2nd Annual

TEMPLE UNIVERSITY

GRADUATE SYMPOSIUM

FOR RESEARCH AND CREATIVE WORKS

PROGRAM

17 April 2026

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NEXT YEAR'S SYMPOSIUM

April 2027

Temple University's 2026 Graduate Symposium

Program at a Glance

Friday, 17 April 2026, 1–5 pm

Paley Hall Main Lobby

Breakout Sessions

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Poster Presentations

Poster Session A: 1:15 – 2:30 pm			
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7	Nyein Nyein Kyaw	Htay	Exploring Non-Tuition Barriers in STEM Pathways at Community Colleges
8	Alexis	Washington	Advancing Leadership Diversity for Black Women: Removing Systemic Barriers in the Educational Leader Pipeline
9	Kizzy	Davis	Exploring Academic Advising in Pharmacy Education: A Qualitative Case Study of Student and Faculty Perceptions
10	Jacquayla	Jackson	Teacher Beliefs and the Discipline Gap: A Mixed-methods Study of Educator Identity, Racialized Perceptions, and Discipline Practices
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12	Sarah	Barrett	Understanding Multilingual Literacy Leadership: Bilingual Counseling Assistants as Bridges across Home and School
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18	Shivani Ulhas	Angre	Cardiovascular Disease Disparities by Sexual Minority Status Among U.S. Adults: NHIS 2021-2024
19	Hallie	Anderson	Impact of Program Levels of Care on Recidivism in Philadelphia, 2016 - 2025
20	Teona	Zoidze	Optimizing Vascular Access Through Midline Catheters: A Program Evaluation in A Community Hospital
21	Shu-Jin	Kust	Illuminating Bone Through Skin: Phantom-Guided Evaluation of Transcutaneous VNIR Spectroscopy

22	Michael	Levin	Diet-Induced dsRNA Signatures in MASLD: Integrative RNA-Seq Analyses and Prioritization of TE-Derived Duplex Candidates
23	Jessica	Longstreth	Modeling the Tumor Stroma to Understand Oncofetal Fibronectin Deposition
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Poster Session B: 2:45 – 4:00 pm			
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53	Javad	Mohammad Alizadeh	DT4PCP-T2D: A Digital Twin Framework for Proactive ED Visit Prevention and Personalized Care Planning in Type 2 Diabetes
54	Erin	Mraz	Evaluating research practices for disseminating NeuroHIV findings to non-academic audiences
55	Brandi	Crawford	Institutional Strain: The Staff Experience at an HBCU
56	Alyssa B.	Green	Academic Stress and Coping Behaviors in Neurodivergent Students: An Explanatory Sequential Mixed Methods Study
57	Sihua	Han	Tracing Engineering Students' Identity Development Through Linguistic Change in Design Thinking
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59	Jawaria	Ashraf	The Architecture of Educators: Strategic Dual Enrollment Model for Workforce Readiness
60	MG	Hodge	Pathways to School Psychology: A Social Cognitive Career Theory Analysis
61	Kristen	Brighter	Emotional Engagement Dynamics in Graduate Statistics Learning
62	Zarin	Tasnim	Reflective Self-Regulated Learning Interventions in Online Environments: A Mixed Methods Study of Student Experience
63	Michael	Iwan	Unequal Democratic Responsiveness
64	Shreyas	Rao	"Can we stop this discussion and get back to play?" - decoding children's perspectives and expectations from school sport
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66	Jigyasu Kumar	Verma	When Does Agentic AI Hurt? Strategic Autonomy and Governance in Platform Markets
67	Lauren	Morelli	Design, synthesis, and preliminary in-vitro evaluation of α-substituted-γ-lactones as potential therapeutic agents
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78	Radwa	Abdelaziz	The effect of runoff pH on water soil partition coefficient of orthophosphate and dissolved organic phosphorus
79	Alkesh Kumar	Srivastava	Coordination and Collaboration in Multi-Robot Teams: Planning, Creativity, and Interactive Human-Robot Decision-Making
80	Hamidreza	Ghasempoor	Experimental Study of Percutaneous Needle Insertion into Viscoelastic Tissues
81	Nikolaos	Farfaras	Fatigue Study of Fenestration in Endovascular Graft
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84	Sushma	Hegde	Leveraging supervised machine learning approaches to identify susceptible and resilient phenotypes to activity-based anorexia
85	Maria	Diaz	Pandemic Cohort differences in College Student Adjustment: Living arrangement & social media coping
86	Mia	Roberts	Impact of biological sex on PICK1 expression in the reward circuit in drug-naive and cocaine-exposed mice
87	Sofia	Oquendo	Effects of adolescent social isolation on opioid anti-nociception and microglial morphology in the periaqueductal gray
88	Emma	Roman	Detection of the Free-Living Phase of a Marine Symbiont Using Environmental DNA
89	Hashini	Fransiscus	Z-Selective Isomerization of Terminal Alkenes Catalyzed by W(0) and Mo(0) Complexes
90	Yasmine	Sakinejad	Understanding how MutS2 coordinates ATP hydrolysis with nuclease activity to suppress genetic recombination in H. pylori
91	Jonathan	Piscitelli	Mlh1-Pms1 couples nick recognition with ATP hydrolysis to promote mismatch removal
92	Tangrui	Li	Behavioral Regulation of Agentic Large Language Models via External Symbolic Control
93	Madison	Dautle	Improved Recovery of Host-Associated Microbial Genomes with Oxford Nanopore Adaptive Sampling
94	Ifeanyichukwu	Onuoha	Reimagining Waste as a Resource for Resilient Infrastructure: Mechanistic Linkages Between

			Composition, Reactivity, Microstructure, and Long-Term Durability in Low-Carbon Concrete.
95	Zhenting	Xiang	Fungal Contributions to Oral Microbiome Dysbiosis in Early Childhood Caries
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97	Suriya Muthukumaran	Natarajaseenivasan	Elucidating the role of non-coding RNAs in Ventricular Pacing-Induced Heart Failure of Canines
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Graduate Dean's Message

Greetings, members of the graduate community, and welcome to Temple University's second annual Graduate Symposium for Research and Creative Works! At this year's symposium, we host over 100 scholars from schools and colleges across the university. These presenters offer breakout discussion sessions and poster presentations covering a wide range of topics and content. At the symposium, you will encounter cutting-edge research and creative work from first-year graduate students through post-doctoral scholars, and everyone in between.

Many thanks to our presenters for sharing their scholarship with the university community. Thank you to the Graduate Symposium Award subcommittee of the Graduate Board who generously volunteered their time and expertise in reviewing the submissions. I also thank our on-site reviewers for providing constructive feedback to our presenters. A special thanks to Dr. Swati Nagar who devoted extra time and energy to organizing this event. Finally, I thank the Graduate School staff for their dedication to this event and to helping all graduate students succeed every day in their daily work.

Wishing you a thought-provoking symposium.

Renée M. Tobin, PhD
Dean of the Graduate School

BREAKOUT SESSIONS

Breakout sessions focused on topical areas of discussion are co-facilitated by graduate students

Location	2:00–2:30 pm	3:15–3:45 pm
Room 150 K	Session 1: Smart and Inclusive Transportation	Session 5: Music in Our Lives and in Our Curricula
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Session 1

Smart and Inclusive Transportation

Co-facilitators:

Riya Dixit, Civil and Environmental Engineering, College of Engineering

Phoebe Park, City and Regional Planning, Tyler School of Art and Architecture

Session 2

Forever Chemicals and Sustainable Environments

Co-facilitators:

Elham Akbari, Oluwafemi Omidele, and Ifeanyichukwu Onuoha

Civil and Environmental Engineering, College of Engineering

Session 3

Artificial Intelligence and Society

Co-facilitators:

Adetola Babalola, Oral Health Sciences, Kornberg School of Dentistry

Tangrui Li, Computer and Information Sciences, College of Science and Technology

Emma Roman, Biology, College of Science and Technology

Alkesh Kumar Srivastava, Mechanical Engineering, College of Engineering

Jigyasu Kumar Verma, Statistics, Operations, and Data Science, Fox School of Business

Session 4

Teacher Education – Trends and Concerns

Co-facilitators:

Brandi Crawford, College of Education and Human Development

Shreyas Rao, School of Sport, Tourism, and Hospitality Management

Zarin Tasnim, Teaching and Learning, College of Education and Human Development

Jason Tavares, Applied Linguistics, College of Education and Human Development

Session 5

Music in Our Lives and in Our Curricula

Co-facilitators:

Jennifer Gravish, Music Therapy, Boyer College of Music and Dance

Ian Sadock, Music Theory, Boyer College of Music and Dance

Session 6

Mental Health and Illness Research

Co-facilitators:

Hallie Anderson, Epidemiology and Biostatistics, Barnett College of Public Health

Britney Bonhomme, Epidemiology, Barnett College of Public Health

Zeeshan Huque, Psychology and Neuroscience, College of Liberal Arts

Cooper Sharp, Statistics, Operations, and Data Science, Fox School of Business

Alexis Washington, Education Leadership, College of Education and Human Development

Session 7

Health and the Structure of Healthcare

Co-facilitators:

Chinmaya Agarwal, Oral Health Sciences, Kornberg School of Dentistry

Shivani Angre, Epidemiology and Biostatistics, Barnett College of Public Health

Jianan Gu, Psychological Studies in Education, College of Education and Human Development

Teona Zoidze, Nursing, Barnett College of Public Health

Session 8

Philosophy, Society, and Communication

Co-facilitators:

Yulia Liberman, Philosophy, College of Liberal Arts

Dom Openko, Cardiovascular Sciences, Lewis Katz School of Medicine

POSTER PRESENTATIONS

POSTER SESSION A: 1:15–2:30 PM

1

Embodying Tatreez: Cultural Practice as Choreographic Framework

Presenter: Olivia Alsamadi

Co-author(s): N/A

Department: Dance
College/School: Boyer College of Music and Dance

Faculty Mentor: Dr. yaTande Hunter

This poster presents a practice-based research inquiry developed through the creation of the choreographer's MFA in Dance thesis concert. The project examines how Palestinian cultural frameworks, specifically tatreez, informed choreographic and artistic decision-making as a means of reclaiming Palestinian embodiment within Western concert dance, a field historically shaped by colonial power, cultural erasure, and disciplinary hierarchies. Grounded in studio-based experimentation, rehearsal processes, reflective writing, and facilitation with dancers, the research engaged tatreez as a lived cultural practice and methodological guide rather than a symbolic reference. Logics embedded in embroidery-motif selection and repetition, pattern assembly, material constraint, stitching order, improvisation, and revision-were translated into movement generation, spatial composition, rehearsal structures, and collaborative authorship. These methods shaped choices related to space, movement dynamics, relationships between dancers, and the visibility of labor within the choreographic work. The resulting choreography resisted linear development, singular authorship, and virtuosity-driven aesthetics, instead foregrounding adaptability, collective investment, and care within the creative process. This approach enabled Palestinian identity and presence to be articulated through embodied structure rather than representational imagery. The project positions Palestinian cultural methodologies as generative choreographic systems and demonstrates how culturally grounded craft practices can function as rigorous artistic research within contemporary dance. As an outcome of the thesis process, this work contributes to ongoing discourse on decolonial dancemaking, practice-as-research, and the role of cultural lineage in shaping ethical, sustainable artistic processes, while pointing toward future applications in performance creation and dance pedagogy in higher education.

2

Cognitive Architecture of Emotional Arousal Associated with Discrete Musical Structures in Collective Political Chanting

Presenter: Ian Sadock

Co-author(s): N/A

Department: Music Theory
College/School: Boyer College of Music and Dance

Faculty Mentor: Edward Latham

Labor strikes are a potent form of protest, empowering dissatisfied workers to challenge workplace power dynamics. On Monday, September 23rd, 2024, Unite Here Local 274 Aramark workers refused to enter the workplace after their employers refused requests for higher pay and better healthcare — a historic event as the first in American history to involve all (three) sports stadia in a major city. Many activities occur at labor strikes, including marching, chanting, singing, sign-holding, physical blockade, "scab"— (temporary replacement worker) shaming, and news interviews - a highly emotional environment. This research paper seeks to understand the cognitive foundations of emotional arousal at labor strikes that are associated with music and sound produced by striking laborers. The unpitched chants heard at the Unite Here Local 274 Aramark strike are examined via melograph analysis, ITPRA theory, BRECVEMA framework, embodied cognition, and the identification of discrete musical structures associated with dimensional models of affect, psychoacoustics, and traits of political propaganda song. Previous research (in the form of scholarly journal articles and peer reviewed scholarly texts) on music and emotion, political/organizational theory, psychoacoustics, embodied cognition, strong experiences with music (SEM), and music perception are summarized and built upon. Addressed are those elements of unpitched chant which might be responsible for high arousal, negative valence emotions on the picket line. Ultimately, the paper will present observations regarding a possible mechanism with which collective political chants elicit strong emotional experiences towards the goal of impacting labor negotiations during a labor strike.

3

Compression and Inference in Immersive Environments: How Perceived Reality Shapes Navigation and Embodied Sense-Making

Presenter: Yuliya Liberman

Co-author(s): W. Geoffrey Wright

Department: Philosophy
College/School: Liberal Arts

Faculty Mentor: Brian Hutler

Human behavior operates at a surprisingly low information rate relative to the massive amount of sensory input we receive, suggesting that the brain must compress and selectively update information to construct meaning and guide action. This research program investigates immersive sense-making as a bandwidth-limited process that unfolds in discrete updates and shapes both conscious interpretation and bodily movement. Across three complementary studies using custom virtual and augmented reality environments, we examined how uncertainty and environmental consistency influence how people understand and navigate space. In a VR reveal study, participants entered an initially ambiguous room in which objects were gradually disclosed. Interviews showed that understanding emerged through structured hypothesis testing, elimination, and coherence-based integration rather than immediate recognition. A second study used open-source motion capture to measure hesitation, walking speed, and trajectory changes while participants navigated uncertain virtual structures. Movement patterns shifted systematically as realism and stability cues changed, indicating that bodily regulation tracked evolving certainty. In a third study, participants walked between staggered boxes in AR and VR while object physicality and collider presence were manipulated. Minimum distance to the first obstacle varied significantly with environmental configuration, demonstrating that spatial regulation reflects inferred environmental structure rather than visual similarity alone. Together, these findings suggest that immersive environments reveal how humans compress, sample, and update information in bounded moments, and that this constraint shapes both how we make sense of space and how we move within it.

4

Designing for Trees Species' Adaptability and Evolution - A Proposed Redesign of Curtis Arboretum

Presenter: Joseph Rozek

Co-author(s): n/a

Department: Landscape Architecture
College/School: Tyler School of Art and Architecture

Faculty Mentor: Nathan Heavers

Landscape architecture focuses on satisfying social, environmental, and economic needs on human time scales. How might one design on an evolutionary time scale instead? This research, conducted through a speculative design for the Curtis Arboretum, considers how the Miyawaki method introduces genetic variation in planting stock that subsequently goes through an accelerated selection process due to the tight planting formation. The Miyawaki method, pioneered by ecologist Akira Miyawaki over 50 years ago in Japan, establishes forests quickly with dense plantings of climax forest species, bypassing two stages of forest succession, and placing the planted saplings under strong selection pressure. In this proposed design for the 47-acre Curtis Arboretum in Cheltenham, Pennsylvania, a 1930s Olmsted Brothers landscape, the individual trees that thrive and survive in the Miyawaki planting will be locally adapted, and later disperse, becoming the bulwarks of the urban forest and sustaining a minimum effective population size in the face of urbanization and habitat fragmentation. The goal is to establish tree populations that reproduce and evolve as a forest, rather than living, dying, and being replaced as individual specimen trees, typical for arborea. The proposed plantings will need to be monitored, and genetic analyses conducted of new recruits to determine their contribution to the population, and possible evolution.

5

The Potential of Music in the Post COVID-19 Pandemic Realities of Mothers in South Jersey

Presenter: Jennifer Gravish

Co-author(s): Wendy Magee

Department: Music Therapy
College/School: Boyer College of Music and Dance

Faculty Mentor: Helen Shoemark

This narrative inquiry explores the experiences of women who are mothers in south Jersey and how their involvement in group music experiences might contribute to everyday life. Since the COVID-19 pandemic, mothers have experienced unfavorable health and wellbeing outcomes and are in need of emotional health resources within post-pandemic conditions. There remains a gap in understanding how community programs can effectively support mothers' wellbeing in post-pandemic contexts. This study was informed by constructs including the social construction of motherhood, the sociology of music, matricentric feminism and community music therapy.

Five women who are mothers engaged in in-person, co-created group music experiences (GMEs) that centered their music preferences and provided opportunities to engage in unfamiliar music experiences.

Data collection occurred via group verbal processing, audio diary submissions, and a focus group interview. Reflexive thematic analysis featured iterative phases of in vivo, open, and simultaneous coding to center participants' voices.

The research findings illuminated the temporality of participants' musical identity in various life phases. Two categories emerged: Music as an Experience of Identities Now, and Music as a Bridge to and From Life Phases and Identities. These findings contribute a nuanced understanding of the meaning and value that mothers may ascribe to involvement in group music experiences and discussions.

The discussion integrates theoretical frameworks of matricentric feminism (O'Reilly, 2016), music as technology of self (DeNora, 2000), nepantla (Anzaldúa, 1987) and small stories (Georgakopoulou, 2006).

Implications for music therapy research and clinical practice along with recommendations for community music programming are provided.

6

Validating a Semi-Structured Interview Tool to Investigate the Patient Care Experience of Black Men in North Philadelphia Facing Diabetes and Major Lower Extremity Amputation

Presenter: Heather Border

Co-author(s): Susan VonNessen-Scanlin, DNP, MSN, MBA; Hoda Jradi, PhD, MPH; Ronald Renzi, DPM

Department: Health Services Administration and Policy
College/School: Barnett College of Public Health

Faculty Mentor: Sherief Ibrahim

Purpose/Hypothesis:

Non-traumatic major lower extremity amputations (mLEAs) are a costly, life-changing procedure, and an estimated 80% are performed on patients with diabetes mellitus. The most recent study on mLEA rates in Pennsylvania suggests it is modestly rising in prevalence annually (1.3%), with high rates clustering in distressed, majority-Black communities in North Philadelphia. Consequently, three regional healthcare professionals (HCPs) desire a standardized tool to measure these patients' experiences, identify pain areas, and potentially reduce their population's incidence of mLEA.

Methods/Materials:

A semi-structured interview tool was constructed based on a literature review and input from local HCPs, including podiatrists, nurse practitioners, and vascular surgeons (n=12). The tool was designed to document the experiences of Black men with diabetes and an mLEA in North Philadelphia. Key domains of interest were identified using the biopsychosocial model. The tool was circulated to HCPs through REDCap to establish face and content validity. IRB determined approval was unnecessary.

Results:

Results via REDCap are expected by March 4th, with translation into validity ratios establishing final tool contents expected by March 10th. Preliminary review anticipates minimal yet valuable changes to the tool's scope and language. Literature suggests this tool may discover areas of improvement for HCPs' prevention and management of diabetes mellitus-related mLEAs in the target population.

Conclusion:

Non-traumatic mLEAs are a significant, preventable procedure with a disproportionate incidence in distressed, majority-Black neighborhoods in Pennsylvania. The current research lacks an appropriate tool to measure these patients' experiences, so the novel tool aims to fill this gap.

7

Exploring Non-Tuition Barriers in STEM Pathways at Community Colleges

Presenter: Nyein Nyein Kyaw Htay

Co-author(s): N/A

Department: Policy, Organizational & Leadership Studies (POLS)
College/School: Education and Human Development

Faculty Mentor: Jennifer Johnson

Although research on community college STEM pathways has expanded, studies that center STEM students' lived experiences with non-tuition barriers to college retention and institutional supports, particularly how STEM students navigate basic needs insecurity and interpret institutional environments in practice, remain limited.

This study examines how STEM students and institutional stakeholders in community colleges understand non-tuition barriers and institutional support. Drawing from a larger mixed-methods NSF S-STEM Hub project, the qualitative component explores students' experiences navigating basic needs challenges and accessing resources, while also examining how stakeholders describe the design, delivery, and institutional context of support systems. Data were collected through 60-minute focus groups conducted across four community colleges with 21 students and 22 institutional stakeholders. Transcripts are being analyzed using a deductive thematic approach informed by Browman's (2025) theoretical model for understanding belonging in educational settings through four forms of fit: self-concept, goal, social, and resource.

Initial analysis of data suggest that participants' experiences may reflect different dimensions of belonging. Students describe moments of alignment and friction related to social fit, self-concept fit, and goal fit, while discussions of resource fit highlight issues of food, housing, and transportation needs, safety, and limited access to supports. Stakeholder perspectives emphasize the supply side of these areas, recognizing limits in student knowledge of supports on campuses. Together, findings point toward how experiences of fluency and disfluency across these domains of fit shape belonging and engagement within community college STEM contexts.

8

Advancing Leadership Diversity for Black Women: Removing Systemic Barriers in the Educational Leader Pipeline

Presenter: Alexis Washington

Co-author(s): N/A

Department: Policy, Organizational, and Leadership Studies
College/School: Education and Human Development

Faculty Mentor: Jennifer Johnson

Despite longstanding calls to diversify educational leadership, Black women remain significantly underrepresented in K-12 principal and district leadership roles. This disparity persists even as Black women continue to comprise a substantial portion of the educator workforce and are the most educated population in the United States. Existing scholarship documents the historical displacement of Black educational leaders following Brown v. Board of Education, the intersectional barriers confronting Black women in leadership spaces, and the importance of mentorship and preparation programs in shaping leadership pathways. However, limited research examines the critical transition period between enrollment in principal preparation programs and the first five years following completion, a time when hiring, placement, and retention decisions most directly shape leadership outcomes.

Grounded in intersectionality (Crenshaw, 1989), Black Feminist Thought (Collins, 2000), and critical race perspectives in education, this qualitative study investigates how leadership preparation programs and institutional hiring systems influence the recruitment, placement, and early-career trajectories of Black women in K-12 educational leadership. Focusing on Black women currently enrolled in or within five years of completing a leadership preparation program, the study explores how structural barriers, mentorship access, hiring practices, and organizational climates shape leadership access and sustainability.

