

29th Annual Graduate Student Research Symposium & Exhibit

Sponsored by
the Graduate Student Association
& the Graduate School

April 22, 2026

University Student Commons,
Commonwealth Ballrooms





WE ARE THE UNCOMMON.

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Dear Participants and Guests,

I am pleased to welcome you to the 29th Annual Graduate Student Research Symposium and Exhibit sponsored by the Graduate Student Association (GSA) at Virginia Commonwealth University. The Symposium is organized by graduate students and provides them with an opportunity to display their scholarly work and cutting-edge research.

The Research Symposium and Exhibit also gives our faculty, staff, undergraduate students, and other members of our university community a chance to witness the outstanding work of our graduate students. The work presented today covers an array of topics reaching across many academic disciplines, representing the impressive scholarship of our graduate student body. I congratulate all of this year's presenters for their contribution to the success of this important program.

I would particularly like to thank Ron Byamungu, chairperson of the Symposium, the symposium committee, and the officers of the GSA who have helped in planning this event. The symposium is an excellent example of how an active GSA can benefit all graduate students.

Thank you for attending this year's Symposium. I hope that you enjoy the event.

Sincerely,

A handwritten signature in black ink that reads 'Manu Gupta'. The signature is written in a cursive style with a long horizontal line extending from the end of the name.

Manu Gupta, Ph.D.
Graduate School Vice Provost and Dean

Graduate Student Association

What is GSA?

The Graduate Student Association (GSA) provides many valuable services to the graduate student body at Virginia Commonwealth University (VCU). The GSA organizes events throughout the academic year, including Graduate Student Orientation, Meet & Greet events and social mixers, and the Graduate Research Symposium & Exhibit. The GSA also appropriates funds for graduate student organizations to enhance the quality of graduate student experience at VCU. Finally, the GSA helps to place graduate students on campus committees, where they represent the voice and express the concerns of VCU's graduate student body.

Our Mission:

The purpose of the GSA is to serve as an advocate for the issues and needs of the graduate students at VCU. The GSA is committed to facilitating programs that enhance the academic skills, professional development, and social environment of all graduate students. There is no fee to join the GSA; every graduate student is a member and eligible to participate in and contribute to the GSA and GSA activities. However, the GSA-sponsored events are not limited to graduate students – all students and faculty are welcome.

Executive Committee:

The purpose of the GSA Executive Committee is to represent, advocate, facilitate communication, and provide social activities for the VCU graduate community.

2025-2026 Executive Committee

Isaac Yeboah, President

L Douglas Wilder School of Government and Public
Affairs

De-Graft Agyei, Vice President

College of Humanities and Sciences

Ron Byamungu, Symposium Chair

College of Engineering

Uchenna Paul Ucheaga, Appropriations Chair

College of Humanities and Sciences

Cammie Justus-Smith, Treasurer

School of Education

Jay Edwards, Communications Chair

L Douglas Wilder School of Government and Public
Affairs

GSA Council:

The purpose of the GSA Council members is to represent VCU graduate schools, programs, and departments by relaying student concerns to the GSA and the Executive Committee. The GSA is looking for representatives from each school to form the Graduate Student Council. Applications may be found at: <https://graduate.vcu.edu/life/graduate-student-association/>

More Information:

For more information about the GSA, please visit: <https://graduate.vcu.edu/life/graduate-student-association/>

Follow us on Facebook: Facebook.com/VCUGraduateStudentAssociation

Follow us on Twitter: @VCUGSA

Contact us at gsa@vcu.edu



2026 Symposium Judges

A heartfelt thank you to all the faculty and staff who supported the graduate students presenting today, as well as those faculty who were involved in the symposium but not named below. We could not host such an innovative event without your help!

Campus Learning Center

Sunauz Moezzi

College of Engineering

Akshay Bhatt, PhD
Casey Grey, PhD
Tom Roper
Ritesh Sharma, PhD
Volodymyr Sheremet, PhD
Shivam Shukla, PhD

College of Health Professions

Yonella Demars, PhD
Waggy Zeleke, PhD

College of Humanities & Sciences

Sachin Baravkar, PhD
Gamze Bulut, PhD
Staci Carr, PhD
Amanda Hale, PhD
Grace D. Gipson, PhD
Maxwell Hollem, PhD
Daeha Joung, PhD
Zachary Lange, PhD
Julianne McCobin, PhD
Sayaji More, PhD
Jill Reid, PhD
Sarah Seashols-Williams, PhD
Baneshwar Singh, PhD
Sivenesi Subramoney, PhD
Tava West, PhD

Division of Community Engagement

Maghboeba Mosavel, PhD

Division of Student Affairs

Lisa Cooper, PhD

Massy Comprehensive Cancer Center

Rob Lera, PhD
Heidi Sankala, PhD

Office of Research and Innovation

Lisa Ballance, PhD

School of Nursing

Christopher Schreiner, PhD

School of Public Health

Kellie Carlyle, PhD

School of Education

Jose Alcaine, PhD
Moe Greene, PhD

School of Business

Brittany Elmore, PhD
Ruchi Kakar

School of Dentistry

Chinmoy Ghosh, PhD
Jaqueline Vaz Vanini, PhD

School of Medicine

Asal Aflatounian, PhD
Paige Allen, PhD
Matthew Fernandez, PhD
Lane Fickert, PhD
Dina Garcia, PhD
Fariha Imtiaz, PhD
Javier González-Maeso, PhD
Alexandra Lempke, PhD
Brandon Lê, PhD
Usha Mahawar, PhD
Fatma Mufti, PhD
Jessie Oldham, PhD
Amber Paulus, PhD
Jinkal Shah, PhD
Stacey Wahl, PhD
Megan Williams, PhD
Rabha Younis, PhD
Bin Yu, PhD

School of Pharmacy

Kiran Agrahari, PhD
Milagros Galan-Llario, PhD
Abu Hamza, PhD
Emily Miller, PhD
Nitai Sarkar, PhD
Neha Upadhyay, PhD

School of Social Work

Maurice Gattis, PhD
Yifan Lou, PhD

School of World Studies

Rebecca Gibson, PhD

L. Douglas Wilder School of Government and Public Affairs

Nancy Ann Morris, PhD
Lilian Chineme- Ugwu
Chernoh M. Wurie, PhD

VCU Libraries

Kelsey Cheshire
Brenna Kate Cox, MLIS
Julie Arendt
Nia Rodgers

University College

William Benton, PhD

Symposium Judging

Symposium participants submit abstracts to participate in the event in early Spring. Abstracts are reviewed by a committee of graduate students to ensure high-quality research. Participants are asked to categorize their research into one of four broad categories. These include, Life Sciences; Humanities and Fine Arts; Social Sciences, Business, and Education; and Math, Physical, Sciences, and Engineering. Students from all disciplines are encouraged to participate.

Judges include faculty, staff, and postdoctoral scholars from both campuses. During the symposium graduate students engage in conversations with judges throughout the 90-minute session to share aspects of their research highlighted in their poster. Judges use a provided rubric and scale to provide students with constructive feedback on their introduction and objectives, methodology, contribution to the field, poster appearance, clarity of presentation, and engagement. Each student will have at least one judge that is within their discipline. Other judges will be from other fields who are interested to learn about the students' research. The goal will be for students to translate their work for researchers from diverse disciplines. Students with the top scores in each category will receive recognition and a small scholarship. The winners of the symposium will be announced on the Graduate School website and social media pages within one week of the event.

This year the Division of Community Engagement is sponsoring an additional award for students who have self-identified their research as community-engaged. Community-Engaged Research (CER) is a collaborative process between the researcher and community partner that creates and disseminates knowledge and creative expression with the goal of contributing to the well-being of the community.¹ Students with CER projects will be tasked with demonstrating how their research collaborates with the community, addresses identified needs, and incorporates community voice to address identified needs. CER posters will be easily identified throughout the symposium by the Carnegie symbol near the presenter's poster and an ** in the program.



¹ Taken from <https://community.vcu.edu/about/community-engagement-glossary/>

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Session Guide

Session A | 10:30am – 12:00pm

Session B | 12:30pm – 2:00pm

Session A

Aasma Dahal

Biomedical Engineering

Title: Assessing the effectiveness of revascularization in critical limb ischemia patients using non-invasive optical imaging technique

Abstract:

Critical limb ischemia (CLI) is an advanced form of peripheral arterial disease marked by severe perfusion impairment and high rates of limb loss and mortality. Although revascularization restores vascular patency, clinical outcomes vary. Current methods offer limited insight into distal (such as feet) and microvascular perfusion recovery. We previously developed a bedside near-infrared spectroscopy (NIRS) imaging technique to monitor real-time spatial hemodynamic changes in distal extremities. This study applies that spatio-temporal NIRS approach to quantify perfusion improvement following revascularization in patients with CLI. In this study, CLI patients (n=1) undergoing lower extremity revascularization and healthy controls (n=1) were recruited. The images of the foot were acquired longitudinally using a standardized leg elevation maneuver to evaluate the hemodynamic changes in CLI subjects pre- and post- intervention, with healthy individuals serving as controls. Hemodynamic responses were normalized to an initial timepoint, and perfusion change between the resting and reperfusion phases were determined. Preliminary analysis showed that the resting state signals for both control and CLI individuals were steady within 1% of baseline. Following leg elevation and lowering, the control subject demonstrated a 7% increase in hemodynamic signal over the course of 1 minute, indicating restored peripheral tissue oxygenation. Prior to revascularization, these hemodynamic parameters in the CLI patient remained close to the baseline, indicating impaired blood flow to the foot. Following revascularization, normal reperfusion was restored with a 5% increase in hemodynamic signal following leg elevation. Future work will apply this technique to track hemodynamic changes over weeks following revascularization in CLI patients.

Session A

Aimee Straka

Biomedical Engineering

Tissue Engineered Amnion as a Tool to Study Premature Rupture of Amniotic Membranes

Background: Preterm premature rupture of membranes (PPROM), the rupture of the amniotic sac before 37 weeks of gestation, causes 30% of preterm births and increases neonatal morbidity and mortality. PPRM results from weakening of the amniotic membrane, but the mechanisms driving this process are poorly understood. Research is hindered by a lack of suitable membrane models; animal amnions differ physiologically from those of humans, and ex vivo human membranes have limited availability and short viability. To address this shortcoming, we developed a tissue-engineered amniotic membrane (TEAM) to facilitate the controlled testing of PPRM mechanisms.

Methods: Human amnions from healthy term deliveries were mechanically characterized using uniaxial testing to determine rupture strength, elastic moduli, and viscoelastic time constants. TEAMs were developed using a layered cell sheet approach and consisted of a collagen matrix base, an extracellular matrix protein coating that mimics the basement membrane, and an amniotic epithelial cell monolayer.

Constructs were assembled on methylcellulose, a thermally responsive polymer, to allow enzyme-free release. TEAMs underwent the same mechanical testing to determine their physiological relevance. Stress-strain data from native and engineered amnions were fitted to the Rubin-Bodner model for soft tissues.

Results: Native membranes demonstrate significantly greater rupture strength than TEAMs, and the fitted Rubin-Bodner parameters (elastic moduli, viscoelastic time constants) differ between groups. This suggests current TEAMs do not fully replicate native mechanics.

Conclusion: Further optimization of TEAMs, including the incorporation of mesenchymal cells and elastin polymerization, is necessary to better match the physical and mechanical properties of native amnions.

Session A

Bhalaji Yadav Kantepalle

Chemical & Life Science Engineering

Title: Quantifying Mechanochromic Response in Smart Textiles: A Computer Vision Approach

Background: Background: Smart fabrics using a red liquid crystal polymer blend act as optical shutters. When stretched, the cloudy coating becomes transparent, revealing a hidden printed pattern. Traditional testing tools measure only a single, fixed spot, making them unable to track moving textiles or map exactly how much stretch reveals the pattern.

Methods: We developed a computer vision pipeline that dynamically tracks the fabric as it stretches, anchoring a ~4,500-pixel measurement area to the moving material. Converting the video into a human-vision color model (CIELAB) separates the true sensor response from the stretching illusion caused by fabric pores opening. It uses Lightness (ΔL^*) to flag physical thinning, Chroma (ΔC^*) to measure true color intensity, and Total Color Difference (ΔE_{00}) to quantify human visibility.

Results: Dynamic tracking reduced signal noise by ~40% compared to a static measurement. Uncoated fabrics showed massive lightness shifts ($\Delta L^* > 8.0$) but no color change ($\Delta C^* \sim 0$), confirming the noise is simply pores opening. Conversely, the coated fabric maintained stable lightness and hue but showed significant chroma increases, proving a genuine chemical response. The color change perfectly synchronized with mechanical stretching, indicating high reversibility. At 50% stretch, 85% of the patterned area became clearly visible to the human eye ($\Delta E_{00} \geq 2.0$).

Conclusions: This framework resolves the tracking limits of traditional testing. By mathematically validating the true color reveal and filtering out physical noise, it establishes a strict quality assurance protocol. This accelerates the mass manufacturing of power-free, visually interactive garments for reliable health and sports monitoring

Session A

Christopher Cogliano

Mechanical & Nuclear Engineering

Improving Material Identification Capabilities in Neutron Tomography via Machine Learning

Background: Neutron tomography (NT) is a powerful non-destructive technique used to infer the internal material structure of a target object, especially if it contains elements with lighter nuclei. With advances in computational simulation tools and the rapid development of artificial intelligence, significant new opportunities exist to further enhance NT material identification techniques.

Methods: The objective of this project is to first use Monte Carlo N-Particle Transport (MCNP) code to simulate neutron transmission through different materials in a target object. Next, the simulation data from the various materials will be collected and organized into a data library, which would then be used to train and validate an Artificial Neural Network (ANN) model so it learns how neutron feedback corresponds to different materials and locations. Afterwards, the ANN's material identification abilities will be assessed.

Results: To date, an extensive simulation-based data library of MCNP simulations has been curated, which will be used to construct a trained ANN that accurately identifies materials from neutron transmission data. Other anticipated deliverables include performance evaluations of the ANN and a full technical report summarizing findings and recommendations.

Conclusions: This research would help benefit the mission of nuclear safeguards and security by improving methods for detecting and monitoring nuclear materials, enabling faster and more reliable inspections, and assisting in developing of advanced technologies for nonproliferation and threat reduction.

Session A

Claire Klaye

Biomedical Engineering

Modeling the Mechanopathology of Pulmonary Fibrosis via Precision-Cut Lung Slices

Background: Pulmonary fibrosis is a progressive lung scarring disease marked by spatial heterogeneity in cell and matrix composition. Pathogenesis involves crosstalk between fibroblasts, epithelial cells, and endothelial cells. Piezo2 has been identified as a critical mechanosensor in pulmonary fibrosis, but characterization of how its function relates to cellular responses remains poorly understood. To study the effects of Piezo2-mediated mechanotransduction, we used precision-cut lung slices (PCLS) as a translational ex vivo model system for preserving the lung architecture and cell composition that is not otherwise maintained in traditional monoculture systems.

Methods: PCLS were established from Piezo2 FL/FL x Col1a1CreERT2 mice and cultured for 5-7 days. Cell viability, cre activation following 4-hydroxytamoxifen, and profibrotic gene expression after TGF β treatment was assessed.

Results: PCLS maintained significant viability with insignificant cell death correlating with edge effects and handling of the samples over 7 days. Treating the PCLS with 4-HT for 4 doses was sufficient to activate cre recombinase. Furthermore, TGF β treatment induced profibrotic phenotypes in the lung sections.

Conclusions: Pulmonary fibrosis is a complex pathology that involves numerous cell types and their interaction with the extracellular matrix. To investigate these complexities, we will leverage this PCLS model system. Elucidating the role of Piezo2 in Pulmonary Fibrosis will provide a framework for developing therapeutic targets that address genetic alterations to halt disease progression. This translational model allows us to recapitulate the complex niche of fibrosis for investigating mechanotherapeutic interventions.

Session A

Coral O'Brien

Pharmaceutical Engineering

Phycobiliprotein Biosensors for Critical Mineral Detection

Background: Living organisms have evolved to survive through the expression of unique protein systems, such as the bioluminescent proteins found in fireflies for signaling. Scientists can take advantage of these adaptations for other applications as tools outside of biological contexts. Here, we demonstrate that fluorescent phycobiliproteins (PBPs) from cryptophyte algae can be used for metal detection in contaminated environments.

Methods: PBPs were exposed to CuCl_2 and ZnCl_2 for two hours and evaluated with UV-Vis absorbance, fluorescence spectrometry, circular dichroism, fluorescence decay to investigate spectroscopic, secondary structural, and fluorescence lifetime of PBP's.

Results: We show that two unique PBPs, PE545 and PC577, can be used to detect CuCl_2 , but are not sensitive to ZnCl_2 based on their decreased fluorescence within two hours. The fluorescence quenching mechanism from CuCl_2 is different between PE545 and PC577 likely due to protein structural differences, as indicated by fluorescence lifetime decay and circular dichroism spectroscopy.

Conclusions: These results demonstrate that PBP's are ideal metal detectors for use in remote areas as their spectroscopic changes are fast, water soluble, and biodegradable. PBP biosensors stand in stark contrast to traditional metal detection methodologies such as Inductively coupled plasma mass spectrometry, which require specialized instrumentation and thus are not ideal for rapid assessment of contamination in remote areas due to a lack of transportation and time delays.

Session A

Daniel Delgado

Biomedical Engineering

Apolipoprotein E3 Modulates Motor Endplate Formation and Muscle Force

Background: Each year in the U.S., approximately 250,000 cases of volumetric muscle loss (VML) occur due to injuries such as gunshot wounds and lacerations. These VML injuries frequently result in incomplete functional recovery due to impaired neuromuscular junction (NMJ) reinnervation at the motor endplates, which are packed with acetylcholine receptor (AChR) clusters that mediate synaptic transmission and muscle contraction. In prior VML studies, our lab observed increased levels of apolipoprotein E (ApoE), suggesting a potential role in muscle injury response and neuromuscular repair.

Methods: C2C12 myoblasts were seeded on 24-well plates at 10,000 cells/cm² in α -MEM supplemented with 10% FBS and 1% P/S. At 100% confluence, cells were treated with recombinant ApoE3 or ApoE4 at 10^{-7} , 10^{-8} , or 10^{-9} M. RNA was isolated for analysis of myogenic and synaptic gene expression. Gene expression was measured by RT-qPCR for myogenic markers (Myod, Myog, Myh1) and synaptic markers (Chrng, Chrne, and ApoE). Male ApoE3 Knock-in (KI) mice were compared to male C57BL/6 controls to assess differences in muscle function. AChR clusters were imaged and quantified using fluorescent α -bungarotoxin staining.

Results: In vitro, treatment of myoblasts with ApoE3 or ApoE4 did not alter Myod, Myog, or Myh1 expression, but did alter Chrng expression and AChR cluster dispersion in a dose- dependent manner. In vivo, ApoE3 KI mice generated greater muscle force than C57BL/6 controls, while bone/tissue volume ratios remained unchanged.

Conclusions: In this study, ApoE3 (but not ApoE4) enhanced AChR expression and clustering, highlighting its potential as a therapeutic factor in neuromuscular repair.

Session A

Hala Ali

Computer Science

Post-Incident Runtime SBOM Generation from Python Memory

Background: Modern software relies heavily on third-party components, expanding the software supply chain attack surface. SBOMs built from metadata or filesystem artifacts fail to capture components loaded and executed at runtime, especially in dynamic ecosystems like Python. In adversarial scenarios such as ransomware attacks, volatile memory becomes the only reliable source for recovering the actual runtime state.

Methods: MEM-SBOM, a memory forensics framework, extracts loaded modules from the Python interpreter's internal memory structures, resolves package versions, and analyzes bytecode to build dependency graphs identifying reachable vulnerable functions. It was implemented as a suite of Volatility 3 plugins and evaluated against 51 real-world Python applications.

Results: MEM-SBOM achieves 100% extraction accuracy, identifies Streamlit as the only application calling vulnerable tornado routines, and recovers all runtime packages missed by existing SBOM tools.

Conclusions: MEM-SBOM provides a forensically sound runtime view of executed software, offering a practical foundation for software supply chain security and incident response.

Session A

Hanhzen Zhao

Biomedical Engineering

Impact of Age of Injury Onset on Peak Normalized Rotator Cuff Muscle Forces and Glenohumeral Joint Contact Forces During Manual Wheelchair Propulsion**

Background: Paraplegia, paralysis affecting the lower extremities, is commonly caused by spinal cord injury and disorders (SCI/D) such as multiple sclerosis and spina bifida. Paraplegia due to SCI/D is the leading cause of manual wheelchair (MWC) usage affecting approximately 302,000 individuals within the United States [1]. Age of injury onset is of particular interest due to adults with pediatric-onset SCI/D reporting lower incidences of shoulder pain (48%) compared to adults with adult-onset SCI/D (84%) despite having more years of wheelchair usage [2]. Furthermore, only 15% of adults with adult-onset SCI/D reported having shoulder pain prior to wheelchair usage [3]. Shoulder muscle and joint forces during wheelchair propulsion presumably contribute to the development of shoulder pain and pathology [4].

Methods: 82 MWC users were recruited by our collaborators at the University of Wisconsin-Milwaukee. This preliminary analysis includes 13 participants who were divided into one of three subgroups: children (age = 15.2 ± 2.2 years), adults with pediatric-onset SCI/D (age = 34.2 ± 15.3 years), and adults with adult-onset SCI/D (age = 27.6 ± 3.4 years). For each participant, maximum voluntary isometric contractions, anthropometric measures, marker-based motion capture, handrim forces, and electromyography were recorded.

Results: Preliminary analysis supports our hypothesis with results showing that adults with adult-onset SCI/D have the highest peak normalized force.

Conclusions: Identifying relationships between rotator cuff muscle forces and glenohumeral joint contact forces during wheelchair propulsion with age of injury onset and shoulder pain and pathology will provide rationale for rehabilitation approaches that reduce shoulder demand after SCI/D.

Session A

Himaddri Shakhar Roy

Biomedical Engineering

Validation of Tissue Curvature Correction Models in NIRS Imaging

Near-infrared spectroscopy (NIRS) imaging has been used to provide assessment of tissue oxygenation in diabetic foot ulcers (DFUs). However, the curved surface of the foot introduces inaccurate tissue oxygenation measurement. The changes in tissue oxygenation may result from variations in the underlying physiology of the foot or from the curvature of the tissue surface. Therefore, the effect of tissue curvature must be accounted for to ensure the accurate tissue oxygenation measurement. Curvature correction models have been developed in terms of height and angle to correct the diffuse reflectance signal obtained from curved geometries via Monte Carlo simulations. The curvature correction model for convex curved geometry reduced the median error from 9.4-9.67% to 0.03-2%. The objective of this study is to validate mathematical curvature-correction models via phantom studies to account for the effects of tissue curvature on diffuse reflectance in NIRS imaging. The phantom validation studies were performed using polydimethylsiloxane (PDMS)-based solid phantoms with various geometries applying developed correction models. The results show that one of the correction models provides a reduction in the median error from a range of 9.27-25.5% to a range of 0.41-11.01% for the convex curved phantom and irregular optical phantom. However, concave curved surfaces do not need correction in both simulation and optical phantoms. The correction models corrected the signal up to 1 cm depth from the imaging plane in both simulation and optical phantoms. Ongoing studies are to apply the validated correction models to in-vivo control subjects and DFUs.

Session B 12:30 pm – 2:00 pm

Session B

Caleb Wells

Mechanical and Nuclear Engineering

Critical Quality Attributes of a Novel Aerosol Formation Engine Based on Micro-Air-Jet Technology

Background: Many dry powder aerosol therapies, including surfactant therapy for infants and inhaled anti-infectives for children, require large doses ranging from 30-1000 mg. Current commercially available high-dose devices are passive, relying on patient inhalation [1-3]. Active devices, using an external air source, offer advantages including consistent aerosol formation, improved user compliance, and suitability for infants and sedated patients [4-6]. However, existing active devices face limitations at high doses, including complexity, required device manipulation between actuations, and orientation constraints [7, 8].

Methods: To best design a new high-dose active dry powder inhaler (DPI), a parametric study was conducted to determine the effects of design attributes on the performance of a new aerosol formation engine in terms of aerosol size and emitted dose. Key design attributes included aerosolization chamber length and diameter, number of micro-air-jet inlets, outlet flow-passage diameter, and geometry. Aerosol size distribution (volumetric) was determined by a Malvern Spraytec® laser diffraction system. Emitted dose was evaluated by quantifying residual drug mass within the engine using validated high-performance liquid chromatography (HPLC).

Results: Fourteen different aerosol engine designs were examined. Ten achieved the minimum emitted dose criterion of 70% and four reached the optimal target of $\geq 85\%$. 11 designs met the optimal average volumetric particle diameter of $\leq 1.5 \mu\text{m}$, while 3 failed to meet the minimum requirement of $< 1.6 \mu\text{m}$.

Conclusion: Of the fourteen designs, two configurations demonstrated the best balance of high emitted dose and small particle size: a filleted chamber-to-outlet connection and a design increasing chamber diameter by 0.5 mm.

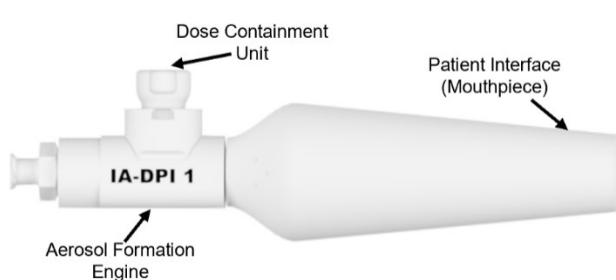


Figure 1: Rendering of New Inhalation Assisted (IA) High-Dose Active Dry Powder Inhaler (DPI) System

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Session B

Johanna Tsala Ebode

Chemical Engineering

PLGA Nanoparticle Delivery of Methotrexate and IKK Inhibitor for Deep Infiltrating Endometriosis Treatment

Gynecological conditions are diseases that affect the reproductive tract of women, with an estimated 97 per 1,000 women in the United States diagnosed annually. Despite their prevalence, many of these conditions remain poorly understood, leading to inadequate diagnostic tools and treatments. Among them, endometriosis is a chronic disease characterized by the presence of ectopic endometrial-like tissue, causing severe pelvic pain, infertility, and organ dysfunction. Deep Infiltrating Endometriosis (DIE), the most aggressive form, invades pelvic structures and often necessitates surgical intervention. However, recurrence remains a major challenge due to residual microscopic lesions and persistent inflammation, highlighting the need for targeted post-surgical therapies. In this study, we investigate the therapeutic potential of SPC-839 and methotrexate for DIE post-surgery treatment. The efficacy of these drugs individually and in combination was assessed by evaluating cell proliferation inhibition using the MTS assay across various drug ratios. We hypothesized that the combination of SPC-839 and methotrexate enhances therapeutic efficacy by disrupting the inflammatory-proliferative cycle that drives DIE recurrence. The most effective drug combination, determined by IC50 values, served as the basis for nanoparticle encapsulation using a PLGA-based system functionalized with a heptapeptide.

Session B

John Chilaka

Electrical & Computer Engineering

Electronic Fingerprinting: A System-On-Chip Implementation of a Physically Unclonable Function

Physically unclonable functions (PUFs) are integrated circuits (IC) whose operations are defined by non-deterministic physical attributes of the chip itself. These attributes are introduced on silicon during manufacturing as a result of process variations. The delay-difference IC (DD-PUF) is one such example, primarily favored for its economic design and memory-less operation. These properties make the DD-PUF a potential source for a secure Root of Trust (RoT) on resource-constrained/lightweight devices. Our project extends a preliminary study which showed the theoretical viability of the DD-PUF for secure key generation and storage on a dedicated core for running encryption (CryptoPUF). In this work, we physically implemented a DD-PUF both as a standalone on-chip module and within an on-chip security module. From these implementations, we extracted PUF data to characterize the DD-PUF for large-scale applications. Methods for characterization included tests for physical layout variations, inter-die vs intra-die references and fault injections. Criteria for PUF performance included bit hamming, aliasing, uniqueness which were evaluated both on an intra-die and inter-die basis. On standalone modules, fault injections were evaluated based on output tolerance. The standalone module results provide a template for integrating the DD-PUF into the security module. Further applications of the DD-PUF as a hardware complement to security modules were explored within the margins of the characterization results.

