GRADUATE + POSTDOCTORAL

RESEARCH SYMPOSIUM

Tuesday, March 5, 2024

12:00 - Registration
1:00 - Welcome Remarks
1:10 - Keynote Speaker
2:00 - Poster Session
3:30 - Oral Presentations
5:00 - TED-like Talks
6:00 - Awards & Reception

UNIVERSITY OF MIAMI

GRADUATE + POSTDOCTORAL

RESEARCH SYMPOSIUM

Poster Presenters

Chris Li

Ph.D. Student in Microbiology and Immunology

Attenuating the Alloimmune Response in Transplantation through Co-implantation of Autologous, Donor Antigen-primed Lymph Node Stromal Cells

Objective/Background: Patients receiving allogeneic tissue transplants require lifelong immunosuppression, reducing quality of life and applicability of transplantation. We aim to eliminate the need for immunosuppression by co-transplanting fibroblastic reticular cells (FRCs), a lymph node stromal cell subtype. FRCs are unconventional antigen-presenting cells that contribute to restraining autoreactive T cells and can possibly be used in transplantation to prevent alloreactive T cell activation. We hypothesize that autologous FRCs pre-primed with donor cell lysate, pre-conditioned with interferon-γ (IFNγ) to upregulate antigen-presenting machinery, and co-transplanted with allogeneic donor tissue will reprogram the recipient's alloimmune response toward inactivation/anergy.

Methods: In all experiments, recipient-matched C57BL/6 FRCs were pre-conditioned with 10ng/mL IFNγ for 72h. To demonstrate FRC uptake of donor-derived antigens, FRCs were pre-primed with CellTrace-labeled NIT1 (non-obese diabetic background) cell lysate overnight. No, low (100 IEQ), or high (1000 IEQ) doses of NIT1 cell lysate were administered to FRCs. To demonstrate FRC presentation of antigen after uptake, FRCs were treated with 50μM OVA257-264 (SIINFEKL) peptide overnight, and presentation in MHC I was detected with a SIINFEKL-H2Kb antibody. Dendritic cells (DC) and macrophages were derived from age-matched C57BL/6 mice. Three biologically distinct cell lines/preparations were tested.

Results: With NIT1 lysate, FRC viability was not affected while DC and macrophage viability decreased 10-20% with high dose. Across all cell types, uptake of fluorescent lysate was dose-dependent. At high dose, a greater proportion of FRCs took up NIT1 lysate (~96%) compared to DCs (~81%) and macrophages (~70%). Analysis of mean fluorescence intensity indicates that FRCs have ~2.4- and 1.4-fold higher antigen uptake compared to DCs and macrophages, respectively. With SIINFEKL, FRC viability was not affected while DC and macrophage viability decreased ~15% and 5%, respectively. IFNγ potentiates SIINFEKL presentation, with >99% positive cells in all cell types. Median fluorescence intensity indicates that FRCs have ~2-fold higher SIINFEKL presentation compared to DCs.

Conclusion/Significance: FRCs have antigen uptake and presentation capacities equal to or greater than that of DCs and macrophages, predicting effective interaction with antigen-specific T cells. Recipient FRCs are capable of uptaking allogeneic donor cell antigen and could provide immunomodulation of recipient T cells alloreactive to donor tissue.

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Deema Abayawardena

Ph.D. Student in Biology

An RNAseq analysis of isolated animal and vegetal halves from Patiria miniata oocytes

The formation of a metazoan embryo from an egg is one of the most complex and amazing processes in biology. A critical event during embryonic development is the specification of the primary body axis, the anterior posterior (AP) axis in the early embryo. It is well-established that localized activation of Wnt/β-catenin (cWnt) signaling in posterior blastomeres plays a significant role in AP axis formation during embryogenesis. Studies in Patiria miniata have shown that Dishevelled (Dsh), a central regulator of cWnt signaling, is required for activation of this pathway in posterior blastomeres. Live imaging of Patiria oocytes showed that a Dsh-GFP fusion protein was localized to puncta throughout the cortex of the oocyte, and during oocyte maturation these puncta are lost from the cell cortex and new puncta are assembled at the vegetal pole. The mechanisms that regulate Dsh localization and "activation" at the vegetal pole are not known, but the elucidation of these processes is critical to understanding how the cWnt pathway is selectively activated in vegetal blastomeres to initiate AP axis patterning. To identify maternal factors that may play a role in regulating Dsh activity and cWnt activation in vegetal blastomeres, we carried out RNAseq of isolated animal and vegetal halves of Patiria oocytes. Preliminary analysis of this data indicated that there were coding and non-coding RNAs enriched in animal and vegetal halves of oocytes. The significance of these molecules to establishing the animal vegetal axis and their putative roles in activating cWnt signaling will be discussed.