9

Exploring Academic Advising in Pharmacy Education: A Qualitative Case Study of Student and Faculty Perceptions

Presenter: Kizzy Davis

Co-author(s): N/A

Department: Policy, Organizational, and Leadership Studies
College/School: Education and Human Development

Faculty Mentor: Jennifer Johnson

Academic advising plays a critical role in promoting student success, persistence, and professional development in higher education, particularly within rigorous professional programs such as pharmacy education. Despite its importance, limited research has examined how advising is structured and experienced within Schools of Pharmacy, especially from both student and faculty perspectives. This study addresses this gap by exploring academic advising within a School of Pharmacy using a qualitative case study approach.

Guided by an interpretivist paradigm, this study examines advising as a bounded system within a single institutional context. Data are collected from PharmD students and faculty advisors through semi-structured interviews, supplemented by document analysis and, where applicable, student focus groups. Purposeful and maximum variation sampling strategies are used to capture diverse perspectives across different stages of the program and advising roles. Data are analyzed using thematic analysis to identify patterns and themes related to advising structures, practices, and experiences.

Preliminary findings are expected to highlight key similarities and differences between student and faculty perspectives, as well as strengths and challenges within the advising system. The study also examines how advising practices align with developmental and prescriptive advising models and the extent to which they support student integration and success.

Findings have practical implications for improving advising structures, enhancing faculty support, and aligning advising practices with student needs in pharmacy education.

10

Teacher Beliefs and the Discipline Gap: A Mixed-methods Study of Educator Identity, Racialized Perceptions, and Discipline Practices

Presenter: Jacquayla Jackson

Co-author(s): N/A

Department: Psychological Studies in Education
College/School: Education and Human Development

Faculty Mentor: Avi Kaplan

Data on academic and disciplinary outcomes disaggregated by student race demonstrate similarities to historical trends in racial disparities underpinned by institutional and systemic bias. Black students are overrepresented in rates of exclusionary discipline after accounting for self- and teacher-reported behavior, socioeconomic status, and prior academic achievement. Researchers and education stakeholders alike call for culturally responsive approaches to discipline that address the role of race in the disciplinary process due to the significant impact teachers' racialized beliefs and actions have on students. Racial disparities in academic outcomes persist despite attempts to modify disciplinary praxis in teacher education and professional development to reflect antiracism. This extends the need for research that focuses specifically on the mechanisms that sustain this phenomenon. The proposed explanatory sequential mixed-methods study will adopt a dynamic systems professional identity perspective to explore the role of preservice teachers' racialized beliefs about discipline, particularly regarding the behavior of Black students, in their perceived disciplinary practice intentions.

11

Beyond the Game: An Interpretative Phenomenological Study of How Division I Student-Athletes Cope with Chronic Pain

Presenter: Jianan Gu

Co-author(s): Mason Williams

Department: Psychological Studies in Education
College/School: Education and Human Development

Faculty Mentor: Avi Kaplan

Pain and injury are inherent aspects of athletic participation. These can result in chronic pain, which impacts daily functioning and long-term well-being. For collegiate student-athletes, coping with chronic pain is challenging given the tension among athletic performance, academic demands, career preparation, and personal life. Research has generated ample findings and recommendations regarding rehabilitation and physical recovery processes to help student-athletes cope with injury and chronic pain. However, little research has focused on the psychological impact and lived experiences of student-athletes who cope with persisting chronic pain.

This study will investigate how Division I student-athletes experience and cope with chronic pain and chronic physical conditions. Approximately 15 participants will be recruited from NCAA Division I universities in the northeastern United States using a combination of purposeful criteria and snowball sampling. Using interpretative phenomenological analysis (IPA), the study will explore how athletes make sense of and respond to the physical, emotional, and social challenges of living with chronic pain while maintaining athletic and academic responsibilities. Semi-structured interviews and related artifacts such as training and recovery logs, journal reflections, will be analyzed to identify shared and individual coping strategies and track the evolution of well-being over the course of experience with chronic pain. Data will be examined through the Coping Circumplex Model (CCM, StanisÅ‚awski, 2019), with the emphasis on participants' interpretations of their experience. This work will contribute to understanding how diverse athletes make meaning of injury and chronic pain experiences, and what interventions can accompany rehabilitation to promote identity growth and resilience.

12

Understanding Multilingual Literacy Leadership: Bilingual Counseling Assistants as Bridges across Home and School

Presenter: Sarah Barrett

Co-author(s): N/A

Department: Teaching & Learning
College/School: Education and Human Development

Faculty Mentor: Sabina Neugebauer

While public schools in the United States have a long history of working with multilingual families, they often struggle to meaningfully incorporate their linguistic and cultural resources (Darder, 2017; Onchwari Keengwe, 2025). One possibility for addressing this systemic gap involves equipping bilingual community members to serve as bridges between families and schools (Ventura, 2020).

This study examines how Bilingual Counseling Assistants (BCAs) in an urban, Mid-Atlantic school district conceptualize their role as bridge-building literacy leaders. Our research questions are: How do BCAs understand their roles and identities as literacy leaders? How do these understandings contribute to an expansive view of multilingual literacy?

Participants include 40 BCAs who work in eight public elementary schools. All BCAs were hired by the district, represent multiple language groups (i.e., Arabic, Mandarin, Spanish), and were nominated by their school principal to participate in eight training workshops. In this train the trainers' model, BCAs then provide a workshop to families, tailored to their linguistic community.

We used a qualitative approach to conducting interviews and focus groups. Data was then iteratively coded (Corbin & Strauss, 2008). While initial results suggest a number of preliminary themes, we plan on conducting a final round of interviews at the end of the school year. We expect to find additional support for the role that BCAs can play in building meaningful connections between multilingual families and schools. Directions for future research include gathering feedback from families themselves, and comparing both sets of data.

13

Early Agricultural Adaptations During the Age of Exploration

Presenter: Brian Carroll

Co-author(s): Dr. Ilya Buynevich

Department: Anthropology
College/School: Liberal Arts

Faculty Mentor: Leslie Reeder-Myers

How do humans adapt to new environments, particularly those that are isolated and subject to extreme weather events? Archaeological research on the Azores provides a rare opportunity to examine human expansion into uninhabited territories during the past millennium. The Azores were colonized in the mid-15th century AD by Portuguese farmers, who frequently shifted agricultural strategies in response to volcanic eruptions, landslides, and other changing social and environmental conditions. Additionally, archaeobotanical evidence suggests that pre-Portuguese settlers occupied the islands between AD 1000 and AD 1400. Archaeobotanical analysis of sediment cores can both trace Portuguese agricultural strategies over time and gather evidence of any pre-Portuguese settlement. I hypothesize that Portuguese agricultural flexibility explains why their settlement persisted when earlier settlements failed.

To explore the timing and nature of changing agricultural strategies, the first part of my dissertation research established a relative chronology for sedimentary layers. Changes in magnetic susceptibility values allow me to identify stratigraphic layers in the field using a rapid, inexpensive method. I conducted magnetic susceptibility testing of 1-meter sediment cores collected in March 2026 during a trip to Sao Miguel, Azores with Dr. Buynevich, Department of Geology. Magnetic susceptibility profiles for each of my field sites allow me to identify key layers of interest during the next stage of my research. Future fieldwork will include collecting sediment samples from paleosol layers and processing them for archaeobotanical remains and radiocarbon dating.

14

Evaluation Results of the Making the Connection Program to Reduce Loneliness, Isolation, and Depressive Symptoms in Older Adults

Presenter: Kelly Banks

Co-author(s): Philip McCallion, PhD, ACSW , Lisa Ferretti, LMSW, Astrid Uhl, MSW, Kelly Banks, MA, Ken Fernandez

Department: Social Work
College/School: Social Work

Faculty Mentor: Lisa Ferretti

Purpose: Social isolation and loneliness are common in older adults and can contribute to worsening health and quality of life, especially when health changes, life events, and mobility or sensory limits reduce chances to connect. The goal was to see if the psychoeducational Making the Connection (MTC) intervention, a 10-week workshop, helped older adults feel less lonely reduce depressive symptoms and become more connected to others.

Methods: From 2023-2025, 335 adults age 60 and older participated in the MTC program. 22 groups were conducted across 14 senior centers in Bucks, Montgomery, and Philadelphia counties. The program used group discussion, goal setting, games, mindfulness, and simple skills for coping and connecting. At the start and end of the intervention, and again three months later individuals filled out a questionnaire comprising measures of loneliness, mood, and social connections (e.g., UCLA-3, CES-D, Lubben). Participants also responded to open-ended questions. Data was analyzed using SPSS.

Results: Overall, participants reported feeling more connected, having fewer depressive symptoms, and a reduction in loneliness ($p = .026$). In the 2025 group ($n = 80$), depressive symptoms decreased and social connection increased. People who attended 8 or more sessions were about seven times more likely to report improvement at the 3-month follow-up. Participants (93%) reported liking the program and that they would recommend it to others.

Conclusion: MTC was practical to run and well-received. Results indicate it may help older adults build connection and improve mood.

15

A Mixed-Methods Approach to Investigating How Sports Time Commitments Impact University Student-Athletes' Identities

Presenter: Janine Conti

Co-author(s): N/A

Department: Teaching and Learning
College/School: Education and Human Development

Faculty Mentor: Janelle Bailey

From international to intramural, many college students take classes and play sports simultaneously. For those who consider themselves student-athletes, navigating the influence of university life and sports organizations can create tension. The impact of these two competing arenas is complex and can evolve over time. An issue faced by student-athletes is the amount of time dedicated to practice each week, creating potential conflict with the student component of their identity, making it necessary to consider how student-athletes view the balance of education and sports. The purpose of this study is to evaluate the relationship between student-athletes' sports time commitments and their student identity within their universities. The quantitative data is a survey using the Portuguese version of the Baller Identity Measurement Scale (BIMS) to explore student-athlete identity profiles (n = 862) through a cluster analysis organized by hours spent on a sport each week. The qualitative data is extreme case sampling using semi-structured interviews (n=4) and thematic analysis to provide additional insight into the students with the most time spent on sports. The expected results are that an increase in time spent on sports creates conflict with the student identity for student-athletes. This mixed-methods data analysis will provide universities with information to implement support services for student-athletes to achieve balance in their dual roles while playing sports and taking classes.

16

The relationship between SDOH and adverse mental health outcomes

Presenter: Britney Bonhomme

Co-author(s): Alison Casola

Department: Epidemiology
College/School: Barnett College of Public Health

Faculty Mentor: Jena Fisher

Purpose/Hypothesis: There is a lack of empirical research that explores how specific social determinants of health (SDoH) are associated with psychiatric outcomes. This study aims to evaluate how SDoH, including housing, substance use, transportation, and finances, are associated with health outcomes like hospitalization and suicidal attempts.

Participants: Electronic health records (EHR) (N=27,868) from patients (ages 18-89) within the Merakey system (2021-2025) were utilized for this study.

Methods: An observational cross-sectional study was conducted using de-identified data from Merakey EHR. Health related social needs were collected through a screener. In addition to sociodemographic characteristics, confidence in oneâ€™s ability to manage health, suicide attempts, and psychiatric hospitalizations were gathered. Descriptive statistics were reported. Bivariate analysis and multiple logistic regression models were conducted to assess the association between SDoH and outcomes.

Results: The sample consisted of 27,868 individuals, with a mean age of 43.81 (SD=16.40). Multivariable logistic regression revealed that housing instability was the strongest predictor of suicide attempts (OR = 2.16, CI [1.45,3.22], $p < 0.001$). For psychiatric hospitalization, multiple SDoH were significant including housing instability (OR = 1.33, $p < 0.001$) and transportation barriers (OR = 1.34, $p < 0.001$). Age was a significant confounder across both models, with younger age being associated with an increased risk.

Conclusion: These findings suggest that systemic barriers are primary divers of psychiatric emergencies. Integrating housing and transportation support can help reduce psychiatric crises.

Clinical Relevance: This study provides further evidence that SDoH have an impact on adverse mental health outcomes.

17

AI Companionship and Loneliness: Cross-sectional Study of U.S. College Students

Presenter: Alexis Wheeler

Co-author(s): Brittney McLarty, Jon Morris, Henok Tadesse

Department: Epidemiology
College/School: Barnett College of Public Health

Faculty Mentor: Hoda Jradi

Purpose/Hypothesis: The U.S. Surgeon General reported an increase in young adults experiencing loneliness each year for 43 years. Loneliness is associated with adverse health outcomes including mortality, infections, and cognitive decline. U.S. college students increasingly turn to AI, with approximately 22% of college-aged students seeking mental health advice from AI chatbots. This aligns with ascending trends of adolescents using AI for companionship. However, the effect of AI on loneliness is undetermined. We hypothesize that in 2024-2025, higher frequencies of AI companion use among U.S. college students will be associated with greater loneliness.

Methods: Using data collected from the Healthy Minds Study, we evaluated AI companionship and its association with indicators of loneliness and other characteristics of U.S. college students in the 2024-2025 school year. The response scale utilized lower numbers for greater AI use (1 = constantly, 6 = never). We conducted logistic regression.

Results: Of survey respondents, 890 answered questions on AI companionship and loneliness. Nearly 56% reported loneliness, but for AI companion users, 68% reported loneliness. We found that higher frequency of AI companionship use corresponded with an increased risk of reporting loneliness, OR = 0.77, 95% CI [0.64, 0.91].

Conclusion: This sample suggests that AI for purposes of companionship is related to increased feelings of loneliness, which may lead to serious health consequences including immune system susceptibility and cognitive decline. More research is warranted. Programs targeting students with high AI use may be a solution to mitigate feelings of loneliness and isolation.

18

Cardiovascular Disease Disparities by Sexual Minority Status Among U.S. Adults: NHIS 2021-2024

Presenter: Shivani Ulhas Angre

Co-author(s): A. Tai Simpson, Stephanie M. Hernandez

Department: Epidemiology & Biostatistics
College/School: Barnett College of Public Health

Faculty Mentor: Allison R Casola

Background and Purpose: Cardiovascular disease (CVD) remains the leading cause of mortality in the United States, yet disparities remain underexamined among sexual minority (SM) adults. Guided by the Minority Stress Framework, this study examined whether SM adults have higher odds of reporting CVD compared with heterosexual adults and whether healthcare access modifies this association. We hypothesized that SM adults would have higher odds of CVD. Methods: This cross-sectional study used pooled 2021-2024 data from the National Health Interview Survey (NHIS), including 111,566 U.S. adults aged 18 years and older. Sexual orientation was self-reported and categorized as heterosexual or SM. A composite measure of self-reported CVD, which included hypertension, coronary heart disease, or stroke, was the main outcome. Crude and adjusted odds ratios were calculated using survey-weighted logistic regression models that controlled for age, sex, race/ethnicity, education, poverty level, insurance status, and survey year. An interaction term was used to assess effect modification by insurance status. This study was determined to be Non-Human Subjects Research by the Drexel University IRB. Results: In unadjusted analyses, SM adults had lower odds of reporting CVD compared with heterosexual adults. After adjustments, SM adults had 1.22 times the odds of reporting CVD compared to heterosexuals (adjusted OR =1.22; 95% CI: 1.13-1.32). Insurance access did not significantly modify the association. Conclusion: SM adults had 1.22 times the odds of self-reported CVD in the NHIS 2021-2024 after accounting for sociodemographic factors. Social/Clinical Relevance: The findings encourage inclusive surveillance and earlier, affirming CVD screening and prevention measures that address structural and social variables associated with sexual orientation.

19

Impact of Program Levels of Care on Recidivism in Philadelphia, 2016 - 2025

Presenter: Hallie Anderson

Co-author(s): Dr. Chris Von Zuben (PMHCC), Robert Sachs (PMHCC)

Department: Epidemiology and Biostatistics
College/School: Barnett College of Public Health

Faculty Mentor: Allison Casola

Purpose: Aim to understand effects of program levels of care on recidivism among adults with severe mental illness and legal oversight. Residential Treatment Facilities for Adults (RTFA) will have lower recidivism than Community Residential Rehabilitation (CRR). Methods: A retrospective cohort study analyzed data on 225 individuals from January 1st, 2016 - June 1st, 2025. Data were obtained from internal BHJD databases (CCS and F360) containing information from Philadelphia Municipal Court criminal dockets. Variables included program admission and discharge dates, demographics (race, ethnicity, and sex), and program levels. Statistical analyses included Kaplan-Meier, log-rank, and Cox proportional hazards models. IRB approval was unnecessary as de-identified data remained internal. Results: Among 93 CRR participants and 132 RTFA participants, 33 recidivated. Unadjusted analyses showed no significant difference in re-arrest time across program levels. However, after adjusting for demographics and program duration, RTFA participants are associated with 68.7% lower hazard of re-arrest than those in CRR (aHR = 0.31, [95% CI = 0.10, 0.99], p = .05). Each additional day spent in programs is associated with 0.80% increased hazard of re-arrest (aHR = 1.01, [95% CI = 1.00, 1.01], p = < .05). Conclusions: RTFA is associated with a lower risk of re-arrest than CRR, and additional days spent in programs are associated with increased risk of re-arrest after adjusting for program duration and demographics. Social Relevance: This work shows which program has lower recidivism, to inform changes to interventions affecting individuals' ability to reintegrate into society and community safety.

20

Optimizing Vascular Access Through Midline Catheters:

A Program Evaluation in A Community Hospital

Presenter: Teona Zoidze

Co-author(s): NA

Department: Nursing
College/School: Barnett College of Public Health

Faculty Mentor: Amy Bieda

Background/Problem:

Vascular access selection directly influences patient safety, complication rates, and hospital costs. Central venous catheters (CVCs) carry a high risk of central line-associated bloodstream infections (CLABSIs), while peripheral IVs frequently fail in patients requiring intermediate-duration therapy. Evidence supports midline catheters as a safer, cost-effective alternative; however, prior to program implementation, their use was inconsistent and non-standardized in this community hospital.

Purpose:

The purpose of this Doctor of Nursing Practice quality improvement project was to evaluate the effectiveness of a nurse-driven midline catheter program in improving insertion success, reducing complications and CLABSI risk, and decreasing unnecessary central venous catheter utilization.

Methods:

A retrospective program evaluation guided by the Context-Input-Process-Product (CIPP) model was conducted. Electronic medical record, vascular access log, and infection-prevention surveillance data from 113 adult inpatients (2024-2025) were analyzed using descriptive statistics. Outcomes included first-attempt success, dwell time, complications, escalation to central access within 72 hours, and documentation compliance.

Results:

First-attempt insertion success was 85.8%, with a mean dwell time of 6.39 days. No patients required escalation to a CVC within 72 hours, and no midline-associated bloodstream infections occurred. The overall complication rate was 9.7%. Insertion documentation compliance was 91.3%, while maintenance documentation was 77.4%, with extremity circumference recorded in 42.5% of assessments.

Conclusions/Implications for Practice:

The nurse-driven midline program demonstrated high procedural success, low complication rates, and complete avoidance of CLABSI and early central line escalation, supporting midlines as a safe and effective vascular access strategy. Findings highlight the value of nurse-led device selection and standardized protocols in reducing infection risk and central line exposure. Strengthening electronic medical record prompts and maintenance surveillance may further enhance early complication detection, patient safety, and sustainability of evidence-based vascular access practice.

Keywords: midline catheter, nurse-driven vascular access, CLABSI prevention, CIPP model, quality improvement, patient safety

21

Illuminating Bone Through Skin: Phantom-Guided Evaluation of Transcutaneous VNIR Spectroscopy.

Presenter: Shu-Jin Kust

Co-author(s): William Querido, Chetan Patil

Department: Bioengineering
College/School: Engineering

Faculty Mentor: Nancy Pleshko

Background: Current clinical approaches to evaluate fracture risk and monitor disease progression rely predominantly on Xray-based methods that provide limited information on bone composition. Visible near-infrared spectroscopy (VNIRS) offers a non-ionizing approach for transcutaneous assessment of metacarpal bone quality, an accessible anatomic site shown to reflect overall skeletal health. However, validation and optimization of VNIRS sensitivity is challenging in vivo because the detected spectra represent a mixture from skin and bone with comparatively weak bone features, making their individual contributions difficult to isolate. To rigorously assess probe depth of detection under controlled conditions, we employed spectrally distinct plastic substrates as surrogate deep-layer markers for transcutaneous spectroscopy.

Methods: A gelatin-based skin-mimicking phantom was constructed atop three candidate plastics: high-density polyethylene (HDPE), polystyrene, and polycarbonate. Fiber-optic VNIR spectra were acquired and preprocessed using extended multiplicative signal correction and Savitzky-Golay second derivatives to reduce scattering and baseline variability. Phantom spectra were then compared with spectra from clinical metacarpal data.

Results and Discussion: Preliminary results demonstrate that in the second NIR window, polystyrene exhibited distinct overtone and combination bands that closely overlapped spectral regions associated with bone and collagen in the clinical data, while remaining separable from skin-only signatures. In the third NIR window, HDPE provided the most suitable deep-layer surrogate, with C-H features aligning with bone-sensitive regions and robust detectability beneath the skin phantom. These findings support the use of polystyrene and HDPE as practical surrogates to validate probe sensitivity and to guide probe design for transcutaneous VNIR bone spectroscopy.

22

Diet-Induced dsRNA Signatures in MASLD: Integrative RNA-Seq Analyses and Prioritization of TE-Derived Duplex Candidates

Presenter: Michael Levin

Co-author(s): Aizhan Surumbayeva and Igor Astsaturov

Department: Bioengineering
College/School: Engineering

Faculty Mentor: Yunyun Zhou

Metabolic dysfunction-associated steatotic liver disease (MASLD) features chronic hepatic inflammation induced by diet, yet endogenous nucleic-acid triggers remain poorly defined. We hypothesize that excess refined dietary sugars increase endogenous double-stranded RNA (dsRNA), engaging viral-sensing pathways and interferon signaling. Using total RNA-seq from human MASLD livers and mouse diet models, we quantified four dsRNA-linked features: (1) retained-intron splicing (rMATS-turbo); (2) transposable element (TE) expression and genomic context (atena + ChIPseeker); (3) A-to-I RNA editing as an in vivo dsRNA proxy (SPRINT); and (4) disruption of transcription termination (DoTT). Across species, MASLD/HCD livers showed increased intron retention, higher intronic TE expression, and elevated editing. DoTT identified 3' UTR read-through in insulin-regulated lipid-metabolism genes (e.g., Fasn, Scd1). As an extension, we developed a genome-wide, candidate-prioritization workflow to rank inverted TE pairs with high dsRNA-duplex potential in the HCD mouse model (HCD vs fasted). We first enumerated candidate inverted TE pairs under proximity/orientation constraints, then integrated RNA duplex folding (Vienna RNAcofold), sequence complementarity (BLAST), and concordant HCD-associated signals (TE upregulation, local A-to-I editing, and overlap with retained-intron events) to generate a ranked shortlist for experimental validation. Together, this framework links diet-induced transcriptional and post-transcriptional dysregulation to endogenous dsRNA-associated signatures and prioritizes TE-derived duplex candidates for targeted experimental validation in metabolic liver disease.