Session B

Joseph Lee

Mechanical & Nuclear Engineering

Machine Learning-Assisted LIBS for Real-Time Monitoring of Molten Salt Coolant in Next-Generation Nuclear Reactors

Background: As the world searches for safer and more efficient sources of energy, researchers turn their attention to Molten Salt Nuclear Reactors (MSRs). In place of pressurized water MSRs use high temperature molten salts as coolant. Monitoring the chemical composition of these salts is critical for safe reactor operation. Current direct sampling methods are impractical and hazardous because the salts are extremely hot, corrosive, and often toxic.

Methods: Laser-Induced Breakdown Spectroscopy (LIBS) enables remote, non-invasive, and real-time chemical analysis. A laser is fired through a transparent window (e.g. quartz) at a material to generate a plasma plume, whose emission spectrum identifies elemental composition. This study focuses on FLiBe (lithium fluoride-beryllium fluoride), a promising MSR coolant whose toxicity limits direct study. A 1D Convolutional Neural Network (CNN) is trained on LIBS spectral data from chemically similar salts LiCl-KCl and FLiNaK (lithium, sodium, and potassium fluorides). Transfer learning is then applied to adapt the model for predicting elemental concentrations in FLiBe.

Results: Model training is currently ongoing. Preliminary results are expected to demonstrate that a CNN trained on LiCl-KCl and FLiNaK spectral data can be successfully adapted to predict FLiBe composition, validating transfer learning for molten salt systems.

Conclusions: This work aims to establish a machine learning framework for real-time, non-invasive LIBS-based monitoring of hazardous molten salts in MSRs. If validated, this approach could significantly improve the safety and operability of next-generation Molten Salt Nuclear Reactors by enabling continuous compositional analysis without direct salt contact.

Session B

Laura Vargas

Mechanical & Nuclear Engineering

Development and Validation of a Customizable Neonatal Breathing Simulator for Aerosol Delivery Evaluation Using a Laryngeal Mask Airway Aerosol Delivery System

Background: Neonatal aerosol drug delivery remains challenging due to small tidal volumes, rapid respiratory rates, and narrow safety margins that limit pulmonary deposition and complicate pressure control [1]. Existing in-vitro platforms provide limited control over waveform shape, respiratory timing, and transient maneuvers [2]. To address these limitations, a customizable electromechanical (EM) neonatal breathing simulator (NeoBreath Simulator) was developed to generate physiologically representative breathing waveforms with controlled respiratory parameters and realistic pulmonary mechanics (PM).

Methods: The NeoBreath Simulator is a closed-loop EM piston–cylinder system controlled by a Teensy 4.1 microcontroller that enables programmable neonatal breathing waveform and transient maneuvers, including breath-holds. The simulator was used to evaluate a laryngeal mask airway aerosol delivery system (LMA-ADS) [3] integrated with a CPAP pressure-monitoring and control (CPAP-PMC) unit that can temporarily isolate the circuit during aerosol actuation.

Results: The simulator generated stable neonatal waveforms with a 1-s breath hold. CPAP isolation provided controlled pressure assistance (~ 10 cm H₂O) while maintaining peak inspiratory pressures below 25 cm H₂O. Tracheal filter deposition averaged $21.6 \pm 2.3\%$ of the loaded dose.

Conclusions: The NeoBreath Simulator enables neonatal breathing with programmable breath holds, providing a platform to evaluate aerosol delivery strategies. Under a 1-s breath-hold, the LMA-ADS maintained stable pressure regulation and achieved effective aerosol transport.

Session B

Mahdi Paslar

Biomedical Engineering

Multimodal Predictors of Resting Motor Threshold and Corticomotor Excitability in Healthy Adults

Background: Resting motor threshold (RMT) and corticomotor excitability vary substantially across healthy adults, limiting precision in transcranial magnetic stimulation (TMS) dosing and interpretation. Prior work suggests that both network-level physiology and anatomy contribute to this variability, but most studies have emphasized static measures or single modalities. We investigated whether multimodal resting-state connectivity features derived from electroencephalography (EEG) and functional MRI (fMRI) can characterize individual differences in RMT and recruitment-curve measures.

Methods: Thirty healthy adults underwent resting-state EEG, MRI/fMRI, and single-pulse TMS over primary motor cortex. EEG was source modeled into 30 regions of interest using linearly constrained minimum variance beamforming. Static and dynamic functional connectivity were quantified using weighted phase lag index and orthogonalized amplitude envelope correlation, including mean, variability, and graph-based features. fMRI analyses were designed to estimate effective connectivity among motor-relevant resting-state regions. TMS outcomes included RMT and first dorsal interosseous recruitment curve metrics.

Results: Source-level EEG processing successfully generated static and dynamic connectivity matrices for all retained regions and yielded subject-level network features across frequency bands. These outputs provide both trait-like and time-varying descriptors of motor-network organization. Multimodal integration with fMRI effective connectivity is being used to test whether directed motor-network interactions improve

prediction of RMT and recruitment-curve measures beyond EEG connectivity features alone.

Conclusions: A multimodal framework combining EEG static and dynamic connectivity with fMRI effective connectivity is feasible for studying interindividual differences in corticomotor excitability. This approach may help identify network-level biomarkers relevant to personalized TMS dosing and selection of candidates for neuromodulation-based rehabilitation.

Session B

Mayzie Espey

Biomedical Engineering

TGF- β 1-Integrin-Fibronectin Crosstalk in an In Vitro Progression Model

Background: Ductal Carcinoma In Situ (DCIS) is a critical non-invasive precursor to breast cancer, yet the mechanisms driving its transition to invasive disease remain poorly understood. Bidirectional crosstalk between malignant and healthy epithelial cells within the tumor microenvironment (TME) drives early tumor progression. While these cells exhibit crosstalk via transforming growth factor-beta 1 (TGF- β 1), integrin, and fibronectin (FN) pathways, it is unclear whether this crosstalk occurs via soluble signaling, extracellular matrix assembly (ECM), and/or direct contact. We hypothesize that soluble signals from the malignant cells drive transformation in healthy cells, resulting in upregulation of ECM assembly that creates a positive feedback loop that drives tumor progression.

Methods: We used a progression model of four cell lines, ranging from healthy to malignant cells, to investigate secreted signaling. Conditioned media experiments exposed healthy cells to the malignant cell secretome. Quantitative and morphological assessments identified early phenotypic changes from the secretome exposure.

Results: Conditioned media assays demonstrated observable morphological changes in healthy cells and in malignant cells. These initial results suggest that the secreted factors from the malignant cell environment are sufficient to alter the healthy cell phenotype. Current efforts focus on quantifying cell proliferation and characterizing ECM assembly via fibronectin fibril assembly.

Conclusions: These early findings confirm that the malignant secretome significantly impacts healthy cell proliferation and morphology. Future research will utilize 2D co-cultures and 3D organoids to investigate mechanical interactions further and targeted inhibition of signaling to block this progression.

Session B

Michael Dexheimer

Biomedical Engineering

Repeating Spatiotemporal Patterns of Cortical Activity in the Human Brain

Background: Cortical oscillations detected via electroencephalography (EEG) are not stationary. These oscillations propagate across brain regions during a variety of behavioral and cognitive contexts. Detecting these traveling waves is challenging, typically requiring curated thresholding methods applied to phase gradient fields. This work introduces a continuous, data-driven detection approach that situates traveling waves within a global dynamical context while preserving a phase gradient perspective.

Methods: Electrocorticography (ECoG) recordings from human participants during finger tapping, working memory, and auditory perception tasks were analyzed for stable spatiotemporal patterns using singular value decomposition (SVD). SVD derived dominant motif vector field representations whose dynamical stability was assessed via cosine similarity measures, revealing repeated spatiotemporal configurations of cortical activity.

Results: Consistent with prior work, cortical activity progressed through stable spatiotemporal states separated by sharp transitions, with average dwell times of ~75 ms. Dwell time distributions were remarkably consistent across participants, task conditions, and ECoG grid locations.

Conclusions: We present evidence that traveling waves occupy a state-space continuum characterized by sharp transitions between recurring, stable spatiotemporal patterns of cortical activity. The dynamical consistency of these patterns across participants, task conditions, and grid locations suggests they may reflect intrinsic cortical dynamics rather than task-driven responses.

Session B

Muhammad Uzair Rehman

Biomedical Engineering

Ventricular Micro-Conduction Responses to Orthostatic Stress Following Transspinal Stimulation in Chronic Cervical Spinal Cord Injury: A Case Series

Background: Autonomic cardiovascular dysfunction is common after cervical spinal cord injury (SCI), yet it remains unclear whether improvements in blood pressure regulation after neuromodulation are accompanied by parallel changes in cardiac micro-conduction. High-frequency QRS (HF-QRS) analysis can detect subtle ventricular conduction abnormalities through reduced-amplitude zones not captured by standard ECG.

Methods: Four participants with chronic cervical SCI completed a 16-week cervical transspinal stimulation (TSS) intervention. Lead II ECG and beat-to-beat hemodynamics were recorded at baseline and post-intervention during supine rest and 60° head-up tilt. TSS was not delivered during testing. HF-QRS root mean square (RMS) and NASA RAZ count were analyzed during supine rest and the final 30 seconds of tilt.

Results: All participants demonstrated a reduced drop in supine-to-tilt mean arterial pressure (MAP) after intervention, but electrical responses were heterogeneous. Two participants showed concordant patterns, with improved end-tilt MAP accompanied by lower HF-QRS RMS and lower NASA RAZ count. One participant showed a less favorable pattern, with lower end-tilt MAP and increases in both electrical descriptors. One participant showed a dissociated response, with improved end-tilt MAP and lower NASA RAZ count despite increased HF-QRS RMS.

Conclusions: Cervical TSS was associated with improved orthostatic blood pressure regulation across all participants, but accompanying electrical remodeling was participant-specific. HF-QRS analysis during orthostatic challenge may provide complementary insight into cardiac adaptations underlying hemodynamic recovery after SCI.

Session B

Riley Schweizer

Pharmaceutical Engineering

Development of an Inhalation-Assisted Pediatric DPI and SLS-EEG Platform for Anti-infective Aerosol Delivery

Background: Pneumonia is characterized by the inflammation of the lungs due to infection and can affect a wide variety of patient populations including those in ICUs, with cystic fibrosis, and infants/children in both the developing and developed world [1-3]. Two tobramycin (Tobi) formulations were produced, one containing synthetic lung surfactants (SLS) and excipient enhanced growth (EEG) technology, and another containing only EEG technology [4,5]. Both formulations were tested using a novel pediatric Inhalation Assisted Air-Jet Dry Powder Inhaler (IA-DPI).

Methods: Two Tobi formulations were explored and shown in (Table 1). All formulations were manufactured using a Buchi Mini Spray Dryer S-300. Inspired by previous work, the novel AI-DPI platform comprises three components: the air-jet aerosol engine, dose containment unit (DCU), and oral patient interface [6]. Aerosol performance, (Figure 1), was evaluated by connecting the DPI to a “Small” Realistic Mouth Throat (MT) Model with a Pulmoguard™ tracheal filter, which has previously been verified to be consistent with dimensions of ~5-6 year-old children [7].

Results: Lung drug (Tobi) delivery efficiency (estimated by the tracheal filter Tobi deposition), (Table 2), was high and there was very limited MT deposition losses (~5% or less) for both formulations. However, there were significant differences in the DPI and MP regional drug deposition for the two formulations.

Conclusions: The inclusion of synthetic lung surfactant was shown to not impede the formation of a high-quality aerosol and to have equivalent physicochemical characteristics to a formulation without surfactant based on preliminary testing. The IA-DPI design has proven to meet standard metrics in comparison to other air-jet DPI designs.

Session B

Sepideh Gohari

Electrical & Computer Engineering

Development and Analysis of a Sample Driving Environment Dataset for Autonomous Cars

Background: Robust perception in autonomous vehicles remains challenging under adverse weather and complex lighting conditions. Existing datasets often lack the specificity to isolate environmental variables from route variances. This study introduces a small-scale, controlled dataset collected using the X-CAR platform, comprising 360-degree imagery and LiDAR data across four road types (urban, highway, residential, rural) and seven environmental conditions (e.g., rain, fog, low light, direct light). This work primarily focuses on a high-fidelity annotation pipeline employing the Segment Anything Model 3 (SAM3) to systematically annotate keyframes, with outputs validated through manual inspection. Additionally, we utilized a hybrid approach combining Co-DETR for bulk ground-truth generation with targeted manual corrections to mitigate algorithmic failures in extreme weather. We then trained a YOLOv8-based detection model specifically optimized for weak environmental conditions. Experimental results demonstrate this approach's efficacy; the fine-tuned YOLO model achieved a mean Average Precision (mAP) of 0.764, representing a 45.2% accuracy increase over the baseline YOLO performance and an 11.3% improvement over the Co-DETR algorithm. Finally, our analysis explicitly quantifies the degradation of detection performance caused by specific weather phenomena, highlighting critical vulnerabilities in current automated annotation pipelines.

Keywords—Autonomous Vehicles, Object Detection, Controlled Dataset, YOLOv8, Co-DETR, SAM3, Adverse Weather.

Acknowledgements—The authors gratefully acknowledge Xuelai Du, whose foundational research forms the basis of this study, despite their unavailability during its current execution..

Session B

Valentina Santos Agreda

Biomedical Engineering

Piezo Channel Localization in Human Lung Fibroblasts

Background: Cells are able to sense mechanical changes in their environment through receptors that are sensitive to mechanical forces called mechanoreceptors. Piezo channels are mechanosensitive non selective ion channels that were discovered for sensing pressure and pain in nerve cells. Fibroblasts are structural cells that produce matrix in fibrotic pathologies. The objective of this study is to investigate Piezo channel localization in human lung fibroblasts to understand their connection to fibroblast function.

Methods: Primary human lung fibroblasts were seeded on chamber slides and fixed in paraformaldehyde. Cells were stained for Piezo1 and 2, and counterstained with DAPI, TGN46 (Golgi), and Reagent F-actin phalloidin conjugate. Samples were imaged using confocal microscopy. Colocalization analysis was performed by using ImageJ.

Results: Using immunofluorescence microscopy, we were able to observe the Piezo localization along with the nucleus, Golgi apparatus, and F-actin in human lung fibroblasts. This analysis showed that Piezo 1 strongly colocalizes with the nucleus; however, there was minimal colocalization with the Golgi apparatus

and F-actin. We observed that Piezo 2 colocalizes with the nucleus and F-actin, but it is also shown elsewhere, and there is minimal colocalization with the Golgi apparatus.

Conclusion: Our results from this experiment show intriguing Piezo intracellular localization in healthy human lung fibroblast, which suggests additional functions beyond extracellular mechanosensing from the plasma membrane. The strong Piezo 1 colocalization with the nucleus and Piezo 2 colocalization with the nucleus and F-actin suggest that Piezo channels might have a role in intracellular mechanosensing and signaling.

College of Humanities & Sciences

Session A 10:30 am – 12:00 pm

Session A

Abigail Adade

Clinical Psychology

The Somatic Expression of Psychological Distress: Analyzing Pathways to Psychiatric Care in Low-Resource Tanzanian Health Systems

Abstract: This study investigates the systemic and sociocultural factors influencing the "pathways to care" for adolescent mental health in resource-constrained settings. While psychiatric morbidity often manifests through somatic symptoms in sub-Saharan Africa, diagnostic delays remain a significant barrier to integrated care. Drawing on a case series of three adolescent females at a regional hospital in Tanzania, this paper analyzes the trajectory from initial physical presentation to psychiatric intervention.

The findings indicate that diagnostic opacity is driven by a triad of factors: limited specialist infrastructure, sociocultural paradigms that prioritize organic etiologies, and fragmented institutional referral mechanisms. The analysis reveals inconsistent entry points into the mental health system, ranging from formal primary-care escalations to informal kinship-based networks.

Results suggest that while brief psychotherapeutic interventions are effective for functional recovery, their utility depends on overcoming structural bottlenecks in the referral chain. This research highlights the necessity of decentralizing psychiatric expertise and integrating mental health protocols into primary care to mitigate the "somatization trap" and improve health equity in low-income jurisdictions.

Session A

Alexis Stokes

Developmental Psychology

The Impact of Familial Sociopolitical Discussions on Five Dimensions of Sociopolitical Development of Black Youth: An Examination of Gender Differences **

Background: Sociopolitical development (SPD) literature emphasizes the role of community contexts, such as programs and institutional supports, in fostering civic awareness and action among youth. Less is known, however, about the role of sociopolitical discussions within the family context, particularly for African American adolescents living in under-resourced urban communities with high rates of community violence exposure. This study examined whether familial sociopolitical discussions were associated with adolescents' SPD and whether associations varied by gender.

Methods: Participants were 237 African American adolescents ($M_{age} = 14.45$, $SD = 1.62$; 50% female). Hierarchical multiple regression models examined whether the frequency of familial sociopolitical discussions was associated with five dimensions of SPD: civic engagement, political engagement, civic efficacy, critical reflection, and social responsibility/personal beliefs. Age was included as a control variable, and gender was tested as a moderator.

Results: Greater frequency of familial sociopolitical discussions was associated with higher scores on civic engagement ($b = 0.51$, 95% CI [0.40, 0.61], $p < .001$), political engagement ($b = 0.39$, 95% CI [0.27, 0.51], $p < .001$), civic efficacy ($b = 0.35$, 95% CI [0.21, 0.49], $p < .001$), critical reflection ($b = 0.24$, 95% CI [0.11, 0.38], $p < .001$), and social responsibility/personal beliefs ($b = 0.38$, 95% CI [0.26, 0.50], $p < .001$). Associations did not vary by gender. **Conclusions:** Familial sociopolitical discussions are an important context for fostering multiple dimensions of SPD among African American adolescents in under-resourced urban communities, regardless of gender.

Session A

Alyssa Guilfooy

Biology

Environmental Drivers of Mammalian Community Dynamics in South Luangwa National Park

Background: South Luangwa National Park in Zambia supports one of Africa's most diverse mammalian communities, yet systematic data on species interactions and habitat use have remained limited. This project, conducted through the Zambia Rift Valley Research Project (ZRVRP), examined spatial and ecological patterns of mammalian groupings across floodplain, woodland, and grassland habitats to better understand community structure and behavioral Ecology.

Methods: Baseline animal census surveys carried out in 2023 provided the first organized dataset on mammalian distributions and associations within the park. These surveys were replicated in 2025 to assess variation over time and identify consistent ecological trends. Observations recorded species composition, group size, temperature/seasonality and co-occurrence patterns, with species categorized by dietary type such as browsers, grazers, omnivores, and carnivores. Comparative maps from 2023 and 2025 illustrated areas of overlap and difference in animal sightings, providing visual evidence of changes in group structure and habitat preference. To quantitatively evaluate differences between the two years, statistical analyses included chi-square tests to test whether the frequency of mixed-species versus single-species groups changed significantly due to environmental factors, ANOVAs to compare average group sizes.

Results: Preliminary results indicated frequent mixed-species groupings, particularly among grazers, browsers, and omnivores in open areas. These associations appeared to reflect anti-predator strategies and complementary foraging behaviors that minimized competition for food resources.

Conclusions: Understanding modern species interactions within the Luangwa ecosystem also provides valuable ecological context for interpreting fossil assemblages in this region, which is considered a potential secondary or tertiary site for hominin remains..

Session A

Brianna Boggs

Clinical Psychology

Why People Stay: Factors Contributing to Staff Retention in Community Mental Health Clinics**

Background: The current behavioral health crisis is exacerbated by a crisis in the behavioral health workforce, making access to services for those needing them even more difficult. This study aimed to examine which factors have the strongest influence on an employee's work engagement and decision to remain employed at their current organization. This study used Aarons et al.'s multilevel, multiphase implementation model (2011) to help inform potential interventions to address the factors and improve retention. This study also applied the Me-We-Us framework identified by Jarden and Jarden (2016), as an organization model and offered simpler language to discuss the ideas with community partners.

Methods: Participants from two community mental health agencies that serve the Southwestern region of Virginia completed a survey that contained 107 questions compiled from seven individual measures. Some of the variables included were psychological safety, job embeddedness, and organizational climate. Regression analyses to test models predicting (a) intent to stay and (b) work engagement. Analyses were conducted separately for the two agencies. A total of four regression models were tested.

Results: Results revealed that for the staying employed variable, the We variables contributed the most variance for both agencies. However, for the level of work engagement, the Me variables were most potent. Overall, Us variables contributed a significant, though lower, variance to all four models.

Conclusion: Overall, these data suggest the need for different approaches for employers, depending on which goal is most important—employee retention or employee work engagement. Specific approaches are then discussed.

Session A

Cael Sinclair

English

Reconstructing the Medieval Palette: Making Paints and Inks Using Medieval Recipes

Abstract: When considering the medieval period, most people imagine brilliantly painted and gilded manuscripts but not many people actually imagine the labor behind making those manuscripts. Similarly, modern perception of a scribe tends to be a single, solitary person slaving away at the entire manuscript. Contrary to these beliefs, the process of producing a manuscript was a highly collaborative and, more importantly, highly documented process. Throughout the period, numerous treatises (or handbooks) were created documenting instructions and advice for making ink and paint, for drawing and painting, and everything in between. While it is possible for one to just read these manuscripts, a much deeper understanding of them can be gained by actually following the instructions. Over the course of a year and ongoing, the researcher has selected instructions from several treatises and followed them, producing a variety of historical materials including a range of paints, pigments, and inks. The present study seeks to display these materials and the knowledge that can be learned about these unique manuscripts via the application of hands-on research as a framework.

Session A

Cristian Rivera Nales

Clinical Psychology (Child/Adolescent)

Psychometric Evaluation of the Treatment Integrity Instrument for Elementary School Classrooms - Observer Report: Preliminary Evidence for Construct and Discriminative Validity**

Background: Treatment integrity is the degree to which a program and its practices are delivered as intended, but few treatment integrity measures are designed for research conducted in schools. The Treatment Integrity Instrument for Elementary School Classrooms – Observer Report (TIES-O) is an observational measure used to assess the treatment integrity of teachers implementing evidence-based programs (EBPs) in their classrooms. This study evaluated the psychometric properties of the TIES-O, which captures Adherence, Competence, and Differentiation of teacher-delivered practices.

Methods: Data from a randomized controlled trial that evaluated the effectiveness of BEST in CLASS – Elementary, a Tier 2 classroom-based EBP that trains teachers to support students with unwanted problem behaviors, were used. One hundred fourteen K-3rd grade elementary school teachers (96.5% female; 70.2% White) and 237 students (M age = 7.00 years; 70.9% male; 43.9% Black) were included in the present study. Teachers were randomized to either the BEST in CLASS – Elementary condition or business as usual. Trained coders observed teachers during instructional periods and rated their Adherence and Competence for each TIES-O item.

Results: Interrater reliability (ICC [2,1]) ranged from “poor” to “good” for Adherence and Competence items, with the majority falling in the “poor” range. Current findings also suggested initial evidence of convergent, divergent, and discriminative validity at the item- and scale-level.

Conclusions: The TIES-O demonstrates favorable characteristics for use in effective research. Future research will need to address the poor interrater reliability and use item response theory to inform improvements to the item design.

Session A

Elizabeth Taylor

Developmental Psychology

Associations amongst childhood adversity, threat appraisal, marginalized/minoritized identity, and suicidality in emerging adulthood

Background: Previous studies show that greater childhood adversity increases risk for suicidality later in life. The Dimensional Model of Adversity and Psychopathology proposes that fear learning may link the threat dimension of childhood adversity (harm or threat of harm in childhood) and internalizing symptoms, including suicidality. Maladaptive fear learning may manifest as higher threat appraisals, which in turn may increase risk of suicidality. Moreover, research has found that those with minoritized status often face increased psychological distress from stigma, prejudice, and discrimination, compounding the impact of other stressors. We assess whether threat appraisals link childhood adversity and suicidality. Additionally, we evaluate how identifying as part of a marginalized or minoritized group influences these relationships.

Methods: We recruited approximately 500 undergraduate students from two diverse U.S. universities. Cross-sectional data were collected via an online survey. We will conduct a moderated mediation analysis with Hayes' process macro model 59. If data on the outcome variable are zero-inflated, we will explore alternative ways of addressing the hypotheses (for example, by using a mixture model).

Results: Results are pending, though data have been collected.

Conclusions: Discussion will focus on risk of suicidality and the impact of childhood adversity, threat appraisals, and identity within the context of the developmental stage of emerging adulthood, a stage particularly important for identity development.

Session A

Emily Pappalardo

Psychology (Social)

I Can Do It Better Myself: Examining Habituation as a Mechanism Underlying the Shift from Passive Schadenfreude to Active Sadism

Background. Sadism is the tendency to experience pleasure when actively inflicting harm on others. It is robustly associated with other antisocial personality traits. Schadenfreude is the pleasure one feels when passively watching the suffering of another. Habituation is a learning process in which repeated presentation of the same stimuli gradually produces less and less intense affective reactions.

Methods: The present study examined sadistic habituation as a possible mechanism leading sadistic passive enjoyment to actively pursuing harm. We predicted that greater sadism would be associated with faster habituation of pleasant reactions to harm stimuli (e.g., watching people fall off bikes) versus appetitive, non-harm stimuli (e.g., watching people get married). Results. We found that sadism was positively correlated with habituation to harm stimuli, while statistically accounting for habituation towards appetitive, non-harm stimuli. However, this greater habituation among relatively sadistic participants did not predict their subsequent desire to harm others.

Conclusions: Although habituation to harmful stimuli did not encourage a desire to aggress, the schadenfreude experience partially explained the connection of sadism and the desire to aggress after being exposed to harmful stimuli. Understanding these mechanisms is crucial to preventing future acts of aggression and is important for a variety of contexts. Future research should include a behavioral measure of aggression and examine longitudinal habituation.

Session A

Eunsoo Park

Kinesiology & Health Sciences

Associations Between BIA-Derived Phase Angles and Handgrip Strength in Older Adults

BACKGROUND: Bioelectrical impedance analysis (BIA) is a method for assessing body composition, including fat mass index (FMI) and lean soft tissue (LST). Beyond these quantitative BIA-derived metrics, phase angle (PhA) has emerged as an indicator of muscle quality reflecting cellular health; yet, its utility in predicting age-related functional decline remains unclear. This study examined associations of whole-body (WB) and segmental PhA with handgrip strength (HGS) compared to quantitative BIA metrics and whether the associations vary by sex, age, and physical activity (PA) level.

METHODS: In 92 older adults [50 females; mean age=68 years], PhA was measured using a 50 kHz BIA device in the supine position. HGS was determined by maximal voluntary contraction of the dominant hand. Separate multiple linear regression models, adjusted for age, sex, and chronic disease, predicted HGS using PhA, FMI, and LST. Stratified analyses were performed by sex, age, and PA level. Results were reported as unstandardized coefficients (B) with 95% confidence intervals.