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Diego Sanchez

Master's Student in Biomedical Sciences

Development of Novel Fatty Acid Oxidation Inhibitors for Cancer Treatment

Cancer cells rely on several metabolic processes to produce energy, some of which operate differently than in normal, healthy cells. The inhibition of these metabolic processes is currently a target for clinical research, as this approach could provide other ways to treat cancer in a more targeted approach with less side effects than current treatments. One of these bioenergetic pathways that cancer cells exploit is fatty acid oxidation (FAO), the process through which fatty acids are broken down into energy metabolites. There are few FAO inhibitors which are currently in use, but they are used for other clinical considerations such as treating chest pain. Some examples of these partial fatty acid oxidation (pFOX) inhibitors, and their associated enzymes, include: Etomoxir (CPT1-1), Mildronate (Carnitine Biosynthesis) and Trimetazidine (3-KAT). The aim of our experiments was to target the substrate of fatty acid oxidation in brain cancer cells by mimicking its structure thereby inhibiting the pathway while also measuring the effects on two key factors for mitochondrial health. The inhibition of this bioenergetic pathway would then hinder cancer cells' growth and proliferation while also ensuring that it does not disrupt mitochondrial function in healthy cells. The molecules engineered are bound to TPP (see figure above) which allows them to be targeted directly to the mitochondria of the cancer cells more efficiently than non-targeting inhibitors.

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Raksha Narasimhan

Master's Student in Medicine

Seroprevalence and Epidemiology of HSV-1 and HSV-2 Infections in the United States: A Secondary Data Analysis of NHANES (1999-2016)

Background: Herpes Simplex Virus type 1 and 2 (HSV 1 & 2) are highly prevalent viral infections in the United States (U.S.). HSV-1 involves cold sores and blisters in the oral cavity, while HSV-2 causes genital herpes. HSV-1 infections are incurable and cause recurrent outbreaks that generate discomfort and social stigma.
Methods: We utilized National Health and Nutrition Examination Surveys (NHANES) from 1999-2016 to analyze HSV-1 and HSV-2 serology data and demographic information. The analysis includes individuals aged 20-49 with complete data on HSV-1 and HSV-2 serology and demographics. Multivariable binary logistic regression models examined the association between HSV infection status and demographic factors. These models were repeated for each of HSV type (HSV-1 and HSV-2). Adjusted odds ratios (aOR) were calculated with 95% confidence intervals (95%CI). Data management and statistical analysis were performed with SAS v9.4 for Windows (Cary, NC: SAS Institute Inc.).
Results: Among n=22,647, the overall HSV seroprevalence was 71.8%. HSV-1 has a higher seroprevalence (64.6%) than HSV-2 (21.3%). Individuals aged 40-49 exhibited the highest seroprevalence (81.3%), followed those aged 30-39 (73.6%) and those aged 20-29 (67.7%). Females demonstrated higher HSV seroprevalence (75.4%) than males (67.7%). Among racial/ethnic groups, non-Hispanic Whites have the lowest seroprevalence (58.7%). Lower educational fulfillment predicts higher seroprevalence (81.9%). Widowed, divorced, or separated individuals exhibited higher seroprevalence (73.0%) than those married or living with a partner (49.0%). Individuals below the poverty index ratio (PIR) exhibit higher seroprevalence (80.0%) than counterparts (68.6%). Of 14,623 HSV-1 positive individuals, 3,195 were also HSV-2 positive (21.8% dual infection rate). The multivariable binary logistic regression model showed that age, gender, race/ethnicity, education, marital status, and PIR are significant predictors for overall HSV and HSV-1 infection. Aforementioned variables except PIR significantly predicted HSV-2 infection.
Conclusions: The associations between sociodemographic factors, including age, gender, race/ethnicity, education, marital status, and socioeconomic status, and HSV infection enhance our understanding of HSV prevalence in the U.S. population. These findings may inform public health strategies to reduce infection rates and overall seroprevalence through prevention, education, and targeted interventions.