23

Modeling the Tumor Stroma to Understand Oncofetal Fibronectin Deposition

Presenter: Jessica Longstreth

Co-author(s): Ghazal Bashiri

Department: Bioengineering
College/School: Engineering

Faculty Mentor: Karin Wang

Breast cancer remains the most diagnosed cancer worldwide, with the development of multidrug resistance (MDR) in tumors hindering current anticancer therapies. Oncofetal fibronectin (oFN), an O-glycosylated form of the extracellular matrix (ECM) glycoprotein fibronectin (FN), has increased expression in MDR cancer cells. While the connection between oFN and cancer progression has been made, the mechanisms by which oFN contributes to the tumor microenvironment (TME) remain unexplored. This project mimicked cancer associated fibroblasts (CAFs), the cells primarily responsible for over secretion and remodelling of ECM proteins like oFN in the TME. Specifically, human mammary fibroblasts (HMFs) were grown in tumor conditioned media (TCM) from HCC-1937 and MDA-MB-231 cell lines (primary site and metastatic breast adenocarcinoma cell lines, respectively) to take on a CAF-like phenotype. Tumor conditioned HMFs were allowed to deposit matrices on polyacrylamide gels with a bulk stiffness of cancerous breast tissue (20 kPa) for 5 days. Samples were immunostained for cell nuclei, α-smooth muscle actin (αSMA), F-actin, FN, and oFN. Tumor conditioned HMFs had significantly more αSMA incorporated into the cells' F-actin network – an indication of higher cell contractility which is characteristic of CAFs. These CAF-like HMFs deposited denser oFN-containing matrices than non-conditioned HMFs grown on gels of normal adipose tissue stiffness (2 kPa). These findings further support the hypothesis that CAFs in the TME arrange dense oFN networks to facilitate tumor progression. Further visualizing oFN matrices through this in vitro tumor stroma model can provide insight into distinct matrix microarchitecture that facilitates cancer progression.

24

Structural Inequality and Individual Traits Amplify Problem Gambling Behaviors

Presenter: Cooper Sharp

Co-author(s): Elizabeth Newman, Jeremy Mennis, Vinod Venkatraman, David V. Smith

Department: Statistics, Operations, and Data Science
College/School: Fox School of Business

Faculty Mentor: David Foster-Smith

Problem gambling likely reflects the convergence of individual vulnerability and structural stressors, yet most work examines these influences separately. We tested a multilevel model in which trait reward sensitivity, affective symptoms, and structural context jointly predict gambling severity and gambling thoughts/urges. We hypothesized that reward sensitivity and affective symptoms would predict greater severity and urges, and that loneliness and income inequality would strengthen these associations. U.S. adults (N=1,031) completed a Qualtrics survey. Problem gambling was defined as endorsing at least 1 item on the Brief Biosocial Gambling Screen (BBGS). Depressive and manic symptoms were measured with the Seven-Up Seven-Down Scale and loneliness with the 3-item UCLA Loneliness Scale. Structural context included local income inequality and proximity to gambling venues. Compared with participants without BBGS endorsement, BBGS-positive participants were younger, reported higher reward sensitivity, and lived in areas with greater income inequality. Within BBGS-positive participants, higher gambling severity was associated with greater reward sensitivity, more depressive symptoms, and more manic symptoms. Loneliness moderated reward sensitivity: the association between reward sensitivity and gambling thoughts/urges was stronger among participants reporting higher loneliness. Income inequality predicted stronger urges among non-gamblers. These findings indicate that risk for gambling problems is shaped by both person-level traits and structural conditions, with loneliness marking heightened reactivity to reward cues. This interdisciplinary project integrates perspectives from psychology, marketing, and geography to better situate gambling behavior in its local environment. Future work will examine responses to gambling advertisements and test whether local advertising intensity contributes to gambling urges and escalation risk.

25

Sustainable Foam Fractionation for Simultaneous Removal and Concentration of PFAS and Microplastics in Water Systems

Presenter: Md Saiful Islam

Co-author(s): N/A

Department: Civil & Environmental Engineering
College/School: Engineering

Faculty Mentor: Gangadhar Andaluri

Per- and polyfluoroalkyl substances (PFAS) and microplastics (MPs) represent a persistent and growing challenge for drinking water and wastewater utilities due to their chemical stability, widespread occurrence, and resistance to conventional treatment processes. As regulatory requirements tighten, utilities require innovative, efficient, and environmentally sustainable treatment alternatives. Existing technologies such as granular activated carbon and ion exchange are often costly, energy intensive, and generate secondary waste streams, particularly when addressing short-chain PFAS. This study evaluates foam fractionation (FF) as a transformative, rapid, and energy efficient treatment strategy for co-contaminant removal. Control experiments using air-only foam fractionation achieved near-complete removal (>95%) of long-chain PFAS within 30 minutes, demonstrating their strong affinity for the air-water interface. However, short-chain PFAS exhibited substantially lower removal efficiencies under identical conditions due to reduced surface activity, necessitating longer treatment durations. To overcome this limitation, the research incorporates non-toxic, plant-derived foaming additives to enhance PFAS and microplastic enrichment, bubble attachment, and foam stability while minimizing secondary environmental and human health risks. A key advantage of foam fractionation lies in its ability to concentrate PFAS and MPs into a small foam fraction, typically less than 1% of the treated water and further reduced to approximately 0.1% through multi-stage operation. This significant volume reduction enables more cost-effective downstream destruction of contaminant-rich concentrates. By integrating rapid removal kinetics, minimal concentrate volumes, and safer foaming chemistry, this work advances foam fractionation as a scalable, low energy, and sustainable solution for comprehensive PFAS and microplastics management across One Water systems.

26

The Dual-Axis Credibility Model (DACM): A New Framework for Leadership Legitimacy in Engineering Management

Presenter: Niyati Gajjar

Co-author(s): N/A

Department: Engineering Management
College/School: Engineering

Faculty Mentor: Thomas V. Edwards

Engineering managers occupy a uniquely demanding leadership position: they are expected to command both technical respect from highly analytical peers and interpersonal trust from their teams as people leaders. General management frameworks, which treat authority as primarily positional and relational, fail to account for this dual requirement. This paper introduces the Dual-Axis Credibility Model (DACM), a conceptual framework proposing that leadership legitimacy in engineering management operates along two interdependent dimensions - the Technical Credibility Axis (TCA) and the Interpersonal Credibility Axis (ICA).

The DACM's central claim is that these axes are coupled: in engineering professional cultures, credibility loss on one axis accelerates decay on the other. Engineers evaluate all managerial behavior - including people decisions â€” through the lens of logical consistency and demonstrated competence. This coupling effect is not observed in general management contexts and is not captured by existing leadership theory.

The framework maps four leadership states from the interaction of the two axes: Integrated Authority (high TCA, high ICA), Technical Authority (high TCA, low ICA), Relational Authority (low TCA, high ICA), and Authority Vacuum (low TCA, low ICA). Each state is associated with distinct team dynamics, communication patterns, and organizational risks.

Preliminary findings from structured behavioral simulations conducted at Temple University support the coupling hypothesis: engineering participants challenged managers' logical consistency at significantly higher rates than non-engineering comparison scenarios, and managers who acknowledged uncertainty outperformed those projecting full confidence on post-simulation trust measures. The DACM offers both a theoretical contribution to leadership scholarship and practical implications for engineering organizations developing technical leaders.

27

Internal Short Circuit Detection and Preventing Thermal

Runaway of Fully Charged Li-ion Batteries under Mechanical

Impact

Presenter: Huzefa Patanwala

Co-author(s): Kevin Kong PhD, Vidyu Challa PhD, Kurosh Darvish PhD, Elham Sahraei PhD

Department: Mechanical Engineering
College/School: Engineering

Faculty Mentor: Elham Sahraei

Lithium-ion batteries (LIBs) are increasingly used in electric vehicles and energy storage systems, where they can be subjected to mechanical abuse during crashes or impact events. Understanding the onset and progression of internal short circuits (ISCs) under dynamic loading is critical for preventing thermal runaway and improving cell safety. Prior studies on dynamic mechanical abuse have often focused on either fully discharged cells or fully charged cells that proceed directly to thermal runaway, limiting the ability to isolate short-circuit initiation and perform post-test inspection. In addition, while short-circuit initiation thresholds have been studied under quasi-static loading, corresponding thresholds under dynamic conditions remain less well characterized. This work presents a controlled experimental approach to (i) identify internal short-circuit initiation under dynamic loading while (ii) avoiding thermal runaway, including in highly charged cells.

28

A Multi-scale Approach for Safety Evaluation of EV Batteries

Presenter: Shantanu Ramesh Shinde

Co-author(s): Abhijeet Thorat, Yihan Song PhD, Marian Bulla, Elham Sahraei PhD

Department: Mechanical Engineering
College/School: Engineering

Faculty Mentor: Elham Sahraei

A multiscale framework for crash-safety design and analysis is proposed. This framework utilizes Homogenization approach and sub-modeling technique along with the state of art Finite Element Analysis code (LS-Dyna) and High-Performance Computing, to provide the designer with a better insight into the deformation of EV's battery module and pack structure in a real-world crash scenario. The procedure begins with the identification of appropriate representative volume element of the battery module. A 3D Finite Element Model of the RVE is developed and appropriate boundary conditions are imposed. The RVE is subjected to several deformations, and the homogenized properties are calculated from the obtained RVE response. Based on the RVE response, an appropriate material model is calibrated to describe the non-linear anisotropic behavior of the battery module at the full-vehicle level simulation, where the battery module is assumed to be a continuum. Full-vehicle crash scenario is simulated with the homogenized battery module. After studying the results of this simulation, the battery module experiencing the maximum damage is identified and the displacement history of its protective casing is extracted. A detailed model of the battery module with homogenized cell model is established, and the nodal displacement histories of the protective casing extracted in the full vehicle simulation is used as an input to the simulation at module level. An advanced failure criteria i.e. Sahraei's Failure Criteria is used to detect internal short-circuits in the cylindrical cell. The results from the simulation at the sub-module level provide a better insight into the sequence and extent of deformation experienced by the internal structure of the battery module and probability of internal short-circuits, if any. Such insights would help in detecting short-circuit and optimizing the design of the internal architecture of the battery module and the protective structure around it leading to decrease in the overall weight and increase in the driving range, ultimately leading to safe and green transportation.

29

Understanding Curved Needle-Tissue Interaction Through Experimental and Computational Investigation

Presenter: Doyoung Kim

Co-author(s): N/A

Department: Mechanical Engineering
College/School: Engineering

Faculty Mentor: Parsaoran Hutapea

Minimally invasive procedures rely on accurate needle placement to reach deep or anatomically complex targets. Unlike conventional straight needles, curved needles enable non-linear insertion paths; however, a comprehensive mechanical understanding of curved needle-tissue interaction remains needed. This research investigates how needle geometry and insertion strategy influence needle-tissue mechanics to improve mechanical efficiency. An experiment and computational framework was developed to evaluate curved needle geometries with bent angles of 7.5°, 15°, 22.5°, and 30°, a curvilinear insertion technique, and mosquito-inspired barb surface modifications. The insertion experiments were conducted in tissue-mimicking gel using multi-axis force/torque sensor and video-base tracking to quantify axial force, transverse force, bending moment, and needle tip trajectory. Curvilinear insertion was compared to linear insertion to isolate the effect of the needle base manipulation. Finite element analysis (FEA) was used to qualitatively visualize stress distributions and support the interpretation of force and needle tip trajectory. Results show that curvilinear insertion significantly reduces transverse force (55.76%), axial force (45.87%), and bending moment (57.36%) compared to linear insertion. Needle curvature strongly influences force distribution and path stability, while bio-inspired barbs reduce insertion force in linear insertion but show minimal impact under curvilinear insertion. For linear insertion, FEA shows strong agreement with experimental trends in axial force, needle tip location, and post-insertion tissue displacement. This work establishes an understanding of curved needle-tissue interaction for optimizing steerable needle design. Future studies will extend biological tissues to assess potential relationships between mechanical loading and tissue damage.

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Effect of Circumferential Fracture of a Suture Anchor on Arthroscopic Rotator Cuff Repair: A Biomechanical Study

Presenter: Mehrdad Swizi

Co-author(s): Mehrdad Swizi, Gabriel A. Garrido, Seena Amin-Sanayei, Sharon Ashok, Kurosh Darvish, Leslie F. Barnes.

Department: Mechanical Engineering
College/School: Engineering

Faculty Mentor: Kurosh Darvish

Arthroscopic rotator cuff repair is a minimally invasive procedure designed to treat rotator cuff tears by re-approximating torn tendon back to its origin on the humours with suture anchors. Despite providing long term structural integrity, suture anchors can fracture upon insertion of the ancho. Removal of the broken anchor can be inefficient, and also increase the risk for short-term complications. This study hypothesizes some surgically implanted suture anchors do not require replacement upon fracturing, hereby avoiding the insertion of a new anchor at a new insertion site. To investigate, 12 4.5 mm — 14 mm suture anchors at 100%, 80% and 60% integrity (4 samples each) underwent cyclical and tensile testing in an artificial bone block. Controlled circumferential fractures were created under microscope guidance. Anchors were inserted using a standard protocol: 3.5 mm pilot hole (14 mm deep), tapping, and flush screw-in placement. Mechanical tests were conducted using a Bionix Tensile Test Machine. After 10 N preload, specimens underwent 300 sinusoidal cycles between 65 and 140 N at 0.5 Hz, followed by uniaxial pull-out at 0.04 mm/s. Failure was defined as a â‰¥10% force drop. No specimen failed during cyclic loading. Tensile curves showed an initial linear region, nonlinear plateau, then abrupt pull-out drop. Mean failure force was 305.40 ± 6.25 N (intact), 300.12 ± 12.27 N (20% fracture), and 306.22 ± 17.07 N (40% fracture), with no significant group difference (p=0.77). These data suggest 20-40% anchor fracture does not significantly reduce fixation strength in this model.

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Validation of a Sahraei-Based Failure Model for Tesla 21700 Cells and Toward Multiscale Battery Pack Simulation

Presenter: Nima Alisadeghi Arani

Co-author(s): N/A

Department: Mechanical Engineering
College/School: Engineering

Faculty Mentor: Elham Sahraei

The rapid growth of electric vehicle adoption has significantly increased the demand for lithium-ion batteries. Mechanical damage to battery cells during crash events can lead to internal short circuits and thermal runaway. While stiff structural enclosures are used to protect battery packs, predictive modeling remains challenging. Because detailed battery pack behavior cannot be efficiently modeled at the cell level in full-vehicle crash simulations, manufacturers often adopt conservative design strategies, leading to structural overdesign, increased vehicle mass, and reduced driving range. Detailed cell-level models are computationally prohibitive, whereas simplified models often lack sufficient fidelity to capture local damage and short-circuit risk. This study develops a multiscale modeling framework to bridge this gap.

Tesla 21700 cylindrical cells are modeled using a homogenized representation combined with the universal Sahraei failure criterion. The failure formulation defines the in-plane failure strain of the jellyroll as a function of the ratio of through-thickness compressive strain to in-plane tensile strain. The model is validated under major loading scenarios, demonstrating accurate prediction of forceâ€“displacement response and failure initiation across different deformation modes.

At the pack level, a representative volume element (RVE) is constructed and subjected to classical first-order boundary conditions to extract homogenized material properties. These properties are used to calibrate an LS-DYNA material model capable of describing the nonlinear multiaxial response of battery modules at the macroscale. The developed RVE framework significantly reduces simulation time while maintaining the predictive accuracy of detailed cell-level models, enabling efficient full-vehicle crash simulations while preserving sensitivity to local failure mechanisms.

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Pre-test Polariscopy Method to Predict Burst-Line Direction in Mylar (BOPET) Shock-Tube Diaphragms

Presenter: Tahmineh Aghabarari

Co-author(s): Mehrdad Swizi

Department: Mechanical Engineering
College/School: Engineering

Faculty Mentor: Kurosh Darvish

Mylar® (biaxially oriented polyethylene terephthalate, BOPET) diaphragms are widely used in shock tubes to separate the high-pressure driver section from the low-pressure driven section; diaphragm rupture initiates the shock wave. Because diaphragm opening is progressive rather than instantaneous, rupture direction and morphology (slit-like tearing versus multi-petal opening) can alter the opening-area history and contribute to variability in shock characterization. BOPET is birefringent due to processing-induced anisotropy, suggesting that pre-test polarized-light signatures may predict preferred tear paths.

This study evaluates a rapid, low-cost pre-test polariscopy method to predict diaphragm rupture direction. Circular diaphragms were laser-cut and imaged in a plane polariscope (diffuse LED backlight; crossed linear polarizer films). Each sample was rotated through 360° in 45° increments, and the extinction “dark axis” was recorded as the predicted rupture axis (θopt). Diaphragms were then burst in a shock tube, recovered, photographed, and classified by rupture morphology. When a dominant burst line was present, its orientation (θburst) was measured and the angular deviation was computed as Δθ. Burst pressure was also recorded.

For the two primary thickness groups, least-squares mean Δθ increased from 5.64° for 0.001 in (0.0254 mm; n=55) to 8.60° for 0.004 in (0.1016 mm; n=24) (R^2=0.0457; RMSE=6.36°; p=0.0584). Burst pressures were distinct by thickness (~35–41 psi vs ~100–110 psi). Higher petal counts were associated with broader Δθ distributions and high-angle outliers. Overall, pre-test polariscopy provides a practical predictor of rupture direction across operating regimes, with rupture morphology as a key contributor to prediction variability.

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Childhood trauma, psychotic-like experiences, and hippocampal and amygdala neurite density

Presenter: Zeeshan Huque

Co-author(s): Blake L. Elliott, Ranesh Mopuru, Thomas M. Olino, Jason Schiffman, Vijay A. Mittal, & Lauren M. Ellman

Department: Psychology & Neuroscience
College/School: Liberal Arts

Faculty Mentor: Lauren Ellman

Purpose: Childhood trauma has been linked to structural and functional alterations in the hippocampus and amygdala, yet few studies have examined microstructural alterations within these regions. Preclinical evidence suggests stress exposure may be associated with reduced neurite density. Research in clinical populations remains limited, including among individuals with psychotic-like experiences (PLEs) who frequently report childhood trauma. We leverage NODDI microstructural diffusion modeling to examine associations between childhood trauma, PLEs, and hippocampal and amygdala neurite density. Methods: 66 individuals aged 16-30 from the Multi-site Assessment of Psychosis-risk study self-reported childhood trauma and PLEs. Hippocampal and amygdala neurite density index (NDI) was estimated from diffusion-weighted MRI data. Regression models tested main and interaction effects of childhood trauma and PLEs on whole hippocampal and amygdala NDI. Exploratory analyses examined hippocampal subfields and amygdala subnuclei. Results: Childhood trauma was associated with significantly decreased whole hippocampal NDI (b=-0.009, SE=0.004, t=-2.238, p=0.029), and reduced NDI in CA2/3 (p=0.042) and CA4 (p=0.047) subfields. Although childhood trauma was not associated with whole amygdala NDI changes (p=0.068), significantly reduced NDI was found in the basal (p=0.033), lateral (p=0.039), and paralaminar (p=0.035) subnuclei. PLEs were associated with reduced NDI in the parasubiculum (p=0.034) and lateral nucleus (p=0.015). No interactions were observed. Discussion: This study provides novel evidence that childhood trauma is associated with widespread hippocampal microstructural alterations, particularly in stress-sensitive subfields CA2/3 and CA4. Specificity with amygdala basolateral complex subnuclei highlight the importance of subregion analyses. Future directions include utilizing microstructural imaging to prospectively identify early neural vulnerabilities in adolescents/young adults with childhood trauma.

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Investigating the Development of Large-Scale Spatial Skills in Late Childhood and Early Adolescence

Presenter: Stephanie Doner

Co-author(s): Merve Tansan, Abigail Losey, Lily Steele, Sofia Offutt, Angela Dang, Nora Newcombe

Department: Psychology and Neuroscience
College/School: Liberal Arts

Faculty Mentor: Nora Newcombe

Late childhood and early adolescence are a crucial period for the development of large-scale navigation skills. Children refine their ability to use distal cues (Buckley et al., 2015), take shortcuts (Burles et al., 2020), integrate information across viewpoints (Nazareth et al., 2018; Brucato et al., 2022), and combine information adaptively.

41 participants aged 11-14-years-old completed a spatial battery where they navigated and completed tasks within four virtual environments: Virtual Silcton (Weisberg, et al., 2014), Copetown (Tansan et al., 2025), Spatial Spy (Malanchini et al., 2020), and StarMaze (Bullens et al., 2010). They also completed two assessments of navigation-related spatial skills: map reading (Liben & Downs, 1989) and perspective taking (PTT-A, Frick, et al., 2014).

Our project aims to deepen our understanding of navigation skill development while advancing methods for assessing navigation in 11-14-year-olds. By combining immersive virtual towns, open-world city tasks, and controlled maze environments, this study delivers a comprehensive approach to assessing adolescent navigation. Analyses will evaluate the reliability of the tasks with this age group, investigate the extent to which different virtual environments and their scoring parameters converge on the same underlying constructs, and whether they align with broader spatial skills. Our study fills current research gaps and advances the field methodologically by strengthening reliability and validity, and theoretically by clarifying how navigation strategies consolidate during early adolescence.

Future directions of this study are to increase the sample size, and to use this battery to determine if an intervention can be used to support enhanced spatial skill use.

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Chemotherapy-Induced Crosstalk Between Fibroblasts and Neutrophils Promotes Awakening of Dormant Tumor Cells in the Lung

Presenter: Akhmadjon Azimov

Co-author(s): Seun Oyemomi, Andreia Lopes

Department: Biology
College/School: Science and Technology

Faculty Mentor: Lucia Borriello

Breast cancer metastasis is the primary cause of mortality in breast cancer patients, with triple-negative breast cancer (TNBC) being the most aggressive subtype. The standard treatment for TNBC is neoadjuvant chemotherapy. While most TNBC patients respond well, ~25% develop lung metastases within six months after treatment, leading to their deaths. Therefore, understanding the mechanisms that lead to metastases after treatment is urgent.