RESULTS: WB PhA was associated with HGS [B=5.16 (1.35–8.98)], whereas FMI and LST were not. Segmental PhA derived from the right arm [4.83 (0.83–8.83)], right leg [3.53 (0.68–6.39)], and left leg [3.59 (0.80–6.38)] showed significant associations. These associations attenuated when stratified by sex and age; however, associations for the right arm [5.51 (0.27–10.74)] and left leg [4.43 (0.14–8.72)] persisted in the high PA group.

CONCLUSION: PhA demonstrated a stronger association with muscle strength than quantitative, suggesting its utility as a practical indicator of functional outcomes in older adults.

Session A

Soha (Fatemeh) Jafari

Chemistry

Single Molecule FRET-based Multiplexed Detection of PDAC miRNA Biomarkers**

Background: Pancreatic ductal adenocarcinoma, or PDAC, is the most common form of pancreatic cancer, accounting for over 90% of all pancreatic cancer cases. It originates in the ducts of the pancreas and is known to be one of the most aggressive and deadly cancers. In recent years, miRNAs have gained attention as promising non-invasive biomarkers for cancer detection because miRNAs can be detected in body fluids such as blood and urine. Therefore, miRNAs can be considered as promising biomarkers for PDAC diagnosis and disease monitoring.

Aims: Our work aims to enable the simultaneous detection of multiple biomarkers within the same sample, allowing high-confidence identification while eliminating the need for target labeling or amplification, yet maintaining high sensitivity.

Methods: We introduce a simple and potentially broadly applicable multiplexed platform for the detection of miRNA biomarkers based on a four-way DNA junction strategy and DNA–RNA hybridization. This approach utilizes single-molecule fluorescence resonance energy transfer (smFRET), in which the distance between two fluorophores on the sensor serves as a marker for target detection.

Results: The sensors remain in a stable FRET state without targets, whereas target binding induces distinct dynamic FRET signatures that enable clear discrimination. We detected three PDAC-miRNAs

(miR-192-5p, miR-21-5p, and miR-200a-3p) simultaneously based on their various FRET ranges in both synthetic and biological environment using serum and plasma. Conclusion: Overall, we anticipate the proposed technology can bring new initiatives in clinical diagnosis for non-invasive early diagnosis of PDAC, cancer assessment, and individualized cancer treatments.

Session A

Garrett Oehlert

Rehabilitation and Movement Science

Near-Infrared Spectroscopy Muscle Oxygenation Kinetics Reflects Functional Fitness in Men with Prostate Cancer

BACKGROUND: Patients with prostate cancer (PC) undergoing androgen deprivation therapy (ADT) experience heightened risk for cardiovascular disease (CVD), characterized in part by exercise intolerance and reduced cardiorespiratory fitness. Identifying physiological contributors to intolerance is paramount for development of interventions aimed at reducing CVD burden and enhancing quality of life (QoL). This study examined the role of skeletal muscle contributors to functional exercise capacity in men undergoing ADT.

METHODS: Twelve patients completed dual-energy X-ray absorptiometry to assess lean mass, a six-minute walk test (6 MWT) to evaluate functional aerobic capacity, and a cardiopulmonary exercise test to confirm exercise intolerance. During the 6 MWT , a near-infrared spectrometer was fixed on the gastrocnemius to monitor skeletal muscle oxygen saturation (StO₂), reflecting balance between oxygen delivery and local utilization. Time to steady-state StO₂ (tSS-StO₂) was defined as time from test onset to stabilization of oxygen saturation, indicating efficiency in meeting local oxygen demand.

RESULTS: Group cardiorespiratory fitness and functional capacity each were significantly impaired (<20th percentile). There was a significant negative correlation between tSS-StO₂ and 6 MWT distance ($r = -0.62$, $P = 0.032$). In addition, patients with lesser leg muscle mass indexed to body surface area took longer to reach SS-StO₂ ($r = -0.72$, $P = 0.008$).

CONCLUSIONS: Delayed local oxygenation response was linked with worsened functional fitness in patients undergoing ADT. Muscle wasting may contribute to impaired oxygenation, suggesting that peripheral limitations to exercise capacity may signify an important therapeutic target to improve fitness, alleviate CVD risk, and improve QoL in men with PC.

Session A

Hailley Moore

Developmental Psychology

Food Insecurity and Mental Health: Unpacking the Role of Diet in Adolescent Well-Being

Background: Poor nutrition is a side effect of food insecurity, which impacts 700 million people globally. In adolescence it has been associated with later psychopathology; however limited research has investigated the underlying mechanisms. Thus, this study explores diet as a possible mechanism for this relationship. Parents from the Adolescent Brain Cognitive Development study ($n = 11,498$) completed measures on their youth's diet, internalizing symptoms, and food insecurity at three different timepoints within a ten-year longitudinal study.

Methods: Food security status was asked in a demographic survey during year one. Dietary assessment was taken at year two using the Block Kid's Food Screener (BKFS). Year three the parents completed the Child Behavior Checklist (CBCL); this study utilizes the internalizing behavior portion measuring anxious/depressed, withdrawn/depressed, somatic symptoms. EFA supported a one-factor model (i.e., diet) which included six indicators: saturated fat, polyunsaturated fat, fiber, glycemic load, cholesterol, and protein.

Results: The results identified a significant relationship between food insecurity and all internalizing symptom subscales ($p < .001$). Such that, youth from food insecure households were more likely to experience internalized symptoms two years later. Diet partially mediated the relationship between food insecurity and anxiety/depression ($p = 0.02$), and somatic symptoms ($p = 0.03$). Conversely, diet did not mediate the relationship between food insecurity and withdrawn/depression ($p = 0.07$).

Conclusion: Evidence was found that diet played a role in the relationship between food insecurity and internalizing symptoms. However, the significance varied based on the type of the internalizing symptoms.

Session B 12:30 pm – 2:00 pm

Session B

Jessica Geller

Rehabilitation and Movement Science

Depression and Physical Activity Among U.S. College Students: The Role of Psychological Distress

BACKGROUND: College students experience high levels of depression and psychological distress, which may reduce engagement in physical activity (PA) and contribute to poor well-being and academic struggles. This study examined the association between depression, psychological distress, and meeting PA guidelines in a national sample of college students.

METHODS: Data were drawn from the American College Health Association–National College Health Assessment IIIb ($n=128,112$). Depression diagnosis was self-reported and psychological distress was measured using the Kessler-6. Meeting PA guidelines was defined as ≥ 2 days of muscle strengthening activity and ≥ 150 min/week of moderate aerobic activity. Logistic regression models estimated the odds of meeting PA guidelines by depression diagnosis. Models were progressively adjusted for demographics (age, sex, year in school), contextual factors (first-generation status, food insecurity, disability, working for pay), and psychological distress.

RESULTS: Overall, 26% of students reported depression, 20% reported moderate-to-severe psychological distress, and 41% met PA guidelines. Students with depression had lower odds of meeting PA guidelines compared with non-depressed peers (Model 1 OR = 0.65, 95% CI: 0.65-0.69). This association remained significant after adjustment for demographics, contextual factors, and psychological distress. Sex-stratified analyses showed stronger associations among males (OR = 0.63, 95% CI: 0.59-0.67) than females (OR = 0.76, 95% CI: 0.74-0.79).

CONCLUSION: Depression was associated with lower odds of meeting PA guidelines, even after adjusting for psychological distress and other contextual factors. Addressing distress, coping, and barriers to PA within behavioral and social-support interventions may enhance PA participation and academic success among vulnerable college students.

Session B

Jisu Kim

Rehabilitation and Movement Science

Age-Varying Associations Between Disrupted Circadian Rest-Activity Rhythms and Frailty Among 7,236 U.S. Adults

BACKGROUND: Disrupted rest-activity rhythms (RAR) are associated with frailty among older adults. However, it remains unclear whether this association emerges in earlier life stages and is influenced by predispositional factors, such as biological sex. This study aims to examine sex differences in age-varying associations between RAR and frailty.

METHODS: The data came from the 2011–2014 NHANES involving 7,236 U.S. adults aged 20–80+ years [Females=51.9 %; mean age=49.14 years]. Actigraphy- measured non-parametric RAR profiles included relative amplitude (RA; rhythmic strength), inter-daily stability (IS), intra-daily variability (IV), mean activity levels during the most-active 10-h (M10) and least-active 5-h (L5). Frailty was assessed using physical frailty phenotype comprising five self-reported indicators. Time-varying effect modeling (TVEM) was employed to examine the sex-specific, age- varying associations between RAR and frailty.

RESULTS: Age-varying associations between RAR profiles and frailty were identified [ORs (95% CIs)], with peaks at age 47 for low RA [1.90 (1.17–3.08)], age 69 for low IS [3.03 (1.38–6.64)], age 35 for high IV [2.48 (1.30–4.74)], age 80+ for high M10 [0.84 (0.77–0.91)], and age 44 for high L5 [1.37 (1.05–1.77)]. Significant sex differences were observed in the association between low RA and frailty at age 57 [Male vs. Female; 0.61 (0.27–1.39) vs. 4.95 (1.98–12.33)].

CONCLUSION: Disrupted RAR profiles were significantly associated with frailty, exhibiting non-linear patterns with varying peaks across ages. The findings suggest that individuals with unfavorable RAR profiles, particularly females with low RA, may be at higher risk of frailty, beginning in early-to-mid adulthood.

Session B

Laura Boylan

Developmental Psychology

Parent Self-Regulation in the Context of Parent-Child Physiological Synchrony: A Scoping Review

Authors: Laura E. Boylan, MS and Marcia Winter, PhD

Parent-child physiological synchrony is the intricate ‘dance’ of internal states between parents and children during interactions and contributes to children’s self-regulation (SR), but is not uniformly beneficial. Parents’ own emotional and physiological SR may be one factor shaping the varying presence and meaning of synchrony for child outcomes. This scoping review provides the first empirical review of parent SR in the context of physiological synchrony. A systematic search was conducted on CINAHL, PsycINFO, Academic Search Complete, Psychology and Behavioral Sciences Collection, PubMed, and Web of Science databases. A total of 15 English, peer-reviewed articles assessing parent-child physiological synchrony with parent SR met inclusion criteria. Key findings included determining emotion-regulation as the most common measure of parent SR, whereas there was a paucity of research on physiological regulation and parent response to child emotion. Studies focused almost exclusively on assessing the relationship between parent SR and the presence or absence of synchrony. The association between worse parent SR and a lack of synchrony was well-documented, however developmental timing and the interaction in which this relationship is examined need to be more thoroughly investigated in future studies. Limited research has been conducted on how parent SR influences the meaning of synchrony, however there is preliminary evidence that synchronizing with a dysregulated parent has poor impacts on child outcomes. Future work should seek to explore developmentally-specific models and elucidate a more comprehensive understanding of the meaning of synchrony in the context of parent SR as a means to develop more effective prevention strategies.

Session B

Louis Tawam

Clinical Psychology

Culture, Religion, Personality: Examining Predictors of Flourishing in Ghana

Background: Flourishing, a multidimensional indicator of well-being, is shaped by cultural values, personality traits, and religious commitment, yet little is known about how these factors interact in African contexts. This study examined how nine cultural dimensions (uncertainty avoidance, power distance, institutional collectivism, ingroup collectivism, gender egalitarianism, assertiveness, future orientation, performance orientation, and humane orientation) predict flourishing among Ghanaian adults, and whether personality traits and religious commitment moderate these relationships.

Methods: Using a cross-sectional design, data were collected from 1,000 adults in the Greater Accra Region through validated measures of flourishing, cultural dimensions, personality, and religious commitment. Standard multiple regression analyses assessed direct and moderating effects.

Results: Institutional collectivism, ingroup collectivism, assertiveness, and performance orientation significantly predicted flourishing, together explaining 15.1% of its variance. Religious commitment negatively moderated these associations, weakening the predictive effects of cultural dimensions. Personality traits also showed significant moderation: extraversion and openness weakened the culture flourishing relationship, whereas conscientiousness strengthened it.

Conclusion: These findings highlight the central role of collectivist values in shaping well-being in Ghana while revealing that individual differences, particularly religious commitment and personality, alter how cultural orientations translate into flourishing. The study underscores the need for culturally grounded well-being research in nonWEIRD contexts and suggests that interventions promoting flourishing in Ghana should account for cultural values alongside personality and religious dynamics.

Conclusions: Collectivist values are central to well-being in Ghana, while individual differences in religious commitment and personality alter how cultural orientations translate into flourishing, underscoring the need for culturally grounded well-being research in non-WEIRD contexts.

Session B

Mahmoud M. Kaid

Chemistry

Engineering Electrocatalytic Sulfur-Based Cathodes for Rechargeable Batteries

Background: Practical deployment of lithium-sulfur batteries (LSBs) is hindered by poor sulfur utilization, sluggish ion transport, and low areal capacity. Direct ink writing (DIW) additive manufacturing is presented as a strategy to fabricate advanced 3D-printed sulfur cathodes with hierarchically porous architectures.

Results: The optimized 3D-printed cathode with sulfur loading of 5.4 mg/cm² delivered a high reversible capacity of 1041.4 mAh/g at 1C with 85.5% capacity retention after 1000 cycles. At a higher sulfur loading of 8.1 mg/cm², it achieved a discharge capacity of 1538.4 mAh/g and an areal capacity of 12.5 mAh/cm².

Conclusions: The synergistic effects of Co/Ni dual-atom sites accelerate redox kinetics and mitigate polysulfide shuttling, establishing a scalable, transformative platform for high-energy-density lithium-sulfur battery manufacturing.

Session B

Md Mehedi Hasan

Chemistry

Droplet Self-Division and Growth to Mimic Life-Like Behaviors

The origin of life remains a major unresolved question. It is widely believed that life arose from abiotic chemistry on early Earth, where simple molecules (e.g., CH₄, NH₃, H₂O, H₂) formed organic building blocks that evolved into compartmentalized, self-replicating systems preceding the Last Universal Common Ancestor (LUCA).¹⁻² However, the physicochemical transition from simple chemistry to autonomous, cell-like systems remains unclear. In particular, how primitive compartments gained the ability to grow and self-divide without biological machinery is still unknown. Understanding these mechanisms is crucial for explaining life's origins and guiding the search for life beyond Earth.²⁻³ Our central hypothesis is that increasing droplet surface charge triggers self-division when electrostatic repulsion exceeds interfacial tension, consistent with the Rayleigh instability. We employed single-droplet electrochemistry coupled with fluorescence microscopy to uncover principles and mechanisms by which droplets divide (and grow) in solution and when they collide with the surface of an ultramicroelectrode.

In this study, we prepared both water and organic (Dichloromethane (DCM)) droplets loaded with redox tracers (ferrocyanide or ferrocene), selected based on their solubility profiles, which can be analyzed by single droplet electrochemistry for studying droplet growth and division. Deciphering the chemical pathways that give rise to life-like behaviors from nonliving matter will enhance our understanding of our own origins and inform the search for life beyond Earth.

Session B

Md Monirul Islam²

Chemistry

Single-Molecule High-Confidence Detection of Colorectal Cancer miRNA Biomarkers

Background: Colorectal cancer (CRC) is the world's third most frequent cancer, as well as one of the leading causes of death; however, early detection significantly improves the chances of successful treatment. But current diagnostic approaches are either too invasive or lack the sensitivity and specificity required for reliable detection. Circulating microRNAs (miRNAs) have recently emerged as promising biomarkers, offering a less invasive and potentially more reliable strategy for the early detection of CRC. However, current miRNA detection techniques face challenges due to the complexity of miRNA extraction, primarily due to their short length, extremely low concentrations (femto – picomolar range) in biological fluids, and overlapping expression across multiple cancer types.

Aims: To overcome the existing limitations, offering a more effective and patient- friendly diagnostic approach.

Methods: Using single-molecule fluorescence resonance energy transfer (smFRET), our lab has recently developed a Holliday junction (HJ)-based multiplexed sensing platform capable of detecting multiple nucleic acids simultaneously with high sensitivity and selectivity, achieving detection limits down to the femtomolar range. These HJ-based sensors generate dynamic FRET signals in the presence of a target, driven by the intrinsic conformational switching of the junction, making them particularly well-suited for miRNA detections with high confidence.

Results: Among many, the highly reported CRC miRNA biomarkers are miR-18a-5p, miR-92a-3p, miR-199a-5p, and miR-423-5p, which have already been detected with femtomolar sensitivity. Conclusion: The enhanced accuracy and reliability of this approach highlight its strong potential for clinical application in the early detection of CRC cancer.

Session B

Niki Goode

English

Memories of Trauma and Its Effect on Literature: An Analysis of Virginia Woolf's "The Mark on the Wall"

Memory becomes the intermediary between trauma and literature; a relationship that can only coexist through rhetorical approaches that the author chooses to articulate. When we look at gaps in thought, hysteria, or lapses in time, we are viewing symptomatic responses to triggering memories, or trauma. This leads us to question how an author's direct experience with trauma permeates the language they use within their novels. Renowned psychiatrist, Dr. Bessel van der Kolk argues that "without stories, memory becomes frozen; and without memory you cannot imagine how things can be different" (Kolk 221). If narrative is used to reconstruct memory, then literary form becomes crucial in representing trauma. Literature does not merely recount traumatic events; it stages the mind in a way that allows it to process them. This paper argues that Virginia Woolf's "The Mark on the Wall" uses fragmentation as a way of processing traumatic memories through free indirect discourse, ellipses, and syntactic disruptions. The

essay merges Woolf's voice with the consciousness of the narrator as free indirect discourse. The repetitive nature of ellipses serves as momentary disruptions in thought, while the sentences that precede and follow them suggest dissociations. Similarly, the narrator's erratic fixations on the mark interspersed with memories, and Woolf's use of dashes marking shifts in the passage of time, replicate the nonlinear movement of traumatic storytelling. Through these rhetorical strategies, Woolf's early work shows how literary form can mirror the mind's attempt to process and restructure traumatic memories.

Session B

Srishty Sethi

Chemistry

Toward miRNA Multiplexing for Early Detection of Triple-Negative Breast Cancer**

Background: Breast cancer is the top two leading causes of cancer-related mortalities in women, prompting research to explore novel biomarkers. Among all types of breast cancers, Triple-Negative Breast cancers (TNBCs) are the most aggressive and challenging to treat because they lack the three common cancer receptors. Studies have identified circulating miRNAs in body fluids as promising indicators of TNBC. Nevertheless, their low concentration and association with multiple health conditions pose significant challenges, hindering their accurate and reliable detection. Our work aims to develop a technique that simultaneously detect multiple TNBC-miRNAs to achieve higher accuracy. **Methods:** We introduced a simple multiplexed platform for miRNA biomarkers. Herein, we first identified the most prominent TNBC-miRNAs via miRNA sequencing and then determined four TNBC-miRNAs utilizing single-molecule fluorescence resonance energy transfer (smFRET) and a 4-way DNA junction strategy. We custom-designed four probes which provide non-overlapping dynamic FRET traces upon target/miRNA binding.

Results: These 4-way DNA junctions were designed to exhibit a relatively static FRET state in the absence of the targets and produced a non-overlapping dynamic FRET states in the presence of the target. We detected four TNBC-miRNAs simultaneously in the synthetic and biological environment. **Conclusion:** Our method offers a clear multiplexed detection of four TNBC-miRNAs with low femtomolar sensitivity without requiring target amplification and labeling. The key advantages include detection of miRNAs directly from serum and plasma with only one set of excitation source and a single FRET pair. We anticipate advancing this platform to be a generic, non-invasive, and high-confidence detection of miRNAs.

Session B

Talab Hassouna

Nanoscience

3D Printed Stretchable PEDOT: PSS Hydrogel Electronics

Implantable hydrogel electronic sensors offer a promising approach for monitoring human health through soft and conformable interfaces. Conducting polymer hydrogels are particularly attractive for bioelectronic devices because they combine ionic and electronic conductivity while maintaining mechanical compatibility with compliant materials. However, achieving the simultaneous requirements of stretchability, electrical conductivity, and printability necessary for microscale device fabrication remains challenging. In this work, we develop a poly(3,4-ethylenedioxythiophene):poly(styrene sulfonate) (PEDOT:PSS) hydrogel conductive ink using a multifunctional additive formulation consisting of a conductivity enhancer, surfactant, plasticizers, and crosslinker. Our chemically engineered formulation enables stable hydrogel formation while preserving electrical conductivity and mechanical compliance. The resulting ink exhibits rheological properties suitable for direct ink writing (DIW) 3D printing, enabling the fabrication of self-supporting microscale structures with overhanging and suspended geometries. This capability allows the creation of three-dimensional hydrogel electronic architectures that are difficult to realize using conventional fabrication techniques. The developed material platform provides a promising route toward 3D-printed hydrogel-based electronic sensors and bioelectronic devices.

Session B

Udena Kalhara Epitawala Arachchige

Nanotechnology & Nanoscience

Integrated Stretchable Electronic Textile Platform for Wearable Tactile Sensing and Vibrotactile Feedback

By integrating flexible electronic sensors, vibrotactile actuators, and wireless textile interconnects, this platform demonstrates a wearable device capable of detecting mechanical stimuli and delivering tactile feedback for human and machine interaction. Such systems have potential applications in wearable medical devices, smart textiles, prosthetic feedback systems, and rehabilitation technologies. This study investigates a wearable sensing and feedback platform composed of three key components. First, carbon-based stretchable elastomeric sensors serve as tactile sensing elements. These sensors combine flexibility, stretchability, and high sensitivity to mechanical deformation, detecting strain or pressure through resistance changes in conductive nanomaterial percolation networks embedded within the elastomer. Second, an electromagnetic vibrotactile actuator was developed using a solenoid-based linear resonant actuation mechanism. Mechanical signals detected by the tactile sensors activate compact actuators that generate vibration feedback, enabling real-time tactile responses for the user. Third, to enable seamless integration into wearable systems, flexible conductive pathways were fabricated on textile substrates using silver-based conductive materials. Conductive traces were printed directly onto fabric and evaluated under cyclic stretching and relaxation while monitoring variations in force, resistance, and current. These conductive textile interconnects provide reliable signal transmission and enable monitoring of vibration amplitude and frequency within the stretchable electronic textile and wireless communication system. Overall, this work highlights the importance of integrating sensitive tactile sensors with mechanically robust conductive interconnections to enhance the reliability and performance of wearable electronic systems.

Session B

De-Graft Agyei

Psychology

Fear, Fire, Formidable: Examining the Functional Utility of Fear in African Traditional Religion

Background: Affect in Abrahamic religions has been the focus of some research, but the role of emotion in indigenous religions has been underexplored. This study examines the role of fear as an organizing affect within African Traditional Religion, tracking its role and regulation in the recruitment, training, and ritual practice of traditional priests in Ghana, West Africa.

Method: Phenomenological fieldwork with 40 adult spiritual intermediaries indicates that for this population, fear operates not only as an emotional response to situations, but also as a structuring force shaping moral conduct, relational obligations, and perceived spiritual power.

Results: Our sample acknowledged multiple fears—of spiritual consequence, ritual error, and particular spaces and actions. Discussion/conclusion: Yet, rather than leading to paralysis or avoidance, these fears appeared to promote discipline, spiritual vigilance, and ethical comportment, often through the use of emotion regulation strategies with behavioral psychology undertones. For them, fear was situated, cultivated, and spiritually and socially meaningful.

Office of Research and Innovation

Session B

Brooke Moorman

Predictors and Persistence of Disordered Eating Symptoms in Adolescence: Evidence from the ABCD Study

Background:

Eating disorder symptoms often emerge during adolescence, yet early predictors of symptom persistence remain understudied. The Adolescent Brain Cognitive Development (ABCD) Study provides a large, diverse longitudinal cohort that enables examination of transdiagnostic risk factors for eating pathology across development. This study investigated whether childhood internalizing symptoms, emotion regulation difficulties, impulsivity, and body mass index (BMI) predict adolescent eating disorder symptoms and whether distinct trajectories of symptom persistence emerge over time.

Methods:

Participants included 11,647 youth enrolled in the ABCD Study, assessed at baseline (ages 9–10) through the 6-year follow-up (ages 15–16). Predictors included internalizing symptoms, emotion regulation difficulties, negative urgency, and BMI. Outcomes included weight distress, weight-control behaviors, and binge eating in adolescence. Biological sex, age, and baseline eating disorder symptoms were included as covariates. Linear mixed-effect models examined associations between childhood predictors and later eating pathology, and latent class growth analyses characterized trajectories of symptom persistence across assessment waves.

Results:

Higher levels of childhood internalizing symptoms and emotion regulation difficulties were associated with increased adolescent eating disorder symptoms. Elevated negative urgency was uniquely associated with binge eating. Baseline BMI demonstrated differential associations with eating pathology, with higher BMI associated with non-low-weight symptoms. Trajectory analyses identified heterogeneous symptom patterns, including persistent, transient, and minimal symptom groups.

Conclusions:

Findings highlight the importance of transdiagnostic emotional and behavioral risk factors in the development and persistence of adolescent eating pathology. Early identification of predictive behaviors and symptoms may inform prevention efforts targeting youth at elevated risk for persistent eating disorder symptoms.

VCU Life Sciences

Session A 10:30am – 12:00pm

Session A

Alyssa Darling

Integrative Life Sciences

Antioxidant Effect of Nanoceria in Coral Symbiotic Dinoflagellate *Breviolum psygmophilum* under Thermal Stress

Background: Coral reefs represent some of the most diverse and economically valuable ecosystems globally; not only do they support 25% of all marine life, but they provide approximately \$10 billion USD annually in goods and services. The foundation of these ecosystems are calcifying corals, which live in symbiosis with microscopic marine algae called *Symbiodinium*. When the water temperature stays elevated for too long, the *Symbiodinium* produce reactive oxygen species (ROS), which signals their expulsion from the coral in a process known as bleaching. If a coral remains bleached for an extended period of time, it can lead to death, threatening the functionality of the ecosystem as a whole.

Methods: This study will use the antioxidant nanoparticle poly(acrylic acid)-coated cerium oxide (nanoceria) to scavenge ROS produced by the symbiont *Breviolum psygmophilum*. *B. psygmophilum* will be incubated for 1 hour at either 27 °C or 35 °C. Following incubation, *B. psygmophilum* will be exposed to nanoceria, and changes in ROS production will be measured by fluorescence.

Expected Results: Previous studies on *Breviolum minutum* show that when incubated at 27 °C and 34 °C, cells with internalized nanoceria exhibit a significant decrease in intracellular ROS compared to the cell-only control. Toxicity studies also indicate no negative effect on the growth of *B. minutum*.

Conclusions: This study lays the foundation for exploring interventions to protect the coral–symbiont relationship under acute thermal stress. By reducing thermally induced ROS in symbionts, bleaching and eventual coral death may be prevented.

Session A

AnnaMari Stump-Hicks

Cellular and Molecular Biology

Sphingolipid dysregulation contributes to ER stress sensitivity in a yeast model of ALS8

Amyotrophic lateral sclerosis (ALS) is a fatal neurodegenerative disease that results in progressive loss of upper and lower motor neurons, leading to death typically within 3–5 years of diagnosis. Numerous genes are linked to familial ALS, including VAMP-associated protein B (VAPB), which encodes an ER-resident protein that functions at membrane contact sites with organelles including the plasma membrane and mitochondria. A P56S mutation in VAPB is linked to ALS8 and results in protein misfolding, ER collapse, and sensitivity to ER stress. We previously developed a fungal model for ALS8 in *S. cerevisiae* by deleting the yeast VAP homologs *SCS2* and *SCS22* and expressing humanized mutant *scs2* P51S, P58S that bears the analogous ALS8-linked mutation (P58S). Yeast ALS8 cells phenocopy ER collapse and stress sensitivity seen in mammalian cells expressing VAPB P56S; thus, we used our model to perform a high-copy suppressor screen to identify genes whose overexpression reduced sensitivity to ER stress. We find that numerous components of the sphingolipid biosynthetic pathway, including the sphingosine kinase *Lcb4*, the mannosylinositol phosphorylceramide synthase subunit *Sur1*, and a fragment of the ceramide synthase *Lac1*, improve cell growth under ER stress conditions. Moreover, we show that pharmacological manipulation of sphingolipid biosynthesis in the yeast ALS8 model reduces ER stress sensitivity. Taken together, we propose that ceramide biosynthetic enzymes may be a relevant therapeutic target in ALS8.