Keywords: Human simplex virus, HSV, HSV-1, HSV-2, HSV seroprevalence disparities, NHANES.

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Sidrah Shaikh

Ph.D. Student in Nursing Science

Breaking Boundaries in Healthcare: A DNP Journey towards Transformative Patient-Centered Interventions and Improved Clinical Outcomes

By investigating novel and patient-centered approaches, this ground-breaking study from the Doctor of Nursing Practice (DNP) program seeks to push the boundaries of traditional healthcare practices with the ultimate goal of improving clinical results. To provide a thorough knowledge of the complexity involved, the study uses a mixed-methods approach that includes qualitative interviews, quantitative assessments, and extensive literature studies.

The main emphasis is on creating and executing innovative treatments that put patients' comfort and well-being first. This DNP route aims to close gaps in current practices by working with interdisciplinary healthcare teams and applying evidence-based techniques to change the way that care is delivered. To determine how these treatments affect patients' overall satisfaction and health outcomes, a thorough assessment of their experiences and views will be conducted.

Furthermore, by a critical analysis and synthesis of pertinent literature, the project hopes to add to the body of knowledge already in existence. The study aims to provide guidance for future practices and policies by identifying gaps and emerging trends in healthcare transformation. This will help to provide the foundation for long-term improvements in pa□ent care.

The researcher hopes to further their own clinical skills through this DNP journey, as well as provide insighful information to the larger healthcare community. The results of this study have the power to completely alter the way that healthcare is provided, encouraging the nursing profession to adopt a culture of pa□ent-centered care and ongoing development.

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Tericka Cesar

Ph.D. Student in Nursing Science

Building Blocks: Modeling Pediatric Metabolic Syndrome (METS) with the Built Environment

Introduction: There is a growing body of knowledge that supports a significant association between the built environment and pediatric METS. Yet limited knowledge persists about how the built environment impacts METS in ethnically diverse pediatric populations. Current data on the built environment suggests that availability and access to greenspace could be protective of METS. The purpose of this research was to examine the hypothesis that having enough greenspace is negatively associated with pediatric METS, in a sample of Hispanic minorities of Tennessee.
Methods: The original study conducted in 2015-2016 included a sample of 150 Hispanic guardian-child dyads, recruited from a community health center in Northeast, TN. Children were between the ages of 2 and 10 years. Logistic regression modeling was performed with SPSS (n=114) to examine the relationship between the built environment feature (of having enough greenspace) and having METs while controlling for covariates: parental education, gender, dietary fiber intake, and anger (state how it was defined).
Results: The average child age was 6.62 years (SD: 2.73 years) with 42% rating their neighborhood overall as average. After controlling for covariates and having a stomach or intestinal illness), having enough green space was associated with reduced odds for METS (Odds Ra□o = 0.089; 95% Confidence Interval: 0.010-0.798).
Discussion/Conclusion: Having enough greenspaces in the built environment was found to be protective of METS in the sampled Hispanic pediatric population. In the future, longitudinal research can assist in fully understanding the complex mechanisms between the built environment, food availability, and pediatric METS in diverse representative populations.

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Kaitlyn Dillon

Ph.D. Student in Psychology

Neural Correlates of Physical Weakness in Persons Living with HIV

Background: Frailty is characterized by slow gait, weakness, low physical activity, unintended weight loss, and fatigue. PLWH, frailty onsets earlier and poses an even greater health risk. Due to factors including chronic heightened immune activation, PLWH tend to exhibit symptoms of frailty an average of 10 years earlier than their HIV-negative counterparts. While evidence supports the relationship between cognitive impairment and frailty in the general population is supported by a common neural network no single imaging technique has been shown to reliably differentiate weak from non-weak individuals living with HIV based on dynamometer strength assessment.
Methods: Eighteen older adults living with HIV (aged 62.2 ± 3.4 years) were participated in a multi-modal neuroimaging session that involved the collection of a 5-minute resting state scan to characterize functional brain connectivity, diffusion tensor imaging for white matter microstructure, and a T1-weighted scan to assess gray matter volume. Physical weakness was assed via dynamometer in conjunction with Alley et al., 2014 criteria. Groups were compared using an independent sample t-test.
Results: Diffusion maps revealed weak individuals show greater fraction anisotropy (i.e., greater restriction of water flow) in the superior and posterior radial corona ($p < .01$ unthresholded). Orientation dispersion index (ODI), which assesses the orientational coherence of neuroglia indicated greater angular variability in the genu of the corpus callosum, head of the pontine crossing tract, and the superior corona radiata ($p < .01$ unthresholded). Gray matter volume analysis revealed weak individuals had significantly grater volume of the thalamus and globus palladium, however lower volume in cerebellum, frontal, temporal, and parietal lobes ($p < .001$, uncorrected). No differences in mean functional activity at rest were observed.
Conclusion: Physical weakness in HIV is associated with reduced global brain volume and isotropic movement of water in white matter regions implicating neuroinflammation along pathways subserving global cognitive control.