Metastases arise from dormant disseminated tumor cells (DTCs), that are triggered to resume proliferation (awakening) and form metastases. Growing evidence suggests that, paradoxically, awakening may be triggered by inflammatory changes induced by chemotherapy, abating the beneficial effects of treatments. However, little is known about how chemotherapy awakens dormant DTCs.

Our preliminary data demonstrate that paclitaxel, a commonly used chemotherapy for TNBC, alters the composition of the lung microenvironment, leading to the awakening of dormant DTCs and subsequent lung metastasis. Specifically, we have found that paclitaxel induces activation of lung fibroblasts. In turn, paclitaxel-activated lung fibroblasts secrete elevated levels of a pro-tumorigenic cytokine, Lipocalin-2 (LCN2), which promote awakening and proliferation.

We also found that paclitaxel-activated lung fibroblasts secrete CXCL1 and CXCL5, triggering neutrophil infiltration in lungs. Additionally, these fibroblasts also secrete IL-6, which stimulates neutrophils to release neutrophil extracellular traps (NETs). NETs are intricate structures composed of chromatin-bound DNA, and prior studies suggest they may facilitate metastasis.

Altogether, these data demonstrated that paclitaxel-treated lung fibroblasts support the awakening of dormant DTCs and the formation of metastatic outgrowth in the lung through two mechanisms: 1) directly, by secreting LCN2 to stimulate DTC awakening and proliferation; 2) indirectly, by recruiting neutrophils via CXCL1 and CXCL5, which secrete NETs to further support metastatic outgrowth.

This work will pave the way for new therapeutic strategies that enhance chemotherapy efficacy by eradicating proliferating tumor cells and preventing the awakening of dormant ones.

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Synthesis of NiFe and CoFe layered double hydroxides (LDHs) and enhancement of the oxygen evolution reaction (OER) by Formamide treatment

Presenter: Mohammad Robel Molla

Co-author(s): Zeshawn Rahman

Department: chemistry
College/School: Science and Technology

Faculty Mentor: Michael J. Zdilla

Developing low-cost, highly efficient, and earth-abundant electrocatalysts for the oxygen evolution reaction (OER) is a hot topic among electrochemists. Layered double hydroxides (LDHs) like NiFe LDH and CoFe LDH are two electrocatalysts which can satisfy the above criteria. This paper will include a facile synthesis strategy for these LDHs and a method to enhance the catalytic performance of these materials via treatment with Formamide, an exfoliating agent for layered materials. The NiFe and CoFe LDHs as well Formamide treated (FT) NiFe and CoFe LDHs were characterized using XRD and FTIR, indicating successful synthesis of LDHs. The overpotentials of the bulk-NiFe and bulk-CoFe LDHs for the OER reaction were 567 mV and 455 mV respectively. However, treating these LDHs with Formamide significantly enhanced OER performance by lowering the overpotentials to 433 mV and 339 mV at 10 mA/cm2 respectively. In addition, smaller Tafel slopes and higher ECSA of the FT-LDHs indicate higher kinetics and more active sites for the OER reaction, respectively. TEM analysis confirms the action of Formamide on the layered structure LDHs regarding delamination of layers into nanosheets (NS). As per EDX analysis, it is noteworthy that the original elemental ratios of NiFe and CoFe LDHs were preserved. Powder XRD results indicate the presence of defects or oxygen vacancies (Ov) because of lattice-contraction on the treated LDHs layers which increased OER activity.

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Understanding the Mechanism of NucS-mediated Mismatch Repair Pathway and its Regulation by the Processivity Clamp in Mycobacterium tuberculosis

Presenter: Amruta Bhalkar

Co-author(s): N/A

Department: Chemistry
College/School: Science and Technology

Faculty Mentor: Carol Manhart

The DNA mismatch repair (MMR) pathway is a key genome maintenance mechanism extensively studied in both bacterial and eukaryotic systems. In the canonical MMR pathway, the steps of mismatch detection, nuclease recruitment, and nucleolytic cleavage are carried out by different proteins, which further signal the replication machinery to repair the DNA. In contrast, some actinobacteria and archaea have developed a non-canonical way of using a single, multifunctional DNA repair protein known as NucS, which can detect the mismatch and cleave the DNA to initiate the repair. However, the mechanism and reconstitution of this pathway are not well understood. Characterizing this NucS-mediated mismatch repair pathway is particularly important because it is the mutation avoidance pathway utilized by antibacterial-resistant Mycobacterium tuberculosis. One of the major areas of interest is particularly how MMR mechanisms involving NucS are correctly directed to the nascent DNA strand. This work will involve probing for the contributions of the beta clamp, previously shown to interact with NucS, in directing the MMR to the correct DNA strand using a gauntlet of biochemical assays. Uncovering the mechanisms of NucS-mediated MMR can help us understand the causes leading to antibacterial resistance in Mycobacterium tuberculosis and potentially open new avenues for tuberculosis therapeutics.

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Study of PTEN Homodimers in Cells Using FRET Microscopy

Presenter: Todd Lewis

Co-author(s): N/A

Department: Chemistry
College/School: Science and Technology

Faculty Mentor: Ross Wang

The phosphatase PTEN is a key regulator of cellular processes including cell cycle progression, apoptosis, proliferation, and migration, and PTEN defects are widely implicated in cancer. PTEN has been reported to form a homodimer, but many aspects of this phenomenon, including what significance it has in the nucleus, remain understudied. Expression of PTEN-fluorescent protein fusions allows PTEN dimers to be studied in living cells by FRET imaging, and preliminary experiments in HEK293T and PC3 cells suggest a possible role for PTEN homodimerization in regulation of nuclear localization of PTEN.

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The Mismatch Repair Factor Mlh1-Pms1 Uses ATP To Compact And Remodel DNA During DNA Mismatch Repair

Presenter: Bryce Collingwood

Co-author(s): Amruta Bhalkar, Kanij Fatema

Department: Chemistry
College/School: Science and Technology

Faculty Mentor: Carol Manhart

In eukaryotes, mismatch repair begins with MutS homolog (MSH) complexes, which scan newly replicated DNA for mismatches. Upon mismatch detection, MSH complexes recruit the PCNA-stimulated endonuclease Mlh1-Pms1/PMS2 (yeast/human), which nicks the DNA to allow downstream proteins to remove the mismatch. Past work has shown that although Mlh1-Pms1 is an ATPase and this activity is important in vivo, ATP is not required to nick DNA. Our data, using yeast as a model, suggests that Mlh1-Pms1 forms oligomeric complexes that drive DNA conformational rearrangements using the protein's ATPase activity. These DNA rearrangements may serve to connect strand discrimination signals within the DNA, with the site-specific endonuclease activity in DNA mismatch repair. Our data show that protein-DNA interactions as well as DNA-DNA associations made through conformational changes are important to functional mismatch repair. Additionally, we show that non-B-form DNA structures, common in microsatellite regions, inhibit Mlh1-Pms1's activities, likely through impeding Mlh1-Pms1-dependent DNA conformational changes. This could explain an additional mode for instability in these regions of the genome. These findings highlight the importance of DNA compaction and topological rearrangements in Mlh1-Pms1's function and provide insight into how mismatch repair relies on DNA structure to coordinate events.

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A generative algorithm model for synthesizing underrepresented skin

tones in dermatological imaging

Presenter: Santhiya Theanraj

Co-author(s): Hayan Lee;Vahid Khalkhali

Department: Computer and Information Science
College/School: Science and Technology

Faculty Mentor: Xinghua Mindy Shi

Life-threatening skin conditions such as melanoma, basal cell carcinoma, squamous cell carcinoma, etc., are affecting approximately 100,000 people in the US. Deaths due to skin cancers are estimated to be up to 8,000 in 2025, as per the National Cancer Institute (NCI). The melanoma 5-year survival rate is 94.7% when detected early and treated promptly. The overall survival drops substantially in advanced and metastatic stage, highlighting easy diagnosis is critically important. Skin cancer diagnosis and screening have widely improved after the 2000s, but sometimes we still miss catching the disease in some people. Lack of diverse medical data is also a key issue in AI-powered cancer detection, as most training models are based on lighter skin tones. Therefore, we need balanced training data with diverse skin tones. Previous research utilizing the Fitzpatrick scale for generating synthetic lesion images fails to capture the diverse skin spectrum. Our research involves a 10- scale MST-based skin tone scale combined with a GAN algorithm to synthesize diverse skin lesion images. Our methodology employs computer vision to create bounding boxes around lesions, establishing semantic mappings between synthetic and real images. We trained a CycleGAN architecture using MST-categorized facial images alongside lesion datasets, enabling the model to learn diverse skin tone characteristics. The synthetic images are evaluated using an MST-AI skin tone prediction algorithm, and the statistical quality of the image is evaluated by the Fréchet Inception Distance (FID) score.

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3-dimensional Tomography (3DT) of the Pion and Kaon

Presenter: Joseph Torsiello

Co-author(s): Joshua Miller, Martha Constantinou

Department: Physics
College/School: Science and Technology

Faculty Mentor: Martha Constantinou

Atomic nuclei and nucleons comprise more than 99% of the mass of visible matter. Given the role of nucleons in nature, understanding their structure is among the most important research areas in Nuclear Physics. Nucleons contain quarks and gluons (partons), which govern their structure and properties. Partons are bound by the strong force, described by the theory of quantum chromodynamics (QCD). QCD is very complex and cannot be solved analytically. The only known theoretical approach to comprehensively study hadron structure is lattice QCD (LQCD). LQCD is a space-time discretization with billions of degrees of freedom, and one requires numerical simulations on supercomputers. Hadron structure is described in terms of distribution functions that provide a wealth of information on the partons within the hadron. This constitutes 3-dimensional tomography (3DT).

The research presented will be on the 3DT of the two lightest hadrons, the Pion and Kaon, which is part of my thesis research. The forward limit of the generalized parton distribution function (GPD) is calculated, which describes the fraction of momentum coming from the quarks. We aim to advance knowledge on GPDs, based on a novel approach to fully determine GPDs in the 3D parameter space. This is non-trivial and demands cutting-edge fast algorithms and access to large-scale computing resources. Results from this project will contribute in several areas where the experimental data are limited or non-existing. We anticipate a great impact on the synergy between LQCD and global analyses of experiments, which can achieve a better constraint of GPDs.

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Piezoelectric BTO coating to enhance Titanium surface bioactivity

Presenter: Chinmaya Agarwal

Co-author(s): Carolina Montoya, Dmitriy Dikin, Yuan Liu

Department: Oral Health Sciences
College/School: Kornberg School of Dentistry

Faculty Mentor: Santiago Orrego

Objectives: This study aimed to fabricate and characterize barium titanate (BTO)–coated titanium implant surfaces and evaluate their antibacterial and anti-inflammatory behaviour under simulated physiological loading.

Methods: Grade 5 titanium alloy samples were coated with BTO via hydrothermal synthesis (200°C, 5h). Surface morphology, roughness, and wettability were characterized by SEM, profilometry, and contact angle analysis respectively. Electrical charge generation was also quantified. To assess antibacterial activity, samples were inoculated with P. gingivalis and subjected to cyclic loading (2Hz, 24h) to simulate physiological mastication. Resulting biofilms were quantified for biomass, metabolic activity, viability (CFU), and LIVE/DEAD imaging. Anti-inflammatory responses in human gingival fibroblasts were determined by IL-6 and TNF-α. Data were analysed by one-way ANOVA with Tukey post-hoc test ($p < 0.05$).

Results: Piezoelectric BTO coated surfaces showed uniform morphology, distinct barium chemical composition, increased wettability with measurable piezoelectric activity with voltage output rose proportionally with applied compressive force. Under cyclic loading, BTO-coated samples exhibited distinctly enhanced antibacterial performance, with biofilms showing 2–3 log reductions in CFU counts compared to uncoated controls ($p < 0.001$). Biofilm biomass was markedly lower on coated surfaces, while metabolic activity remained proportionally reduced. Imaging confirmed fewer viable cells and thinner, less structured biofilms on BTO-coated specimens. Notably, low-load conditions produced the strongest antibacterial response, indicating a charge-dependent effect. BTO-coated surfaces also attenuated inflammatory signaling, as the low-level piezoelectric charges generated under cyclic loading down regulated IL-6 and TNF-α secretion in gingival fibroblasts.

Conclusion: Piezoelectric BTO coatings on titanium generated bioelectric charges that suppressed P. gingivalis biofilms and reduced IL-6/TNF-α expression, demonstrating a mechanoelectrical strategy to prevent peri-implant infection and inflammation.

Keywords: Barium Titanate; Titanium; Mechanoelectrical; Piezoelectric; Hydrothermal

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Metabolic Responses of Lactic Acid Bacteria to Different Sugars and Their Antimicrobial Efficacy against Oral Pathogens: A Probiotic-based Approach for Oral Health

Presenter: Priya Mullick

Co-author(s): N/A

Department: Oral Health Sciences
College/School: Kornberg School of Dentistry

Faculty Mentor: Yuan Liu

Early Childhood Caries (ECC) is a highly prevalent biofilm-associated infections in preschool children caused by cariogenic biofilms formed by pathogens such as Streptococcus mutans and Candida albicans. The coexistence of S. mutans and C. albicans promotes the formation of a highly pathogenic microbial community that accelerates enamel demineralization and caries progression. Probiotic therapy, particularly using Lactobacillus species, has emerged as a promising strategy for caries prevention. However, the role of probiotic-derived secondary metabolites in oral health remains insufficiently understood.

In this study, we aim to evaluate the inhibitory effects of Lactobacillus cell-free supernatants (CFS) against cariogenic microorganisms. L. plantarum ATCC 8014 and L. plantarum ATCC 14917 were cultured in MRS medium supplemented with different carbon sources (glucose, fructose and sucrose) for CFS preparation. The inhibitory and bactericidal activities of different CFS dilutions and combinations were tested against planktonic S. mutans and C. albicans. Anti-biofilm activity was further assessed using single- and dual-species biofilm models under cariogenic conditions.

CFS derived from L. plantarum ATCC 8014 grown with glucose or fructose exhibited superior antimicrobial activity compared to sucrose. Interestingly, combining CFS from both strains enhanced antimicrobial effect against both pathogens. While rapid glycolysis and lactate-mediated acidification may contribute to antimicrobial activity, neutralized CFS retained inhibitory effects, suggesting the involvement of bioactive metabolites beyond pH reduction. Future studies will employ mass spectrometry to identify secreted secondary metabolites and elucidate their mechanisms in modulating microbial pathogenicity. These findings highlight the therapeutic potential of probiotic-derived metabolites as a novel approach for preventing ECC.

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Investigating The role of the protein kinase TNIK in supporting partial EMT in lung squamous cell carcinoma

Presenter: Mohaddase Hamidi

Co-author(s): Korrey Hart, Kenneth Omolo, Adrian Dizon, Amir Yahmarmoodi, Margret Einarson, Shrey Sitaram

Department: Cancer Biology
College/School: Lewis Katz School of Medicine

Faculty Mentor: Pedro Torres-Ayuso

Background: Non–small cell lung cancer (NSCLC) remains the leading cause of cancer-related mortality, driven by early metastatic dissemination and frequent relapse after therapy. Partial epithelial–mesenchymal transition (pEMT), a hybrid state marked by concurrent epithelial and mesenchymal features, promotes collective migration, immune evasion, and resistance to cytotoxic stress. Defining regulators of pEMT may uncover new therapeutic strategies.

Hypothesis: TNIK supports pEMT and tumor progression in NSCLC, and its inhibition will promote epithelial reversion, impair malignant behavior, and induce a senescence-like state.

Methods: We examined the effects of TNIK depletion or inhibition in NSCLC cell models. RNA sequencing was performed to identify TNIK-dependent transcriptional programs. EMT marker expression (E-cadherin, EpCAM, Vimentin, CD44), migration, invasion, clonogenicity, proliferation, and senescence (β-galactosidase, IL-6) were assessed. MYC dependency was evaluated using genetic silencing and rescue approaches.

Results: RNA sequencing of TNIK-knockdown cells revealed broad transcriptional reprogramming consistent with reduced mesenchymal signaling and epithelial reversion. TNIK depletion increased epithelial markers and decreased mesenchymal markers, accompanied by diminished migration, invasion, and clonogenic capacity. Loss of TNIK also reduced proliferation and induced senescence-associated features, including β-galactosidase accumulation and IL-6 upregulation. Mechanistically, TNIK regulated the oncogene MYC: TNIK silencing or inhibition suppressed MYC expression, whereas MYC restoration rescued the phenotypic effects of TNIK loss. Conversely, MYC knockdown phenocopied TNIK depletion, identifying MYC as a downstream effector of TNIK-driven pEMT.

Conclusions: These findings establish TNIK as a regulator of pEMT and malignant behavior in NSCLC. Ongoing studies are evaluating the TNIK–MYC–pEMT axis in patient tumors and testing TNIK-targeted therapies, alone and in combination with standard treatments, in preclinical NSCLC models.

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FXR1 Regulates Vascular Smooth Muscle Cell Cytoskeletal Dynamics by Post-Transcriptional Regulation of RhoA

Presenter: Dom Openko

Co-author(s): Xinji Guo, Amanda Peluzzo, Sheri Kelemen, Michael Autieri

Department: Cardiovascular Sciences
College/School: Lewis Katz School of Medicine

Faculty Mentor: Michael Autieri

Hypertension affects about half of the US population and may be in part due to changes in vascular smooth muscle cell (VSMC) cytoskeletal dynamics and actomyosin interactions. RhoA is a small GTPase that has been shown to modulate VSMC cytoskeletal dynamics by activating Rho kinase (ROCK1/2). Fragile X-related protein 1 (FXR1) is an RNA binding protein that our lab has shown to regulate the stability of inflammatory and cytoskeletal RNA. Our hypothesis is that FXR1 regulates RhoA by multiple mechanisms, contributing to changes to cytoskeletal dynamics and VSMC physiology.

Aortas isolated from tamoxifen-injected, VSMC-specific conditional knockout (FXR1smc/smc) mice had significantly decreased RhoA mRNA and protein compared with control mice. In hVSMCs, when FXR1 is knocked down with siRNA, RhoA mRNA abundance and stability, protein abundance, as well as VSMC contraction are significantly reduced. RNA immunoprecipitation demonstrates that FXR1 binds RhoA mRNA. Mass spectrometry and co-immunoprecipitation demonstrated an interaction between FXR1 and ROCK1. FXR1 deletion reduced phosphorylation of MYPT1, an effector of RhoA/ROCK1 involved in VSMC contraction. Using pull-down assays, when FXR1 is knocked down, ROCK1/RhoA interaction is decreased, implying that FXR1 acts as a scaffold to keep ROCK1 in reactive proximity with RhoA.

We conclude that FXR1 regulates cytoskeletal dynamics by at least 1 of 2 mechanisms: 1- regulation of RhoA mRNA stability, and 2- regulation RhoA activity by reducing its proximity with its effector protein ROCK1. In the future we aim to assess differences in response to vasoactive stimuli via wire myography.

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Defective Lymphatic Drainage and Junctional Disorganization Impair Cardiac Injury Resolution After Myocardial Infarction

Presenter: Long Do

Co-author(s): Long Do, Jingjing Pang, Esteban Delgado, Jianan Zhao, Liam Flynn, Hongxia Liu, Sarah Fallouh, Erhe Gao, Juncheng Wei, Xiaofeng Yang, Michael Autieri, Guillermo Oliver, and Xiaolei Liu

Department: Lemole Center for Integrated Lymphatics and Vascular Research
College/School: Lewis Katz School of Medicine

Faculty Mentor: Xiaolei Liu

Cardiac lymphatic vessels play a critical role in immune cell clearance, interstitial fluid balance, and tissue repair following myocardial infarction (MI). However, whether lymphatic dysfunction worsen ischemic cardiac injury and adverse remodeling, and the molecular mechanisms that disrupt lymphatic junctional integrity after MI, remain poorly defined. To determine how lymphatic impairment influences the cardiac response to ischemic injury, we used a tamoxifen-inducible, lymphatic-specific Prox1 heterozygous deficient mouse model exhibiting dysfunctional lymphatic drainage. We performed MI and characterized cardiac lymphatic vessel density, morphology, structure, immune cell infiltration and cardiac function and fibrosis changes after MI. In vitro, PROX1-deficient lymphatic endothelial cells (LECs) generated by siRNA knockdown were used to examine junctional organization and VEGFR2/ERK signaling. Conditional Prox1 haploinsufficiency (Prox1ΔLEC/+) mice exhibited markedly reduced lymphatic drainage capacity and developed worsened cardiac function, increased fibrosis, heightened immune cell infiltration, and altered cardiac metabolic regulation post-MI. Prox1ΔLEC/+ hearts displayed fragmented lymphatic vessels with disrupted VE-cadherin localization and reduced tight junction proteins of ZO-1 and Claudin5. PROX1-deficient LECs in vitro recapitulated these defects, showing junctional disorganization and increased intercellular gaps. Transcriptomic and protein analyses revealed downregulation of VEGFR3 (FLT4), upregulation of VEGFR2 (KDR), and enhanced VEGFA/VEGFR2/ERK activation in PROX1 deficient LECs. Pharmacological inhibition of ERK in vitro, or blocking VEGFR2 in vivo restored junction integrity and resolved macrophage accumulation in PROX1-deficient LECs or in Prox1ΔLEC/+ mice after MI. These findings revealed a previously unknown PROX1-dependent VEGFR2/VEGFR3/ERK balance controlling lymphatic junction barrier function, and established lymphatic dysfunction as a contributor to adverse cardiac remodeling following MI.

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Comparative Study of Kinetics, Interfacial Activation, and Inhibition Behavior of Blood Esterases with Substrates of Different Lipophilicity

Presenter: Tashnuva Rifat

Co-author(s): N/A

Department: Pharmaceutical Science
College/School: Pharmacy

Faculty Mentor: Marc Ilies

Human esterases in blood, tissues, and the gastrointestinal tract exhibit distinct substrate preferences, hydrolyzing either hydrophilic or lipophilic esters to maintain physiological homeostasis and mediate detoxification of xenobiotics. A mechanistic understanding of how drugs, prodrugs, and drug delivery systems interact with these enzymes is essential for designing formulations with well-defined stability in the circulatory system.

We evaluated esterase activity using substrates that match their polarity preference: 4-nitrophenyl acetate for hydrophilic preferring esterases (e.g., carbonic anhydrase and acetylcholinesterase), and 4-nitrophenyl palmitate for lipophilic preferring esterases (e.g., classical lipase and lipoprotein lipase). Using these optimized and validated assays, we determined the kinetic parameters (Vmax and Km) of carbonic anhydrase, butyryl cholinesterase, classical lipase, and lipoprotein lipase, as well as the potency of selected inhibitors against these enzymes.