Session A

Anne Sciolino

Life Sciences

Facilitative and competitive interactions among dune grass species in monoculture and polyculture communities

Coastal dunes are natural barriers between land and sea and are imperative to the protection and preservation of inland ecosystems and human infrastructure. However, due to global warming, sea level rise, and coastal development, coastal dunes are under constant threat of degradation. Restoration efforts have been implemented to rebuild the protective function of dunes through the planting of dune-building grasses. Dune grasses build and maintain these vital sand dunes, yet little is known about facilitative and competitive relationships among dominant grass species. To maximize restoration efforts, research is needed to better understand the biotic interactions among restorative grass plantings. To help fill this knowledge gap, we quantified potential biotic interactions of four common dune-building grasses along the eastern United States coast—*Ammophila breviligulata*, *Panicum amarum*, *Spartina patens*, and *Uniola paniculata*—in both polyculture and monoculture communities. Plantings were conducted on the southern end of Hog Island, a Virginia barrier island along the Delmarva peninsula, and within mesocosms where plants were grown in pots that either allowed root interaction or excluded it through

belowground partitions. Measurements included stem count, plant height, and biomass. *Panicum amarum* had the highest yield in polyculture planting designs where interspecies belowground root interactions were allowed, indicating greater facilitation in polyculture plantings. *Ammophila breviligulata* exhibited competition in polyculture mesocosm plantings when roots interacted; however, this was not observed in the field where roots had more space. No effects were observed with *S. patens* in any planting design, suggesting this species may be co-planted to enhance diversity.

Session A

Daniel Rioux

Cell Biology

Avl9 Contributes to Recycling and Sorting of Endosomal Cargo

Trafficking of cargos between cellular compartments requires numerous proteins, including Rabs and their activating regulators, guanine nucleotide exchange factors (GEFs). Biochemically, GEF activity may be encoded in several domains, including the Differentially Expressed in Normal and Neoplastic tissue (DENN) domain. In yeast and humans, the conserved DENN-like protein Avl9 has a poorly characterized role in trafficking and secretion. Here, we show that Avl9 localizes to punctae at the cell periphery that are consistent with secretory vesicles and exhibits colocalization with several secretory and endosomal Rabs, including Ypt1, Ypt31, Sec4, Ypt52, and Ypt10. We next demonstrate that *avl9Δ* results in defects in recycling of the endosomal cargo Snc1 but does not alter secretion of an endocytosis-defective Snc1 mutant, suggesting that Avl9 is not directly involved in secretory traffic from the TGN to the plasma membrane. The *avl9Δ* recycling defect is exacerbated by the additional loss of RCY1 or SNX4, but not VPS35. Each of these three genes contributes to a distinct endosomal recycling pathway, indicating that Avl9 acts in conjunction with multiple pathways.

Session B 12:30 pm – 2:00 pm

Session B

Zoe Allen

MS Biology

Decoding Neutrophil Recruitment in Brain Metastases

Brain metastases are a significant cause of cancer mortality, often with poor prognosis. Cancer involves many complex mechanisms, including hijacking of normal cell processes, interactions among multiple cell types, and a complex tumor microenvironment that makes treatment difficult. Understanding the underlying mechanisms at play is extremely important for the development of new drugs and immunotherapies. The goal of this project is to determine which cellular messengers, specifically cytokines, are involved in the activation of neutrophils, the most abundant leukocyte. Data show that when regulatory T cells (Tregs) are depleted, neutrophil recruitment and activation increase, suggesting that Tregs normally suppress neutrophil recruitment. Based on the literature, various cytokine assays will be used to quantify cytokine levels in samples from mice with depleted Tregs (DT) and control mice. The samples for this project include brain metastases from both DT and control mice. Several test samples

have already been processed, and the remaining samples are currently being prepared, with assays scheduled to begin shortly. Data will be collected before the symposium presentation. Based on the cytokine results, we will then determine which brain cell types (astrocytes, microglia, etc.) are producing the identified chemokines using single-cell RNA sequencing data. Overall, these findings will contribute to identifying new regulatory mechanisms in metastatic disease.

School of Medicine

Session A 10:30 am – 12:00 pm

Session A

Alex Goldman

Medicine

Same Snake Envenomation, Different Clinical Presentation: A Novel Way to Approach Simulated Cases Presenting with Snake Bites

Background: Experiential learning through simulation labs provides students with structured environments to develop essential skills for patient care. North American crotalids possess numerous toxins resulting in diverse clinical presentations, creating a significant diagnostic challenge for medical students. To address this gap, we designed a simulated case of a patient presenting with various manifestations of crotalid snake envenomation to improve clinical competency.

Methods: Fourth-year medical students and residents participated in a quasi-experimental pretest–posttest study. Learners first took a pretest to assess baseline knowledge of snakebite envenomation and management, then received a didactic lecture on treatment protocols. In groups of 3–5, they participated in a simulated clinical case where varying manifestations—including dry bite, myotoxicity, neurotoxicity, hemotoxicity, and venom-induced anaphylaxis—modified required treatment. Students then completed a posttest to evaluate learning outcomes and self-reported confidence.

Results: Thirty learners participated; mean pretest and posttest scores were 55% (SD 19.5) and 91% (SD 12.15), respectively. A Wilcoxon signed-rank test demonstrated a statistically significant increase in knowledge scores (test statistic: 0.0, $p < 0.0001$).

Conclusions: A simulation featuring varying clinical manifestations allowed learners to adapt management strategies to a range of presentations, enhancing both diagnostic reasoning and decision-making skills. This approach led to significant improvements in knowledge and confidence. Key strengths include hands-on experiential learning and collaborative team-based decision making, while limitations include a small sample size and substantial time requirements. This practical curriculum can be integrated into any medical education program with simulation access.

Session A

Alexia Zylko

Pharmacology & Toxicology

Exploration of Psilocybin's Effects on Perineuronal Nets in the Mouse Brain

Background: In recent years, the psychedelic compound psilocybin has emerged as a promising therapeutic for a wide variety of psychiatric conditions, likely due to its ability to promote neuroplasticity in the brain. One regulator of neuroplasticity in the adult brain that has not been investigated as a mechanism behind psilocybin's neuroplastic effects is the perineuronal net (PNN), an extracellular matrix structure that surrounds parvalbumin (PV)-expressing inhibitory interneurons. This project examined the effects of systemic psilocybin on PNNs in the mouse brain.

Methods: Adult mice were treated with an injection of psilocybin or saline, and brain tissue was collected 2.5 or 24 hours after injection. Immunohistochemistry was used to stain and quantify the number and intensity of WFA+ and PV+ cells in the hippocampus, cingulate cortex, and anterior insular cortex. This procedure was repeated in knockout mice lacking the serotonin 2A receptor (5-HT_{2A} R), one of the main targets for psilocybin.

Results: PNNs and PV neurons in the cingulate cortex and dorsal hippocampus did not change after psilocybin administration. However, the intensity of PNNs decreased in the insular cortex and ventral hippocampus of psilocybin-treated female mice after 2.5 hours. Notably, these effects were absent 24

hours post-treatment and in 5-HT2A R knockout mice, indicating that the response is both transient and 5-HT2A R-dependent.

Conclusions: The observed decrease in WFA intensity indicates a reduced density of perineuronal nets, which may “reopen” windows of plasticity and contribute to psilocybin’s neuroplastic effects.

Session A

Allison Molen

Human Genetics

Characterizing Neuron-Enriched Exosomal microRNA in Young Adults

Background: Exosomes are small extracellular vesicles (30–150 nm) released by cells that carry molecular cargo reflective of their cell of origin. Neuron-enriched exosomes, identifiable by L1CAM markers, can cross the blood–brain barrier and provide a minimally invasive window into brain-related processes. Exosomal microRNAs (miRNAs) regulate gene expression and have been implicated in psychiatric disorders, including major depressive disorder (MDD). However, measuring and analyzing miRNA from neuron-enriched exosomes presents substantial analytical challenges due to low abundance and sparse detection across samples. **Methods:** Plasma samples from participants recruited through the Mid-Atlantic Twin Registry were used to isolate extracellular vesicles, followed by immunoprecipitation of L1CAM+ neuron-enriched exosomes. Total RNA was analyzed using the Affymetrix GeneChip™ miRNA 4.0 Array. Raw CEL files (N = 243) were processed using a reproducible pipeline including background correction, normalization, detection-rate filtering, ComBat correction, and principal component analysis. miRNAs present in at least 50% of participants were retained for downstream analyses. Linear mixed models were applied to explore associations between miRNA expression and lifetime MDD status.

Results: Preprocessing reduced 292,681 array features to 2,578 human mature miRNAs, with detection-rate filtering identifying 50 miRNAs consistently detectable across participants. Batch effects were mitigated through correction. Exploratory analyses did not identify significantly differentially expressed miRNAs associated with lifetime MDD.

Conclusions: This study establishes a reproducible analytical framework for neuron-enriched exosomal miRNA microarray data and highlights key challenges related to low abundance and sparsity. These findings provide a foundation for future studies investigating exosomal miRNA as peripheral biomarkers in neuropsychiatric research.

Session A

Annalise Hassan

Pharmacology & Toxicology

Investigating the stability of nucleus accumbens transposable elements as contributing to drug use behaviors in mice.

Background: Some brain transposable elements (TEs) retain the ability to transpose, or “jump,” into different genomic locations, often causing diseases and genomic instability. To prevent transposition and preserve genomic stability, TEs are typically transcriptionally repressed by KRAB zinc finger proteins (KZFPs), which recruit the corepressor TRIM28. We created synthetic variants of TRIM28 to manipulate TE stability within neurons of the nucleus accumbens (NAc), a brain region implicated in reward and reinforcement, to determine the relationship between TEs and drugs of abuse. TRIM28 variants were virally delivered to the NAc of male and female mice to characterize the effects of TE stability on drug seeking, reinforcement, and gene expression profiles in response to cocaine (a representative stimulant) and morphine (a representative opioid).

Methods: (1) Mice will undergo drug conditioned place preference (CPP) using TRIM28 variants. (2) Mice with jugular vein catheters will be used for intravenous self-administration (IVSA) to perform dose–response testing before and after viral delivery of TRIM28 variants into the NAc. (3) Mice will be virally infused with TRIM28 variants into the NAc, then injected with saline, cocaine, or morphine for ten days, after which NAc tissue will be extracted for RNA sequencing.

Results: Preliminary analyses do not reveal significant differences between viral variants. RNA-sequencing analysis shows sex differences among differentially expressed genes (DEGs) and differentially expressed TEs (DETEs).

Conclusions: These studies suggest that this mechanism may contribute to the molecular processes that govern drug-taking behaviors and drug-related gene expression.

Session A

Araba Abaidoo-Myles

Microbiology & Immunology

Inhibition of Glutamine metabolism is essential in decreasing the hallmarks of Atopic Dermatitis pathogenesis.

Background: Atopic dermatitis (AD) remains one of the most chronic inflammatory skin diseases and is strongly associated with other atopic conditions such as asthma. Although the Th2 response is known as the primary humoral driver, follicular helper T (Tfh) cells have recently been identified as key mediators in AD pathogenesis. AD presents with elevated IgE levels and associated cytokines, including IL-4 and IL-13. Our lab has shown that stimulating dendritic cells with *Alternaria alternata* (a fungal allergen) in an allergic-asthma model increases activity in the glutamine metabolic pathway. Inhibiting this pathway reduced downstream Tfh2 polarization and IgE production. We therefore hypothesized that Telaglenastat (CB-839), a glutaminase-I inhibitor, would decrease Tfh2 responses in AD.

Method: Auricles of C57BL/6 mice were treated with MC903 and house dust mite for 15 days, with ear thickness measured throughout. Mice received topical CB-839 treatment beginning on day 6. On day 15, mice were euthanized, and organs were harvested for flow cytometry, tissue sectioning, RNA isolation, and sequencing.

Results: Treatment with CB-839 inhibited AD, reducing IgE, IgG1, and Tfh2 cells, while increasing T follicular regulatory cells. AD-associated genes such as *GATA3* and *CARD11* were decreased in CB-839–treated mice. Bulk RNA sequencing also showed increased expression of genes involved in wound healing, immune regulation, and tissue development following treatment.

Conclusion: Overall, topical treatment of AD with the GLS-1 inhibitor CB-839 in mice is associated with a reduction in hallmark features of atopic dermatitis.

Session A

Catharine Carfagno

Neuroscience

Effect of Methamphetamine Exposure on the Behavioral Economics of Social vs. Food Choice

Background: In 2024, 2.4 million Americans reported methamphetamine use, and despite this number steadily increasing over the past 20 years, no effective treatments have been developed for Methamphetamine Use Disorder (MUD). MUD emerges from behavioral misallocation toward methamphetamine and away from competing alternatives such as social interaction and food. To better understand this behavior, this study examines how methamphetamine exposure alters the reinforcing value of social interaction and food using behavioral economics. By characterizing changes in food versus social choice following methamphetamine exposure, this study aims to improve models of MUD.

Methods: Sprague Dawley rats were trained in an operant choice paradigm in which left lever presses delivered liquid Ensure and right lever presses delivered 30 seconds of social interaction. Baseline preferences between food and social interaction were first established. Animals then underwent 14 days of extended access to self-administer 0.1 mg/kg methamphetamine for 12 hours. Following self-administration, food versus social choice trials were repeated, and preferences were reassessed after the 14-day extended access period. **Results:** Initial results show 77% food choice at baseline across all animals, with no sex differences observed. During methamphetamine access, there was no change in percent food choice; however, animals' food intake was predicted by the number of methamphetamine infusions earned (slope = 0.3084 ± 0.0713 ; $F(1,96) = 18.69$, $p < 0.0001$, $R^2 = 0.163$). **Conclusions:** These findings emphasize the importance of alternative reinforcement and the use of choice paradigms when evaluating methamphetamine use.

Session A

Charanya Uppalapati

Medicine

Evaluating the Rates of SBI and HSV in Infants with Incidental vs. Non-Incidental Hypothermia and Hyperthermia

Background and Objectives: Routine temperatures are commonly taken during well-child checks despite no clear AAP recommendations. Detecting an abnormal temperature can lead to increased healthcare costs and invasive laboratory tests, including lumbar punctures, IV antibiotics, and hospitalization. Our objective was to measure what proportion of patients with an incidental temperature abnormality have a pathogenic infection and to compare the prevalence of pathologic infection between infants with incidental and non-incidental temperature abnormalities. **Methods:** This retrospective chart review included infants 0–60 days of age who visited the Children's Hospital of Richmond Emergency Department with a blood culture or documented temperature irregularity ($\leq 36^\circ\text{C}$ or $\geq 38^\circ\text{C}$). Primary outcomes were final diagnoses of serious bacterial infection (bacterial meningitis, bacteremia, urinary tract infection [UTI]) or HSV. **Results:** After exclusions, 429 charts were reviewed; 48 patients (11.2%) were diagnosed with an SBI (47) or HSV (1). Among patients with incidental temperature abnormalities, 4 were treated for SBI/HSV, all of whom were hypothermic on presentation. For those with non-incidental hypothermia diagnosed with SBI, 2 had UTIs, 3 had bacteremia, and 1 had bacterial meningitis. Among infants with non-incidental hyperthermia, 26 were diagnosed with UTI, 12 with bacteremia, 2 with bacterial meningitis, and 1 with HSV. **Conclusion:** The 4 cases of incidental temperature abnormalities had laboratory findings that may have represented contaminants or false positives but were treated conservatively due to age and were unlikely to represent true pathogenic infections. The harms of routine temperature checks include vaccine deferrals, unnecessary antibiotics, and unnecessary imaging.

Session A

Corinne Smith

Neuroscience

Derepression of Transposable Elements in Mouse Prefrontal Cortex Disrupts Social Behavior

Background: Engaging in social behavior is essential for group-based organisms, but chronic stress can lead to changes in social functioning that significantly impact quality of life. Transposable elements (TEs) are mobile DNA segments implicated in the evolution of transcriptional networks through cis-regulatory activity and have been shown to be dysregulated in numerous human disorders. TE transcription is largely controlled by the KZFP family of transcription factors along with the repressive cofactor TRIM28. Using synthetic TRIM28 constructs to differentially control TE transcription, we observed behavioral and transcriptional consequences in unstressed and stressed mice.

Methods: Our lab developed three synthetic TRIM28 constructs—TRIM28 WT (wild-type), TRIM28 NFD (no functional domain), and TRIM28 VPR (synthetic activator domain VP64-p65-Rta)—which were delivered stereotaxically via HSV viral vector to the medial prefrontal cortex (mPFC) of female and male

C57BL/6J mice. Following viral delivery, we tested social behaviors in stress-naïve mice and performed RNA sequencing. We additionally tested social behaviors in mice that underwent chronic stress prior to viral manipulation.

Results: In stress-naïve mice, disrupting TRIM28 function with TRIM28 VPR or TRIM28 NFD caused nuanced deficits in social cognition, while overexpressing TRIM28 WT had no behavioral effect. These behavioral changes were accompanied by activation of TE transcripts and dysregulation of immune-related genes. In stressed mice, introducing TRIM28 WT did not reverse or prevent social dysfunction, though additional power is needed.

Conclusions: TRIM28-mediated repression of TEs is necessary for normal social behavior in stress-naïve mice, and its role in stress-induced social deficits warrants further investigation.

Session A

Dana Kneisley

Pharmacology & Toxicology

Allosteric effects of lynx1 on $\alpha 3\beta 4$ -nicotinic receptors are mediated by a unique subunit interface

Background: Smoking, maintained by nicotine-seeking behaviors, is the leading cause of preventable death worldwide. In the brain, nicotine acts on nicotinic acetylcholine receptors (nAChRs). The $\alpha 3\beta 4$ -nAChR suppresses somatic nicotine withdrawal by enhancing the activity of GABAergic neurons in the interpeduncular nucleus, which also express the prototoxin lynx1. Lynx1 allosterically diminishes $\alpha 3\beta 4$ -nAChR responses, suggesting that lynx1 may play a role in nicotine withdrawal, though the site of the lynx1/ $\alpha 3\beta 4$ -nAChR interaction is unknown. Hypothesis: Mutating lynx1 binding residues will produce $\alpha 3\beta 4$ -nAChRs less sensitive to lynx1 modulation.

Methods: To define the interactions through which lynx1 exerts its effects, molecular dynamics simulations were used to identify $\alpha 3\beta 4$ -nAChR residues where lynx1 may interact. Two-electrode voltage-clamp (TEVC) and cell-attached single-channel electrophysiology were used to assess how mutating the putative lynx1 binding site alters receptor function.

Results: All mutations diminished ACh-induced function in the absence of lynx1. Several mutations at the site indicated by molecular dynamics reduced the effects of lynx1 compared to wild-type receptors, supporting the hypothesis that lynx1 acts at this interface. Other mutants increased receptor sensitivity to lynx1. Single-channel recordings show that a mutant with apparently enhanced lynx1 potency—corresponding to a critical agonist-binding residue at the orthosteric site—exhibited less frequent bursting activity and shorter burst durations.

Conclusions: Some lynx1-interacting residues at the $\alpha 3/\alpha 3$ interface correspond to residues that bind agonist at $\beta 4/\alpha 3$ interfaces, suggesting a previously unknown lynx1 and ACh binding site at the $\alpha 3/\alpha 3$ interface. Understanding the lynx1–receptor interaction may provide a target for future smoking cessation therapies.

Session A

Daniel Drach

Pharmacology

Assessing Nicotinic Receptor Agonists for $\alpha 9$ Subtype Selectivity for Potential Application in Treatment of Chronic Inflammatory Pain

Background: Nicotinic receptors (nAChRs) are ionotropic receptors activated by the neurotransmitter acetylcholine (ACh). These receptors are expressed throughout the central nervous system as well as in non-neuronal tissues across the body. Previous research has shown that $\alpha 9^*$ nAChR antagonists produce analgesic effects mediated by $\alpha 9^*$ receptors expressed on immune cells. The goal of this project

was to discover agonists selective for $\alpha 9^*$ receptors to determine whether selective $\alpha 9$ -nAChR agonism produces similar or distinct outcomes.

Methods: Two-electrode voltage-clamp (TEVC) electrophysiology was used to assess activity of novel compounds, beginning with identification of those showing selective agonism for $\alpha 9$ over $\alpha 7$ -nAChRs. This comparison was prioritized because $\alpha 7$ -nAChRs are the most similar to $\alpha 9^*$ receptors in primary sequence and pharmacological profile, and minimizing off-target $\alpha 7$ activation is essential.

Results: Compounds GAT3544 and GAT3546 were identified as showing selective agonism for $\alpha 9^*$ over $\alpha 7$ -nAChRs.

Conclusions: We have identified agonists with selectivity for $\alpha 9^*$ over $\alpha 7$ -nAChRs. These compounds will be further evaluated for activity at additional off-target receptors, including $\alpha 6/3\beta 2\beta 3$ - and $\alpha 4\beta 2$ -nAChRs, due to their relevance to reward mechanisms. We will also test for activation of $\alpha 3\beta 4$ receptors because of their prominent role in autonomic nervous system function. Future collaborative experiments include assessing nociceptive properties using the paclitaxel CIPN mouse model with Dr. Damaj at VCU, as well as pharmacokinetic testing with Dr. Sharma at the University of Florida.

Session A

Gilbert Glago

Microbiology & Immunology

The Cytopathogenic Toxin A of *Sneathia vaginalis* Triggers ATP Release and Mitochondrial Damage in Epithelial Cells

Background: *Sneathia vaginalis* is a component of the vaginal microbiome and is clinically significant because of its strong association with adverse pregnancy outcomes, including preterm birth. The mechanisms by which it damages host tissues remain unclear. The only *S. vaginalis* virulence factor studied to date is the cytopathogenic toxin A (CptA), a secreted pore-forming toxin that induces membrane injury in human cells. In this study, we investigated the effects of *S. vaginalis* on mitochondrial integrity and function.

Methods: Human vaginal keratinocytes (VK2) were cultured in KSFM at 37°C and 5% CO₂. *S. vaginalis* strain SN35 and a *cptA* deletion mutant, SN35 Δ *cptA*::erm, were grown anaerobically in porcine BHI containing 10% fetal bovine serum and ciprofloxacin. VK2 monolayers were co-cultured with *S. vaginalis* or vehicle control. Extracellular ATP (eATP) release was quantified using a luciferin/luciferase assay, and metabolic activity was assessed using an MTT assay. To evaluate mitochondrial morphology, VK2 cells were co-cultured with SN35, SN35 Δ *cptA*::erm, or media for 30 minutes, fixed, stained, and analyzed by transmission electron microscopy (TEM). The Seahorse XF analyzer was used to measure oxygen consumption rate (OCR), extracellular acidification rate (ECAR), and ATP production rate.

Results: Wild-type SN35, but not SN35 Δ *cptA*::erm, induced ATP release from VK2 cells within 5 minutes, suggesting ATP may be released through CptA-formed pores. Pretreatment with ATP channel inhibitors did not block ATP release. VK2 cells exposed to SN35 showed decreased intracellular ATP, reduced NADPH-dependent oxidoreductase activity, and reduced OCR and ECAR. TEM revealed that mitochondria in SN35-treated VK2 cells were shorter and contained fewer cristae. Together, these findings indicate that CptA-producing *S. vaginalis* induces profound mitochondrial dysfunction.

Conclusion: *S. vaginalis* promotes epithelial injury by triggering rapid eATP release and causing structural and metabolic mitochondrial impairment in a CptA-dependent manner. These findings highlight opportunities to investigate eATP as a damage-associated molecular pattern (DAMP) contributing to inflammation during *Sneathia* infection.

Session A

Grant Thesing

Medicine

Acute-on-Chronic Valproic Acid Overdose: A Toxicology Simulation Case for Medical Students

Background: Valproic acid is an antiepileptic medication, and overdose is relatively common yet often underemphasized in medical curricula, resulting in a knowledge gap. Simulation-based education provides students with a structured environment to practice caring for patients. We created a simulated case of a patient presenting with valproic acid overdose.

Method: Fourth-year medical students participated in a quasi-experimental pretest–posttest study. Students first completed a pretest assessing baseline knowledge of valproic acid pharmacokinetics and pathophysiology. They then received a lecture on valproic acid and, in groups of 3–5, participated in a simulated clinical scenario involving a patient with valproic acid overdose. A critical actions checklist was used to evaluate performance. After the simulation, students received a structured debrief and then completed a posttest identical to the pretest to evaluate learning outcomes.

Results: Thirty students participated. Mean pretest and posttest scores were 54% and 98%, respectively, with a statistically significant improvement on a Wilcoxon signed-rank test (test statistic 0.0, $p < 1 \times 10^{-9}$). All groups completed the critical actions checklist within 15 minutes.

Conclusion: Valproic acid overdose is an underrepresented clinical presentation in many medical school curricula, and this simulation provides students with an opportunity to manage it in a controlled environment before encountering it clinically. Small variations in the simulated patient's presentation can further allow students to practice additional branches of the treatment algorithm, including L-carnitine administration, dialysis, or activated charcoal.

Session A

Hailey Feinzig and Lillian Nelson

Medicine

Patient Presents with Hypotension and Bradycardia: A Novel Triplet Oral Board Approach

Background: Mock oral examinations are underutilized in undergraduate medical education despite their potential to strengthen clinical reasoning. Although hypotension with bradycardia has a narrow differential, students may experience diagnostic tunnel vision. We evaluated whether a “triplet” oral board approach using three near-identical cases of hypotension and bradycardia improves medical students' ability to differentiate clinical presentations and initiate management.

Methods: Fourth-year medical students on a clinical toxicology rotation participated in this quasi-experimental pretest–posttest study. Students completed a baseline assessment of causes, diagnostics, and management of hypotension and bradycardia, followed by three oral board cases (third-degree heart block, hypothermia, and beta-blocker/calcium-channel blocker overdose). Learners were evaluated using case-specific critical action checklists and a structured debrief focused on comparative reasoning before completing a posttest.

Results: Twenty-four students completed the study. Mean scores increased from 69% (SD \pm 18.6%) on the pretest to 95% (SD \pm 7.6%) on the posttest. A Wilcoxon signed-rank test confirmed a statistically significant improvement ($W = 0.0$, $p < 0.00001$). Students demonstrated marked improvement in identifying and differentiating clinical features and executing critical actions across the three scenarios.

Conclusion: Presenting subtly varied versions of the same clinical presentation is a feasible and effective strategy to strengthen diagnostic reasoning. This reproducible triplet-case model has been successfully integrated into our curriculum and, while best suited for small groups, can be adapted to include clinical presentations relevant to various fields of medicine.

Session A

James Martin

Physiology & Biophysics

The Small Molecule ML290 is an RXFP1 Agonist Protective Against Hypertension and Doxorubicin-Induced Cardiac Dysfunction

Background: Doxorubicin (DOX) is a widely used chemotherapeutic that causes dose-dependent cardiotoxicity (doxorubicin-related cardiotoxicity; DRC) driven by oxidative stress–induced mitochondrial dysfunction and inflammation. The RXFP1 receptor was first identified for its role in the hemodynamic changes of pregnancy, where it mediates cardiac remodeling without pathological effects. Serum levels of Relaxin-2, the cognate peptide hormone of RXFP1, predict risk of postpartum cardiomyopathy, and RXFP1 activation by endogenous or synthetic agonists exerts multiple cardioprotective actions. Current heart failure therapies are ineffective for DRC, but RXFP1 agonists may offer a promising alternative. We hypothesize that the RXFP1 agonist ML290 mitigates DOX-induced cardiomyocyte injury.