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Abdullah Alsaheal

Ph.D. Student in Industrial & Systems Engineering

Adaptive Network Slicing for Prospicient Grids: Enabling Advanced Grid Resilience and Sensibility (AGRES)

Addressing the complexities of network management is a formidable challenge. In response, our proposed methodology integrates two advanced machine learning models to tackle the issues surrounding the automated and dynamic oversight of network slices. The first model, a cutting-edge deep learning reinforcement learning (DRL) system, operates as a proactive monitor. It dynamically allocates network resources, analyzing various data aspects, including slice devices' behavior, network traffic patterns, and device capabilities. Simultaneously, the second model utilizes a state-of-the-art support vector machine (SVM) with supervised learning to precisely classify network slices. This classification, driven by stringent quality of service (QoS) requirements, efficiently groups users and network resources. The SVM model facilitates the tailored creation of network slices for each class, optimizing resource utilization. Moreover, it enables dynamic resource sharing by reallocating underutilized resources among slices based on operational demands. Motivated by a commitment to continuous improvement, the SVM model dynamically adjusts network slices using real-time data from the DRL model, proactively anticipating changes in requirements for smart grid applications, and strategically schedules future network slices. This dual-model approach not only effectively addresses the inherent challenges in current network management but also positions our infrastructure to adeptly meet the evolving needs of dynamic smart grid environments.

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Afshin Asadi

Ph.D. Student in Industrial Engineering

Monitoring Energy Consumption from State Space Models with Latent Variables

Identifying factors that influence the consumption behavior of industrial equipment, such as compressors and chillers, is a significant challenge that requires a comprehensive understanding of both the dynamic behavior of the equipment and hidden variables like efficiency and degradation status. Leveraging the capabilities of Variational Recurrent Neural Networks (VRNNs), our model uncovers latent patterns, contributing to a more accurate estimation of power consumption. By feeding real-time measurements into a Seq2Seq framework, enhanced with the power of LSTM (Long Short-Term Memory) networks, the model dynamically predicts power consumption over time. This VRNN architecture effectively encodes sequences into a compact representation and then decodes them to forecast future states, offering a comprehensive view of equipment performance.
Our model stands out by combining the advanced capabilities of VRNNs with the sequential processing strengths of the Seq2Seq architecture, enabling precise real-time predictions of power consumption in large industrial devices. This approach not only captures immediate operational data but also delves into identifying underlying trends and patterns, providing insights for proactive energy management. The integration of LSTM and Seq2Seq models focuses on temporal dependencies, further enhancing prediction accuracy. An expectation maximization method is employed to train the model, optimizing its performance. The integration of these technologies creates a powerful tool that goes beyond just regular monitoring. It provides detailed predictions and strategies for managing energy use in complex industrial settings. This means we cannot only keep an eye on equipment performance but also predict future needs and find better ways to operate efficiently.

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Foluso Adeosun

Ph.D. Student in Chemical, Environmental & Materials Engineering

Rheological Structure and Tunability in Bio-based Surfactant Systems through Engineered Biopolymer-Surfactant Interactions

Rheological structuring and tunability of surfactant solutions is a vital aspect of product formulation for pharmaceutical, cosmetic and consumer product applications. Sulfate-free anionic surfactants (amino acid-based or bio-based surfactants) do not tend to build adequate structure in the presence of zwitterionics and salts as easily as their sulfate-based counterparts which are able to build structure via the formation of worm-like micelles. We explored an alternate structuring approach to building rheological structure in a mixed sodium laurylglucosides hydroxypropyl sulfonate (SLHS)-based surfactant system, by engineering interactions between a biopolymer-surfactant system. We report in this work that the interplay of hydrophobic and electrostatic interactions between SLHS+CAPB and Carrageenan produces a synergistic increase from ~103 to ~106 mPa.s in viscosity of the overall system, giving rise to a structuring mechanism which is tunable and responsive to external stimuli- such as change in pH or electrolyte levels. This finding may prove helpful to formulators in related fields for the development of sulfate-free formulations which impart a novel and differentiated consumer experience.