We further investigated how surfactant, at concentrations below and above critical micelle concentration, as well as physiological scavenger (albumin) and the fatty acid reaction product (palmitic acid), modulate enzyme activity and interfacial activation. We will present our results through a comparative analysis that highlights clear relationships between esterase structural features, interfacial activation, and their kinetic and inhibition properties, providing mechanistic insights that guide rational drug and drug-delivery systems design.

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Design and SAR Exploration of 5F02 Analogues as Selective Allosteric PARP1 Inhibitors

Presenter: Reem Mohsen

Co-author(s): Irfan Khan, Elizabeth Hewlett

Department: Pharmaceutical Sciences
College/School: Pharmacy

Faculty Mentor: Wayne Childers

The clinical use of PARP1 inhibitors such as olaparib (Lynparza®) in BRCA1/2-deficient breast cancer has validated the use of synthetic lethality as a personalized cancer therapy approach. Nonetheless, all marketed PARP1 inhibitors target the NAD+ binding site, and that has resulted in the emergence of resistance. Allosteric PARP1 inhibition offers a potential approach to overcome this limitation. A high-throughput screen has previously identified 5F02 as an allosteric PARP1 inhibitor that inhibits the activation of histone H4-mediated PARP-1 enzyme. In this study, we investigated the structure-activity relationships of the 5F02 scaffold. Optimization of the lead molecule has resulted in a series of novel analogues that exhibited low-nanomolar PARP/H4 inhibition activity, improved aqueous solubility, stronger human liver microsomal stability, and overall improved drug-like properties relative to 5F02. Future studies will expand in in vitro and in vivo evaluation of the optimized analogues to assess mechanistic selectivity, anticancer efficacy and pharmacokinetics in BRCA-deficient models. In parallel, selected compounds will be incorporated into PROTAC designs to enable PARP1 degradation and evaluate whether targeted protein degradation can overcome resistance associated with catalytic inhibition.

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Characterization of Propranolol Metabolism In Vitro and In Vivo: Mechanistic Modeling to Predict Enterohepatic Recirculation

Presenter: Xinyue You

Co-author(s): Ken Korzekwa

Department: Pharmaceutical Sciences
College/School: Pharmacy

Faculty Mentor: Swati Nagar

Purpose:

Enterohepatic recirculation (EHR) is a critical determinant of drug disposition and variability, particularly for compounds undergoing glucuronidation and/or sulfation followed by intestinal deconjugation. Propranolol was selected as a model compound due to its direct as well as sequential glucuronidation. We aim to characterize its glucuronidation kinetics in vitro and in vivo, and to develop a physiologically based pharmacokinetic (PBPK) model capable of predicting EHR.

Methods:

In vitro enzyme kinetics for propranolol 4-hydroxylation, propranolol glucuronidation, and 4-hydroxypropranolol glucuronidation were characterized in rat liver and intestinal microsomes. Both explicit equations and numerical methods for double substrate binding were utilized. Equilibrium dialysis was conducted to determine microsomal unbound fractions, which were incorporated into kinetic parameter estimation.

In vivo pharmacokinetic studies were conducted in male Sprague-Dawley rats following intravenous and oral dosing under fed and fasted conditions. Plasma concentrations of propranolol, 4-hydroxypropranolol, propranolol glucuronide, and 4-hydroxypropranolol glucuronide were quantified with a validated LC-MS/MS assay. To further interrogate pathway contributions, a drug-drug interaction (DDI) study was conducted using quinidine (potent human CYP2D6 inhibitor) in rats, administered orally in combination with intravenous and oral propranolol administration. An intestinal absorption model incorporating feeding time and food effects was applied to simulate concentration-time profiles.

Results:

In rat liver and intestinal microsomes, propranolol metabolism exhibited atypical kinetics for both hydroxylation and glucuronidation. The kinetics of these reactions were different in the liver versus the intestine. Mechanistic numerical methods provided improved characterization relative to the explicit equations.

In vivo, propranolol and its oxidative and sequential conjugated metabolites were successfully quantified. Propranolol glucuronide, though quantified in vitro, was detectable but not quantifiable in vivo. Preliminary simulations from the intestinal absorption model yielded reasonable predictive performance. PK profiles showed evidence of EHR, emphasizing the importance of biliary excretion and recycling processes. In the DDI study, quinidine significantly increased propranolol exposure and altered metabolite profiles, with propranolol glucuronide now at high enough concentrations to be quantifiable.

Future studies will incorporate in vitro enzyme kinetic parameters into in vivo metabolism models. Parent and metabolite pharmacokinetics were highly variable in rats, with evidence of EHR. The DDI results with quinidine suggest either a competition between propranolol hydroxylation and glucuronidation pathways, or increased circulating concentrations of propranolol glucuronide that may not have been quantifiable due to fast deconjugation. Results from mechanistic model simulations will be discussed.

Funding: Grants NIGMS 2R01GM104178 and 3R01GM114369.

POSTER SESSION B: 2:45–4:15 PM

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Genealogies of Monstrosity: The Female Body from Romantic Ballet to Radical Contemporary Performativity

Presenter: Maria Teresa Olmedilla

Co-author(s): N/A

Department: Dance
College/School: Boyer College of Music and Dance

Faculty Mentor: Mark Franco

This project examines the transformation of the female body in Western performance through a genealogy that moves from the ethereal idealization of nineteenth-century Romantic ballet to the radical materiality and monstrosity of contemporary performance. It asks how choreographic form produces, regulates, and destabilizes femininity across historical periods.

The research combines historical analysis of Romantic ballet repertoire, theoretical inquiry grounded in feminist and political theory, and critical analysis of contemporary European performance practices. Close readings of choreographic structures are paired with interdisciplinary frameworks from dance studies, performance theory, and media studies to investigate how movement systems organize agency, visibility, and embodied legitimacy.

Preliminary findings suggest that Romantic ballet constructs a disciplined and immaterial feminine body through elevation, weightlessness, and controlled visibility, while contemporary radical performance mobilizes monstrosity-through exposure, excess, risk, and corporeal intensity-to destabilize this ideal. These contrasts reveal choreography as both a regulatory mechanism and a site of resistance.

Monstrosity emerges not as a fantastical trope but as a critical strategy that reconfigures the boundaries of the acceptable female body. By foregrounding vulnerability, materiality, and extremity, contemporary performance challenges inherited aesthetic hierarchies and redistributes embodied agency.

The project demonstrates a continuum linking aesthetic form and political embodiment, proposing a genealogy from ethereality to monstrosity as a shift from disciplined idealization to radical corporeal presence.

Future Directions: Future research will expand comparative case studies and explore implications for feminist choreographic methodologies and performance pedagogy.

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Mini-High Platform Design Elements and their Impact to Disability Inclusivity at SEPTA Regional Rail Stations

Presenter: Phoebe Park

Co-author(s): N/A

Department: City and Regional Planning
College/School: Tyler School of Art and Architecture

Faculty Mentor: Kyle Hearing

While Federal Transit Administration (FTA) guidelines for train station ADA-accessibility have discouraged the use of mini-high platforms (MHPs), the utilization of mini-high platforms to bring rail stations to meet ADA-accessibility standards has increased. This is due to the FTA's All Stations Accessibility program as well as technical constraints where the tracks curve at the location of the station which do not make uniformly high platforms a feasible design choice. However, MHPs increase the likelihood of missed passenger pick-ups for disabled passengers due to lower visibility conditions. This study considers the following design elements which may contribute to lower visibility conditions for disabled passengers at MHPs: MHP placement related to the low platform (before or after), existence of nearby or overhead lighting, and distance of the MHP from the center of the low platform (in ft). Of the 35 MHP Stations within the SEPTA Regional Rail network, 10 stations were selected for study and attempted train boardings. At least 6 inbound and 6 outbound boarding attempts were recorded for successful boarding or delay in boarding. Of the three independent conditions studied, distance of the MHP from the center of the low platform was considered to have the greatest impact in missed wheelchair passenger pick-ups.

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DT4PCP-T2D: A Digital Twin Framework for Proactive ED Visit Prevention and Personalized Care Planning in Type 2 Diabetes

Presenter: Javad Mohammad Alizadeh

Co-author(s): N/A

Department: Department of Health Services Administration and Policy
College/School: Barnett College of Public Health

Faculty Mentor: Huanmei Wu

Purpose/Hypothesis: Emergency department (ED) visits among patients with Type 2 Diabetes (T2D) are largely preventable yet impose a burden exceeding $80 billion annually. This study develops and validates DT4PCP-T2D, a digital twin framework integrating predictive analytics, intervention simulation, and AI-driven recommendations to reduce ED visit risk in T2D.

Participants: The study uses retrospective electronic health record (EHR) data from HealthShare Exchange (HSX), encompassing 200,341 unique patients across over 58 million clinical encounters (2017-2021), augmented with social determinants of health (SDoH) data from the AHRQ database linked at the ZIP code level.

Methods/Materials: This three-aim study develops a comprehensive EHR and SDoH preprocessing pipeline and trains six machine learning models, XGBoost, Random Forest, Logistic Regression, KNN, SVM, and CatBoost, using 10-fold cross-validation to predict ED visit risk at 30, 60, and 90-day horizons. A personalized care planning system integrates D-optimal Design of Experiments (DoE) simulation with a Retrieval-Augmented Generation (RAG) system grounded in clinical guidelines. A clinician-centered GUI presents risk estimates, simulations, and evidence-based recommendations.

Results: Preliminary analyses on 34,151 T2D patients and 703,065 visits found that Ensemble Learning, XGBoost, and Random Forest achieved AUC = 0.82. Key predictors included age, visit frequency, income, and education.

Conclusions: DT4PCP-T2D integrates predictive modeling, simulation, and evidence-based recommendations into a unified clinical decision support system that translates patient risk into actionable, personalized care strategies.

Clinical/Social Relevance: By embedding SDoH alongside clinical data, DT4PCP-T2D advances health equity and shifts care from reactive treatment to prevention, with the potential to reduce avoidable ED utilization and lower the $413 billion annual economic burden of diabetes.

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Evaluating research practices for disseminating NeuroHIV findings to non-academic audiences

Presenter: Erin Mraz

Co-author(s): Kate Devlin, PhD; Maria Schultheis, PhD; Susannah Anderson, PhD

Department: Social and Behavioral Sciences
College/School: Barnett College of Public Health

Faculty Mentor: Sarah Bass

Purpose: Effective dissemination of research findings is essential to reduce the gap between scientific discovery and public health practice, yet dissemination to non-academic audiences remains limited. Thirty to 60% of people living with HIV are affected by NeuroHIV complications, yet few are aware because of communication gaps. This project examined NeuroHIV researchers' dissemination practices, perceived barriers, and needed assistance to inform development of resources for the Community Partnership Core (CPC) of the Comprehensive NeuroHIV Center (CNHC). Methods: As a quality improvement project, IRB review was not required. CNHC-affiliated researchers were surveyed about dissemination behaviors, perceived importance, barriers, and need for assistance, followed by in-depth interviews exploring experiences, influences, and preferred CPC involvement. Analyses included descriptive statistics, bivariate tests, and thematic coding. Results: Researchers (N=37) frequently use traditional dissemination (e.g., publications), while community-facing dissemination is less common and often perceived as outside expectations. Barriers included lack of time (78.1%), financial resources (50.0%), and connections with non-academic audiences (50.0%). Respondents under 45 were more likely to use non-HIV-specific conferences for dissemination (p=.008), and women rated dissemination to non-academic audiences as more important than men (p=.050). Interviews (N=6) highlighted how the CPC could support researchers through quarterly check-ins, workshops, and one-on-one meetings. Discussion/Conclusion: Enhancing dissemination to non-academic audiences requires a comprehensive approach that builds skills, capacity, and non-academic partnerships. Future Directions: By prioritizing non-academic dissemination, the CPC can help bridge gaps among researchers, clinicians, community-based organizations, and people living with HIV, expanding access to scientific knowledge and ultimately contributing to reduced health disparities.

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Institutional Strain: The Staff Experience at an HBCU

Presenter: Brandi Crawford

Co-author(s): NA

Department: Policy, Organizational, and Leadership Studies
College/School: Education and Human Development

Faculty Mentor: Jennifer Johnson

Historically Black Colleges and Universities (HBCUs) have long faced inequitable public funding compared to predominantly White institutions, resulting in structural financial constraints that shape institutional capacity. While existing scholarship documents funding disparities at the policy and institutional levels, limited research examines how chronic underfunding affects the lived experiences of university staff. This qualitative single-case study explores how inequitable financial conditions at one HBCU shape the experiences of student-facing staff. Guided by Critical Race Theory (Ladson-Billings & Tate, 1995), the study conceptualizes underfunding as a manifestation of structural racism embedded within higher education finance systems. Semi-structured interviews were conducted with staff members in roles directly supporting students to understand how financial strain impacts job satisfaction, morale, service delivery, and overall well-being. The study also explores the coping strategies staff employ to navigate resource limitations while sustaining student support efforts. Findings illuminate the emotional labor, professional challenges, and adaptive practices that emerge within under-resourced institutional contexts. By centering staff voices, this research extends scholarship on HBCU funding inequities beyond fiscal analysis to highlight human and organizational consequences. The study contributes to higher education literature by linking structural disinvestment to workforce well-being and student service ecosystems. Implications for institutional leadership, policy advocacy, and equity-centered resource allocation are discussed, offering insights for leaders seeking to strengthen organizational sustainability and student success within historically underfunded environments.

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Academic Stress and Coping Behaviors in Neurodivergent Students: An Explanatory Sequential Mixed Methods Study

Presenter: Alyssa B. Green

Co-author(s): Jasmine Yi, MEd, Rahma Goran MS, MEd, Xu (Lilya) Jiang, PhD

Department: Psychological Studies in Education
College/School: Education and Human Development

Faculty Mentor: Janelle Bailey

Stress is a significant challenge for many neurodivergent students, yet less is known about how adaptive coping behaviors are associated with perceived academic stress, particularly when integrating child self-report and parent perspectives. The present explanatory sequential mixed methods study will examine associations between neurodivergent students' self-reported adaptive academic coping behaviors and self-reported academic stress, while qualitatively exploring parent perspectives on students' coping and parental responses to academic challenges. Students (n = 99; Mage = 14.30) completed structured self-report measures assessing adaptive coping behaviors (Multidimensional Measure of Coping) and academic stress (Adolescent Stress Questionnaire - Stress of School Performance subscale). Greater use of adaptive coping behaviors is hypothesized to be associated with lower levels of academic stress. Correlations will be used to examine associations between coping categories and academic stress. Parent interviews (n = 20) will be analyzed using thematic coding, employing a combination of inductive and deductive approaches. Parent reports are expected to provide insight into factors influencing coping effectiveness, variability in stress experiences, and nuances of coping processes not captured by the quantitative results. This study will clarify how adaptive coping behaviors function within academic stress contexts and illuminate the role of parental interpretations and responses to students' experiences of academic stress. This study will contribute to a more nuanced understanding of self- and caregiver-initiated coping among neurodivergent students and may inform the development of empirically supported interventions aimed at promoting adaptive coping and reducing academic stress.

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Tracing Engineering Students' Identity Development Through Linguistic Change in Design Thinking

Presenter: Sihua Han

Co-author(s): Shaylyn H Westmoreland, Jennifer Patten, Avi Kaplan, Ruth Ochia

Department: Educational Psychology
College/School: Education and Human Development

Faculty Mentor: Avi Kaplan

Changes in engineering students' role identities (RIs) may become visible through shifts in how they position themselves in discourse. Guided by the Dynamic Systems Model of Role Identity (DSMRI), this study examines how longitudinal shifts in language use index evolving RI among 16 bioengineering seniors enrolled in a semester-long Biodesign course integrating iterative Design Thinking (DT) modules. Data included weekly reflections and DSMRI-informed summaries. Using combined inductiveâ€“deductive qualitative analysis, we examined linguistic patterns reflecting agency, ownership, and role positioning over time.

Three longitudinal patterns emerged. First, several students shifted from passive constructions to plural possessive forms, suggesting increased collective agency. Second, some students demonstrated stable integration of singular and plural possessive forms, reflecting ongoing negotiation between individual and team-based roles. Third, isolated regression to singular positioning occurred following team conflict, indicating temporary shifts toward individual responsibility. Notably, no sustained movement toward passive or singular-only positioning was observed.

Students who used more active language also demonstrated greater engagement with DT principles, though linguistic alignment does not necessarily indicate full internalization.

Findings suggest that linguistic positioning provides a discursive window into RI development. Theoretically, the study extends DSMRI by making identity change observable through discourse. Methodologically, it highlights the value of longitudinal reflective analysis. Practically, shifts in students' language may serve as instructional signals to inform feedback and scaffolding.

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Beyond the Individual: How Personality Traits and Institutional Policies Shape Graduate Team Science

Presenter: Jawaria Ashraf

Co-author(s): N/A

Department: Policy, Organizational, & Leadership Studies
College/School: Education and Human Development

Faculty Mentor: Janelle Bailey

The purpose of this convergent mixed-methods study is to explore the association between personality traits and collaborative achievement in interdisciplinary team science. This research focuses on how individual traits facilitate the transition from academic independence to collaborative interdependence.

This study is guided by two research questions: 1) How do individual personality traits predict a graduate student's perceived success and professional comfort in interdisciplinary teams? 2) How do participants describe the influence of team dynamics and individual personality differences on their collaborative experience? Quantitative data (N =26) collected via Ten-Item Personality Inventory (TIPI), and qualitative data included open-ended narrative responses from graduate participants (N =19). Data analysis included linear regression using JASP software and thematic analysis.

Quantitative results showed extroversion as a strong positive predictor of post-program professional comfort ($r=.667$, $p<.001$), and sympathetic traits significantly predict team integration ($R=.400$, $p=.043$). These statistical findings are contextualized by qualitative findings. Qualitative results identified that challenging academic expectations and institutional barriers can dominate personality traits. These merged findings show that structural barriers enhance individual collaboration strengths over interdisciplinarity.

In conclusion, these findings suggest personality traits promote teamwork, but they are insufficient to overcome institutional and structural challenges. Institutional policies can be enhanced by providing formal mentorship to students. These findings offer guidance for graduate student interdisciplinary science programs. Longitudinal studies should be a focus of future to investigate whether professional comfort translates into long-term increases in mentorship and collaboration.

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The Architecture of Educators: Strategic Dual Enrollment Model for Workforce Readiness

Presenter: Jawaria Ashraf

Co-author(s): N/A

Department: Policy, Organizational, & Leadership Studies
College/School: Education and Human Development

Faculty Mentor: Jennifer Johnson

The purpose of this qualitative phenomenological study is to explore the impact of dual enrollment programs on workforce readiness. Focusing on the Temple Education Scholars Program, the study was guided by two research questions: 1) What are the perceived benefits of DE among high school student participants? 2) What is the influence of DE on participants' professional development and learning? Data collection involved review of participant demographic and educational outcome data of 25 program participants along with two semi-structured focus group interviews to understand students lived experiences in the program. Data analysis followed a standardized 6-step analytic process (Creswell, 2013). Findings revealed that participants described the primary benefits of the program as earning college credits, career preparation, support from staff and faculty, and enhanced academic skills and readiness for college. Students credited the DE experience with improving their writing, time management, communication and self-awareness skills that are foundational for both college success and workforce readiness. A key implication of this study is the necessity to strengthen the relationship between school districts and universities to provide funding and support for long-term sustainability to meet workforce demands. Future research should account for policy variation when examining DE outcomes and study the process of creating and scaling DE programs in non-STEM fields across various school districts.

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Pathways to School Psychology: A Social Cognitive Career Theory Analysis

Presenter: MG Hodge

Co-author(s): Lillian Goldberg, Stella Dzifa Awudi, Tim Fukawa-Connelly

Department: Psychological Studies in Education
College/School: Education and Human Development

Faculty Mentor: Jessica Reinhardt

The current study explores thought processes, emotions, and values that school psychology students drew on as they entered a career in school-based education. We interviewed current and recently graduated school psychology doctoral students at a large, urban university. Semi-structured interviews were audio recorded, averaged 60 minutes in length, and were transcribed verbatim. Data analysis drew on thematic analysis (Braun & Clarke, 2006), beginning with codes motivated by the broad categories of Social Cognitive Career Theory (Lent et al., 1994) and iteratively added additional codes when needed (e.g., to reflect emotional valence). Findings highlight that participants were introduced to the field of school psychology through vicarious exposure to the profession while working in education contexts and some furthered their exploration through networking or social media 'day in the life' videos. Approximately 75% of participants explored K-12 teaching as a possible career before ultimately pursuing school psychology, and several participants named research and data-driven practices as a primary motivator for their career in school psychology. The participants each described wanting to serve populations who are traditionally underserved (e.g., immigrants, English language learners, groups for whom mental health services are stigmatized) that often reflected their personal background. The National Association of School Psychologists (NASP) recommends a ratio of one school psychologists per 500 students. At the time of this proposal, NASP estimates a national ratio of 1:1127 (National Association of School Psychologists, n.d.). It is with these shortages in mind that findings have implications for strengthening school psychology pipelines.

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Emotional Engagement Dynamics in Graduate Statistics Learning

Presenter: Kristen Brighter

Co-author(s): N/A

Department: Psychological Studies in Education
College/School: Education and Human Development

Faculty Mentor: Benjamin M. Torsney

Fredericks et al. (2004) define engagement as comprising cognitive, behavioral, and emotional dimensions. Emotional engagement, however, remains significantly underexamined, specifically within statistics and other STEM contexts in which low confidence and anxiety often undermine persistence and motivation (Authors, 2025; Di Leo et al., 2019). The purpose of this study was to examine how graduate students' emotional engagement unfolded in real time throughout an accelerated six-week statistics course and how their emotional experiences connected to instructional practices.

Fifteen graduate students completed semi-structured engagement notes, where they could document their thoughts, learning processes, and emotions throughout each class session. These in-situ reflections gave insight into the dynamic interplay that occurs between cognition, affect, and instruction. Thematic analysis was used to identify students' emotional experiences and trajectories across the semester.

Findings indicate that emotional engagement is non-linear, dynamic, and context sensitive. Numerous students began this course with anxiety and apprehension that was rooted in prior mathematical experiences. Overtime, students demonstrated a shift towards confidence, hope, and even pride which was largely tied to instructional clarity, structured explanations, and pacing. Emotional fluctuations also occurred due to perceived task difficulty and fatigue. Instructor reassurance and humor were also described as supports for students' emotional regulation.