Methods: Mice humanized for the RXFP1 receptor underwent baseline echocardiography and blood pressure measurements before receiving angiotensin II or saline osmotic pumps, doxorubicin or control, and ML290 or control. Cardiac function was monitored weekly, and cardiac tissue was analyzed for fibrosis and inflammation at the end of the 28-day study.

Results: ML290 prevented the decline in left ventricular ejection fraction induced by angiotensin II and by combined angiotensin II + DOX treatment without significantly lowering blood pressure. ML290 also substantially reduced indices of adverse remodeling, including cell death assessed by TUNEL and fibrosis measured by picrosirius red and periostin staining.

Conclusions: These findings suggest that ML290 greatly reduces cardiac dysfunction induced by hypertension and exacerbated by DOX, likely through potent anti-fibrotic effects, highlighting RXFP1 as a potential therapeutic target for DRC. Given the limited effective treatment options, RXFP1 agonism may represent a promising direction for future clinical investigation.

Session B 12:30 pm – 2:00 pm

Session B

Jessica Maltman

Neuroscience

mGluR2's Role in Psychedelic Neural and Behavioral Plasticity

Background: With psychedelics emerging as potential therapeutics for a range of mental health conditions, it is essential to understand the mechanisms underlying their hallucinogenic, behavioral, and neuroplastic effects. While 5-HT_{2A} receptor agonism is necessary for the hallucinogenic effects of classical psychedelics, additional receptors may contribute to their post-acute “therapeutic” effects. The metabotropic glutamate receptor 2 (mGluR2) is an under-researched mediator of psychedelic signaling that is required for hallucinogenic responses and forms heteromers with the 5-HT_{2A} receptor in frontal cortex pyramidal neurons (FCPNs). Our goal is to determine mGluR2’s role in the therapeutic-like effects of the highly 5-HT_{2A}-specific psychedelic 2,5-dimethoxy-4-iodoamphetamine (DOI) in a fear-extinction model and in neuroplastic changes 24 hours after treatment.

Methods: Male and female wild-type (WT), global mGluR2 knockout (KO), and pyramidal-neuron conditional mGluR2 KO (cKO) mice—with and without DOI treatment—underwent head-twitch response

(HTR) testing, open-field testing (OFT), fear acquisition and extinction, and HSV-GFP labeling to measure dendritic spine plasticity in FCPNs.

Results: We observed several drug, sex, and genotype effects across HTR, OFT, fear extinction, and dendritic spine density, indicating that mGluR2 contributes differentially to psychedelic effects across sexes.

Conclusions: These data support previous findings that mGluR2 is necessary for the HTR and provide new evidence that it plays an important role in the therapeutic-like effects of DOI in males, whereas females show limited improvement from DOI.

Session B

Justin Dalton

Human Genetics

Investigating the Effect of Contrasting Dystrophin Isoforms on Disease Progression in Becker Muscular Dystrophy

Background: Dystrophin is a protein that functions as a molecular spring to protect the sarcolemma during muscular contraction. Becker muscular dystrophy (BMD) is a neuromuscular disorder resulting from mutations in dystrophin that preserve the reading frame. Contrasting BMD mutations present with differing disease severity and symptom onset. Patients carrying deletions spanning exon 45–47 ($\Delta 45-47$) develop wheelchair dependency and cardiomyopathy roughly 10 years earlier than those with deletions spanning exon 45–48 ($\Delta 45-48$). To investigate this mechanism, two mouse lines carrying these mutations were generated: bmx ($\Delta 45-47$) and b48 ($\Delta 45-48$). We hypothesize that structural differences between the spectrin-type repeat domains of these dystrophin isoforms drive variable BMD severity.

Methods: At 3 months, muscle function was assessed by grip strength in WT (C57BL/6J), bmx, and b48 mice. At ~10 months, EKG data were collected at baseline and following 3.0 mg/kg isoproterenol injection, and mice were evaluated for atrial arrhythmia and basic conduction differences (PR interval, heart rate, etc.). To observe pathophysiology, skeletal muscle was collected from a cohort of ~4-month-old mice, and tissue quality and dystrophin levels were assessed via H&E staining, immunofluorescence, and JESS capillary western immunoassay.

Results: Ten-month-old bmx mice exhibited significantly higher baseline atrial arrhythmia compared to b48 and WT, as well as a paradoxical PR-interval increase following isoproterenol administration. Dystrophin levels were not significantly different between bmx and b48. b48 mice displayed significantly greater grip strength than bmx.

Conclusions: bmx and b48 mice demonstrate significantly different musculoskeletal and cardiac progression despite similar dystrophin levels, suggesting that dystrophin isoform quality is a major determinant of disease severity.

Session B

Krithika Senthil and Caelan Nzamba

Medicine

Acute-On-Chronic Carbamazepine Overdose: A Toxicology Simulation Case for Fourth-Year Medical Students

Background: Carbamazepine overdose, though relatively common, is overshadowed by other overdoses in medical curricula. To address this knowledge gap, we created a simulated case of a patient presenting with acute-on-chronic carbamazepine overdose coupled with a didactic lecture. This study aimed to examine whether medical students could effectively learn key management steps and the pathophysiology of carbamazepine overdose through a novel simulation.

Methods: This quasi-experimental pretest–posttest study included fourth-year medical students enrolled in a toxicology course. Students completed a pretest on carbamazepine, received a lecture, and then participated in a simulated carbamazepine overdose case. In the simulation, students evaluated a realistic manikin patient, performed a toxicological history and neurologic exam, and engaged in a structured debrief reviewing clinical presentations and multiple treatment pathways. Students were evaluated using a critical actions checklist and a posttest.

Results: Sixty-seven students participated; mean pretest and posttest scores were 71% and 98%, respectively. A Wilcoxon signed-rank test demonstrated a statistically significant increase in scores (test statistic: 0.0, $p < 0.0001$). All simulation groups completed the critical actions checklist within 15 minutes or less.

Conclusion: This simulation provided students with a realistic, structured environment to learn carbamazepine toxicity. Our findings demonstrate that student knowledge of carbamazepine pharmacology and overdose management can be significantly improved through simulation-based education.

Session B

Lanie Mullins

Human & Molecular Genetics

Lifetime and Recent Major Depression Are Associated with Changes in Adaptive Immune System Markers in Older Adults

Background: The monocyte-to-lymphocyte ratio (MLR) and neutrophil-to-lymphocyte ratio (NLR) are peripheral biomarkers indexing the relative balance of the innate and adaptive immune systems. Both MLR and NLR have been reported to be associated with a recent major depressive episode (MDE) in young adults. Here, we sought to examine these associations in an older population.

Methods: Logistic regression was used to test whether MLR or NLR predicted lifetime history of major depression (MD) or recent MDE in the UK Biobank, adjusting for sex, date of blood draw, genetic principal components, age at first MDE, and other relevant covariates. Participants were included if they had valid measures of MDE history, MLR, and NLR and no record of blood or blood-forming organ disorders. This research was conducted using the UK Biobank Resource under application ID 30782.

Results: Among 101,912 eligible participants, 18,784 (18.4%) reported an MDE within the prior 6 months. Higher NLR was significantly associated with increased odds of lifetime MD and recent MDE, while MLR was significantly associated with lifetime MD. In sensitivity analyses limited to individuals with lifetime MD, both NLR and MLR were associated with recent MDE.

Conclusions: The association between NLR and recent MDE in this population-based cohort of middle- and older-aged adults replicates previous findings in young adults. These consistent results across distinct sociodemographic contexts strengthen evidence for pro-inflammatory immune dysfunction co-occurring with or following MDEs. To our knowledge, this is the largest study to date supporting this hypothesis.

Session B

Lauren Leung

Medicine

Same Presentation, Different Diagnosis: Using Parallel Mock Oral Examinations to Teach the Differential Diagnosis of Galactorrhea

Background: Mock oral examinations are an underutilized educational tool in medical training, often relying on specialty-specific scenarios. Galactorrhea, though frequently associated with obstetrics and

gynecology, presents a broad differential that includes endocrine, oncologic, and iatrogenic causes, making it highly relevant to internal medicine. Despite this, it is often overlooked or prematurely referred to subspecialists. To enhance diagnostic reasoning and interdisciplinary thinking among internal medicine trainees, we developed a series of three nearly identical mock oral board cases centered on galactorrhea to evaluate their effectiveness in improving medical knowledge.

Methods: We conducted a quasi-experimental pretest–posttest study. Participants completed a pretest and then engaged in three oral board-style cases featuring a 26-year-old patient with galactorrhea, each with subtle variations in history and findings leading to distinct diagnoses and management strategies: hypothyroidism, prolactinoma, and medication side effects. Learners then received a structured debrief and completed a posttest.

Results: Fourteen medical students and residents participated in the pilot implementation. Mean pretest and posttest scores were 49% and 98%, respectively, and a Wilcoxon signed-rank test demonstrated a statistically significant difference ($W = 0$, $p < 0.001$).

Conclusion: Traditional oral board cases can be enhanced by presenting multiple cases with subtle variations to prevent diagnostic tunnel vision, particularly when paired with structured debriefing. This innovation demonstrates that triplet oral boards are a feasible and effective method to strengthen diagnostic reasoning in medical trainees. Based on these findings, this teaching methodology has been incorporated into the medical education curriculum.

Session B

Mariana Fernandes Gragnani

Medicine

Same Overdose, Different Management: A Novel Approach to Teaching Acetaminophen Overdose

Background: Acetaminophen (APAP) is a commonly used over-the-counter medication. APAP overdose is prevalent, accounting for approximately 56,000 emergency department visits annually, and is the leading cause of acute liver failure in the United States. Overdose is treated with N-acetylcysteine (NAC), and for decades its dosage was determined based on patient weight rather than the amount ingested. In 2021, clinical guidelines introduced high-dose NAC for cases involving massive acetaminophen ingestion. We aim to provide a simulation-based learning tool for medical students on massive APAP overdose.

Methods: We conducted a quasi-experimental pretest–posttest study. Fourth-year medical students completed a pretest on APAP, attended a lecture, and then participated in three simulated APAP overdose cases varying in timing and magnitude. Students performed a focused toxicological history and physical examination and administered NAC in regular or high doses as appropriate. Variations in clinical presentation allowed practice with the treatment algorithm, including oral NAC or adjunctive fomepizole. The primary outcome was posttest performance.

Results: Sixty-one students participated; mean pretest and posttest scores were 56.84% and 89.40%, respectively. A Wilcoxon signed-rank test demonstrated a statistically significant improvement (test statistic 7.0, $p < 0.0001$).

Conclusion: Updates to clinical guidelines may complicate decision-making in APAP overdose management. Simulation provides an opportunity to practice applying these guidelines in a controlled setting before encountering such cases clinically. Variations in APAP overdose scenarios strengthen diagnostic and management skills in accordance with updated recommendations.

Session B

Megan Liebig

Biochemistry

Liver Zone-Specific Expression of Spinster Homolog 2 in Hepatocytes

Background: Sphingosine-1-phosphate (S1P) is a bioactive sphingolipid metabolite with critical roles in the development of metabolic disease and cancer. Spinster Homolog 2 (Spns2) is an S1P exporter, and its expression has been significantly associated with poor survival in patients with hepatocellular carcinoma. However, Spns2 expression within the liver—an organ characterized by zone-specific hepatocyte populations with distinct metabolic functions—remains unknown.

Methods: To determine the spatial and relative expression of Spns2, we used immunofluorescence and immunohistochemical staining as well as single-cell RNA sequencing data. Fluorescence-activated cell sorting was used to separate hepatocytes into periportal and pericentral zone populations, which were then analyzed for Spns2 expression. Additionally, male and female mice fed chow or Western diet were examined for effects on liver zonal markers and Spns2 expression.

Results: Spns2 protein expression was significantly higher in periportal hepatocytes compared to pericentral hepatocytes, consistent with higher periportal Spns2 mRNA levels. Western diet feeding disrupted liver zonation and decreased Spns2 protein levels, mirroring reductions in the periportal zone marker E-cadherin.

Conclusions: Hepatocyte Spns2 exhibits strong zone-specific expression in the periportal region of the liver, and Western diet disrupts liver zonation and reduces Spns2 expression. These findings suggest an important role for Spns2, a major S1P exporter, in zone-specific metabolic functions.

Session B

Meredith Christian

Medicine

Same Presentation, Different Diagnoses: A Novel Approach to Teaching Postpartum Headache

Background: Mock oral board examinations are underutilized in medical education despite offering learners opportunities to apply clinical reasoning outside direct patient care. Traditional case formats typically include unrelated scenarios; however, we developed three nearly identical oral board cases centered on postpartum headache to illustrate how subtle differences in presentation lead to distinct diagnostic pathways and management strategies. This curriculum was incorporated into the third-year Obstetrics and Gynecology (OBGYN) clerkship at Virginia Commonwealth University School of Medicine (VCUSOM) to provide a structured approach to teaching diagnostic reasoning.

Methods: We conducted a quasi-experimental pretest–posttest study. Students completed a pretest and then participated in three oral board–style cases involving a patient with postpartum headache, each differing subtly in key clinical findings. Performance was evaluated using a critical actions checklist assessing diagnostic reasoning and management steps, including neurologic examination, diagnostic testing, and initiation of treatment. After a facilitated debrief, students completed a posttest and a Likert-scale survey assessing confidence in evaluating postpartum headache.

Results: Seventeen students participated. Mean pretest and posttest scores were 52.35% (SD 20.33) and 88.82% (SD 10.48), respectively. A Wilcoxon signed-rank test demonstrated a statistically significant improvement ($W = 194.5$, $p < 0.0001$). Learners also reported increased confidence in history-taking, physical examination, diagnostic evaluation, and management of postpartum headache.

Conclusions: Subtly varied oral board cases enhance diagnostic reasoning and learner confidence. This approach has been integrated into the VCUSOM OBGYN clerkship, with plans to expand to additional clinical scenarios requiring nuanced diagnostic differentiation.

Session B

D. Michael Mann

Microbiology & Immunology

Model-Dependent Variations in Tumor Growth and Immune Infiltration in Preclinical Brain Metastasis

Background: Brain metastasis, a life-threatening condition with limited treatment options, affects 10–20% of cancer patients worldwide. Its poor characterization is partly due to the challenges of experimentally modeling the metastatic cascade. Although emerging immunotherapies show promise, translating them into effective treatments requires a detailed understanding of metastatic tumor growth and immune cell infiltration in preclinical models. Thus, we compared three commonly used metastatic models— intracardiac, intracarotid, and intracranial injection—to assess their differential effects on tumor growth kinetics and immune recruitment.

Methods: A total of 105 mice were each injected with 60,000 luciferase-labeled, brain-tropic EO771 breast cancer cells via intracardiac, intracarotid, or intracranial injection; an additional twenty mice received intracranial vehicle control. Tumor burden was measured regularly via bioluminescence imaging. Mice were sacrificed at predetermined low- or high-burden conditions, and dissociated tumors were analyzed by spectral flow cytometry for immunophenotyping.

Results: Tumor growth rate was highest following intracranial injection, with intracarotid and intracardiac injections producing slower-growing metastases. Overall immune infiltration was significantly higher in the intracranial group—including vehicle controls—compared to either the intracardiac or intracarotid groups.

Conclusions: Intracarotid and intracardiac injection methods generate brain metastases that differ slightly in growth kinetics but are similar in immune recruitment. In contrast, the elevated immune infiltration observed in intracranially injected mice appears to reflect injury-induced inflammation rather than tumor-specific immune responses. Therefore, intracranial injection has limited value for studying immunity in brain metastasis. Extramural Funding: This research was partially supported by Metavivor (P.D.B.), Susan G. Komen Career Catalyst Grant CCR18548205 (P.D.B.), V Foundation Scholar Grant V2018-022 (P.D.B.), and R37CA269249 MERIT Award from the NCI (P.D.B.). Utilization of Massey Support Shared Resources: Cancer Mouse Models Shared Resource, Flow Cytometry Shared Resource.

Session B

Parth Naik

Microbiology & Immunology

Identifying the Importance of Iron in Dendritic Cell Induction of Follicular Helper T Cell Subsets in Allergy

Background: Twenty-two percent of patients are sensitized to mold, with most recognizing *Alternaria alternata*. Dendritic cells (DCs) serve as crucial bridges between the innate and adaptive immune systems by capturing, processing, and presenting antigens to T cells. Conventional type 2 dendritic cells (cDC2s) present antigen on MHC II to CD4⁺ T cells and influence their differentiation. Follicular helper T cells (T_{fh}) are a specialized subset of CD4⁺ T cells essential for supporting antibody-producing B cells. Tfr1 (CD71), the transferrin receptor, is a cell-surface glycoprotein involved in iron uptake.

Methods: Bone marrow–derived dendritic cells (BMDCs) were cultured in FLT3L to skew differentiation toward dendritic cells. After nine days, DCs were exposed to allergens and processed four hours later for flow cytometry. Mice were administered intranasal allergen following drug treatment; on day eight, lymphadenectomy was performed, cells were processed for flow cytometry, and data were analyzed using FlowJo. Statistical analyses were conducted using ordinary one-way ANOVA.

Results: A novel subset of CD71^{hi} cDC2s was identified. Ferristatin II and Deferiprone decreased T_{fh}13 induction, while effector T-cell frequency remained unchanged.

Conclusion: We identified a specific subset of CD71^{hi} cDC2s that likely influences follicular helper T-cell responses and thereby modulates B-cell antibody production.

Session B

Rebecca Doan et al.

Medicine

Swollen Limb: A Toxicology Simulation Case for Medical Students and Residents

Background: Unilateral limb swelling is a frequent emergency department presentation. Medical students are often proficient at recognizing common causes such as deep venous thrombosis, fracture, and cellulitis; however, rare, high-acuity etiologies such as exotic snake envenomation may be under-recognized due to limited clinical exposure. This innovation addressed gaps in trainee preparedness for rare toxicologic emergencies by using simulation to teach evaluation and management of an undifferentiated unilateral swollen limb secondary to exotic snake envenomation.

Methods: Fourth-year medical students and residents on a clinical toxicology rotation participated in a quasi-experimental pretest–posttest study. Learners completed a pretest assessing knowledge of unilateral limb swelling etiologies, then engaged in a group simulation featuring a patient with altered mental status and unilateral leg swelling. Participants were evaluated on stabilizing the patient, developing a differential diagnosis, identifying envenomation by the exotic snake *Oxyuranus microlepidotus*, and acquiring the appropriate antivenom. A structured debrief followed, and learners completed a posttest and a Likert-scale questionnaire assessing their learning experience.

Results: Nineteen students participated; mean pretest and posttest scores were 79.7% (SD 14.55) and 99.5% (SD 2.09), respectively. A Wilcoxon signed-rank test demonstrated a statistically significant increase in scores (test statistic 0.0, $p = 0.00028$).

Conclusions: Simulation-based training provides a structured environment to develop essential clinical skills, yet gaps remain in preparing learners for rare, high-risk toxicologic emergencies. By exposing trainees to life-threatening conditions such as exotic snake envenomation, this simulation enhanced critical thinking, broadened diagnostic frameworks, and strengthened clinical preparedness.

Session B

Rebecca Eshtiaghpour & Tyler Hyun

Medicine

Understanding Patient Needs and Language Preferences for Whole-Health Focused Care

Background: Health is shaped by mental, physical, socioeconomic, and public health factors, yet the U.S. healthcare system treats these domains separately, often missing what matters most to patients and resulting in fragmented care that may not meet their needs. Our goal is to better understand patient needs and language preferences to provide more holistic primary care.

Methods: We conducted a voluntary and anonymous online survey of a national sample of 1,579 primary care patients. The survey took 7–9 minutes to complete. Codes were developed using grounded theory and applied in a template-based approach, with coding frequencies identified using descriptive statistics. The study focused on two open-ended questions: one asking what motivates people to seek healthcare, and the other asking participants to describe a time when their provider made them feel truly cared for and to explain how and why.

Results: When respondents were asked what motivated them to seek help, the most striking responses were the relationship with the care team (7%), inability to solve issues alone (7%), and severity of symptoms (6%). When asked what made them feel cared for, the most prominent themes were empathy (31%), engagement (24%), personal questions (11%), remembering their history (4%), and a personal relationship (4%).

Conclusion: Patients prefer care from clinicians with whom they have longstanding, trusting relationships. Kindness, emotional connection, and a sense of the clinician's investment in their wellbeing motivate care-seeking and help patients feel known beyond their chart. Clinicians can foster connection by asking personal questions and avoiding obvious reliance on scripts or checklists.

Session B

Rishi Raghavan

Medicine

Simulation-Based Education for Stevens-Johnson Syndrome Recognition and Management

Background: Stevens-Johnson Syndrome (SJS) is a rare, life-threatening mucocutaneous emergency with an incidence of approximately 1–6 cases per million person-years. Medical students rarely encounter SJS during training, creating significant preparedness gaps. Simulation-based medical education (SBME) has demonstrated effectiveness for teaching rare, high-acuity conditions, yet published interventions for SJS remain limited. This innovation addresses this gap through a structured simulation-based curriculum.

Methods: We implemented a 90-minute SJS simulation for fourth-year medical students on a clinical toxicology rotation. The session included a baseline assessment, a standardized patient encounter focused on lamotrigine-induced SJS, and a structured debrief using advocacy-inquiry techniques. Performance was measured using critical action checklists and post-simulation learner questionnaires.

Results: Forty-eight students participated with no exclusions. Mean pretest scores of 64.66% (SD 22.10) increased to 99.22% (SD 3.93) post-intervention (Wilcoxon signed-rank test statistic = 0.0, $p < 0.000001$). Critical action checklists showed universal identification of causative medication discontinuation and initiation of supportive care following debrief. Post-simulation questionnaires revealed high satisfaction and increased confidence in managing future SJS cases.

Conclusion: This simulation-based innovation effectively improved student knowledge of SJS through safe, controlled practice. Scalability is limited by a small, single-institution sample and resource-intensive facilitation, and the curriculum lacks data on long-term retention or clinical transfer. Future research should explore multi-institutional implementation and incorporation of Toxic Epidermal Necrolysis (TEN) to broaden clinical relevance. Overall, SBME is a feasible and effective strategy for training students in rare dermatologic emergencies when resources permit.

Session B

Shelbey Strandberg

Neuroscience

Cocaine induces differential regulation of 'jumping genes' across the mouse brain

Background: Transposable elements (TEs) are genetic elements that comprise about half of the mammalian genome and are commonly called 'jumping genes' for their ability to be transcribed and re-integrated elsewhere in the genome. This process, termed transposition, can cause permanent damage to protein coding and regulatory regions of the genome. Increasing appreciation has accumulated for cocaine altering brain TE transcript expression, but the exact time-course, brain region specificity, and transposition capacity of affected TEs remains under-explored. Creation of a cocaine induced TE transcript time-course will reveal time points when the brain is most vulnerable to TE effects and inform future studies.

Methods: We found studies sequencing the NAc, DS, and PFC from brains of cocaine exposed mice (IVSA by Walker et al. 2018; investigator injected by Mukhrejee et al. 2021). Using the Python package Tetranscripts, we aligned the datasets to the reference genome mm39 and used an adjusted p value cutoff of <0.05 to determine differential TE expression.

Results: Across the brain regions, we see time- and dose- dependent changes in TE transcripts. Surprisingly, despite involvement in reward/addiction, each region has unique TE responses. We see that the NAc is predominantly downregulated whereas the DS is primarily upregulated, and the PFC has administration dependent regulation.

Conclusion: TEs, a portion of which retain transposition competency, experience complex and variable regulation follow cocaine exposure. These insights may add an additional dimension of the brain molecular mechanisms involved in cocaine use disorder.

Session B

Srushti Desai et al.

Medicine

Same Presentation, Different Diagnosis: A Novel Teaching Approach to Non-Sudden Onset Paralysis

Background: Rapidly progressive, non-sudden onset paralysis is diagnostically challenging for learners because conditions can present similarly yet require different diagnostic approaches and treatments. Mock oral boards are an underutilized learning strategy and often include single or unrelated cases. We developed a novel educational innovation using three nearly identical oral board–style cases centered on non-sudden onset paralysis for medical students and residents.

Methods: Learners first completed a pretest related to non-sudden onset paralysis, then worked through three oral board–style cases with subtle differences in history and presentation corresponding to diagnoses of Guillain-Barré syndrome, botulinum toxicity, and familial hypokalemic periodic paralysis. Facilitators then led a structured debrief, after which participants completed an identical posttest. A Wilcoxon signed-rank test was applied to analyze score changes.

Results: Data collection is ongoing; to date, 24 learners have participated. Mean pretest and posttest scores were 69% and 98%, respectively. Wilcoxon signed-rank test analysis demonstrated a statistically significant improvement in knowledge following the intervention ($W = 0, p < 0.000001$).

Conclusion: This educational innovation demonstrates that modifying traditional oral board examinations to include multiple, subtly varied cases centered on a single chief complaint is a feasible and effective strategy to strengthen diagnostic reasoning and medical knowledge. Strengths of this approach include reproducibility, enhanced clinical reasoning, and significant improvement in learner performance. Limitations include a small sample size and substantial time requirements. Based on positive outcomes, this triplet oral board methodology has been incorporated into the medical education curriculum and expanded to additional clinical presentations.

Session B

Steven Meas

Medicine

Biparametric vs Multiparametric MRI for Prostate Cancer: Correlation with Pathological Results from Imaging Guided Prostate Biopsies

Purpose: Dynamic contrast-enhanced (DCE) prostate MRI has played an important role in detecting clinically significant prostate cancer (csPCa). However, recent studies suggest that biparametric MRI (bpMRI) may be noninferior to multiparametric MRI (mpMRI) for detecting prostate cancer while reducing scan time and improving imaging efficiency. The purpose of this study was to evaluate whether bpMRI

demonstrates comparable diagnostic performance to mpMRI for detecting csPCa within our clinical setting at Virginia Commonwealth University.

Methods: This retrospective study included 43 patients who underwent imaging-guided prostate biopsies between August 2022 and December 2023. All patients had prior prostate mpMRI with at least one PI-RADS ≥ 3 lesion according to PI-RADS v2 criteria. bpMRI assessment was performed in March 2026 by an experienced genitourinary radiologist using the same diagnostic criteria but excluding DCE sequences. The radiologist was blinded to original reports and biopsy results. Clinically significant PCa was defined as Gleason score ≥ 7 . Interpretation results were correlated with biopsy findings on a lesion-by-lesion basis, and diagnostic performance metrics were compared using the exact McNemar test.

Results: Using bpMRI (without DCE), the radiologist correctly identified csPCa lesions in 33 of 43 patients, whereas original mpMRI interpretations (with DCE) detected csPCa in 41 of 43 patients. Thus, bpMRI demonstrated lower performance, missing 10 lesions in 9 of 43 cases (21%), compared with mpMRI ($p = 0.0039$).

Conclusion: bpMRI demonstrated inferior diagnostic performance compared with mpMRI for detecting csPCa. These findings suggest that removal of DCE sequences reduces sensitivity in prostate MRI and may limit accurate diagnosis of clinically significant disease.

Session B

Jen Wang

Medicine

Same Presentation, Different Diagnosis: A Novel Approach to Teaching Non-Forehead Sparing Facial Droop

Background: Mock oral examinations are an underutilized educational strategy in undergraduate and graduate medical education despite evidence that case-based assessment enhances diagnostic reasoning and clinical confidence. Traditional case formats often involve isolated or unrelated scenarios, limiting learners' ability to distinguish diagnoses with overlapping presentations. Because non-forehead sparing facial droop requires careful diagnostic discrimination, we developed three nearly identical mock oral board-style cases to promote diagnostic reasoning, neurologic examination skills, teamwork, and oral presentation skills.