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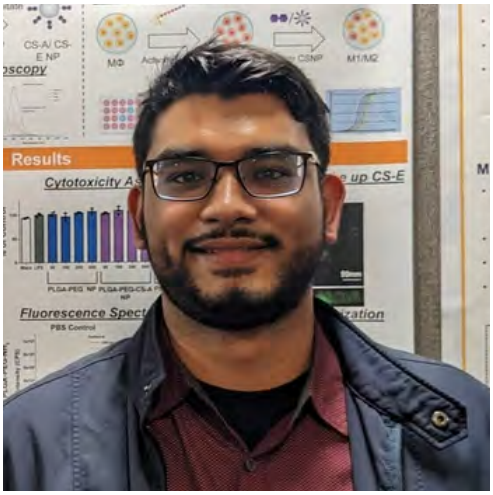

Giancarlo Tejeda

Ph.D. Student in Biomedical Engineering

Anti-inflammatory Scavenger Nanoparticles Induce Macrophage Phenotype Shift in Inflammatory Conditions

Macrophages are innate immune cell that quickly travel to sites of injury and infection. taking up pathogens and damaged cells, and release cytokines to further recruit other immune cells to the lesion site. Macrophages are one of the drivers of inflammation that can further exacerbate the injury within the central nervous system, such as in spinal cord injury and traumatic brain injury. An intense inflammatory response that is accompanied by a cytokine storm released by injured cells and infiltrating immune cells. Cargo-free nanoparticles (NPs) which can modulate immune cell phenotype to an anti-inflammatory state due to their physical properties. Furthermore, glycosaminoglycans (GAGs), a highly negatively charged polysaccharide, have affinity to cytokines due to their structure and electrostatic properties. In this project, we made a cargo-free NP using GAGs (GAG-NPs) to sequester inflammatory cytokines and modulate the injury microenvironment in vitro towards an anti-inflammatory state.

The GAG-NPs and their affinity to pro-inflammatory cytokines were characterized using dynamic light scattering, fluorescent spectroscopy (FL), and enzyme-linked immunosorbent assay (ELISA). Immortalized Bone marrow-derived macrophages (iBMDMs) were used as an inflammatory in vitro model. The effect of the GAG-NPs on the inflammatory phenotype on the iBMDMs was analyzed with flow cytometry and RT-qPCR. Western blotting was used to assess GAG-NP impact on inflammatory cytokine signaling. Confocal microscopy was used to observe the uptake of the nanoparticles into the iBMDMs.

GAG-NPs were characterized to be highly negative, and within an immunomodulatory size range. Cytokines were detected on the surface of the GAG-NPs using FL and ELISAs. Using confocal microscopy, the GAG-NPs were shown taken up in the iBMDMs. Flow cytometry showed that iBMDMs that took up the GAG-NPs showed an increase in anti-inflammatory CD206+ marker. This increase in anti-inflammatory marker indicates that the GAG-NPs were inducing a shift in the macrophages towards an anti-inflammatory phenotype.

Through this work we have shown that due to the physical properties of the GAG-NPs, they are able to modulate immune cell phenotype and sequester pro-inflammatory cytokines. This GAG-NP platform could be used to reduce inflammation after SCI, as there are no clinical therapies to treat acute SCI and secondary injury.

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Ibrahim Ahmed

Postdoctoral Associate

Network Anomaly Detection with Topological Features Utilizing Graph Neural Networks

Detecting anomalies on attributed networks with sensor data has attracted an increasing amount of attention, with impact in various areas, including power grids, cybersecurity and social networks. Graph-level anomaly detection has been a promising tool to detect and predict anomalous nodes and structures in complex networks where a network is modeled as a graph, a well-defined mathematical structure in terms of a set of vertices and edges. This work presents a novel framework for anomaly detection in complex networks using Graph Neural Networks (GNNs). By incorporating graph topology and node attributes, the proposed model offers improved accuracy and detection capabilities compared to traditional methods. The proposed framework utilizes a graph autoencoder with decoders for node features and the adjacency matrix, capturing the underlying structure of the graph. Topological features such as centrality and clustering coefficients are integrated to enhance the model's performance. To address the complexities of the model, a generic algorithm is employed for efficient optimization. Our approach demonstrates superior performance compared to traditional autoencoders and other machine learning models. The model's effectiveness in identifying anomalous nodes and subgraphs highlights the importance of considering both structural components and node attributes in anomaly detection with GNNs. One of the key advantages of the proposed model is its adaptability to various datasets and node features. Training the model with multiple graphs or instances allows for handling diverse working conditions and uncertainties.