These findings enhance engagement theory by foregrounding emotion as a dynamic component of learning and suggest that semi-structured in-situ reflection offers a practical and theoretically grounded approach to supporting engagement in high-anxiety learning environments. Additionally, findings emphasize that emotional engagement is context sensitive and closely related to teaching practices.

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Reflective Self-Regulated Learning Interventions in Online Environments: A Mixed Methods Study of Student Experience

Presenter: Zarin Tasnim

Co-author(s): N/A

Department: Teaching & Learning
College/School: Education and Human Development

Faculty Mentor: Janelle M Bailey

The study examines the design and evaluation of a reflective self-regulated learning (SRL) intervention in asynchronous online community college courses. The purpose of this research is to determine whether structured reflective prompting combined with instructor feedback can enhance students' self-regulation, reduce perceived transactional distance, and improve satisfaction in online environments. It also aims to evaluate the impact of the Self-Regulated Learning Online Reflection and Mentoring Protocol (SRL OnRAMP), an evidence-based meta-design synthesized from prior reflective SRL interventions. An explanatory mixed methods design was employed across eight asynchronous online courses at a community college. Quantitative data have been collected using a two-group quasi-experimental pre-post design measuring behavioral and affective SRL, transactional distance, student satisfaction, and on-time assignment completion. Qualitative data have been gathered through open-ended survey responses and semi-structured interviews to explore students' perceptions of the intervention's impact. Quantitative findings might indicate a considerable effect of the intervention on affective dimensions of self-regulation. However, qualitative findings might reveal that students perceive the reflective prompts and instructor feedback cycles as supportive, enhancing awareness of learning strategies and strengthening student-instructor connection. Overall, the results might suggest that structured reflective SRL interventions can influence learners' metacognitive awareness and perceived support in online courses. The study could offer educators a practical and reproducible model for implementing SRL interventions across diverse online academic programs. Future research should examine longer-term implementations, diverse institutional contexts, and suitable adaptations to strengthen behavioral outcomes and persistence.

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Unequal Democratic Responsiveness

Presenter: Michael Iwan

Co-author(s): N/A

Department: Public Policy
College/School: Liberal Arts

Faculty Mentor: Nyron Crawford

To what extent was the American democratic project designed to be responsive to the interests of ordinary citizens? Although the United States has exhibited somewhat low levels of democratic responsiveness for the average citizen, for example, prior work shows that high incomes and more affluent people tend to be the primary policy winners with government. Using historical analysis, this paper investigates the underlying causes of unequal democratic responsiveness. By comparing the perspectives of the fifty-five members of the Constitutional Convention, dissenting viewpoints, and laws enacted during that historical period with contemporary legislation, as well as analyzing wealth disparities within Congress and Presidential Cabinets and the implications of revolving door politics, I argue that class consciousness and related outcomes have persisted since the founding of this nation. While the effects may be more apparent today, the fundamental causes are rooted in the nation's framing. To effectively address this disparity, policymakers must prioritize addressing the root causes of this issue rather than solely focusing on its manifestations.

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"Can we stop this discussion and get back to play?" - decoding children's perspectives and expectations from school sport

Presenter: Shreyas Rao

Co-author(s): N/A

Department: Sport, Tourism and Hospitality Management
College/School: Sport, Tourism and Hospitality Management

Faculty Mentor: Gareth Jones

School sport remains the primary avenue through which most children learn foundational physical skills and develop formative peer relationships. Participation has been associated with improved positive youth development (PYD) outcomes such as social and emotional competencies, moral character and academic excellence (Whitley et al., 2019). However, these benefits depend on positioning children as active agents (Spaaij et al., 2018) and ensuring their experiences reflect essential characteristics of play - autonomy, intrinsic motivation, make-believe and flexible rules (Gray, 2017). This study investigated the extent to which school sport policy environments enable it by seeking responses directly from children about their participation. An interpretivist qualitative approach was taken to generate data through focus groups with children studying at two schools in India. The discussions were transcribed verbatim and analyzed utilizing an inductive thematic analysis technique (Clarke & Braun, 2017).

Findings revealed three key themes. First, opportunities for self-directed play emerged as central to children inculcating positive associations with sport. Secondly, neglect or over-supervision by adults emerged as a limitation of program design and a barrier to participation, in tandem with other individual and situational factors. Thirdly, children's perspectives about policy refinement demonstrated they are capable of critical reflection and showcased benefits gained from soliciting their feedback and active involvement.

By centering the child's voice, the study contributes novel insights for school sport programming. Additionally, by integrating different models of school sport delivery (i.e., public and private), we offer a critical review that emphasizes the need to consider the influence of varying socio-economic contexts.

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The Impact of Culture and Belonging on the Responses to Stressful Situations

Presenter: Jason Tavares

Co-author(s): N/A

Department: Applied Linguistics
College/School: Education and Human Development

Faculty Mentor: Janelle Bailey

The goal of this study is to determine the impact personal relationships and the feeling of belonging to larger cultural groups have on individual responses to unfamiliar and stressful situations such as coping mechanisms and mental health outcomes. By reviewing individual responses to a shared experience, in this instance the Covid-19 pandemic, across several countries and cultures, parallels can be drawn to help mitigate negative responses in different potentially unusual or stressful situations such as time spent in an unfamiliar culture during study abroad programs. The study will use open data collected from a pool of 1070 participants from 5 European countries utilizing a longitudinal mixed-methods approach. The quantitative data was gathered through online surveys given to participants over the age of 18 and who had the ability to read and write in the respective language of the country in which they resided. The survey was first administered from June through December of 2020 with the follow-up survey being administered during the same time period in 2021. Qualitative data was derived from four open ended questions centered on Covid-19 pandemic-related experiences during both the initial and follow-up surveys. These responses will be coded and common themes will be identified, counted by frequency, and used to explain patterns in the quantitative findings with expectations being that strong connections reduce the negative impacts of stressful situations. Distinctions can be made, however, between how different cultures view personal relationships and who is considered a part of or accepted into larger cultural communities.

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When Does Agentic AI Hurt? Strategic Autonomy and Governance in Platform Markets

Presenter: Jigyasu Kumar Verma

Co-author(s): N/A

Department: Statistics, Operations, and Data Science (SODS)
College/School: Fox School of Business

Faculty Mentor: Subodha Kumar

Leading online retailers, as major customers of digital platforms, are increasingly adopting Agentic AI, which is capable of doing autonomous tasks like executing pricing, promotion, and operational decisions. While higher Agentic AI autonomy can improve productivity, it also introduces operational risks that require governance and verification mechanisms. This study develops an analytical model to examine how Agentic AI autonomy intensity and platform governance can affect platform pricing, demand, and profitability in a competitive environment. We model two competing online platforms, with one providing Agentic AI to the online retailer. Online retailers differ in their learning capabilities, which determine how effectively they leverage Agentic AI-generated decisions. The platform chooses Agentic AI autonomy intensity, whereas governance mitigates risk at the expense of higher marginal costs. Our analysis reveals three major operational insights. First, the price of the agentic AI-enabled platform is non-monotonic in online retailer learning due to escalating governance exposure at high deployment levels. Second, optimal agentic AI autonomy exhibits a sweet spot, balancing productivity gains against operational risk. Third, improving Agentic AI governance does not universally increase profit: When underlying autonomy risk or online retailer learning is low, additional verification primarily raises costs and can reduce profitability. These findings highlight a fundamental cost-risk trade-off in the design of Agentic AI-enabled operations. Our results show that as platforms scale Agentic AI functions, governance investments must be aligned with ecosystem capability. Future research may extend the model to the endogenous governance level and empirical evaluation using platform-level cost and adoption data.

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Design, synthesis, and preliminary in-vitro evaluation of α-substituted-γ-lactones as potential therapeutic agents

Presenter: Lauren Morelli

Co-author(s): Dr. Daniel Canney and Dr. Mirza Feroz Baig

Department: Pharmaceutical Science
College/School: Pharmacy

Faculty Mentor: Benjamin Blass

As part of an ongoing exploration of novel biogenic amine-based structures, previous students in this lab have focused on the design, synthesis, and pharmacological evaluation of a diverse series of functionalized α-substituted-γ-lactones. These heterocyclic scaffolds have emerged as promising frameworks for the development of novel, drug-like compounds that have the ability to engage multiple pharmacological targets with high affinity and selectivity. Using systematic medicinal chemistry optimization and detailed structure-activity relationship (SAR) studies, multiple α-substituted-γ-lactone derivatives that exhibit low-nanomolar potency for the 5-HT7 receptor and the σ2 receptor were identified. These targets play critical roles in a range of neurological and inflammatory conditions such as Alzheimer's disease, substance use disorder (SUD), inflammatory bowel disease, dry macular degeneration, and neuropathic pain. The pharmacophore of these ligands has been determined to encompass a γ-lactone headgroup, a flexible linker region, a piperazine moiety, and an aryl ring system. This scaffold allows for both control over receptor engagement and modulation of physiochemical properties as a means of optimizing drug-like characteristics and enabling biological exploration. In an effort to expand upon these findings, we have extended the medicinal chemistry efforts to include the exploration of β-substituted-γ-lactones. This new series explores how substitution in the β-position influences receptor-binding dynamics in conjunction with changes in steric encumbrance and polarity of substituents in various regions of the molecule. Herein we report on the synthetic methodology, structural characterization, and preliminary in vitro screening data for β-substituted-γ-lactones. Early results suggest that strategic β-functionalization leads to higher affinity and selectivity for the σ1 receptor, whereas α-functionalization results in higher affinity and selectivity for the σ2 receptor. These studies expand the chemical landscape available for therapeutic exploration and further demonstrate the γ-lactones as an adaptable platform for the discovery of next-generation therapeutic agents.

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Aging with Strength: Evaluating Aging Initiative Services and Comprehensive Care for Older Adults Living with HIV

Presenter: Ashley Wright

Co-author(s): Aviva Joffe, MSW (Jefferson Einstein Immunodeficiency Center, Philadelphia, PA)

Department: Epidemiology and Biostatistics
College/School: Barnett College of Public Health

Faculty Mentor: Allison Casola, PhD, MPH, MCES

Purpose/Hypothesis: Older adults living with HIV experience increased multimorbidity and psychosocial challenges that may affect engagement in care. This study evaluated whether participation in Aging Initiative Services was associated with retention in care, preventive screening completion, and hospitalization outcomes among adults aged ≥50 years receiving HIV care.

Number of Participants: The analytic sample included 475 adults aged ≥50 years receiving HIV primary care at the Jefferson Einstein Immunodeficiency Center between January 2024 and January 2026.

Methods: This cross-sectional study used CAREWare and electronic medical record data. The primary exposure was participation in Aging Initiative Services (Medical Annual Wellness Visits, Coffee Chats, and Home Visits). Outcomes included hospitalization frequency, retention in care, mental health screening completion, and preventive HIV screenings. Logistic, multinomial logistic, and Poisson regression models adjusted for age, gender, race/ethnicity, insurance type, and comorbidity burden.

Results: Twenty-four percent engaged in at least one Aging Initiative Service. In adjusted analyses, service participation was strongly associated with mental health screening completion (aOR = 8.95, 95% CI: 4.02–19.92, $p < 0.001$), lipid screening (aOR = 2.27, 95% CI: 1.14–4.53, $p = 0.02$), and syphilis screening (aOR = 2.20, 95% CI: 1.24–3.88, $p = 0.007$). Service participation was also associated with lower relative risk of poor retention in care (RRR = 0.04, 95% CI: 0.01–0.13, $p < 0.001$). No significant association was observed for hospitalization frequency.

Conclusion: Participation in Aging Initiative Services was strongly associated with improved retention and preventive screening completion among older adults living with HIV.

Clinical Relevance: Enhanced mental health screening and sustained retention in care support early identification of psychosocial stressors and prevention of long-term morbidity. Integrating aging-responsive services into HIV care may strengthen continuity and promote equitable, person-centered outcomes in a growing aging population.

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The Longitudinal Impact of Neighborhood Poverty Level History on Prostate Cancer Stage at Diagnosis in Southeastern Pennsylvania

Presenter: Birat Kafle

Co-author(s): Charnita Zeigler-Johnson

Department: Epidemiology and Biostatistics
College/School: Barnett College of Public Health

Faculty Mentor: Kevin Henry

Purpose: Many prostate cancer disparity studies use neighborhood conditions at diagnosis, potentially missing long-term socioeconomic effects. This study investigated whether 20-year cumulative neighborhood poverty before diagnosis is linked to prostate cancer stage and grade at diagnosis in southeastern Pennsylvania.

Methods: A retrospective longitudinal study linking Pennsylvania Cancer Registry data (2008–2021) with LexisNexis residential histories and American Community Survey census-tract poverty data was conducted. The analytic sample only included 34,246 men with ≥80% coverage of residential history over the 20-year pre-diagnosis period. Neighborhood poverty was calculated as a person-time weighted average. Multinomial logistic regression models estimated relative risk ratios for stage at diagnosis and tumor grade, adjusting for age, race/ethnicity, insurance status, residential mobility, and diagnosis period. Age and poverty were scaled per 5-year and 5–percentage-point increases.

Results: Higher cumulative neighborhood poverty was associated with an advanced stage at diagnosis. Each 5–percentage-point increase in poverty was associated with a 3% higher relative risk of advanced-stage disease (RRR=1.03 (1.01, 1.05), $p<0.001$). Older age was significantly associated with advanced stage (RRR=1.06 per 5 years (1.04, 1.07), $p<0.001$) and high-grade tumors (RRR=1.33 per 5 years (1.31, 1.36), $p<0.001$). Poverty was not associated with high-grade cancer

Conclusions: Long-term exposure to living in a poor neighborhood is associated with an advanced stage at prostate cancer diagnosis, which highlights the importance of cumulative socioeconomic context in cancer disparities research. These findings will help target screening efforts and allocate resources more efficiently in high-poverty areas, addressing cancer prevention and detection inequities.

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NSF REIF - Teamwork and Design thinking: A role identity approach

Presenter: Shaylyn Westmoreland

Co-author(s): Shaylyn Westmoreland, Jennifer Patten, PhD., Avi Kaplan, PhD.

Department: Bioengineering
College/School: Engineering

Faculty Mentor: Ruth Ochia

Introduction: The goal in engineering education is developing students' design thinking (DT) and teamwork competencies for real- world problem solving [1-4]. Best practices in DT involve effective teamwork contributing to communication, problem solving, and engineering identity that improve design [5-12]. However, DT has not been studied to see if this process can be used to address emerging team dynamic issues during design projects. We focused on characterizing whether student role identities (RIs) facilitated use of DT to problem-solve emerging team dynamic issues during their design projects.

Methods: Twenty-six students consented from Fall 2024 and Spring 2025 undergraduate design courses. We followed the Dynamic Systems Model of Role Identity Analysis Guide [13] to conduct a deductive-inductive analysis of students' weekly and modular reflections – where students described their use of DT strategies [14].

Results and Discussion: Embedded within the course student RI was the sub-RIs of 'Teammate' and 'Designer'. 'Teammate' described how students approached teamwork within the larger context of the design project, which varied based on the perceived contributions of work by each team member. The 'Designer' sub-RI focused on student's personal contributions towards course project completion and arose when expectations of teammate contributions weren't met.

The study showed that 1) student teams that successfully applied DT within their teams, had more constructive relationships with partners and 2) student team dynamics could change, improving the relationship between their partners. These findings highlight the importance of recognizing and promoting positive team dynamics during larger design projects.

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Extra domain-A fibronectin matrix-mediated immunomodulation in the tumor microenvironment

Presenter: Ghazal Bashiri

Co-author(s): Elizabeth Bakare, Jessica Longstreth, Marshall S. Padilla, Michael J. Mitchell

Department: Bioengineering
College/School: Engineering

Faculty Mentor: Karin Wang

The extra domain A fibronectin (EDA-FN), a cellular FN containing an extra type III domain, is upregulated in the tumor microenvironment (TME) and is associated with poor patient prognosis. In tumors, 5-40% of the tumor mass consists of tumor-associated macrophages. Macrophages interact with the ECM and remodel the matrix to facilitate tumor cell invasion. Even though EDA-FN is recognized as a cancer biomarker, its role in regulating macrophage behavior remains unclear. Therefore, we developed a tumor-associated cell-derived matrix model to study macrophage-EDA-FN interactions.

Human mammary fibroblasts (HMFs) preconditioned in lNC (control) or mTCM (tumor-derived) media were cultured on PA gels of 2kPa and 20kPa, respectively, and decellularized. Confocal images were analyzed for matrix microarchitecture. Parallel decellularized samples were reseeded with macrophages. Confocal images were analyzed for morphology and matrix coverage.

Increased incorporation of Alpha-SMA into F-actin indicates HMFs differentiated into cancer-associated fibroblasts (CAFs). This was accompanied by increased TGF-beta1 in mTCM media compared to control media, suggesting TGF-beta1 contribution to CAF differentiation. Tumor-associated HMFs on pathological gels assembled highly aligned EDA-FN matrices with thinner fibers and larger intrafibrillar space compared to those of controls. Macrophages adhered to EDA-FN-rich matrices, on pathological matrices, displayed higher circularity, reduced aspect ratio, and increased cell body area compared to those on physiological matrices. They induced localized matrix remodeling, whereas macrophages on physiological matrices exhibited diffuse remodeling and lower overall matrix coverage

Overall, this study shows a dynamic reciprocal matrix-macrophage interaction. Future studies will investigate the mechanisms by which macrophages remodel tumor-associated matrices.

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Dysfunctional adipocytes drive adipose tissue macrophages polarization in a three-dimensional model of dysfunctional adipose tissue

Presenter: Julieta Rios-Vergara

Co-author(s): N/A

Department: Bioengineering
College/School: Engineering

Faculty Mentor: Evangelia Bellas

Obesity, a major public health crisis associated with type 2 diabetes, cardiovascular disease, and cancer, is characterized by excess fat tissue, also known as adipose tissue (AT). This expansion impairs blood vessel formation, reducing oxygen availability, to create a hypoxic environment that promotes structural changes (stiff and less flexible tissue matrix), induces cellular stress, and impairs fat cell (adipocyte) function. Simultaneously, AT macrophages (ATMs), an immune cell, adopt a pro-inflammatory phenotype, contributing to inflammation that exacerbates AT dysfunction.

Our research examines how hypoxia-induced adipocyte dysfunction affects ATM behavior. Previously, we demonstrated that hypoxia-induced changes are characterized by altered adipokine balance, and now we ask how these cues influence ATM polarization and inflammatory responses. We hypothesize these changes will lead to pro-inflammatory polarization of ATMs, promoting the expression of pro-inflammatory cytokines interleukin 6 (IL6) and tumor necrosis factor alpha (TNFa), contributing to the overall inflammatory response and metabolic dysfunction.

AT constructs were engineered by encapsulating human adipocytes and macrophages within 2 mg/mL type I collagen hydrogels, following healthy and dysfunctional adipocyte-ATM ratios and cultured under hypoxic conditions. After 7 days, structural, metabolic, and inflammatory responses were assessed using gene expression analysis, imaging, and metabolic assays.

Our findings show that hypoxia and ATMs together impair adipocyte maturation and function by changing adipocyte morphology, altering AT marker expression and metabolic function. However, ATMs notably promoted a proâ€‘inflammatory environment that was not evident in hypoxia.

Understanding adipocyte-ATM communication is critical for developing therapeutics strategies to mitigate inflammation, preserve AT function, and reduce obesity-related comorbidities.

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Tumor-associated ECM acts as a mechanical cue for sensory neoaxonogenesis

Presenter: Svetllana Kallogjerovic

Co-author(s): Maria Carolina Mariano Cesar, Ines Velazquez-Quesada, Janusz Franco-Barraza; Tiffany Luong, Edna Cukierman

Department: Bioengineering
College/School: Engineering

Faculty Mentor: Bojana Gligorijevic

Tumor microenvironment (TME) is a complex and dynamic system consisting of host cells and extracellular matrix (ECM) that interact bi-directionally with cancer cells, shaping tumor behavior while undergoing continuous remodeling during tumor progression. In cancer, the ECM becomes dysregulated, leading to mechanical and architectural changes that convert it into fibrotic, stiff, highly cross-linked, and enriched in aligned fibers.

The latest recognized components of TME are tumor-associated nerve fibers, and their role in cancer progression and metastasis has gained increased attention. In patient tissues, tumor nerve size correlates with metastatic occurrence and lower survival. In breast cancer, high level of TRPV1+ has been inversely associated with patient survival. Despite advancements, the mechanisms driving tumor innervation remain poorly understood, particularly the contribution of ECM topography on sensory neurons.

Here, we aim to decipher the role of mechanical cues from tumor-associated ECM in regulating sensory neoaxonogenesis in mammary tumors. Primary murine sensory neurons (PMSNs) were cultured within cell-derived ECM matrices generated from cancer-associated fibroblasts isolated from a patient breast tumor biopsy. Fibroblasts were treated with DMSO to generate tumor-like bcdECM or normalized using TGF-ÃŸ inhibitor to obtain healthy-like bcdECM.

Culturing PMSNs within these matrices revealed a significant increase in neoaxonogenesis in tumor-like ECM compared to normalized ECM. Overall, our study establishes a novel platform to investigate sensory neuron neoaxonogenesis during breast tumor progression and suggests that tumor ECM acts as a mechanical cue driving axon extension and guidance.

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Breaking Forever Chemicals: Supercritical Water Oxidation as a Path to PFAS Mineralization

Presenter: Elham Akbari

Co-author(s): N/A

Department: Civil and Environmental Engineering
College/School: Engineering

Faculty Mentor: Gangadhar Andaluri

Per- and polyfluoroalkyl substances (PFAS) are recalcitrant environmental pollutants, resisting conventional treatment due to their robust carbon-fluorine bonds. Supercritical water oxidation (SCWO), leveraging water's unique reactivity above its critical point (374Â°C, 22.1 MPa), presents a promising strategy for their complete mineralization. Under supercritical conditions, water generates reactive free radicals, enabling the rapid cleavage of PFAS molecular structures. This study evaluates SCWO's performance in degrading a suite of PFAS, including PFOA, PFOS, PFNA, PFBA, PFBS, PFHxS, and PFHxA, across a range of conditions. Analytical results, obtained via liquid chromatography-mass spectrometry and ion chromatography, reveal destruction efficiencies exceeding 96% for carboxylic PFAS, with negligible formation of fluorinated intermediates. Reaction pathways and fluorine fate are under investigation to elucidate degradation mechanisms by integrating experimental observations with quantum chemistry calculations performed in ORCA to identify key reaction pathways. The process demonstrates pronounced sensitivity to temperature and oxidant concentration, underscoring avenues for optimization. These outcomes position SCWO as a sustainable, scalable alternative to incineration and landfilling, offering a transformative approach to remediating PFAS-contaminated water. Ongoing research targets energy efficiency and field-scale deployment, advancing SCWO's practical utility.