Methods: In a quasi-experimental pretest-posttest intervention, thirteen medical students and residents completed a knowledge-based pretest assessing differential diagnosis, neurologic localization, diagnostic evaluation, and management of facial droop. Groups of 3–5 learners then completed three sequential oral board-style cases presenting with near-identical non-forehead sparing facial droop, with subtle variations in history and exam findings leading to diagnoses of Lyme disease, Bell's palsy, or Ramsay Hunt syndrome. Following a structured facilitator-led debrief, participants completed an identical posttest and a Likert-scale questionnaire assessing Kirkpatrick Levels 1–3.

Results: Mean pretest scores were 52%, compared to 98% on the posttest. A Wilcoxon signed-rank test demonstrated a statistically significant improvement in knowledge following the intervention ($W = 0, p < 0.001$).

Conclusion: This innovation demonstrates that modifying traditional oral board cases to include multiple, subtly varied presentations is a feasible and effective method to enhance diagnostic reasoning, neurologic examination, and learner confidence. Strengths include reproducibility, adaptability, and strong learner engagement, while limitations include small-group learning and limited generalizability to other fields. Future directions include larger-scale implementation and assessment of objective behavior change in clinical settings.

Session B

Yusrat Ahsanullah

Pre-Medical Graduate Health Sciences

Multi-omic Analysis to Characterize *Sneathia vaginalis*-Mediated Damage to Amnion

Background: Preterm birth (PTB) affects approximately 15 million pregnancies annually and remains the leading cause of neonatal morbidity and mortality worldwide. Spontaneous preterm premature rupture of membranes (PPROM) accounts for ~40% of spontaneous PTB and results from premature weakening of fetal membranes, particularly the amnion. *Sneathia vaginalis* (Sv), a Gram-negative anaerobe in the vaginal microbiome, has been strongly associated with PPRM and PTB. Prior work demonstrated that Sv can traverse and damage fetal membranes and produces a pore-forming cytotoxin, cytopathogenic toxin A (CptA), implicated in epithelial injury. Because Sv lacks genes for fatty acid synthesis, it may rely on host cell damage to liberate essential nutrients.

Methods: We will perform a multi-omic analysis to characterize Sv-mediated damage to amnion. Human vaginal and amniotic epithelial monolayers, as well as intact amnion tissue, will be challenged with wild-type Sv or a *cptA* deletion mutant. Spent culture media will be analyzed using proteomics, lipidomics, and targeted metabolomics. Mass spectrometry will identify proteins released from amnion following bacterial challenge, with particular focus on extracellular matrix degradation products.

Results: We expect wild-type Sv to induce greater epithelial damage and release of extracellular matrix peptides, fatty acids, and metabolites compared with the *cptA* mutant, indicating that CptA facilitates host nutrient liberation and tissue degradation.

Conclusions: This study will define molecular signatures of Sv-induced amnion damage and clarify the role of CptA in host cell injury and nutrient acquisition. These findings will provide foundational insight into mechanisms linking vaginal microbes to PPRM and spontaneous PTB.

School of Dentistry

Session B 12:30 pm – 2:00 pm

Session B

Maria Colon

Infection and Immunology

Histone Deacetylase 6 Restrains Antitumor Immunity and Enhances Cancer Stemness in Oral Cancer

Background: Tumor immune responses and cancer stemness are critical determinants of oral squamous cell carcinoma (OSCC) progression. Histone deacetylase 6 (HDAC6) is a cytoplasmic deacetylase that modifies non-histone substrates, influencing cytoskeletal dynamics, trafficking, proliferation, and survival. This study examines how HDAC6 regulates antitumor immunity and cancer stemness in OSCC using cultured cells and syngeneic mouse models.

Methods: Immunofluorescence of lymph nodes from wild-type and HDAC6 knockout (KO) mice was used to assess immune profiles and checkpoint expression. Bulk RNA-sequencing data from murine hematopoietic stem and progenitor cells were reanalyzed to identify HDAC6-dependent pathways related to antigen presentation, IFN γ responses, and myeloid fate. Tumor growth and stemness were evaluated using global HDAC inhibition, HDAC6 knockdown, and HDAC6 KO mice, combined with Western blot, qPCR, sphere-formation assays, and orthotopic OSCC models. Luciferase-tagged tumors were monitored by IVIS imaging.

Results: HDAC6 deletion increased PD-L1 expression in CD20 $^+$ B cells rather than CD11c $^+$ dendritic cells, preserved or enhanced granzyme B (GZB) $^+$ cytotoxic populations, and reduced FoxP3 $^+$ regulatory T cells, indicating immune microenvironment reprogramming. GZB co-localized with CD11b $^+$ macrophages rather than CD8 $^+$ T cells. HDAC6 KO significantly slowed oral tumor growth. RNA-sequencing analysis revealed enrichment of antigen-processing, cytotoxic, and IFN γ -responsive programs consistent with antigen-presenting and dendritic-like myeloid states. HDAC6 inhibition also reduced stemness-associated gene expression and sphere-forming capacity.

Conclusions: HDAC6 functions as a molecular rheostat that restrains antitumor immunity while promoting cancer stemness in OSCC. Targeting HDAC6 reprograms the immune microenvironment and diminishes stem-like properties, supporting HDAC6 as a promising therapeutic target in OSCC.

Session B

Yanli Xing

Oral Health Research

Ateganosine Sensitizes Anti-PD1 Therapy Across Diverse HNSCC Models

Background: Telomerase is an intriguing cancer target, as cancers require expanded telomeres to survive and avoid senescence. Ateganosine (6-thio-dG) is a modified guanosine analog and first-in-class telomerase-targeting drug advancing through clinical trials in NSCLC and SCLC as an effective sensitizer to anti-PD1 therapy. Head and neck squamous cell carcinoma (HNSCC) is the sixth most common cancer worldwide, and although anti-PD1 therapy has emerged as a promising standard of care in locally advanced disease, intrinsic resistance limits response rates. There is an urgent need for effective sensitizing strategies to broaden the patient population and deepen responses to anti-PD1 therapy. We hypothesize that ateganosine acts as a novel immune-activating agent in HNSCC, enhancing response to anti-PD1 therapy. Objective: Evaluate the efficacy of ateganosine and anti-PD1 combination therapy across diverse HNSCC models and apply a proprietary multiomics tumor microenvironment (TME) pipeline to characterize this combination.

Methods: In vitro assays assessed cell viability, qubit dsDNA assays quantified released dsDNA, and immunoblots evaluated molecular responses. In vivo efficacy was tested using mEERL (HPV⁺) and 4-NQO-induced oral cancer (602; HPV⁻) mouse models.

Results: Our data demonstrate that (1) ateganosine effectively limits HNSCC growth in vitro, though responses vary in HPV⁻ HNSCC; (2) ateganosine induces time-dependent DNA damage and subsequent release of dsDNA into the media; and (3) ateganosine sensitizes tumors to anti-PD1 therapy across multiple HNSCC mouse models. **Conclusion:** Ateganosine is efficacious as an anti-PD1 antibody sensitizer. The mechanism likely involves release of dsDNA from HNSCC tumors, activating cGAS/STING signaling in cells of the TME. Ongoing studies include spatial multiomics profiling to identify the immune cell populations and mechanisms activated by ateganosine.

Session A

Aimalohi Okpeku

Pharmaceutical Sciences

Neuropsychiatric Outcomes Associated with PI- vs. INSTI-Based Regimens in People with HIV: A Propensity-Matched Cohort Study

Background: Neuropsychiatric adverse events (NPS) are of particular concern as people living with HIV (PLWH) age, given longer antiretroviral therapy (ART) exposure and increasing comorbidities. This study explores differences in NPS risk between protease inhibitor (PI)-based and integrase strand transfer inhibitor (INSTI)-based ART regimens.

Methods: Using the TriNetX Research Platform, we conducted a retrospective cohort study of HIV patients ≥ 18 years prescribed PI-based versus INSTI-based regimens from January 2015 to December 2022. Patients with pre-existing NPS were excluded. Propensity score matching addressed confounding factors, and Kaplan–Meier analysis evaluated anxiety, depression, and cognitive impairment at 12, 18, 24, and 36 months.

Results: The PI cohort demonstrated significantly higher anxiety-free survival than the INSTI cohort at all time points: 12 months (94.69% vs. 91.46%, $p = 0.0002$), 18 months (91.93% vs. 89.86%, $p = 0.00014$), 24 months (90.30% vs. 87.46%, $p = 0.0004$), and 36 months (88.91% vs. 86.46%, $p = 0.0002$). The PI cohort consistently showed lower anxiety risk (RR 0.739–0.807 across time points, all $p < 0.01$). Depression and cognitive impairment showed no significant differences between groups, and secondary analysis found no significant differences among patients >65 years.

Conclusion: PI-based regimens were associated with significantly reduced anxiety risk compared with INSTI-based regimens across all follow-up periods. These findings highlight the importance of evaluating neuropsychiatric adverse events over extended timeframes when selecting ART regimens.

Session A

Cimone Richardson and Masahiro Sakagami

Pharmaceutical Sciences

Therapeutic Intervention of Ginkgetin in a rat model of lung fibrosis via local lung delivery

Background. Pulmonary fibrosis (PF) is a life-threatening disease characterized by progressive lung tissue scarring due to excessive accumulation of extracellular matrix (e.g., collagen); however, it remains incurable and is poorly managed clinically. This study evaluated the therapeutic potential of ginkgetin (GKT), a natural biflavonoid from *Ginkgo biloba*, via local lung delivery in a rat model of bleomycin (BLM)-induced PF.

Methods. PF was induced in rats by orotracheal (OT) spray administration of BLM at 2.5 mg/kg on Day 1 and 1.25 mg/kg on Day 4. From Day 7, GKT at 0.5 mg/kg or vehicle (Vcl) was administered five times weekly for two weeks via OT spray or subcutaneous (SC) injection. On Day 21, treadmill endurance was measured, and rats were euthanized for lung collection. Lung airspaces were examined histologically, and lung levels of collagen, hydroxyproline (a marker of collagen turnover), α -smooth muscle actin (α -SMA; myofibroblast marker), transforming growth factor- β (TGF- β ; profibrotic cytokine), malondialdehyde (MDA; oxidative stress marker), and myeloperoxidase (MPO; neutrophil infiltration marker) were determined.

Results. Histological fibrosis persisted in BLM-induced PF rats treated with Vcl; however, GKT treatment attenuated fibrosis, with OT delivery showing greater efficacy than SC injection. Table below summarized treadmill endurance and biomarkers measured in each treatment group. When treated with Vcl, treadmill

endurance was impaired and all markers were elevated, compared to healthy controls. In contrast, with GKT treatment, treadmill exercise was less affected and all markers remained uninduced, again with OT delivery showing greater efficacy than SC injection.

	Vcl + Vcl (n=2)	BLM + Vcl (n=3)	BLM + GKT OT (n=5)	BLM + GKT SC (n=2)
Treadmill endurance [min]	>45	6.1±8.5	20.8±11.9	7.3, 21.6
Collagen [fold*]	1.0	1.6±0.1	1.1±0.3	1.4, 1.4
Hydroxyproline [ΔΔ]	0.3, 0.2	0.8±0.2	0.3±0.1	0.4, 0.5
α-SMA [fold*]	1.0	2.4±0.1	1.4±0.1	1.4, 1.8
TGF-β [fold*]	1.0	2.8±0.4	1.3±0.3	1.4, 1.4
MDA [U/mg lung protein]	0.2, 0.4	1.2±0.3	0.5±0.1	0.8, 0.7
MPO [U/g lung]	6.2, 5.2	15.2±2.2	6.4±1.2	13.5, 13.2

Vcl: vehicle *Relative to the level of the Vcl + Vcl-treated healthy controls

Conclusion. GKT demonstrated therapeutic potential as a delayed treatment in this rat PF model, with local lung delivery showing greater efficacy than systemic delivery.

Session A

Jason Funderburk

Pharmaceutical Sciences

Absolute Quantification and Identification of RNA from RNA-Lipid Nanoparticles using High Resolution Mass Spectrometry

Background: RNA therapeutics are a rapidly expanding drug category with potential applications ranging from infectious disease immunization to treatments for cancer and genetic disorders. RNA–lipid nanoparticles (RNA-LNPs) are the leading delivery platform, with approved products including mRNA vaccines and polyneuropathy therapies. Emergency use authorizations and orphan drug status for current RNA-LNP drugs have enabled approval without finalized analytical procedures for quality monitoring. Developing liquid chromatography–high-resolution mass spectrometry (LC-MS) approaches for characterizing RNA from RNA-LNPs is critical for assessing drug quality and performance, given the complexity of oligonucleotide stability arising from high physicochemical instability and large molecular size.

Methods: FLuc dsRNA (57 bp) and custom ssRNA (60 bp) constructs were formulated in LNPs at an N/P ratio of 6. RNA-LNPs were evaluated for RNA concentration and encapsulation efficiency (%EE) using the Quant-iT™ RiboGreen™ assay, and LNP size and polydispersity index (PDI) were measured by dynamic light scattering. RNA was extracted via isopropanol precipitation and diluted 100-fold for LC-MS characterization. Absolute quantification and identification of RNA were performed using an X500R LC-QToF system.

Results: The RNA-LNPs exhibited hydrodynamic diameter, PDI, and %EE values within the target profile. The ssRNA concentration measured 9.21 ± 0.69 ng/μL by fluorescence and 110.92 ± 5.66 ng/mL by LC-MS. The dsRNA concentration was 84.09 ± 8.52 ng/mL, and both RNA constructs were successfully identified by LC-MS.

Conclusions: Absolute quantification and identification of both RNA constructs were successfully achieved using LC-MS and validated according to M10 bioanalytical guidelines.

Session B

Laerissa Reveil

Pharmaceutical Sciences

Determination of neurotransmitter levels in rat brain following opioid-sedative exposure using liquid-chromatography quadrupole-time-of-flight mass spectrometry

Background: Sedation with opioids and benzodiazepines can cause delirium, a cognitive dysfunction hypothesized to result from neurotransmitter (NT) imbalances. Quantifying NT changes may provide evidence for the role of sedation in delirium development. This study aims to determine the effect of multi-drug sedation on dopamine (DOP), serotonin (SERT), glutamic acid (GLU), gamma-aminobutyric acid (GABA), gamma-hydroxybutyric acid (GHB), and acetylcholine (ACT) levels in a young rat delirium model.

Methods: NTs were measured using liquid chromatography quadrupole-time-of-flight mass spectrometry. A standard curve (10–5000 ng/mL) in 90:10 ACN:H₂O and quality controls in diluted, pooled rat plasma or brain were extracted with ice-cold H₂O:MeOH + 0.5% formic acid. Validation followed FDA M10 Bioanalytical Method Validation guidance. Male and female Sprague-Dawley rat pups (18 days postnatal) were treated over five days with saline (n=24), lipopolysaccharide-induced inflammation (LPS; n=20), morphine- (MOR; 2–4 mg/kg/dose) and midazolam- (MDZ; 5–9 mg/kg/dose) induced sedation (n=17), or LPS+MOR/MDZ (n=15). Brains were halved, homogenized, extracted, and analyzed for NTs using validated methods.

Results/Conclusions: Validation met FDA criteria. No significant differences in ACT, SERT, or DOP brain levels were observed with sedation or inflammation compared to saline. Significant changes in GHB, GLU, and GABA levels occurred following MOR/MDZ treatment compared with other groups. These findings suggest that drug-induced sedation may alter GHB, GABA, and GLU levels, and such NT imbalances may contribute to delirium development.

Session B

Madeline Gunawardena

Pharmaceutical Engineering

Machine Learning-Guided Optimization of an Oral Microemulsion Delivery System

Background: Oral microemulsions are a drug delivery system commonly used to improve intestinal permeability and oral bioavailability of poorly water-soluble drugs. They offer practical advantages including high patient compliance and simplified manufacturing that support their potential as marketable drug products. However, microemulsion formulation development is often time-consuming and resource-intensive, requiring extensive component screening and preliminary trials to achieve stable formulations, which can result in suboptimal therapeutic performance. There is therefore an unmet need for improved methods to streamline formulation design.

Methods: A batch Bayesian Optimization strategy was used to design a subset of unique, in-specification microemulsions with highly optimized physicochemical properties across five iterations, each containing batches of five experiments. A two-phase modeling approach enabled navigation of a complex experimental design space involving multiple oils, surfactants, cosurfactants, and processing parameters, using a training dataset of 22 experiments.

Results: Five high-performing microemulsion vehicles were identified, four of which exhibited physical stability after 30 days of storage. When loaded with two different model drug candidates, three

microemulsions achieved high drug loading, acceptable stability, and improved in-vitro permeability compared with the free drugs.

Conclusions: This work introduces a novel machine-learning-based drug delivery optimization platform that supports a shift away from trial-and-error formulation toward more efficient, data-driven development. Additionally, a series of high-performing microemulsions were successfully developed.

Session B

Purnajai Srivijay Saravanan Vanaja

Pharmaceutics

Enzymatically Modified Isoquercitrin Reduces Intestinal First Pass of Quercetin: Human Intestinal S9 Kinetics and Predicted Fraction Escaping Gut Metabolism

Background: Quercetin is a dietary flavonoid with broad therapeutic potential, but its oral bioavailability is limited by poor aqueous solubility and extensive intestinal glucuronidation. Enzymatically Modified Isoquercitrin (EMIQ) is a highly soluble, glucosylated quercetin precursor with GRAS status, yet whether its stepwise hydrolysis can outcompete intestinal UGT-mediated metabolism in an in vitro human system has not been quantified.

Methods: EMIQ, isoquercitrin (quercetin-3-O- β -D-glucoside), and quercetin aglycone were incubated in pooled human intestinal S9 (HIS9) to characterize hydrolysis and glucuronidation kinetics using Michaelis–Menten modeling. Inhibitor studies with phlorizin and D-glucono-1,5-lactone isolated individual hydrolytic steps, and intrinsic clearance (CL_{int}) values were scaled using a well-stirred gut model to estimate the fraction of bioactive quercetin escaping intestinal first-pass metabolism (F_g).

Results: Quercetin aglycone underwent rapid glucuronidation (CL_{int} = 140 \pm 35.1 μ L/min/mg), whereas EMIQ sustained quercetin formation even in the presence of UDPGA. The EMIQ-to-isoquercitrin conversion was identified as the rate-limiting step. Predicted F_g was 88.3% for EMIQ versus 20.6% for quercetin aglycone, representing a 4.3-fold improvement.

Conclusion: These findings quantitatively support EMIQ as a rational oral delivery strategy that shields quercetin from pre-systemic intestinal glucuronidation, substantially improving predicted gut bioavailability relative to the free aglycone.

Session B

Rasajna Madhusudhana

Medicinal Chemistry

Virtual Screening of Novel PfNic Inhibitors for Treatment of Malaria

Background: The growing burden of malaria due to emerging drug resistance highlights an urgent need for new antimalarial agents. Our research focuses on *Plasmodium falciparum* nicotinamidase (PfNic), a key enzyme in the parasite's NAD⁺ biosynthesis pathway. PfNic inhibition disrupts NAD⁺ production and impairs parasite growth. This study aims to identify potent and selective PfNic inhibitors.

Methods: A focused library of more than 33,000 cysteine-targeting covalent ligands was screened against the AlphaFold-predicted PfNic structure, which contains a catalytic cysteine residue. A preliminary screen followed by refined, higher-exhaustiveness docking was performed using AutoDock Vina. Top hits were clustered by structural similarity, and one representative from each cluster was selected. These representative molecules were then docked against a panel of cathepsins, a family of cysteine proteases, to assess selectivity.

Results: The initial screen yielded 5,000 compounds with negative binding energies. Refined docking identified 1,000 molecules with binding energies < -6 kcal/mol. Clustering produced a representative set of 150 structurally diverse molecules. Within this set, high-affinity PfNic binders (binding energy < -8.5 kcal/mol) demonstrated selective binding to PfNic over cathepsins, with selectivity decreasing as binding affinity declined.

Conclusion: This preliminary in silico workflow enabled identification of promising PfNic-targeting covalent ligands. Ongoing computational work includes expanded selectivity profiling against additional cysteine proteases and covalent docking to better model reactivity. Prioritized candidates will advance to in vitro and cellular assays with the goal of identifying high-affinity, selective PfNic inhibitors suitable for preclinical development.

Session B

Trey Halsey

Pharmacotherapy & Outcomes Science

Age-Dependent Modulation of Neuroinflammation in the Setting of HIV

Purpose: HIV affects the central nervous system early after infection, with inflammatory cytokines driving neuroinflammation and neuropathology. The HIV-1 Tat protein is neurotoxic, contributing to cytokine and chemokine dysregulation both centrally and peripherally, yet it remains unclear whether these immune signatures vary with age at viral exposure. This study examined the effects of Tat expression and age on cytokine levels in hippocampal tissue.

Methods: Tat-transgenic mice (n = 79) were grouped by age (1–3, 7–9, and 13–15 months). Following 14 days of Tat induction or control conditions, hippocampal tissue was collected and cytokine concentrations measured using a LegendPlex panel (IL-27, IL-1 α , IL-23, IFN- γ , CCL2, IL-1 β , IL-6, IL-17A). Multiple linear regression models were fit for each cytokine with Tat status, age, and sex as covariates.

Results: Significant effects of Tat, age, and sex were observed for select cytokines. Tat expression was associated with increased hippocampal CCL2, while older age (13–15 months) was associated with lower CCL2. A significant Tat \times age interaction revealed further CCL2 elevation in mid-aged (7–9 month) Tat+ mice, and females exhibited higher CCL2 than males across all groups. Tat also increased IL-27, whereas older mice showed reduced IL-27 independent of Tat or sex, with a significant Tat \times age interaction indicating age-specific modulation.

Conclusions: Tat-associated increases in CCL2 and IL-27 align with their established roles in HIV-related neuroinflammation. Age-dependent interactions suggest that Tat differentially shapes neuroimmune signaling across the lifespan, underscoring the importance of age in HIV-associated neuroinflammatory responses and motivating further investigation into age-specific mechanisms.

Session B

Michael Muhoozi

Healthcare Policy & Research

The Impact of Socio-Behavioral Barriers on HIV Global Target Gaps in Sub-Saharan Africa

Background: Despite progress toward HIV treatment targets in sub-Saharan Africa (SSA), gaps remain among underserved populations. We quantified the impact of socio-demographic disadvantage and sexual risk behaviors on UNAIDS 95-95-95 targets.

Methods: Using 2015–2020 Population-Based HIV Impact Assessment (PHIA) data for 23,950 people with HIV across 14 SSA countries, we evaluated 95-95-95 outcomes (diagnosed, on ART, virally suppressed). Survey-weighted logistic regressions assessed the effects of a socio-demographic disadvantage score (0–5), a sexual risk score (0–3), and their interaction.

Results: Overall, 77.9% were diagnosed, 95.9% were on ART, and 98.8% were virally suppressed. However, among younger, poorer men with high sexual risk, these figures dropped to 46.9%, 82.0%, and 96.8%, respectively. High sexual risk significantly reduced the odds of diagnosis by 47% (aOR 0.53; $P < 0.001$) and being on ART by 48% (aOR 0.52; $P < 0.001$). The interaction between disadvantage and sexual risk was significant only for diagnosis awareness (aOR 0.92; $P = 0.026$). Neither factor significantly affected viral suppression.

Conclusions: Shortfalls against 95-95-95 targets are concentrated primarily at the diagnosis stage. Overlapping socio-demographic disadvantage and high sexual risk behaviors compound this bottleneck, creating substantial care gaps at diagnosis and ART initiation for key subgroups, particularly young, impoverished men.

Session B

Nichole Jannah

Health Services Research & Policy

Medicaid Reimbursement for GLP-1 Receptor Agonists: Diverging Utilization Trends Between Obesity and Diabetes Indications, 2014–2024

Background: GLP-1 receptor agonists treat both type 2 diabetes and obesity, yet utilization patterns in Medicaid programs remain unclear. This study examined 10-year trends in Medicaid reimbursement for GLP-1 medications across obesity and diabetes indications, including spending patterns and prescription volumes adjusted for adult enrollment changes.

Methods: We performed a trend analysis using national Medicaid State Drug Utilization Data (2014–2024) for GLP-1 receptor agonists. Data were standardized to consistent NDCs and mapped to obesity versus diabetes indications. Adult Medicaid enrollment was estimated using CMS enrollment totals and American Community Survey data to calculate per-adult-enrollee metrics. Spending was adjusted to 2024 dollars using the pharmaceutical products component of the Bureau of Economic Analysis's Personal Consumption Expenditures Price Index.

Results: Diabetes-indicated GLP-1 prescriptions increased 32-fold from 157,016 in 2014 to 4,997,600 in 2024, while obesity-indicated prescriptions reached 1,371,917 by 2024 following market entry in 2014–2015. Per-adult-enrollee, diabetes-indicated prescriptions averaged 0.120 versus 0.026 for obesity-indicated agents in 2024. Medicaid spending on diabetes-indicated GLP-1s grew from \$77.3

million to \$5,072.3 million (66-fold), and obesity-indicated spending reached \$1,545.0 million by 2024. Diabetes indications accounted for 77% of prescriptions and spending by 2024. State-level per-adult-enrollee cardiometabolic drug spending increases ranged from \$29 (Hawaii) to \$883 (Kentucky).

Conclusions: Despite dramatic expansion in GLP-1 reimbursement, utilization diverged markedly between indications, with diabetes accounting for approximately 77% of prescriptions and spending by 2024—a disparity persisting despite obesity’s higher prevalence. Substantial state variation suggests coverage policies strongly influence treatment access patterns, highlighting potential barriers to obesity pharmacotherapy in Medicaid beyond drug availability..

Session B

Sarah Talley

MPH Epidemiology

Factors Influencing Parental Intent to Vaccinate Children Against Non-Mandated Vaccines: Influenza, COVID-19, and HPV

Background: School-entry vaccination mandates cover many routine childhood vaccines, but influenza, COVID-19, and HPV are generally not mandated, making parental intent central to uptake. Prior evidence suggests that predictors vary across vaccines and are measured inconsistently. This study compares predictors of intent for all three non-mandated vaccines using a single national survey.

Methods: A cross-sectional online survey of U.S. adults (Nov–Dec 2025) was administered via a quota-based panel. Parents with at least one child under 18 comprised the analytic sample (n=426; HPV analytic sample n=255). Outcomes were vaccine-specific parental intent. Analyses included descriptive and bivariate tests, vaccine-specific multivariable logistic regressions, and a two-step structural equation model incorporating latent constructs.

Results: Intent was 69% for influenza, 61% for COVID-19, and 64% for HPV. Positive attitudes and higher perceived importance and effectiveness were consistently associated with increased odds of intending to vaccinate one’s child. In adjusted models, the strongest predictors were perceived effectiveness (OR=1.68 [1.20–2.36]) and attitude (OR=1.63 [1.28–2.06]) for influenza; perceived importance (OR=1.76 [1.18–2.61]) and attitude (OR=1.68 [1.33–2.12]) for COVID-19; and attitude (OR=2.94 [1.94–4.47]) and comfort discussing vaccination with a doctor (OR=3.70 [1.84–7.43]) for HPV. SEM demonstrated good fit and identified response efficacy as the dominant predictor of overall parental intent ($\beta \approx 0.98$).

Conclusion: Across all three non-mandated vaccines, response efficacy is a universal driver of parental intent. Patient-provider communication is especially relevant for HPV, and safety concerns uniquely reduce COVID-19 vaccination intent. Interventions should emphasize vaccine effectiveness and strengthen provider recommendations.