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Jordan Grant

Ph.D. Student in Biomedical Engineering

Inflammasomes and their effects on neuroinflammation in intracortical implants

Microelectrode arrays (MEs) are used to interface with the central nervous system for recording or stimulating the activity of neurons. A limitation of ME implants is the ensuing acute foreign body response and chronic neuroinflammation that results in declining electrical signal quality and eventually electrode failure. Acutely, intracortical ME implantation causes blood-brain-barrier disruption, tissue displacement and strain, and glial recruitment and activation, which trigger the innate immune response in the hours and days following the implantation. Inflammasomes are multiprotein structures that initiate the innate immune response, resulting in neuroinflammation and pyroptotic regulated cell death. Inflammasome complexes are comprised of sensor molecules, an essential adaptor protein (apoptosis speck like protein containing a caspase recruitment domain, ASC), and caspase-1 enzyme. Once formed, inflammasomes drive proinflammatory cytokine production as well as facilitate enzymatic cellular membrane rupture, which are both hallmarks of pyroptosis. In this study, we implanted a 16-channel non-functional Utah array into the rat somatosensory cortex and studied the inflammasome signaling and its effects on neuroinflammation and the inflammasomemediated cell death mechanism of pyroptosis across acute, sub-acute, and early chronic periods post-implantation. There was significant, persistent upregulation of inflammasome sensor molecules, adaptor protein ASC, and caspase-1 enzyme, as well as of inflammasome-mediated cytokines IL-1β and IL-18 and the membrane-pore forming enzyme gasdermin-D inflammatory markers, which are indicative of pyroptosis. This coincided with a declining trend of neuronal densities surrounding the electrode site by the 4-wk early chronic timepoint Our results demonstrate the activation of inflammasomes and their contribution to neuroinflammation at the electrode-tissue interface.

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Kassidy Rodriguez

Ph.D. Student in Chemistry

Chemical, Thermal, and pH Induced Unfolding of Tetrameric CthEgtB Reveals a pH Dependent Oligomerization and Aggregation Pathway

CthEgtB is a non-heme iron enzyme that can be of use when investigating homo-tetrameric protein assembly and the effect that oligomerization has on protein secondary structure, stability, and activity. In this study, we monitored the unfolding pathway of CthEgtB upon perturbation with temperature, pH, and chemical denaturants. The structural stability and thermodynamics of CthEgtB unfolding at different pHs were determined using fluorescence and circular dichroism spectroscopic measurements. CthEgtB was found to undergo a pH dependent oligomerization with only a distribution between monomeric and tetrameric quaternary structures. The Gibbs free energy and unfolding constant were also calculated for CthEgtB for both temperature and chemical unfolding experiments. CthEgtB was found to undergo different unfolding pathways and have different thermodynamic properties depending on the buffer conditions. The knowledge presented in this study will benefit in understanding the conditions at which CthEgtB retains the highest structural stability.

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Mahdi Zarif

Postdoctoral Associate

Advanced Fault Location Techniques in Power Systems with high penetration of renewable energy by GCM

This study addresses the critical challenge of fault location in power systems, examining it from two primary perspectives. The first focuses on pinpointing the physical location of faults within the power grid, a task essential for grid operators striving for precise fault identification. The second perspective deals with data manipulation or cybersecurity threats. Our research primarily concentrates on the former perspective, yet inherently encompasses the latter as well.
We illustrate this with a scenario where a tree fall disrupts a power transmission line, leading to outages for several subscribers. Rapid identification of the fault area is vital for restoring power, especially when multiple subscribers are affected. To address this, we have modeled the complex IEEE118 network using the Jupiter environment and the Pandapower library. Our simulation assumes that each node in the network is equipped with four sensors (monitoring voltage, phase, active and reactive power), and the transmission lines have sensors for active and reactive power transmission. These sensors record network data both pre- and post-fault, transmitting it to local and central data centers via a mesh network.
The study simulates line outages over a 24-hour period, monitoring bus voltage in compliance with IEEE standards, line current based on network specifications, and current direction changes as indicated by sensor data. Utilizing this data, we train a graph model that efficiently and accurately locates faults within the network.