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Liquid chromatography method development for quantitative assessment of Per and polyfluoroalkyl substances in different sample matrices

Presenter: Oluwafemi Omidele

Co-author(s): N/A

Department: Civil and Environmental Engineering
College/School: Engineering

Faculty Mentor: Erica McKenzie

Per- and polyfluoroalkyl substances (PFAS) are persistent synthetic compounds that have been observed to be bioaccumulative and toxic, which is quantified in an ultra-trace scale to meet regulatory limits (mostly ≤1 ngL^{-1}). Due to their high polarity and ionic nature, some chromatography techniques are not suitable for quantitative measurement of PFAS across different matrices. Liquid chromatography coupled with quadrupole time-of-flight mass spectrometry (LC/QTOF/MS) remains the most reliable PFAS analysis method due to its sensitivity, selectivity, and simultaneous detection of multiple PFAS compounds. In this study, we describe the development and validation of an LC method optimized for the measurement of 40 PFAS compounds in aqueous, solid (soil), and tissue (vegetables, e.g., lettuce, tomato, and carrot) matrices. We optimized the column chemistry, mobile phase composition, and gradient program to avoid coelution of our PFAS, improve peak shape and chromatographic resolution, and reduce matrix-induced ion suppression. For method validation and performance, we will base our assessment on 70-130% recoveries of our PFAS and EIS (extraction internal standard), and a relative standard deviation of ≤20%. These validated procedures meet the criteria established in EPA Method 1633 and provide a reliable and scalable approach to the routine monitoring of PFAS in laboratories associated with the environment and food safety.

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Biomarker expressions of spinal cord injury on avulsed neonatal brachial plexus

Presenter: Thamaraiselvan Rajanbabu

Co-author(s): Baishaki Mahapatra, MS, Gagana Karkada, PhD, Anita Singh, PhD

Department: Bioengineering
College/School: Engineering

Faculty Mentor: Anita Singh

Neonatal Brachial Plexus Palsy (NBPP) occurs during shoulder dystocia. While most cases of NBPP recover spontaneously, 25-30% of cases remain unrecovered. Studies have reported concomitant spinal cord injury (SCI) in avulsion BP injury cases. The diagnosis of this condition is severely limited due to the complex anatomy of BP and the age of the neonate. This study aims to offer a diagnostic tool for detecting NBPP using proteomic biomarker studies. Large animal model, piglet, was used to induce BP avulsion injuries and cerebral spinal fluid (CSF) and spinal cord (SC) tissues were obtained (n=5). The institutional animal care and use committee approved all procedures. The following biomarkers were assessed in the study: Myelin Basic Protein (MBP) and Glial Fibrillary Acidic Protein (GFAP) as structural biomarkers, and Interleukin 6 (IL6) as an inflammatory biomarker. Their expressions were determined by quantitative Enzyme Linked Immunosorbent Assay (ELIZA) using ELISA kits for pigs. The expression from proteomic studies showed upregulation for the inflammatory marker (IL-6) and the structural markers (MBP and GFAP) although non-significant. Detecting injury biomarkers released in the cerebral spinal fluid and spinal cord samples, post-NBPP can lead to accurate diagnoses, such as concomitant SCI, and help determine possible scope for intervention. The changes in the expression of inflammatory biomarkers in the biofluid such as CSF can advance the science of neonatal care.

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The effect of runoff pH on water soil partition coefficient of orthophosphate and dissolved organic phosphorus

Presenter: Radwa Abdelaziz

Co-author(s): NA

Department: Environmental Engineering
College/School: Engineering

Faculty Mentor: Erica Mckenzie

Excessive phosphorus in water bodies promotes phytoplankton overgrowth, leading to reduced sunlight penetration and depleted oxygen. Soil media, including those in infiltration-based stormwater management practices (SMPs), can leach phosphorus, which potentially negatively impacts groundwater quality as well as connected surface water. This study investigates the influence of runoff pH on soil-water partition coefficient (Kd) value of organic and inorganic phosphorus for fill media collected from different basins which vary in their chemical composition, age, and loading ratios. Batch equilibrium experiments were conducted to examine phosphorus desorption under pH conditions ranging from 6.8 to 8, where the pH range was selected based on historic stormwater field data. Fill media were analyzed for particle size and chemical composition, including determination of initial concentrations of inorganic and organic phosphorus, as well as metals such as iron and aluminum. The results show that Kd values for inorganic and organic phosphorus decreased with increasing pH for all tested fill media. For inorganic phosphorus, Kd increased with iron concentration (Spearman correlation = 0.66), likely because phosphate adsorbed to soil via complexes with metal oxides and hydroxides. The high concentration of iron provides active sites for phosphorus attachment. Organic phosphorus Kd increased with higher clay and silt fractions (Spearman correlation = 0.83). Organic phosphorus sorption to soil may be partially driven by hydrophobic interactions with soil organic matter. These findings highlight the role of soil composition and pH in phosphorus retention processes.

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Coordination and Collaboration in Multi-Robot Teams: Planning, Creativity, and Interactive Human-Robot Decision-Making

Presenter: Alkesh Kumar Srivastava

Co-author(s): N/A

Department: Mechanical Engineering
College/School: Engineering

Faculty Mentor: Philip Dames

Robots operating in human-centered environments must coordinate effectively to complete complex tasks such as pickup-and-delivery. While single-robot autonomy has matured, scaling to multi-robot teams introduces challenges in task allocation, spatial interference, and collective decision-making. The objective of this research is to develop principled coordination frameworks that enable scalable collaboration among multiple robots while remaining responsive to human intent. We begin with developing a speech-guided sequential planner that allows robots to interpret high-level human instructions and execute structured behaviors. As task complexity increases to multi-package delivery, explicit coordination mechanisms become necessary to distribute workload and synchronize execution across agents. To address this challenge, we introduce a framework we call DELIVER that enables scalable Voronoi-based coordination with balanced workload distribution. Building on this, Voronoi-Constrained Steiner Tree Relay Coordination Planning (VCST-RCP) formalizes relay interactions as first-class planning primitives, integrating Voronoi-constrained Steiner trees with carrying-capacity and energy constraints. Experimental results show that VCST-RCP achieves significant reductions in total travel distance and energy expenditure while maintaining scalable coordination as team size increases. Beyond logistics, we demonstrate that when coordination principles are extended to larger collectives, coordinated motion gives rise to expressive swarm behaviors, where robots intentionally form interpretable spatial patterns such as smiley faces and hearts. These findings suggest that principled coordination enhances both task efficiency and expressive capability, illustrating that robots are not solely tools for productivity but can also contribute to creative and human-centered experiences. Future work will integrate uncertainty modeling and adaptive role assignment to enable resilient multi-robot coordination in real-world settings.

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Experimental Study of Percutaneous Needle Insertion into Viscoelastic Tissues

Presenter: Hamidreza Ghasempoor

Co-author(s): N/A

Department: Mechanical Engineering
College/School: Engineering

Faculty Mentor: Parsaoran Hutapea

Percutaneous needle insertion is commonly performed in clinical practice, especially for needle biopsies of abdominal tumors, breast cancer, and prostate cancer. Because soft tissue is viscoelastic, insertion velocity affects measured forces by changing the loading rate and time available for stress relaxation. This study experimentally quantifies how insertion velocity and phantom stiffness influence insertion-extraction force-depth behavior. Controlled insertion-extraction experiments were conducted using a stainless-steel 18G hollow needle inserted at constant velocities of 2.5, 5, and 10 mm/s into two phantom gels with Young's modulus of 15 and 25 kPa. Force-depth data were analyzed over a 60 mm insertion depth and quantified using insertion-extraction indicators, including peak and stable-region metrics and hysteresis. At matched speeds, the stiffer gel produced higher insertion-extraction forces and greater energy loss across all indicators. In particular, the stiffer gel exhibited substantially larger hysteresis, increasing by approximately 72-78% relative to the softer gel. This increase is consistent with higher effective stiffness and greater shaft contact pressure in the stiffer gel, which elevates frictional resistance during both insertion and extraction and increases viscoelastic dissipation. Increasing velocity from 2.5 to 10 mm/s increased forces and hysteresis for both gels, with a stronger rate effect in the stiffer gel. These trends support a Zener-type viscoelastic response and show that stable-region metrics enable consistent comparisons and inform insertion parameter selection. Future work will expand stiffness and speed ranges and calibrate viscoelastic parameters using complementary relaxation/creep tests.

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Fatigue Study of Fenestration in Endovascular Graft

Presenter: Nikolaos Farfaras

Co-author(s): Robert Gregory Conway, M.D.

(Department of Surgery, Lewis Katz School of Medicine, Temple University, Philadelphia, PA)

Department: Mechanical Engineering
College/School: Engineering

Faculty Mentor: Parsaoran Hutapea

Fenestrated endovascular grafts enable minimally invasive treatment of aortic pathologies such as aneurysms by sealing the diseased vessel, preventing rupture, and preserving blood flow to branch vessels. Endovascular grafts are typically composed of polymeric fabrics reinforced with metallic stents, combining flexibility with radial strength. Fatigue performance is governed by material properties and manufacturing-induced alterations, such as fenestrations. Fenestrations are either pre-ordered by the manufacturer or modified by the clinician. Once implanted, endovascular grafts are subjected to continuous pulsatile blood pressure generated by the cardiac cycle, resulting in millions of loading cycles over the patient's lifetime. Consequently, long-term reliability is critical, particularly at regions of material discontinuity, where manufacturing-induced damage and stress concentrations may accelerate fatigue failure. Current standardized requirements for endovascular grafts, such as ISO 25539 and ASTM durability test methods for vascular implants, primarily address overall device performance and do not specifically evaluate fatigue behavior at fenestrations. This work proposes a fatigue test setup specifically designed to evaluate the reliability of manufactured graft fenestrations. Controlled cyclic radial loading was applied to 8 mm fenestrations at 1.6 Hz with a 14 mm stroke, representing an accelerated test compared to physiological cardiac pulsatile stress (~1 Hz) and bending stresses from respiration (~0.13-0.27 Hz). This accelerated frequency allows rapid assessment of fatigue at the fenestration. Preliminary results show a decline in mechanical response and damage. Future work will include expanded testing to statistically validate findings and mechanical evaluations such as radial force and pulsatile durability testing to further investigate fenestration durability.

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A new and improved validation framework for Kramers-Kronig Transforms

Presenter: Faezeh Bohlool

Co-author(s): N/A

Department: Mechanical Engineering
College/School: Engineering

Faculty Mentor: Damoon Soudbakhsh

Electrochemical Impedance Spectroscopy (EIS) is an advanced technique for characterizing the electrochemical properties of battery systems. EIS measurements are highly sensitive to test conditions, which makes data integrity essential for accurate analysis. EIS diagrams show the imaginary component of the impedance spectra versus their real component. A major advantage of using EIS is its self-validation, which relies on mathematical fundamentals to connect the imaginary component to the real ones. The theories are based on the Kramers-Kronig transforms (KKT) to evaluate the causality, linearity, stability, and boundedness of the response. However, these theories assume measurements at zero and infinity frequencies, which are not available. Several studies have focused on developing tools to test KKT conditions on practical data. However, most of these approaches proved insufficient given the complexity of the impedance spectra of energy storage systems. Therefore, the most common approach adopted by commercial companies and researchers uses a model with relaxed KKT conditions. We showed that the existing approaches result in both missing KKT-compliant data and mis-categorizing artificial data as KKT-compliant. Here, we propose a novel measurement model to replace the other approaches. We prove that the model correctly categorizes test-case scenarios, including simulation cases and experimental data, and has a much more applicable test space than other approaches. The framework provided in this study has significant implications for the thousands of experimental studies conducted worldwide each day that use impedance spectra.

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Data-Driven Analytical Modeling of Layer-Wise Displacement in Pouch Cell Batteries under Indentation

Presenter: Adel Esmaeili Atrabi

Co-author(s): N/A

Department: Mechanical Engineering
College/School: Engineering

Faculty Mentor: Elham Sahraei

Accurately characterizing the mechanical response of pouch cell batteries under indentation remains a significant challenge due to their multilayered structure, complex internal interactions, and strongly nonlinear deformation behavior. Even when the system is idealized as a homogenized crushable-foam-like material, deriving closed-form expressions for vertical and radial displacements is not feasible, and finite element method (FEM) simulations are typically required. However, repeated FEM analyses are computationally demanding and often rely on iterative parameter calibration.

This study proposes a data-driven analytical framework to reduce dependence on repeated numerical simulations. Layer-wise vertical and radial displacement fields are first extracted from high-fidelity FEM results. These fields are then normalized and represented using fitted analytical expressions, assigning one vertical and one radial displacement function to each layer. A central contribution of this work is the identification of the contact border directly from FEM data. The contact boundary is essential for distinguishing the actively deforming region beneath the indenter from zones dominated by rigid-body motion.

It is observed that beyond a critical radial distance, displacement transitions to rigid-body motion, often appearing as linear or plateau behavior that does not contribute to strain. By isolating this region, the proposed displacement functions capture only strain-producing deformation. Strain fields are subsequently obtained through the deformation gradient tensor, enabling mechanical evaluation without repeated FEM analyses. This framework provides a computationally efficient and physically consistent approach for indentation modeling and establishes a foundation for determining material parameters through virtual work principles.

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Leveraging supervised machine learning approaches to identify susceptible and resilient phenotypes to activity-based anorexia

Presenter: Sushma Hegde

Co-author(s): Taylor A. McCorkle, Ava Bellino, Matthew McGill, Keydy Mendez, Arrington Polman

Department: Psychology and Neuroscience
College/School: Liberal Arts

Faculty Mentor: Ames Sutton Hickey

Anorexia nervosa (AN) is a life-threatening psychiatric disorder marked by severe voluntary food restrictions and an increase in physical activity. Despite the high global mortality, the neural mechanisms underlying AN remain poorly understood. Preclinical studies have sought to understand these mechanisms using an activity-based anorexia (ABA) model in mice that combines limited food access with access to a voluntary running wheel, leading to hyperactivity, self-starvation, rapid weight loss, and death unless removed from the experiment. While elevated physical activity can increase the risk of developing AN, particularly when combined with food restriction, not all individuals who diet and exercise develop the disease. Similarly, a subset of ABA mice is recognized as resistant to weight loss, identified by their ability to remain on the behavioral paradigm. Yet there are currently no phenotypic or neural indicators of ABA susceptibility prior to experimental removal, thus limiting the capability for intervention. Here, we developed a susceptibility indicator for mice on the ABA paradigm prior to severe weight loss by leveraging a comprehensive supervised machine learning pipeline that captures the most severe weight drop and trajectory of the rate of weight change from longitudinal data. By first classifying animals with these computational tools, we were able to identify sex differences in feeding and running patterns during baseline. Analyses are ongoing to determine the behavioral and neural read-outs underlying ABA susceptibility. Taken together, this novel quantitative framework has the potential to identify neuronal mechanisms that mediate ABA, and thus potentially AN, risk to inform early diagnosis and therapeutic strategies.

85

Pandemic Cohort differences in College Student Adjustment: Living arrangement & social media coping

Presenter: Maria Diaz

Co-author(s): Lily Wunsche, Angela Darly, Esmeralda Soriano, Jill Swirsky, Michelle Rosie, and Hongling Xie

Department: Psychology and Neuroscience
College/School: Liberal Arts

Faculty Mentor: Hongling Xie

The COVID-19 pandemic significantly altered social interactions, potentially disrupting psychosocial functioning among college students navigating developmental transitions such as increased autonomy, identity exploration, and close relationships. Guided by the bioecological model of human development, this study examined cohort differences in college students' adjustment before, during, and after the pandemic. We assessed loneliness, emotional distress, and alcohol use, and evaluated whether living arrangement (with family, friends, a partner, or alone) and social media (SM) coping (using SM for connection, emotional regulation, support, or distraction) were associated with students' adjustment, and whether these associations differed by cohort.

Participants were 1,551 undergraduates (80.3% female) from a diverse urban university who completed online surveys in 2019 (n = 636, Mage = 20.62), 2021 (n = 280, Mage = 20.97), and 2023 (n = 635, Mage = 20.52). Pre-pandemic students reported greater loneliness than mid-pandemic students (B = 0.19, p = .01), with no other cohort differences in psychosocial outcomes. Pre-pandemic students were more likely to live with family, whereas mid- and post-pandemic students were more likely to live with a partner or alone (ps < .05). No cohort differences emerged in SM coping.

Living arrangements and SM coping were significantly associated with psychosocial outcomes (ps < .05), with stronger associations among mid-pandemic students. For instance, SM use for social connection was negatively associated with loneliness only among the mid-pandemic cohort (B = 0.51, p < .001). These findings highlight the role of contextual environments in shaping students' adjustment and the need for context-responsive support.

86

Impact of biological sex on PICK1 expression in the reward circuit in drug-naive and cocaine-exposed mice

Presenter: Mia Roberts

Co-author(s): Lillian Hubbard, Arwen Gormley, & Julianna Katz

Department: Psychology and Neuroscience
College/School: Liberal Arts

Faculty Mentor: Lisa Briand

Protein interacting with C kinase 1 (PICK1) plays a critical role in internalizing GluA2-containing AMPARs, a process that is induced by cocaine exposure. Disrupting PICK1 function, by global knockdown or site-specific knockdown in the medial prefrontal cortex, attenuates cocaine seeking in male rodents. However, prefrontal knockdown of PICK1 increases cocaine seeking in female mice. In contrast, preliminary behavioral data show that PICK1 knockdown in the nucleus accumbens reduces cocaine intake and acquisition of both sucrose and cocaine self-administration in females, but not males. Collectively, these behavioral findings indicate that PICK1 plays sex- and region-specific roles in reward and reinforcement. These studies clearly outline the necessity for studying the impact of biological sex in the role of AMPAR trafficking proteins. Despite this, very little is known about sex differences in the regional expression patterns of PICK1 in the brain. The current study aimed to characterize PICK1 mRNA expression in the brain, using RNAScope in both drug naive and cocaine self-administration-experienced mice. Preliminary data show no significant differences in PICK1 mRNA levels in the prefrontal cortex or nucleus accumbens of drug-naive mice. However, cocaine exposure appears to lead to decreased PICK1 mRNA in the infralimbic cortex, prelimbic cortex, and nucleus accumbens core of both male and female mice. In the nucleus accumbens shell, this decrease is sex-specific, detected only in female mice. Ongoing work will further examine how cocaine self-administration impacts PICK1 mRNA across biological sex.

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Effects of adolescent social isolation on opioid anti-nociception and microglial morphology in the periaqueductal gray

Presenter: Sofia Oquendo

Co-author(s): N/A

Department: Psychology and Neuroscience
College/School: Liberal Arts

Faculty Mentor: Lisa Briand

Early life stress is associated with a wide range of psychiatric and behavioral problems. A common form of early life stress is adolescent social isolation, which alters pain perception and increases the incidence of chronic pain, especially in women. Further, stress can accelerate opioid analgesic tolerance, forcing individuals to take higher doses of opioids to achieve pain relief. As social isolation also increases vulnerability to substance use disorder, accelerated tolerance to the analgesic actions of opioids places these individuals at even greater risk. We have established an adolescent social isolation model in mice that leads to accelerated antinociceptive tolerance to oxycodone in a tail flick assay of spinal reflexive pain. The current studies aim to explore how adolescent social isolation impacts supraspinal pain responses and oxycodone analgesia, utilizing a hot plate assay. While we did not see any differences in the baseline supraspial pain responses, we did see that adolescent social isolation impacted oxycodone analgesia. When we examined an escalating dose regimen of oxycodone for 5 days, we found that while isolated females initially exhibited an altered dose response curve on day 1, the effects of housing condition normalized over the 5 days of injections. In contrast, housing condition did not initially impact oxycodone dose response curves in male mice but socially isolated males exhibited slower tolerance over the 5 days of injections. When we examined the impact of 5 days of withdrawal after the daily injections, we found that social isolation led to potentiated tolerance in female mice. While this pattern of results does not directly parallel what we have seen when examining spinal pain responses, it further supports our conclusions that adolescent social isolation alters analgesic tolerance.

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Detection of the Free-Living Phase of a Marine Symbiont Using Environmental DNA

Presenter: Emma Roman

Co-author(s): N/A

Department: Biology
College/School: Science and Technology

Faculty Mentor: Alison Gould

Understanding how animals acquire essential microbial partners from their environment is a fundamental question across biology. The sea urchin cardinalfish, Siphamia tubifer, forms a unique symbiosis with the luminous bacterium, Photobacterium mandapamensis. This specific bacterium inhabits a gut-associated light organ, enabling the fish to camouflage at night by matching downwelling light for counterillumination. Each fish carries only this bacterial species, yet harbors multiple unique strains, making this system a powerful model for understanding how animals recruit specific microbes from a sea of others. Despite this close association, P. mandapamensis is rarely detected in seawater, leaving unanswered how and where every larval fish reliably encounters its symbiont. This project represents the first targeted search for free-living P. mandapamensis using environmental DNA (eDNA) approaches at reef sites around Sesoko Island, Okinawa, Japan. This poster presents preliminary data from long-read 16S rRNA gene sequencing of seawater samples, complemented by the development and application of a species-specific quantitative PCR assay. These data demonstrate that eDNA can detect P. mandapamensis from seawater in reef-associated environments. Ongoing sampling across gradients of host abundance will test whether adult fish locally enrich their surroundings by shedding symbionts, potentially creating microbial "hotspots"_ that facilitate larval acquisition. Together, this preliminary work establishes a framework for uncovering hidden environmental reservoirs of rare but essential symbionts.