School of Social Work

Session A 10:30 am – 12:00 pm

Session A

Alexis Payne

Social Work

Rage as a Methodology: Literature Review of How Black Women Scholars Conceptualize and Use Rage Transformatively

Background: Black women’s emotional expression has historically been suppressed within hegemonic white cisheteropatriarchal society, where anger and rage are often negatively constructed in relation to their intersectional identities. Although professions such as social work claim to address systemic oppression, structurally embedded, gendered anti-Black practices within academia have created an emotionally laborious and harmful landscape for Black women scholars.

Methods: A literature review initiated in September 2025 examined scholarship on Black women’s rage, exploring how rage is conceptualized broadly and from Black women’s perspectives, as well as how Black women use anger productively within scholarly and professional contexts. Key search terms included Black, African American, rage, methodology, framework, anger, transformative, social work, and academia.

Results: Scholarship using rage to analyze and expose systemic failures affecting marginalized groups in social work has increased over the last 10–15 years as Black feminist social work scholars center their voices and experiences in academia. Current literature suggests that rage can be transformative, illuminating injustice and motivating action. While theoretical and analytical contributions are expanding, practical applications of rage within social work research and practice remain underdeveloped.

Conclusions:

Black women’s uses of transformative rage have often been marginalized or erased from public and academic narratives, including within spaces intended to address injustice. To address this gap and contribute to a more accurate and inclusive narrative, additional studies should employ rage as a methodological and analytical framework to center Black women’s voices and experiences in social work academia.

Session A

Cait Parker

Social Work

Factors Influencing Child Welfare Stipend Program Alumni Decisions to Leave Public Child Welfare**

Turnover among child welfare workers is an ongoing issue. The Title IV-E Child Welfare Stipend Program (CWSP) aims to improve retention by creating a pipeline of well-trained, prepared child welfare workers. This study examined preparedness for practice and retention among CWSP alumni in Virginia using quantitative and qualitative data from two time points of a longitudinal evaluation of 113 alumni who graduated between 2018 and 2025. We found that 86.2% of alumni worked in a local DSS agency immediately after graduation; of those, 37.6% stayed in the same job, 16.5% moved jobs but remained in local DSS agencies, and 27.5% left child welfare practice at time 2 (0–7 years post-graduation). Overall, 63.3% of alumni who responded to the time 2 survey were still working at a local DSS agency. Higher levels of preparation for practice were associated with continued employment in child welfare. Qualitative data revealed emerging themes related to motivations for leaving, including dissatisfaction with caseloads, supervision, organizational climate, pay, and burnout, as well as limited opportunities for licensure and career advancement. These findings suggest that most Virginia CWSP alumni remain in local DSS agencies and that preparedness promotes retention. The presentation will further discuss

implications for program improvement and the importance of redefining retention to include those who move positions within the system.

Session A

Emma Adcook

Social Work

Adapting Acuity Scales for Community Partners: The Importance of Community-Engaged Research**

Background: VCU's School of Social Work Evaluation Lab collaborated with a community organization that provides adult day services to review and recommend updates to their current intake cognitive, psychiatric, and activities of daily living (ADL) acuity scales to create a more standardized measure.

Methods: After completing a literature review of scales measuring psychiatric symptoms and ADLs, we compiled a list of widely used, validated tools for the client to consider. The client selected the Katz Index of Independence in Activities of Daily Living (Katz ADL) and the Neuropsychiatric Inventory-Questionnaire (NPI-Q) to integrate with their existing scale to create an updated version.

Results: Both scales were adapted to accommodate the organization's items of interest; for example, the Katz ADL anchors were expanded to reflect greater independence when possible and select NPI-Q items were removed. The final combined measure consisted of 17 items capturing constructs such as delusions, aggression, disinhibition, bathing, dressing, and transferring, which can be summed to generate a total acuity score.

Conclusion: The updated measure reflects a combination of gold-standard tools, practice-informed questions, and lived experience, and can be easily integrated into routine practice. This project illustrates a successful community partnership and highlights the importance of balancing rigorous research with client needs. Community-engaged research ensures that organizations feel empowered to enact meaningful change.

Session B 12:30 pm – 2:00 pm

Session B

Lauren Slaughter

Social Work

A Changing Landscape: HIV/AIDS Training Needs for Providers Across Virginia

Background: Ryan White HIV/AIDS Programs provide essential care for people living with HIV, and medical providers, case managers, HIV testers, and others working in the field are trained by AETCs and VHARCC sites such as VCU's HIV Education Program. In August 2025, due to funding cuts at the state and federal levels, a needs assessment was conducted across the Commonwealth to identify training priorities under reduced resources.

Methods: A mixed-methods survey was distributed to a statewide listserv of community partners, assessing needs across the program's core training areas—HIV Prevention and Testing, Case Management, and Clinical Training—as well as preferred training modalities. The survey also included two open-ended questions about desired training topics and how the program could best support agencies.

Results: Training needs varied by region based on agency responses, with most needs falling within HIV Prevention and Testing and Case Management. Modality preferences indicated that participants favored

synchronous virtual sessions for trainings under three hours, while in-person formats were preferred for full-day or multi-day sessions.

Conclusions: Although designed to guide a specific set of organizations, this research offers insight into the evolving landscape of HIV/AIDS care. Demand for prevention/testing and case management training has increased, and preferences for training modalities have shifted, underscoring the need for adaptable, responsive training strategies within the Ryan White system.

Session B

Liliana Morales

Social Work

Perspectives of Cultural and Family Influences from Latino College Students on Dating Violence, Dating Norms, and Healthy Relationships

Background: Latino college students face elevated risk for dating and sexual violence. Cultural values (familismo, machismo, marianismo) may shape relationship communication, help-seeking, and perceptions of harm.

Methods: Qualitative data from a larger mixed-methods study focused on Latino college students (n=16), ages 18–25. Interviews were coded using inductive thematic analysis in Dedoose.

Results: Dating violence was defined as multidimensional with emphasis on power and control. Cultural influences shaped definitions through gender roles, normalization of abuse, and parental messages. Healthy relationships emphasized communication, consent, and trust.

Conclusions: Prevention efforts may be more effective when incorporating cultural values and creating space for discussion about relationships, consent, and safety within Latino communities.

Session B

Lisa Borotrager

Social Work

Complex Trauma, Internalized Homophobia and Suicide in Sexual Minority Adults:

Does Level of Outness and Sexual Identity Centrality Matter?

Background: Suicide is a major cause of death in the United States (CDC, 2023), with LGB individuals at heightened risk of suicidality (Meyer, 2003; Hottes et al., 2016; Narang et al., 2018). Minority Stress Theory (MST) posits that distal and proximal stressors contribute to adverse health outcomes, including internalized homophobia (Meyer, 2003). Complex trauma has also been strongly linked to suicidality (Herman, 1992; Charak et al., 2023; Maercker et al., 2022). This study examined whether the relationship between complex trauma and suicide is mediated by internalized homophobia in sexual minority adults, and the extent to which level of outness and sexual identity centrality moderate the relationship between complex trauma and internalized homophobia.

Methods: This study used existing cross-sectional baseline data collected from 2016 to 2018, including 1,518 sexual minority adults. Data were analyzed using structural equation modeling (SEM) in Mplus 8 (Muthén & Muthén, 2017). Three SEM models were built using Maximum Likelihood Robust estimation. Fit indices for model one indicated an over-identified, adequate model ($\chi^2=692.79$, $df=428$, $p<.001$, CFI=.86, TLI=.85, SRMR=.079, RMSEA=.02).

Results: Higher internalized homophobia significantly predicted higher suicidality. Additionally, higher complex trauma, lower levels of outness, and lower sexual identity centrality significantly predicted higher internalized homophobia.

Conclusion: Although full mediation and moderation effects were not supported, this study contributes meaningfully to MST literature and offers implications for direct social work practice with sexual minority adults.

Wilder School of Government & Public Affairs

Session A 10:30 am – 12:00 pm

Session A

Ananya Joyita

Urban & Regional Planning

Transforming Underutilized Faith-Based Properties into Affordable Housing Through Education and Engagement**

Background: The underutilized faith-based properties in the United States present an opportunity to address the severe affordable housing shortage while upholding faith missions. However, redevelopment efforts often stall due to limited technical capacity, governance complexity, and stakeholder conflict. This study examined how education and engagement strategies can support congregations in navigating redevelopment decisions and aligning stakeholders around affordable housing initiatives.

Methods: A combination of case reviews and semi-structured interviews was used. Twelve faith-based redevelopment projects were analyzed to identify planning and education models, and seven interviews were conducted with clergy, housing professionals, community representatives, and development experts. Qualitative thematic analysis identified patterns in stakeholder roles, governance dynamics, and capacity-building strategies.

Results: Planning and education models that provide technical assistance to congregations in cohorts, follow phased planning, and use mission-oriented evaluation frameworks were identified as key supports for successful redevelopment. Preparation for community opposition and racial-equity-centered planning further strengthened project outcomes. Efforts required multi-layered governance involving clergy, lay leaders, denominational authorities, developers, and community stakeholders. Education and engagement emerged as primary drivers of project success, enabling mission clarity, transparent governance, and informed decision-making.

Conclusions: Primary recommendations to facilitate faith-based property redevelopment include ensuring stakeholder alignment prior to land acquisition, financing, or regulatory processes. Congregations should invest in structured education, transparent governance, and deliberate engagement to advance successful affordable housing initiatives.

Session A

Anila Smriti Surin

Public Policy & Administration

Development and Tribal Land: An Institutional Analysis

Background: Land is a repository for personal, social, economic, and institutional values. Although often viewed in transactional terms, it is more than property; ownership generates a sense of belonging and continuity within a community, carrying cultural memory and identity (Krueckeberg, 1995). This is especially true for Indigenous peoples, whose ancestral lands are central to their culture and identity (Gilbert, 2007). Tribal land therefore represents both a form of wealth and collateral and a repository of non-economic values that fall outside traditional economic calculus. These latter values constitute the “transactional costs” hidden from the market value of land (Galiani & Schargrodsy, 2011). This study examines the institutional impact of tribal land when it is sold, transformed, or acquired for development projects.

Methods: The study analyzes three land acquisition cases from different time periods in Jharkhand, India, using qualitative methods to draw insights from oral and written materials, interviews, and lived experiences. It traces two competing narratives—modernization and development versus loss of land—and employs thematic coding to identify key patterns emerging from interviews, historical records, and policy documents.

Results: The study explores how national development goals and tribal identity collide to shape the economic and social conditions of individuals and communities, revealing deep-rooted institutional contradictions that continue to marginalize historically oppressed groups.

Conclusions: This study challenges dominant policy narratives that frame development through a homogenized lens, often neglecting the voices, cultural needs, and constitutional rights of tribal communities.

Session A

De'Leigh Steele & Taivyon Palmer

Criminal Justice

Integrating Service Learning Opportunities in Criminal Justice Education: Course Development and Community Partnership with RISE for Youth**

Background: Service learning and experiential pedagogy are commonly used in criminal justice education because they help students connect theoretical knowledge to real-world social issues. These approaches foster student engagement with community organizations and policy discussions while deepening understanding of the challenges within the justice system. Partnerships between universities and nonprofit organizations can provide valuable opportunities for students to explore issues such as juvenile justice reform while applying academic knowledge in practical settings.

Methods: This project examines the preliminary stages of a service-learning internship connected to RISE for Youth (RFY) through Virginia Commonwealth University. The internship supports the development of a service-learning course integrating juvenile justice reform topics for undergraduate and graduate students. Activities include reviewing scholarly readings and multimedia resources related to experiential learning and youth justice reform, developing potential course assignments, and attending weekly meetings focused on course development and learning objectives.

Results: Preliminary observations highlight the foundational work required to design a meaningful service-learning experience. Reviewing course materials and developing potential assignments has provided insight into how experiential learning opportunities can be structured to support student engagement with systemic justice issues.

Conclusions: Intentional course development and partnerships with organizations such as RISE for Youth can offer valuable learning opportunities while connecting academic coursework to broader discussions about juvenile justice reform.

Session A

Isaac Yeboah

Public Policy

Institutional Quality and the Corruption-FDI Nexus: A Comparative Study of Top Resource-Rich Developing Countries in Sub-Saharan Africa and Latin America and the Caribbean

Background: Foreign Direct Investment (FDI) is a critical driver of economic development, technological transfer, and capital formation in developing economies, yet persistent corruption and weak governance structures undermine many resource-rich countries' ability to attract sustainable FDI. In regions such as Sub-Saharan Africa (SSA) and Latin America and the Caribbean (LAC), corruption increases transaction costs, distorts market mechanisms, and creates uncertainty for foreign investors, while institutional quality plays a pivotal role in shaping how corruption influences investment flows, particularly in natural-resource-dependent economies.

Methods: This study adopts a mixed-methods design combining quantitative panel data analysis with qualitative semi-structured interviews. The quantitative phase analyzes data from resource-rich countries in SSA and LAC between 2012 and 2021, examining relationships among corruption, institutional quality, natural resource rents, and FDI inflows using indicators such as the Corruption Perceptions Index (CPI), Worldwide Governance Indicators (WGI), and FDI as a percentage of GDP. The qualitative phase includes interviews with international development experts to contextualize and interpret empirical findings.

Results: Preliminary expectations indicate that corruption negatively affects FDI inflows, while strong institutional quality mitigates these adverse effects, with anticipated regional differences due to variations in governance capacity, regulatory frameworks, and historical institutional development. Originality: This study contributes to the literature by integrating institutional quality and natural resource dependency into the corruption FDI relationship through a cross-regional comparative framework, an area with limited empirical attention. Findings: The research highlights that robust institutions such as effective legal systems and regulatory transparency significantly enhance investor confidence and reduce corruption-related risks.

Conclusions: Strengthening institutional quality is essential for resource-rich developing countries seeking to attract sustainable FDI, offering policy insights for governance reforms that improve transparency, reduce corruption, and foster stable investment environments across developing regions.

Session A

Issa Belmond Thullah

Public Policy

Medicaid Expansion and Immigrant Enrollment Coverage 2017–2023

Background: The 2010 ACA expanded Medicaid to improve healthcare access for low-income adults, but uneven state adoption has led to disparities in enrollment. This study examines immigrant coverage by comparing enrollment among qualified immigrants in expansion versus non-expansion states. While Medicaid expansion has been widely studied, immigrant enrollment—particularly among qualified immigrants—remains less explored, and few studies compare outcomes across states, a gap this research addresses.

Methods: A panel dataset was constructed using administrative records from CMS, BEA, NGA, and USCB. To account for economic and demographic differences across states and time, models controlled for state GDP, population, trends, and number of children. All continuous variables were log-transformed to reduce skewness and allow interpretation of coefficients as elasticities. OLS regression models with an interaction term were estimated to capture heterogeneous effects and assess how relationships vary across state conditions.

Results: Findings show that Medicaid expansion increases immigrant enrollment; wealthier states enroll more immigrants; children's enrollment boosts overall Medicaid figures; population size contributes to per-capita enrollment; and Democratic-led expansion states enroll more immigrants than Republican-led states. These results contribute to scholarship on variations and systemic factors influencing immigrant enrollment.

Conclusions: Immigrants in expansion states are more likely to be insured than those in non-expansion states. Political leadership shapes enrollment patterns, though partisan differences are not statistically significant. The relationship between state GDP and Medicaid enrollment highlights the need for federal policymakers to consider increasing matching funds in low-GDP areas.

Session B

Mary Strawderman

Public Policy & Administration

Exploring Equity and Excellence: A Mixed Methods Study of Research Funding Disparities and Success Among Women Faculty of Color at a Research-Intensive University

Background: The loss of diverse perspectives in academia poses far-reaching consequences for innovation, scientific advancement, and societal progress, driven in part by the persistent attrition of women and faculty of color. Inequality in extramural research funding contributes to this problem. This study investigates individual, interactional, and structural influences on the disparate external funding experienced by historically underfunded groups.

Methods: The quantitative phase of a mixed-methods study is presented, including analyses using the Lorenz curve and Gini index, as well as linear and generalized linear mixed models.

Results: Findings from more than 9,000 grant applications indicate that the top decile of awardees is concentrated among late-career White men. Asian faculty have 29% lower odds of receiving an award than White faculty. Women receive lower award amounts than men despite requesting similar amounts, though they have 31% higher odds of receiving an award overall. However, this advantage is not uniform: White women benefit most from the gender effect, while the corresponding advantage for AHN women is roughly half that observed for White women. Additionally, associate professors both requested and received smaller award amounts, and assistant professors had 30% lower odds of funding than full professors.

Conclusions: Systemic barriers continue to perpetuate research funding disparities. The assumption that merit alone determines success obscures historical inequities and reinforces neoliberal ideologies. Rather than regressing under the current executive branch's anti-DEI agenda, policies that promote inclusivity and equitable opportunities in academia must be strengthened.

Session B

Nusrat Emroz Monika

Public Administration

The Role of Public-Private Partnerships in Transportation: State–Business Collaboration for Infrastructure and Service Delivery

Background: Public-private partnerships (PPPs) combine public oversight with private-sector financing, technical expertise, and operational efficiency, offering an alternative to traditional public procurement while maintaining a focus on public service delivery. This paper explores the key factors that contribute to successful PPPs in public service delivery and economic growth, while examining the challenges that limit their implementation. The primary objective is to assess how PPPs support employment creation, infrastructure development, and economic growth.

Methods: A qualitative approach was used, drawing on a thematic literature review of academic sources analyzed for recurring themes related to PPP governance and institutional frameworks. To complement the review, a comparative case study analysis of PPP projects in Virginia, California, and Texas was conducted.

Findings: The literature review highlights strong connections between PPPs and economic development. Key success factors include robust legal and regulatory frameworks, financial viability, balanced risk allocation, institutional capacity, and stakeholder engagement, all of which contribute to effective PPP

governance. Successful PPPs significantly support economic growth by generating employment, enhancing regional competitiveness, forming capital, and promoting productivity and innovation.

Conclusion: Effective PPPs ensure efficiency and innovation, reduce costs, and expand infrastructure for public service delivery, making them a valuable yet complex tool for transportation and other infrastructure development. These findings underscore how well-designed public-private partnerships can strengthen resilient economic growth through efficiency, employment creation, and innovation.

Session B

Parker Speaker

Urban & Regional Planning

From Planning For to Planning With Living Systems

Background: Urban planning is often framed as a technical practice for coordinating infrastructure and managing urban growth, yet critical planning scholarship shows that planning institutions also organize how urban value is produced, captured, and redistributed across space (Lefebvre; Roy). Building on critiques of urban development and land-value capture, this project introduces the concept of the Urban Value Loop, a framework describing how public investment structures access, private value is produced, and social and ecological costs are externalized while communities sustain urban stability through practices of care, stewardship, and informal governance.

Methods: The research synthesizes literature in critical planning theory, insurgent planning, and commons governance (Miraftab; Ostrom; Russell), alongside scholarship on the political economy of urban development. Through conceptual analysis, the project examines how planning institutions organize authority through jurisdiction, administrative scale, and crisis-driven intervention while economic value circulates through public investment, land markets, and infrastructure systems.

Results: The analysis identifies a recurring governance pattern in which planning authority intervenes primarily after harm escalates into crisis, while systems that sustain urban life—including community care networks, ecological processes, and Indigenous relational knowledge (Daigle & Dorries; Kimmerer)—function continuously yet remain peripheral to planning frameworks even as they subsidize urban economic growth.

Conclusions: The Urban Value Loop suggests that planning systems often depend on social and ecological labor they do not formally recognize or govern. Reorienting planning toward the living systems that sustain cities, including commons governance, ecological stewardship, and distributed decision-making, offers a pathway toward more resilient and equitable urban political economies.

School of Education

Session A 10:30 am – 12:00 pm

Session A

Cameron Parkins & Andreina Arroyo

Higher Education Leadership

From Gatekeeping to Gateway: Understanding Applicant Attitudes Toward Waived Testing Requirements

Background: Graduate admissions have long relied on standardized tests despite evidence that these exams disadvantage applicants from lower socioeconomic backgrounds, underrepresented groups, and nontraditional pathways. During the COVID-19 pandemic, many programs waived or eliminated these requirements, yet little is known about how applicants interpreted these changes. Understanding applicant attitudes is essential to determining whether test-optional policies reduce barriers or introduce new concerns about fairness and quality. This study explored the perceptions, feelings, and decision-making experiences of applicants to VCU's MHA program during a period of waived test requirements, asking: To what extent did the waiver or removal of GRE/GMAT requirements reduce perceived financial, psychological, or systemic barriers for recently admitted students, and how did this influence their decision to apply?

Methods: Using a phenomenological approach informed by Social Cognitive Theory, researchers conducted individual interviews with four first-year MHA students. Interview transcripts were coded thematically to identify patterns related to awareness of test policies, perceived barriers, and anticipated impacts if exams had been required.

Results: Participants described limited familiarity with graduate entrance exams and viewed test requirements as costly, time-intensive, and burdensome. They believed GPA and professional experience more accurately reflected readiness for graduate study and indicated that mandatory testing would have delayed their application—and in some cases deterred them entirely.

Conclusion: As graduate programs reconsider admissions requirements, this study highlights how reinstating test scores may narrow applicant pools, particularly affecting students from lower socioeconomic backgrounds and international applicants.

Session A

Casey Bailey

Research, Assessment & Evaluation

Intersectional Analysis of First-Generation Student Retention in Virginia Post-Secondary Education

Background: Despite gains in college access, persistence among first-generation students (FGS) remains a major barrier to educational equity. Research often treats FGS as a monolithic group, overlooking how intersecting identities compound retention challenges. This study addresses that gap by examining FGS persistence across Virginia's four-year public and private institutions, investigating how race, STEM enrollment, domicile, and comprehensive Gift Aid (Federal, State, Institutional, etc.) interact to influence student success.

Methods: Using a quantitative, intersectional design grounded in Structural Equation Modeling (SEM), this study models demographic and structural variables as latent constructs to estimate direct and indirect causal pathways. Data come from multi-institutional student-level records, including financial aid and demographic datasets, allowing the analysis to capture non-linear interactions such as how Gift Aid buffers disparities across diverse student groups, including those at Historically Black Colleges and Universities and Minority-Serving Institutions.

Proposed Results: Anticipated findings will quantify compounding disparities in retention rates and identify which intersectional identity groups face the highest attrition risk. The study is expected to show that the effectiveness of financial support varies significantly by student domicile and program of study, offering empirical evidence of where institutional support models fail to address equity gaps.

Conclusions: This research will provide a roadmap for policymakers and institutional leaders to shift from generalized support to targeted, high-impact interventions. By identifying evidence-based equity gaps, the findings will inform institutional practices and state-level workforce development efforts, ultimately fostering more equitable pathways to degree completion for Virginia's FGS population.

Session A

Damali Curry et al.

Educational Leadership

History Is Durable: A Mixed-Methods Study Exploring Stakeholder Perceptions of the Degree and Career Relevance

This capstone project consists of five chapters. The research team began by examining the problem of practice presented by the Virginia Commonwealth University Department of History (VCUDOH): declining undergraduate enrollments in history courses and majors. Grounded in the principles of improvement science, Chapter One introduces the project's theoretical framework and research questions while outlining the methods, limitations, and delimitations. Chapter Two presents a comprehensive literature review, guided by a systematic and intentional process to establish a scholarly foundation for the project. Chapter Three details the research methodology and specific procedures used to address the study's research questions, explaining how the theoretical framework informs data collection and analysis and presenting the evaluative criteria used to ensure trustworthiness and validity. Chapter Four presents the study's findings, organized by research question to provide a clear and comprehensive analysis of the collected evidence. Chapter Five summarizes significant findings and their connection to existing literature, and, building on these findings, the capstone team proposes practical interventions and recommendations for consideration by the VCUDOH.

Session A

Jared Grigg

Research, Assessment & Evaluation

Restructuring for Retention: The Case for Focused Wellness Leadership

Background: University counseling centers face record demand alongside high staff and senior leadership turnover. Although improvements in mental health symptoms are linked to student retention, no research has examined how leadership structures influence resource distribution and, in turn, retention. Using Role Theory, this study investigates whether Chief Wellness Officers (CWOs) affect retention through diffuse campus culture shifts or through focused advocacy and resource management.

Methods: Data were collected from 404 randomly selected four-year U.S. universities using IPEDS and university websites. Leadership structures were categorized as Focused CWO (overseeing counseling/health departments), Broad CWO (health, counseling, and campus recreation), and No CWO. Path analysis tested whether university counseling center staffing levels mediated the relationship between CWO type and student retention, and multigroup analysis assessed model invariance between CWO and non-CWO campuses.

Results: The model revealed no direct effect of CWOs on retention, suggesting they do not influence retention through campus culture mechanisms. However, a significant mediation effect ($p < .01$) was found for CWO campuses: Focused and Broad CWOs were associated with 5.7 and 4.4 more therapists, respectively, which subsequently predicted higher retention. Multigroup analysis confirmed model invariance between CWO and non-CWO campuses ($p = .396$), though CWO campuses averaged five more therapists overall.

Conclusions: Specialized wellness leadership enhances institutional outcomes through targeted resource advocacy and deployment rather than diffuse cultural influence. To avoid ineffective initiatives, university leaders should empower CWOs with clear departmental portfolios focused on strategic resource development to build the clinical capacity necessary to support student success.

Session B 12:30 pm – 2:00 pm

Session B

Luke Parker

Research, Assessment & Evaluation

Equity, Adequacy, and Achievement in Public Schools: A Multilevel Structural Equation Model of School Finance in Virginia

Background: The equity and adequacy of school finance systems remain a central concern for public education in the United States. This study asks how a school district's structural wealth contributes to the adequacy of its funding and how this adequacy influences school-level academic achievement after accounting for student need.

Methods: Using secondary data from schools (N = 1,789) nested within districts (k = 132), this study employed Multilevel Structural Equation Modeling (MSEM) to examine how structural wealth predicts academic achievement via adequacy while controlling for vertical equity.

Results: The proposed model adequately fit the empirical data. Structural wealth and achievement demonstrated strong factor loadings, whereas vertical equity loadings were divergent, suggesting a formative construct. Structural wealth was significantly and positively associated with adequacy, indicating that educational dollars are stretched further in wealthier districts. Positive adequacy values were the strongest predictor of academic achievement. A clear divergence emerged: within districts, higher vertical equity needs sharply depressed achievement, while between districts, greater aggregate need was associated with higher achievement after controlling for funding. The model explained more than 70% of achievement variance.

Conclusions: Funding adequacy partially mediates the relationship between structural wealth and achievement after accounting for the compensatory load of structurally disadvantaged students. Multilevel divergence revealed that aggregate district-level relationships obscure school-level concentrations of need, demonstrating how district-level surpluses can mask opportunity gaps for students in high-need schools.

Session B

Margaret Gatongi

Research, Assessment & Evaluation

STEM Study Abroad: QuantCrit Intercultural Competence Measurement**

Background: This conceptual study proposes applying the Intercultural Sensitivity Scale (ISS) within a QuantCrit-informed framework in the context of a short-term STEM study abroad program. In a pilot phase, VCU students traveled to Brazil and engaged in collaborative learning with Brazilian university students, and the ISS was administered to examine students' intercultural sensitivity. Consistent with QuantCrit theory, the study emphasizes contextualized interpretation of quantitative results and avoids deficit-based comparisons across student groups.

Methods: To extend this QuantCrit measurement approach, the study draws on Community Cultural Wealth (CCW) theory, which conceptualizes six interrelated forms of capital. Within the study abroad context, CCW offers an asset-based lens for examining how cultural resources are enacted and recognized by students from different backgrounds as they engage in shared learning. The five guiding tenets of QuantCrit inform the interpretation of both ISS and CCW data, with particular attention to power,

positionality, and the social construction of quantitative measures in an intercultural context. A follow-up study will integrate both ISS and CCW measures to more fully operationalize this QuantCrit-aligned approach.

