customized raised forms. This allows me to create a design that doesn't follow a pattern and allows me to work with angular shapes that complement my previous creative projects. As a current ICRU fellow I work with three dimensional woven forms. This research has informed my current individual work by giving me an understanding of weaving, and how to create unique forms without needing to follow a previously designed pattern.

134 **Sarah Dockery-Jackson** (Accounting, Entrepreneurship, 3D Design)
5:10-5:55pm **Mentor(s): Correia, Monica** (Art, Art History & Design)
UCC-2520D

Hand Woven Textiles for Home Decor

The purpose of this research is to explore the process of creating hand woven textiles for home decor. The research has consisted of collecting images of traditional Irish textiles (particularly the Aran sweater), investigating how forms are repeated in patterns, and comparing the visual and physical texture of different yarns. The aim is to test the initial designs and apply them in pillow forms. This research is applicable interior items and can be developed in many different forms that have different functions. It will help advance my design pursuits in 3D Design and create work using diverse materials.

135 **Shreyas Natarajan** (Biomedical Sciences)
5:10- Kathit Patel (Biomedical Sciences)

5:55pm
UCC-2520D

Rohan Ramesh (Computer Science)
Rohith Senthil Kumar (Data Science)
Mentor(s): Samuel, Isaac (Surgery)

AI Image Analysis of Intraoperative Laparoscopic Gallbladder Surgery

AI image analysis of intraoperative laparoscopic cholecystectomy (LapChole) findings has been a focal point of technological research. LapChole cases which have greater adhesions, inflammation, scarring and other indications of complication pose a greater threat of bile duct injury (BDI) and morbid complications to the patient. Artificial intelligence image analysis models can aid the surgeon in predicting vital anatomical regions and structures (i.e. hepatobiliary triangle, cystic duct, etc.), as a preventive measure against BDI. However, clinical reliability of AI anatomy prediction is lacking due to no data of regarding its accuracy across differential anatomic variation and high-disease severity, complex cases. This is a retrospective study of AI image analysis of anatomy prediction and the critical view of safety (CVS) across different complication rates and anatomical variation of intraoperative LapChole findings.

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5:10-5:55pm
2nd Floor Hall

Preethika Naveen (Biomedical Engineering)
Mentor(s): Karen Cyndari (Emergency Medicine)

The Interaction Between Serotonin, Dopamine, Histamine, and Norepinephrine-related Drug Classes on Osteoarthritis Diagnosis

Introduction: Osteoarthritis (OA) is the most common form of arthritis; OA is defined by the progressive breakdown of cartilage at the ends of bones and degeneration of various joint structures. Previously, OA was primarily considered a mechanical wear-and-tear condition; however, various studies over the past decade have revealed that OA is closely associated with chronic, low-grade inflammation. Given this inflammatory component, we are investigating the potential relationship between OA diagnoses and the use of various drug classes with known immunomodulatory properties including Selective Serotonin Reuptake Inhibitors (SSRIs), Selective Serotonin and Norepinephrine Reuptake Inhibitors (SNRIs), Norepinephrine Dopamine Reuptake Inhibitors (NDRIs), anti-psychotics which have anti-dopamine effects, and anti-histamines. This study explores the correlation between the use of these drug classes and the

incidence or progression of OA. We hypothesize that individuals on SSRIs and SNRIs will have a lower likelihood of developing OA in the future.

Methods: To evaluate the association of SSRIs, SNRIs, NDRIs, antipsychotics, and antihistamines, on the development of osteoarthritis, we utilized the TriNetX database in June 2025 to evaluate the correlation between the individuals exposed and unexposed. We filtered our search from an academic healthcare organization based on sex, age, and diagnosis and exposure. To form our queries, we followed a case-control study design. The case group consists of those with OA who either have or have not been exposed to the medication class of interest. The control group consists of those without OA who have or have not been exposed. Patients with medication exposure were filtered in a time dependent manner, excluding patients who had been on the medication for less than a year before diagnosis. We followed exclusionary criteria to ensure the patient was on only one of the medications and we compared to patients on medications that should not have any specific immune effect (eye drops, anti-coagulants). After data collection, unadjusted relative risk and unadjusted absolute risk reduction were calculated for each medication class.

Results: Across age groups (40â□□79 years) and academic versus non-academic settings, relative risk (RR) values varied by medication class. SSRIs, SNRIs, NDRIs, antihistamines, and antipsychotics consistently showed lower RR values (<1), and showed reduced risk after adjustment. In contrast, blood thinners and eye drops demonstrated higher RR values (>2 across most groups), with blood thinners reaching the highest risk values. Unadjusted Absolute relative risks (ARR) were consistently lower than unadjusted RR, often reducing apparent effects to minimal levels. Overall, while psychiatric medications showed RR <1 associations, over-the-counter categories (blood thinners and eye drops) had relative risks >2 across both settings and all age groups.

Conclusions: Unadjusted relative risk (RR) values and unadjusted absolute relative risk (ARR) values varied by academic setting across both age groups. While the initial RR values appeared high for all medication classes, they were minimal once adjusted. SSRIs and antipsychotics showed the greatest relative risk, though over-the-counter medications demonstrated a comparatively greater effect. However, without adjustment for sex, comorbidities, medication interactions, and other confounding factors, the true impact of these medications remains unclear and will be an area to further investigate."