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Z-Selective Isomerization of Terminal Alkenes Catalyzed by W(0) and Mo(0) Complexes

Presenter: Hashini Fransiscus

Co-author(s): Victoria Loucks and Justin Steets

Department: Chemistry
College/School: Science and Technology

Faculty Mentor: Graham Dobereiner

Efficient Z-alkene synthesis is challenging due to its thermodynamic instability and purification difficulties. Developing a catalyst capable of converting terminal olefins to internal Z-isomers, especially Z-2 olefins, is of great interest to synthetic chemistry and will benefit many fields. Our lab has identified cis-Mo(CO)4(pip)(PCy3) as an active molybdenum pre-catalyst for Z-selective isomerization of terminal alkenes, proceeding via an allyl pathway. The tungsten analog, cis-W(CO)4(pip)(PCy3), exhibited good Z-selectivity, but slower reaction rates and sensitivity to air and moisture led us to focus on other Mo(0)-based pre-catalysts. Based on computational studies (DFT), we hypothesized that the active catalyst contains three carbonyl ligands, guiding our search for ML3(CO)3-type pre-catalyst. Cycloheptatriene molybdenum tricarbonyl [Mo(CO)3(Cht)] was identified as an effective new pre-catalyst, and recent optimization studies conducted with 1-octene demonstrated that the Mo(CO)3(Cht)/PCy3 system exhibits superior catalytic performance, achieving turnover numbers (TON) of ~5000 with high Z-selectivity. Kinetic investigations of this study indicate a zero-order dependence on alkene concentration and an apparent second-order dependence on total catalyst concentration, suggesting that two catalytic molecules are involved in the mechanism. These findings represent a notable improvement over our prior catalytic systems and open new avenues for future development within the project.

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Understanding how MutS2 coordinates ATP hydrolysis with nuclease activity to suppress genetic recombination in H. pylori

Presenter: Yasmine Sakinejad

Co-author(s): Ariel A. Garcia

Department: Chemistry
College/School: Science and Technology

Faculty Mentor: Carol Manhart

Genetic recombination is a mechanism by which organisms can incorporate exogenous DNA into the genome leading to genetic variability, adaptation to local environments, and in cases of pathogenic organisms, antibiotic resistance. The highly recombinant and pathogenic organism, H. pylori, infects over 50% of the population worldwide and rapidly becomes antibiotic resistant through genetic recombination, causing H. pylori to be a leading cause of stomach cancers. H. pylori contain a nuclease and ATPase MutS homolog called MutS2 that suppresses genetic recombination in vivo where both nuclease and ATP hydrolysis activities are required but the mechanism of how it coordinates these two enzymatic activities is unclear. I hypothesize that MutS2's ATPase abilities allow for specific recombination DNA substrate recognition such as D-loop and junction formation, that enable it to be in a conformation to recognize the invading strand and use its nuclease activity to make the DNA break, suppressing recombination. Herein, I present preliminary results showing a step wise- ATP dependent mechanism that may allow MutS2 to switch its confirmation during recombination, as well as other tools including the creation of MutS2 mutants, substrate design, and a set of assays, that will be used to further elucidate the mechanism.

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Mlh1-Pms1 couples nick recognition with ATP hydrolysis to promote mismatch removal

Presenter: Jonathan Piscitelli

Co-author(s): Jordan Lowder, Yasmine Sakinejad

Department: Chemistry
College/School: Science and Technology

Faculty Mentor: Carol Manhart

In eukaryotic post-replicative mismatch repair, MutS homolog complexes detect mismatches and in the major eukaryotic pathway, recruit Mlh1-Pms1/MLH1-PMS2 (yeast/human) complexes, which nick the newly replicated DNA strand upon activation by the replication processivity clamp, PCNA. This incision enables mismatch removal and DNA repair. Beyond its endonuclease role, Mlh1-Pms1/MLH1-PMS2 also has ATPase activity, which genetic studies suggest is essential for mismatch repair, although its precise regulatory role on DNA remains unclear. Here, we use an ATP-binding and hydrolysis-deficient yeast Mlh1-Pms1 variant to show that ATP hydrolysis promotes disengagement from Mlh1-Pms1-generated nicks, with hydrolysis in the Mlh1 subunit driving this activity. Our data suggest that the ATPase-deficient variant becomes trapped on its own endonuclease product, suggesting a mechanistic explanation for observations in genetic experiments. Additionally, we observed that Mlh1-Pms1 selectively protects DNA from exonuclease degradation at pre-existing nicks, which may act as strand discrimination signals in mismatch repair. Together, our findings suggest that Mlh1-Pms1 exhibits distinct behaviors on its own endonuclease products versus substrates with pre-existing nicks, supporting two distinct modes of action during DNA mismatch repair.

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Behavioral Regulation of Agentic Large Language Models via External Symbolic Control

Presenter: Tangrui Li

Co-author(s): Justin Y. Shi, Eduard C. Dragut

Department: CIS
College/School: Science and Technology

Faculty Mentor: Pei Wang

Large Language Models (LLMs) demonstrate strong reasoning abilities but remain difficult to control, understand, and reliably align with task objectives.

Fully formalizing LLM problem solving into symbolic logic is often infeasible and impossible, and requiring partial strict output formats is also incompatible with the closed-source nature of large commercial LLMs.

This project investigates an alternative approach: rather than symbolizing the internal reasoning process, we introduce an external symbolic control layer that regulates LLM behavior at key decision points within an agentic problem-solving framework.

In our approach, the LLM generates candidate actions or intermediate solutions step-by-step, while an additional Non-Axiomatic Reasoning System (NARS) monitors behavioral patterns and feedback signals (e.g., success, failure, inconsistency).

Rather than extracting logical relations from the semantic content of LLM outputs, we derive logic directly from the agentic interaction structure. By grounding logic in observable stateâ€“action transitions rather than textual form, the framework avoids rigid output constraints while enabling structural stability analysis and belief revision.

Preliminary experiments in agentic tasks (e.g., multi-step question answering and entity linking) suggest that outcome-driven external control improves behavioral stability and reduces error propagation compared to purely heuristic scoring mechanisms.

This work reframes neuro-symbolic integration as behavioral regulation rather than full logical co-reasoning. Future directions include formalizing the agentic state-transition structure, improving conflict-driven representation refinement, and extending the framework toward planning and long-horizon decision-making.

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Improved Recovery of Host-Associated Microbial Genomes with Oxford Nanopore Adaptive Sampling

Presenter: Madison Dautle

Co-author(s): Magdalena Warren, Emma RomÃ¡n

Department: Department of Biology
College/School: Science and Technology

Faculty Mentor: Alison Gould

Host-associated microbial systems are central to understanding mutualistic interactions, but recovering microbial genomes from these systems remains challenging due to host DNA dominating sequencing output. This imbalance limits microbial genome coverage and assembly, increasing sequencing costs and effort. Methods that enrich microbial reads relative to host reads are therefore needed. Here, we evaluate whether Oxford Nanopore Technologies (ONT) adaptive sampling improves microbial genome recovery compared to standard ONT sequencing in light organs of the cardinalfish Siphamia tubifer, which houses its bioluminescent symbiont, Photobacterium mandapamensis. The light organs from six S. tubifer individuals were dissected, homogenized, and sequenced using standard ONT sequencing, ONT enrichment adaptive sampling (targeting P. mandapamensis), and ONT depletion adaptive sampling (rejecting S. tubifer). Reads were filtered by quality and length and aligned to the reference genomes of S. tubifer and P. mandapamensis. Performance was assessed using the ratio of mapped reads and bases, as well as microbial genome coverage depth and breadth. Adaptive sampling did not significantly change the ratio of mapped reads between host and microbe. However, both enrichment and depletion approaches increased the ratio of mapped bases by approximately threefold relative to standard ONT sequencing. Additionally, adaptive sampling doubled mean microbial coverage depth and genome breadth at 3x coverage. These results demonstrate that adaptive sampling improves microbial genome recovery without altering overall read composition. This approach provides an efficient strategy for sequencing host-associated microbes. Future work will evaluate the utility of adaptive sampling for detecting biologically relevant features such as DNA methylation.

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Reimagining Waste as a Resource for Resilient Infrastructure: Mechanistic Linkages Between Composition, Reactivity, Microstructure, and Long-Term Durability in Low-Carbon Concrete.

Presenter: Ifeanyichukwu Onuoha

Co-author(s): N/A

Department: Civil and Environmental Engineering
College/School: Engineering

Faculty Mentor: Mehdi Moradllo

The durability of concrete infrastructure and the adoption of sustainable, low-carbon materials are fundamental to developing resilient systems that meet long-term structural and environmental goals. This dual objective requires addressing two interconnected global challenges: the high carbon footprint of ordinary Portland cement (OPC) and the deterioration of reinforced concrete due to corrosion and freeze-thaw (FT) cycles.

This research evaluates the sustainability and durability issues by mechanistically examining the valorization of coal bottom ash (BA) and municipal solid waste incineration fly ash (MSWI-FA) as alternative supplementary cementitious materials (ASCMs). Major challenges include variability in BA composition by source and elevated chloride and heavy metal levels in MSWI-FA, which affect reactivity, mass transport, air-void stability, and corrosion risk. The multi-scale framework integrates advanced physicochemical characterization techniques such as LD-PSD, BET, SEM, XRD, XRF, and TGA with strength testing, electrical resistivity-based mass transport evaluation, and non-destructive electrochemical half-cell potential monitoring under chloride exposure to explore the links between material properties and their effects on microstructure, performance, and durability. Results indicate that BA performance depends not only on fineness but also on mineralogy, which is influenced by coal source, morphology, and grindability, thereby affecting beneficiation efficiency and pozzolanic reactivity. Treated MSWI-FA systems experience earlier de-passivation than OPC, highlighting the role of free chloride availability and transport kinetics. Ongoing research on freeze-thaw resistance and interactions with air-entraining agents aims to further assess long-term durability. Overall, this work provides mechanistic insights for developing durable, low-carbon concrete systems aligned with net-zero infrastructure goals.

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Fungal Contributions to Oral Microbiome Dysbiosis in Early Childhood Caries

Presenter: Zhenting Xiang

Co-author(s): Weiming Hu, Kyle Bittinger, Hyun Koo

Department: Oral Health Sciences
College/School: Kornberg School of Dentistry

Faculty Mentor: Yuan Liu

Objectives

Dental caries remains one of the most common global diseases, particularly in children. While bacterial contributions are well-documented, the role of fungi and bacteria-fungal interactions remains less understood. This study aimed to characterize the supragingival plaque bacteriome and mycobiome across varying caries statuses, emphasizing interkingdom interactions and their potential influence on caries development.

Methods

Plaque samples were collected from children aged 3-5 years old and stratified by caries status and Candida colonization. Shotgun metagenomic sequencing was used to profile bacterial communities, and ITS2 sequencing was performed for fungal characterization. Analyses included taxonomic composition, bacterial-fungal interkingdom interactome, and functional pathway profiling using KEGG annotations.

Results

Caries-associated plaques exhibited distinct microbial profiles compared with healthy controls. Notably, Candida dubliniensis was associated with increased Streptococcus mutans and Veillonella parvula, both linked to caries progression. Interestingly, S. mutans abundance was higher in children colonized with C. dubliniensis than with C. albicans. Health-related taxa including Neisseria and Lautropia were reduced, indicating a shift toward a pathogenic community. Fungal diversity was significantly lower in caries samples dominated by Candida (C. albicans or C. dubliniensis) compared with caries-free or Candida-negative caries samples. Metabolic analyses showed enrichment of sucrose metabolism and amino acid biosynthesis pathways in C. dubliniensis-associated caries.

Conclusions

Our findings highlight the contribution of fungal taxa, particularly C. dubliniensis, to the oral microbiome dysbiosis in early childhood caries. These interkingdom dynamics may modulate both community composition and metabolic function, potentially enhancing caries pathogenicity.

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Comparing Radiographic Interpretation Accuracy Between Dental Students and Artificial Intelligence.

Presenter: Adetola Babalola

Co-author(s): Jie Yang, Jay Patel, Jinha Lee and Amid Ismail

Department: Oral Health Sciences
College/School: Kornberg School of Dentistry

Faculty Mentor: Mustafa Badi

Objectives: This study aimed to compare the diagnostic accuracy of the Overjet AI system and dental students in detecting dental caries on intraoral radiographs, using consensus readings by oral radiologists as gold standard.

Methods: In this cross-sectional analysis conducted at the Kornberg School of Dentistry (IRB #32451), 28 dental students (D3 and D4) participated in a 60-minute radiographic calibration session. Students and the Overjet AI system independently evaluated 53 radiographs (bitewing and periapical) featuring various caries depths: sound surfaces (E0), enamel lesions (E1/E2), and dentin lesions (D1/D2/D3) across mesial, occlusal, and distal surfaces. Diagnostic performance was compared against the radiologist reference standard using descriptive statistics, chi-square tests, Wilcoxon signed-rank tests, weighted kappa scores, and Bland-Altman plots. Data were analyzed via SPSS version 27.0 with a 5% significance level.

Results: Descriptive analysis showed high concordance between Overjet and expert radiologists for dentin caries (90.9%) and sound tooth structure (86.81%). No statistically significant differences were found between Overjet's accuracy and expert scores across all lesion depths ($p > 0.096$). The weighted kappa between Overjet and experts was 0.70, indicating substantial agreement. Overjet achieved an overall accuracy of 77.9%, while the combined student cohort averaged 70.1%. Although Overjet trended higher, the difference between the AI and mean student scores was not statistically significant (Wilcoxon $p = 0.068$).

Conclusion: Overjet demonstrated high agreement with expert radiologists, particularly in identifying dentin caries and sound surfaces. While dental students achieved 70.1% accuracy, the AI system consistently outperformed students in identifying carious lesions across all tooth surfaces.

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Elucidating the role of non-coding RNAs in Ventricular Pacing-Induced Heart Failure of Canines

Presenter: Suriya Muthukumaran Natarajaseenivasan

Co-author(s): Amit Kumar Rai, Noemi Nisini, Remus Berretta, Tao Wang, John W. Elrod, Raj Kishore, Fabio A. Recchia

Department: ACDC
College/School: Lewis Katz School of Medicine

Faculty Mentor: Venkata Naga Srikanth Garikipati

Pacing-induced heart failure (HF) in dogs is a well-established model that mimics key features of human dilated cardiomyopathy and systolic dysfunction. Despite advances in pharmacologic and device-based therapies, HF exhibits high morbidity and mortality, highlighting the burning need for early detection and innovative interventions. Recent studies indicate that non-coding RNAs (ncRNAs), including microRNAs (miRNAs), long non-coding RNAs (lncRNAs), small nucleolar RNAs (snoRNAs), and circular RNAs (circRNAs), play critical roles in cardiac remodeling, fibrosis, and contractile dysfunction. Using high-throughput small and long ncRNA sequencing in a canine pacing-induced HF model, we profiled the full non-coding transcriptome to identify novel regulatory RNAs. Intriguingly, circRNAs exhibited dynamic changes, suggesting potential as biomarkers or therapeutic targets. Our findings provide mechanistic insights into HF pathophysiology and offer a blueprint for the design of innovative diagnostics and therapeutics.

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Functional roles of KIF11/EG5 in lymphatic development and lymphangiogenesis

Presenter: Liam Flynn

Co-author(s): N/A

Department: Cardiovascular Science
College/School: Lewis Katz School of Medicine

Faculty Mentor: Xiaolei Liu

Congenital lymphedema is a chronic and life-limiting condition characterized by severe swelling and fluid accumulation in the extremities characterized by dysfunctional or malformed lymphatic vessels. So far there is no cure nor approved therapeutics to ameliorate disease conditions and the mechanisms underpinning the development and functions of lymphatic vessels are under researched and incompletely defined. Recent clinical studies show that variants in KIF11 cause MCLID (Microcephaly, Chorioretinopathy, Lymphedema, and Intellectual Disability), a rare developmental disorder characterized by severe, congenital lymphedema in humans. Lymphatic drainage functions are largely impaired in these patients, indicating a role of KIF11 in regulating the growth and function of lymphatic vessels. KIF11 encodes the mitotic kinesin EG5 and is well studied for its role crosslinking microtubules to separate centrosomes during mitosis and proliferation in cancer. Furthermore, EG5 and other kinesin family proteins are shown to regulate intracellular trafficking in neurons and blood endothelial cells. However, whether KIF11 directly regulates lymphatic development, and the therapeutic potential of targeting KIF11 in lymphatic endothelial cells (LECs) has never been explored. My preliminary data revealed that mice with embryonic or early postnatal deletion of KIF11 in LECs resulted in lethality accompanied by severe edema and lymphatic aplasia, indicating a functional role of KIF11 in regulating lymphatic development. In vitro KIF11 knockdown in LECs induced multinucleation, apoptosis, and junctional instability in LECs, indicating regulation of LEC mitosis. Furthermore, in line with the emerging evidence of kinesin involvement in membrane protein trafficking, I found EG5 directly interacts with VEGFR3 affecting its intracellular trafficking with KIF11 loss resulting in increased VEGFR3 lysosomal degradation. Accordingly, KIF11 deficient LECs showed reduced VEGFR3 expression levels and reduced p-VEGFR3 and downstream signaling in response to VEGFC. Based on these, I hypothesize that KIF11 is a novel and essential regulator of lymphatic vessel development and homeostasis by coordinating LEC mitosis (canonical) and regulating intracellular trafficking of VEGFR3 (non-canonical).

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Targeting DOT1L to improve the immune response in ovarian cancer

Presenter: Aisha Jamil

Co-author(s): Shraddha Gupta, Sangeeta Kumari, Channita Keuk

Department: Fels Cancer Institute for Personalized Medicine
College/School: Lewis Katz School of Medicine

Faculty Mentor: Sergey Karakashev

High-grade serous ovarian cancer (HGSOC) remains the most lethal gynecological malignancy, largely due to an immunosuppressive tumor microenvironment that facilitates immune evasion. A hallmark of HGSOC is the epigenetic downregulation of MHC Class I (MHC I) molecules, which prevents cytotoxic T cells from recognizing and eliminating tumor cells. Targeting epigenetic drivers to "re-warm" these cold tumors is an urgent clinical priority.

Our preliminary bioinformatics analysis identified DOT1L (a histone H3K79 methyltransferase) as a significant negative regulator of MHC I. High DOT1L expression correlates with decreased patient survival and lower MHC I levels. Crucially, our preliminary data showed that DOT1L knockout or pharmacological inhibition with the clinical-stage drug Pinometostat significantly upregulated MHC I surface expression in HGSOC cell lines. Our data revealed a sharp reduction in H3K79me3 upon restoration of MHC I expression. While H3K79 methylation is typically associated with active transcription, emerging evidence suggests that it contributes to gene repression. Through our RNA-seq analysis, we observed upregulation in HLA gene expression upon DOT1L inhibition. Thus, we hypothesize that DOT1L-mediated hypermethylation of H3K79 at the promoters of MHC I directly suppresses their transcription. We will employ ChIP-seq to map these site-specific H3K79me3 changes and confirm the novel repressive mechanism. This suggests that DOT1L serves as an "epigenetic brake" on tumor immunogenicity. Thus, we proposed that DOT1L inhibition restores MHC I-mediated antigen presentation, thereby sensitizing HGSOC cells to T-cell-mediated anti-tumor immunity. Pharmacological strategies to restore MHC I expression are key to sensitizing tumors to the immune response.

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A Spatial Analysis of Factors Influencing Bicycle and Pedestrian Crashes Using GIS

Presenter: Riya Piyusbhai Dixit

Co-author(s): N/A

Department: Civil and environmental engineering
College/School: Engineering

Faculty Mentor: John Ash

Bicyclists and pedestrians represent a disproportionately high share of traffic-related fatalities despite accounting for a smaller portion of total roadway travel. Improving safety for these vulnerable road users is a growing priority for transportation agencies seeking data-driven approaches to reduce serious injuries and fatalities. This research presents a spatial analysis of factors associated with bicycle and pedestrian crashes using Geographic Information Systems (GIS).

The objective of this study is to investigate spatial patterns and contributing factors related to bicycle and pedestrian fatalities and severe injury crashes. Several years of crash data are analyzed and integrated with roadway, infrastructure, and environmental characteristics within a selected study area. GIS is used to map crash locations, examine injury severity, and explore relationships between crash occurrence and factors such as roadway design, lighting conditions, and surrounding land use. Spatial analysis techniques are applied to identify crash hotspots and corridors with elevated risk for active transportation users.

In addition, spatial statistical methods are used to assess how various factors may influence crash patterns and fatality trends. The analysis focuses on understanding broader spatial relationships rather than isolated crash locations, supporting a corridor-based approach to safety assessment. No programming or automated scripting tools are used; the study is conducted entirely within a GIS environment.

The findings of this research provide insight into where and why bicycle and pedestrian crashes are concentrated and support the development of targeted, practical safety strategies. This work contributes to efforts aimed at improving safety for active transportation users and supports informed transportation planning and policy decisions.

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Fatty acid derivatization of tissue plasminogen activator for half-life extension

Presenter: Kishore Pathivada

Co-author(s): N/A

Department: Pharmaceutical Sciences
College/School: Pharmacy

Faculty Mentor: Patrick Glassman

Purpose: Tissue-type plasminogen activator (tPA) is approved for treatment of acute thrombotic disorders. Its poor pharmacokinetics (PK) and severe side effects necessitate improvements in its pharmacology. We hypothesize that the use of a clinically-viable technology, fatty acid derivatization, will confer tPA with improved in vivo pharmacology through reversible albumin binding.

Methods: tPA was conjugated to fatty acids of varying acyl chain length through amine-reactive chemistry. The potency of native and conjugated tPA was assessed using a plate-based assay. PK of total (ELISA) and active (enzyme activity) tPA were studied after IV injection in mice.

Results: tPA had nanomolar potency in prophylactic (IC50: 27.8 nM) and therapeutic (IC50: 0.62 nM) settings. Fatty acid coupling had minor effects on IC50 in both prophylactic (myristic: 32.1 nM; palmitic: 30 nM; stearic: 30 nM; arachidic: 21.2 nM) and therapeutic (myristic: 1.01 nM; palmitic: 1.96 nM; stearic: 0.68 nM; arachidic: 2.62 nM) settings. Following IV injection, palmitic- and arachidic acid-tPA had a 37% increase and ~50% decrease in total protein exposure and ~66% and ~30% increase in activity exposure versus unmodified tPA, respectively.

Conclusions: Fatty acid derivatization had a minor effect on potency and our results suggest a larger impact on PAI-1 inactivation rather than other elimination mechanisms. This suggests that fatty acid derivatization is a viable strategy for improving the in vivo pharmacology of tPA. Future studies will focus on derivatization with other fatty acids to establish a structure-function relationship, molecular characterization and PK, safety, and efficacy of fatty acid-derivatized tPA.