Findings: This work has important implications for education policy and curriculum design in study abroad contexts, particularly for STEM programs seeking to integrate intercultural learning and sustainability goals.

Conclusions: The study underscores the value of embedding equity-oriented, asset-based frameworks into the measurement of intercultural competence and highlights the importance of using QuantCrit approaches to better understand how intercultural learning unfolds within short-term, collaborative STEM study abroad experiences.

Session B

Rory Cantwell

Educational Psychology

Summer Literacy Interventions and Student Reading Attitudes

Background: Literacy is a key predictor of long-term reading and academic outcomes (Goldstein et al., 2024). While most literacy interventions target deficits in content knowledge (Brady & Mason, 2024), the Camp Curious Summer Literacy Intervention (CCSLI) instead seeks to address deficiencies in literacy attitudes.

Methods: This study evaluated the relationship between CCSLI participation and students' general, recreational, and academic attitudes toward reading. Twelve upper-elementary students (Grades 3–6) completed the 20-item Elementary Reading Attitudes Survey on the first and final days of the camp. Researchers calculated individual sum scores, as well as recreational and academic subscores, using the survey's recommended scoring guide.

Results: A Wilcoxon signed-rank test assessed changes in pre- and post-test attitudes. There was no significant difference in overall attitudes toward reading ($Z = -.891$, $p = .373$), nor in recreational ($Z = -.045$, $p = .964$) or academic attitudes ($Z = -1.076$, $p = .282$).

Discussion: These results suggest that participants' reading attitudes did not significantly change over the course of the intervention. Implications for practice, study limitations, and directions for future research are discussed.

Session B

Amy Bollt

Counseling & Special Education

Empowering Independence: Self-Determination Instruction and Quality of Life in Youth with Disabilities

Young adults with intellectual disabilities (ID) often face limited opportunities to make independent choices, which can hinder autonomy and quality of life (QoL). This literature review synthesized 13 empirical studies (2010–2025) to examine the impact of self-determination instruction on QoL, transition outcomes, and student voice. Studies were identified via ERIC, Education Research Complete, and PsycINFO and evaluated using established quality indicators. The review underscores the need for explicit, embedded instruction and student-centered practices that amplify student voice. Providing authentic choice-making, inclusive communication strategies, and opportunities for active engagement in educational planning can promote autonomy and improve long-term life outcomes. Fostering self-determination is essential for supporting meaningful transitions to adulthood and enhancing the overall QoL for young adults with ID. Findings indicate that self-determination is a strong predictor of QoL, linked to greater autonomy, social inclusion, and postsecondary success. Yet, many students, particularly those

with complex communication needs, remain passive or “technical” participants in Individualized Education Program (IEP) planning. Environmental barriers, such as limited choice-making opportunities and adult-centered decision-making, contribute to learned helplessness, highlighting the importance of context in applying self-determination skills.

Session B

Mohammad Jahanaray

Psychology

Lifespan Pathways from Adverse Childhood Experiences to Adult Quality of Life: The Mediating Roles of Obesity, Physical Activity, Physical Health, and Emotional Support

Background: Adverse childhood experiences (ACEs) are prevalent and linked to poorer adult well-being, yet actionable mechanisms connecting early adversity to reduced adult quality of life (QoL) remain insufficiently specified in population-based public mental health research. Guided by Life Course Theory, this study tested whether modifiable social and health pathways—obesity, physical activity, physical health, and emotional support—mediate associations between ACEs and adult QoL across the lifespan.

Methods: Behavioral Risk Factor Surveillance System (BRFSS) 2024 data from 21,362 adults in five U.S. states/territories were analyzed. ACEs were modeled as a higher-order latent construct (household dysfunction; emotional/physical abuse; sexual abuse) indicated by 11 binary items, and adult QoL was modeled as a latent factor indicated by life satisfaction, loneliness (reverse-coded), and mental health days. Structural equation modeling (Mplus 8.10; WLSMV) estimated direct and indirect associations, adjusting for age, sex, education, and relationship status.

Results: The final model showed excellent fit ($\chi^2(190)=1672.9$; RMSEA=.019; CFI=.95; TLI=.94; SRMR=.06). Higher ACE exposure was associated with lower QoL ($\beta=-.280$, $p<.001$). ACEs were linked to lower emotional support ($\beta=-.375$, $p<.001$), poorer physical health ($\beta=-.243$, $p<.001$), and higher odds of obesity ($\beta=.084$, $p<.001$), but not physical activity. Indirect effects indicated that the ACE–QoL association was primarily mediated by emotional support ($\beta=-.154$, $p<.001$) and physical health ($\beta=-.098$, $p<.001$), while obesity and physical activity pathways were not significant. The model explained 70.5% of QoL variance.

Conclusions: In this public mental health, life-course model, diminished emotional support and compromised physical health—both modifiable social determinants—were the dominant pathways linking ACEs to adult QoL. Findings support prevention- and equity-oriented strategies that expand access to emotionally supportive relationships and strengthen physical health among adults with ACE histories through scalable community and health system interventions.

College of Health Professions

Session A 10:30 am – 12:00 pm

Session A

Aarushi Patel

Medical Laboratory Sciences

The Impact of Interprofessional Education on the Understanding of Medical Lab Sciences Amongst Future Health Professionals

Background: Interprofessional education (IPE) is the process by which two or more professions learn from each other about their respective roles and responsibilities. Although studies demonstrate the value of incorporating medical laboratory science (MLS) into IPE, students from other health professions often have limited understanding of MLS and its role in patient care. Most IPE initiatives rely on case studies or simulation-enhanced programs, yet few examine the impact of lecture-based learning (LBL) for IPE. LBL offers a direct and accessible format for sharing information and correcting misunderstandings. This study evaluates whether LBL-IPE improves understanding of MLS in relation to patient care among future health professionals, with the goal of strengthening communication and enhancing patient outcomes.

Methods: A LBL-IPE lunch-and-learn program will be delivered to non-MLS healthcare students in the College of Health Professions at Virginia Commonwealth University. Students will complete pre- and post-assessments to measure their understanding of MLS before and after the session, which will include brief interactive components reinforcing the roles and responsibilities of medical laboratory scientists.

Results: Data collection will occur from March 24–30, 2026, with analysis completed by April 10, 2026. **Conclusions:** Although data collection and analysis are forthcoming, it is hypothesized that students participating in an interactive LBL-IPE session will demonstrate higher post-assessment scores compared to pre-assessment scores, as well as consistent levels of understanding across all four learning objectives.

Session A

Alanna King

Clinical Mental Health & Rehabilitation Counseling

"Should We Be Giving This Presentation?" A Literature Review on Impostor Phenomenon in First-Generation Students**

Background: This literature review examined the efficacy of interventions commonly used to mitigate impostor phenomenon (IP) in higher education while also exploring their effectiveness in addressing the unique socio-academic needs of first-generation college students (FGCS). The review synthesized scholarship across three domains: the general prevalence of academic IP, the heightened susceptibility of FGCS, and the impact of standard psychological interventions for IP.

Methodology: Over 15 peer-reviewed research articles published between 2016 and 2025 were analyzed, sourced from APA PsycINFO, PubMed, and institutional databases. A thematic analysis approach was used to identify recurring patterns in student outcomes and intervention accessibility.

Results: Findings demonstrated a significant prevalence of IP among higher education students, with strong positive correlations between IP and poor self-image, and in some cases, increased likelihood of college dropout. IP was consistently more intense and common among FGCS. Some interventions—such as mindfulness and group support—showed promise in reducing IP-related feelings, yet literature specifically examining their effectiveness for FGCS was limited.

Conclusions: The review highlighted a clear gap in culturally responsive IP interventions tailored to FGCS. These findings inform an ongoing study evaluating a mindfulness-based group intervention currently being conducted by the HEARTFUL Lab in the College of Health Professions at Virginia Commonwealth University, with the long-term goal of developing evidence-based institutional guidelines to improve self-image and persistence among first-generation college students.

Session A

Annalise Porreca

Occupational Therapy Doctorate

Fine Motor and Visual Motor Differences in Chronic Migraine With and Without Aura

Background: Migraine is the leading cause of disability in women and the second leading cause of disability worldwide. Clinical presentation may include motor weakness with hemiplegia, brainstem aura, or seizure secondary to aura. Aura is a sensory disturbance that can affect visual, sensory, olfactory, and speech domains. Pediatric migraineurs without aura (MwoA) exhibit significantly more motor coordination and visual perception impairments than controls. However, the role of motor capacity in the development of chronic migraine symptoms remains unclear, particularly in relation to migraine with aura (MwA). We hypothesize that MwA and MwoA involve differentially impaired sensory-motor dysfunction and integration, predicting that motor capacity will differ among groups such that MwoA will perform significantly better than MwA, and both will perform worse than controls.

Methods: Ten MwA participants and ten MwoA participants will complete a 3D-VR reaching task in which a perceptual illusion—visual distortion of arm position—alters perceived hand location along the transverse plane, requiring participants to adjust their reach direction opposite the VR rotation to adapt. Participants will then complete a motor assessment battery evaluating functional bilateral upper extremity performance.

Results: The 3D-VR task and motor assessment battery have been successfully developed and pilot-tested among controls, and recruitment for MwA and MwoA participants is ongoing.

Conclusion: Successful implementation of the 3D-VR task suggests this assessment may be useful for characterizing motor capacity in MwA and MwoA, though further research is needed. Improved understanding of the relationship between aura and motor capacity may inform future treatment approaches.

Session A

Caroline Selb

Occupational Therapy Doctorate

Leveraging Computer Vision for the Development of an Automated Movement Assessment Pipeline in Stroke Rehabilitation

Background: Common motor/sensory assessments tracking stroke rehabilitation progress may be subjective and lack interrater reliability. An automated method for administration and scoring of the Fugl-Meyer Assessment for Upper Extremity (FMA-UE) could improve accuracy and efficiency.

Methods: Healthy participants were video-recorded completing the FMA-UE. Videos were processed using OpenPose. Custom Python and MATLAB scripts automatically calculated bilateral joint range of motion for shoulder abduction and assigned scores based on FMA-UE scoring standards.

Results: Initial testing in one healthy participant demonstrated 100% scoring agreement compared to traditional methods. The program detected range of motion differences between left and right upper extremities within 4 degrees of traditional goniometry.

Conclusions: Computerized FMA-UE scoring may reduce subjectivity and rater bias. As pilot testing continues, all FMA-UE items will be added and a user interface developed for clinical use.

Session A**Emily Parsowith***Rehabilitation & Movement Science****Limb Loading Symmetry During Dual-Task Walking in Individuals With Lower Limb Amputation***

Introduction: Lower limb amputees (LLAs) exhibit limb-loading asymmetry, impairing function and increasing knee osteoarthritis risk. Cognitive-motor dual-task assessments reveal altered joint loading in response to additional cognitive demands, but this response may vary by cognitive task type utilized. The purpose of this study was to compare kinetic parameters between single-task walking (ST), vision-based cognitive-motor dual-task walking (VP), and non-vision-based cognitive-motor dual-task walking (SS) in LLAs.

Methods: 16 participants were enrolled, 14 with complete data for analysis (9 males, 5 females; age=56.9±11.1 yrs, BMI=29.1±4.5 kg/m², 10 transtibial, 4 transfemoral). Loadsol® wireless force-sensing insoles were placed in the shoes of the amputated and non-amputated limb to measure peak loading, impulse, and loading rate. Normalized symmetry index (NSI) was calculated to compare the effect of task condition on peak loading, impulse, and loading rate normalized to body weight. An NSI of 0% is considered perfect symmetry between amputated and non-amputated limbs.

Results: Repeated measures ANOVA revealed a significant main effect of task condition on peak loading NSI ($F=3.547$, $p=0.043$). Post-hoc comparisons indicated peak loading NSI was improved during VP compared to ST ($p=0.022$, $d=-0.697$). Differences between ST and SS ($p=0.344$, $d=-0.263$) and SS and VP ($p=0.06$, $d=-0.55$) were not significant. No main effects of task condition on impulse ($F=0.361$, $p=0.700$) or loading rate ($F=0.827$, $p=0.449$) were observed.

Discussion: VP increased between-limb peak loading symmetry, primarily through increased loading of the amputated limb. These findings suggest unique adaptations based on cognitive task during cognitive-motor dual-task walking, including deviations from the individuals' preferred loading strategy.

Session A**Ethan Calupitan***Medical Laboratory Sciences****Comparison of Magnetic Bead-Based and Spin Column-Based DNA Extraction Methods Using Saliva as a Sample Source***

Background: DNA extraction is foundational for a wide range of genomic applications, and saliva offers a non-invasive alternative to traditional blood-based collection. Multiple extraction approaches exist, including spin column-based and magnetic bead-based protocols, and these methodological differences may influence downstream genomic testing. Although both approaches are widely used, comparative data evaluating their performance in saliva samples remain limited. This study aims to compare DNA yield and purity ratios obtained from paired saliva samples processed using these two extraction methods.

Methods: Saliva samples will be collected from 15 participants and divided into paired aliquots. Each aliquot will undergo DNA extraction using either a magnetic bead-based or spin column-based method, followed by spectrophotometric quantification of DNA concentration (ng/μL) and purity assessment using A260/280 and A260/230 absorbance ratios, which indicate protein, RNA, and chemical contamination. Comparative statistical analyses will determine differences between extraction methods.

Results: Recruitment and sample collection are underway, with DNA extractions and spectrophotometric analyses planned for late March.

Conclusion: This study will provide a direct comparison of magnetic bead-based and spin column-based DNA extraction methods using matched saliva samples. Findings may inform laboratory decision-making regarding saliva-based DNA extraction and support improved standardization of genomic workflows.

Session A

Hallie Bruce-Ross

Medical Laboratory Sciences

A Novel Flow Cytometry Procedure For Detecting Fetomaternal Hemorrhage

Background: Fetomaternal hemorrhage (FMH) occurs when fetal erythrocytes enter maternal circulation during pregnancy or delivery, and significant hemorrhaging can lead to complications such as anemia, kernicterus, and hemolytic disease of the fetus and newborn. Although the Kleihauer-Betke test remains the gold standard for quantifying FMH, it has substantial limitations. This project aimed to develop a flow cytometry procedure capable of distinguishing fetal from adult erythrocytes based on fetal hemoglobin expression as an alternative to traditional testing.

Methods: Rh-positive infant cord blood and Rh-negative adult blood samples from VCU Medical Center were spiked to model FMH, with Rh discordance serving as an internal control. Cells were permeabilized and stained with fluorescent antibodies targeting fetal hemoglobin and surface antigens, and the percentage of fetal cells in each spiked sample was quantified using flow cytometry. The relative percentage of Rh-positive fetal cells was compared with the percentage of erythrocytes expressing fetal hemoglobin.

Results: Data collection and analysis are ongoing, with completion expected in late March.

Conclusion: Given the inconsistency of the Kleihauer-Betke test, improved FMH detection methods are needed. This study developed a flow cytometry protocol capable of detecting both intracellular and extracellular antigens to differentiate fetal from adult erythrocytes. While analysis is still underway, preliminary findings suggest the protocol successfully distinguishes these cell populations based on Rh status and fetal hemoglobin expression.

Session A

Jacobelle Otoo

Health Services Organization & Research

Interprofessional Case Conferencing in Home Health and Community-Based Care: A Systematic Review

Background: Interprofessional case conferencing (ICC) is a formal, structured team practice in which distinct healthcare professionals convene regularly to review, coordinate, and document care. Its conflation with routine interprofessional collaboration has obscured mechanisms and produced inconsistent findings.

Methods: A systematic search of PubMed/MEDLINE, CINAHL, Embase, and Web of Science identified 5,812 records (2010–2025). After duplicate removal and independent screening, 10 empirical studies met inclusion criteria.

Results: Effects on hospital and emergency use were mixed. Functional and patient-reported gains were modest. The strongest impacts occurred when ICC had clear structures and targeted high-risk patients.

Conclusions: ICC is promising but context-dependent; its impact hinges on structural fidelity, clear membership, steady cadence, documented outputs, and coordination quality.

Session A

Narges Yaghoubi

Rehabilitation & Movement Sciences

Non-Invasive Transcranial Stimulation Demonstrates a Lateralized Role of the Posterior Parietal Cortex in Dominant-Hand Speed-Accuracy Relationships During Precision Drawing

Background: Approximately 90% of individuals exhibit right-hand dominance for precision tasks such as writing and drawing. Following loss of dominant-hand (DH) function due to stroke, peripheral nerve injury, or amputation, individuals may compensate using the non-dominant hand (NDH). Increased connectivity within a left parietal–prefrontal network has been linked to more effective NDH compensation, and high-definition transcranial direct current stimulation (HD-tDCS) applied to the left—but not right—posterior parietal cortex (PPC) has been shown to improve gross motor learning transfer to the NDH. We hypothesized that the left PPC is engaged in NDH precision and predicted that applying HD-tDCS to the left PPC would facilitate DH-to-NDH motor learning transfer.

Methods: Forty-one right-handed young adults received HD-tDCS (15 min, 2 mA) over the left PPC (n=15), right PPC (n=16), or sham (n=10). During stimulation, participants used a stylus to trace shapes with their DH; after 60 trials, they repeated the task with their NDH without stimulation. To assess transfer effects, five additional participants completed the task only with their NDH under sham. Mean stylus tip velocity and tracing error (Euclidean distance between tip and shape outline) were calculated.

Results: Error increased with HD-tDCS regardless of hemisphere (LPPC $p=.0003$; RPPC $p<.0001$). Velocity decreased significantly when switching to the NDH, with the largest reduction in the LPPC group ($p=.006$). Normalizing error to velocity revealed a significant speed–accuracy relationship for the DH. Participants who initially trained with their DH exhibited lower tracing errors ($p<.0001$) when using their NDH compared to those who performed exclusively with their NDH.

Conclusion: These findings suggest bi-hemispheric PPC involvement in DH precision drawing, which appears disrupted by HD-tDCS. Data collection is ongoing.

Session B 12:30 pm – 2:00 pm

Session B

Manolo Anleu Tuquer

Doctorate of Physical Therapy

Automated Assessment of Hand Myotonia Using Markerless Tracking in Myotonic Dystrophy**

Background: Myotonic Dystrophy Type 1 (DM1) is a progressive neuromuscular disorder characterized by muscle weakness, cognitive impairment, cardiac complications, and myotonia. Myotonia, defined as delayed muscle relaxation after contraction, is a hallmark feature of disease burden in DM1 and an important outcome for monitoring disease progression and treatment response. Clinically, myotonia is assessed using video Hand Opening Time (vHOT), measuring the time required to open the hand after making a fist. However, vHOT is typically measured manually, making the process time-consuming and subject to rater variability.

Methods: This study aims to develop and evaluate an automated software tool capable of objectively measuring vHOT from standard video recordings. 24 videos from 12 individuals with DM1 performing vHOT according to established protocols as part of the HELP-DM1 natural history study were analyzed.

Each trial was independently evaluated by trained clinicians and a custom automated software program developed using the MediaPipe hand-recognition framework. The software tracked anatomical hand landmarks and analyzed motion characteristics including position, velocity, and digit alignment to determine the start and end points of hand opening.

Results: The software was unable to determine velocities for 6 videos due to interference from another hand or movement in or out of frame, which disrupted landmark tracking. Average and maximum velocity ranges overlapped across digits, though variability in the rate of opening was observed.

Conclusions: Automated vHOT measurement appears feasible and may improve the objectivity, efficiency, and scalability of myotonia assessment in both clinical and research settings.

Session B

Noah McLemore

Interdisciplinary Studies — Health Systems & Data Analytics

An Interdisciplinary Analysis of Medicare Advantage Enrollment Behavior

Since 2010, enrollment in Medicare Advantage (MA) plans has grown rapidly, yet many beneficiaries still experience within-year switching between plans. Although most MA enrollees are limited to annual enrollment periods, certain high-need populations qualify for Special Enrollment Periods (SEPs) that allow more frequent transitions. This creates volatility in the health system and may fragment care for vulnerable groups, including dual-eligible and low-income beneficiaries. This capstone project for the Master of Interdisciplinary Studies investigates beneficiary-level characteristics and plan-level factors associated with the frequency and timing of these switches. Using longitudinal data from the Medicare Current Beneficiary Survey (MCBS), the study will track month-by-month enrollment changes to identify correlations between switching behavior and variables such as plan star ratings, premiums, and beneficiary health status. Integrating health systems policy analysis and data analytics, the project conceptualizes switching as a complex system behavior shaped by interactions between federal regulatory design and socioeconomic need, following William Newell's theory of interdisciplinary studies. The findings will provide a framework for future policy interventions aimed at improving enrollment stability and advancing health equity for disadvantaged populations.

Session B

Reid Moseley

Rehabilitation & Movement Sciences

Concurrent Validity of VALD Force Decks Relative to Bertec Force Plates During Jumping and Balance Assessments

Background: The purpose of this study was to assess the concurrent validity and agreement between VALD Force Decks and research-grade Bertec force plates during three common force-plate assessments: the countermovement jump (CMJ), drop jump (DJ), and single-leg balance (SLB).

Methods: Seven healthy graduate students (six males, one female) completed one laboratory visit and performed three CMJ trials, three DJ trials, and two SLB trials (one per limb). The VALD Force Decks were stacked on top of the Bertec force plates to allow simultaneous data collection. Agreement was evaluated using mean differences, standard deviation of differences, and Pearson correlation coefficients.

Results: Across jump tasks (42 trials), mean force differences between systems were small (CMJ: 1.88 N; DJ: -4.96 N), with near-perfect correlations (CMJ $r = 0.995$; DJ $r = 0.994$). For SLB trials, mean absolute differences in center-of-pressure position were 11.26 mm (X plane) and 5.43 mm (Y plane), with strong correlations (X $r = 0.980$; Y $r = 0.992$).

Conclusions: Overall, VALD Force Decks appear to be a valid tool for assessing jumping and balance tasks. They demonstrated strong agreement with Bertec force plates for vertical force measurements during jumping assessments, though increased noise was observed during SLB trials.

Session B

Sophia Eliza Andrion

Medical Laboratory Sciences

Stability of *Clostridioides difficile* Toxin in Patient Fecal Samples

Background: *Clostridioides difficile* (*C. diff*) is a leading cause of healthcare-associated colitis in hospitalized or long-term care patients due to its production of toxins TcdA and TcdB. Current CDC guidelines recommend testing fresh stool within two hours of collection because toxin degradation at room temperature may lead to false-negative results.

Methods: This study evaluated *C. diff* toxin stability over seven days using twelve toxin-positive patient stool samples from VCU Health. Samples were aliquoted and stored at room temperature (18°C), refrigerated (4°C), or frozen (-18°C). Toxin positivity was assessed using the Quik Chek Complete toxin A/B rapid enzyme immunoassay (TechLab) on Days 1, 2, 3, and 7, with stability defined as retained positivity.

Results: By Day 7, three of the twelve samples lost positivity, most frequently in frozen aliquots, while refrigerated samples showed the greatest stability. Preliminary statistical analysis indicates no significant differences between storage temperatures.

Conclusions: These findings suggest that *C. diff* toxin detection may persist beyond the CDC's recommended two-hour testing window, supporting greater flexibility in specimen processing while still emphasizing timely testing for accurate diagnosis and treatment. Further research is needed to quantify toxin levels and explore associations between toxin stability and disease severity.

School of the Arts

Session A 10:30 am – 12:00 pm

Session A

Grace Carter

Masters of Interior Environments

Sustainable Management and Air Quality in Historic Academic Buildings

Historic academic buildings present unique challenges for maintaining healthy indoor environments while preserving architectural integrity. This research investigates how interior designers can mediate between the physical limitations of aging institutional buildings and contemporary standards for environmental health and sustainability. Focusing on a university building completed in 1971, the project examines how evolving ventilation standards and aging mechanical systems may contribute to poor indoor environmental quality (IEQ) and early symptoms of sick building syndrome (SBS), which could serve as indicators for early intervention. Using a mixed-methods approach, the study integrates a literature review on SBS, biomimicry, and sustainable building practices with a preliminary HVAC assessment. Semi-structured interviews with health experts, mechanical experts, and staff capture lived experiences of the interior environment, and thematic analysis identifies patterns linking perceived health impacts to institutional responses. The research also proposes incorporating diagnostic metrics—airflow, filtration, humidity, dust accumulation, temperature, and light levels—to better understand environmental conditions. Findings suggest a disconnect between occupant experiences and institutional communication about building health, underscoring the need for clearer design-driven strategies. The project proposes a low-cost monitoring and maintenance framework using environmental sensors and targeted mechanical improvements, demonstrating how interior design research can advance sustainable adaptation, occupant well-being, and climate-resilient futures within historic academic buildings.

Session B

Owen Parker

Economics

Medical Malpractice Venue Rules in Lawsuit Rewards and Defensive Medicine

Despite extensive literature examining the relationships between medical malpractice policy, physician behavior, and patient outcomes, no prior research has identified the causal effect of venue filing rules. This study finds a strong association between malpractice venue rules and lawsuit payouts: consistent with legal scholarship, jurisdictions governed by plaintiff-friendly venue rules yield 23% higher awards than non-plaintiff venues, while jurisdictions with defendant-based and cause-of-action venue rules are associated with 15% and 20% lower payouts, respectively. Using a recent venue policy change in Pennsylvania, we further demonstrate how physicians adjust their practice patterns to mitigate malpractice liability under a plaintiff-favorable legal regime. The policy change resulted in a 1.6% increase in imaging studies and a 5.1% increase in the use of durable medical equipment, with imaging effects concentrated in X-ray procedures, which rose by 6.8%. Finally, consistent with broader malpractice research, the venue policy change did not improve patient health outcomes.

Session B

Priyankar Bose

Information Systems

TerAMIND: A Multitask Learning System for Automating the Generation of Structured Terrorism Data from Unstructured News Articles

Terrorism poses complex challenges amplified by the overwhelming volume of unstructured textual data, and traditional manual methods for structuring terrorism-related information from news articles are slow, reactive, and unsuitable for real-time analysis. Drawing on Sensemaking Theory and Multiple Resource Theory (MRT), this research introduces TerAMIND (Terrorism Attention-based Multitask Intelligence for National Defense), a multitask deep learning system designed to automate terrorism event detection, classify attack types, and generate perpetrator profiles (in progress) from unstructured text. The system leverages RoBERTa for contextual feature extraction and residual convolutions to enhance gradient flow and hierarchical learning. Sensemaking Theory informs the system's high-level modular structure by mapping early foraging processes to terrorism detection and deeper schema construction to attack-type identification and perpetrator profiling, while MRT guides the low-level architecture by advocating separate processing of cognitively distinct inputs—such as headlines and article bodies—to reduce interference and improve learning efficiency. MRT also motivates the inclusion of intra-modal (self-attention) and inter-modal (cross-attention) mechanisms and contrastive fusion to emulate human shifts in cognitive focus. Trained and evaluated on 4,399 curated news articles, TerAMIND performs binary classification for terrorism detection and multilabel classification for attack-type identification, with the generative perpetrator profiling module under development. This research addresses a critical gap in Information Systems literature by integrating AI, multitask learning, and cognitive theories into a unified, real-time intelligence artifact, aligning with design science research pathways outlined by Abbasi et al. (2024). TerAMIND advances theoretical understanding of intelligent augmentation and multitask architectures in national security contexts while extending MRT to machine learning applications. Practically, it offers agencies such as the FBI, RAW, and DIA a scalable and efficient alternative to manual terrorism-data structuring, and its architecture provides a foundation for transfer learning across domains, supporting automated database generation and knowledge management.