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Marcus Vinicius Batista Oliveira

Ph.D. Student in Environmental Engineering

New Particle Formation Events in a Remote Environment in the Southeastern Atlantic

New particle formation (NPF) is a two-stage process consisting of the formation of thermodynamically stable clusters from trace gas molecules, followed by their growth to a detectable size. These particles can affect cloud formation, visibility, and air quality, and understanding this process is vital for comprehending the complexities of atmospheric dynamics. However, challenges remain in fully capturing the complexities of this phenomenon. Because few measurements in the 3-5 nm size range are made in remote environments and across the oceans, it's more challenging to assess regional and global variations. Research has shown that the availability of precursor gases, cloud structure, and precipitation events play a crucial role in this process. Studies have also identified natural and anthropogenic sources that contribute to the formation of these particles.
Using data collected in the LASIC (Layered Atlantic Smoke Interactions with Clouds) U.S. Department of Energy campaign and retrieved from the DOE Atmospheric Radiation Measurement (ARM) website, we investigated the particle distribution, precursor gas concentrations, and meteorological data around Ascension Island (ASI) in the southeastern Atlantic from June 2016 to October 2017. Our results indicate the importance of analyzing cloud, meteorological, and synoptic conditions for investigating NPF events. We identified 50 NPF events and classified them as weak or strong. We found an association between NPF events and vertical velocity suggesting that the newly formed particles may be vertically transported to the surface from the upper boundary layer or free troposphere during downward movements. In addition, NPF events coincided with the African biomass-burning season (June to September), suggesting that biomass-burning pollution from Africa may be one of the contributors to NPF in southeastern Atlantic. Our results corroborate with recent findings that cloud structures can play a role in allowing photochemical reactions that produce nucleating and condensing vapors. Our findings demonstrate that the continuous growth of particles observed in new particle formation events can be hindered by condensation sinks in the marine environment. The impact of NPF on cloud properties will be further discussed.

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Mariana Viso

Ph.D. Student in Biomedical Engineering

Engineering Immune-driven Stromal Remodeling in Pancreatic Cancer

Pancreatic ductal adenocarcinoma (PDAC) is characterized by a dismal five-year survival rate of 12.5%, with a mere 1% increase in survival rate in the last decade. These bleak data highlight both the gap in knowledge for understanding PDAC chemoresistance, and the need to develop effective new tools to reverse it. Previous research, primarily driven by animal models, has suggested that chemoresistance arises from the polarization of cancer-associated fibroblast (CAF) into pro-inflammatory cells (iCAFs) within the stromal microenvironment of PDAC. Further, this polarization is driven by immune-interactions with myeloid-derived suppressor cells (MDSCs). However, these models, in addition to not being patient relevant, also do not allow real-time demonstration of the immune and stromal mechanisms of interactions of the tumor microenvironment.
We will present our ongoing efforts in developing an MPS to examine the polarization of CAFs as they interact with MDSCs, and their contributions to stromal remodeling and chemoresistance development. MPS is designed in SolidWorks after performing finite element based computational analyses to establish flow dynamics that enforce a laminar flow (a particular challenge for large clearance fluidics), while minimizing shear stress (for optimal cell viability). Flow dynamic predictions are confirmed by conducting particle imaging velocimetry. Concave shaped wells are milled into clear, bio-inert acrylic sheets to hold tumor/CAF spheroids. An interlocking top piece that contains fluidic channels for perfusion and introduction of immune cells. The pieces can be reversibly clamped for manual seeding and retrieval of spheroids, as well as for conducting perfusion and live imaging of dynamic cellular events. Dual reporter CAFs that switch fluorescence when they adopt inflammatory phenotype (iCAFs) are combined with tumor cells in optimized ratios to form spheroids, that then interact with live-tagged MDSCs that are fluidically introduced at physiologically relevant dosages. Positive and negative controls for polarization are conducted by flowing in cytokines that stimulate an inflammatory (IL-1β) or non-inflammatory (TGF-β) phenotype. MDSC trafficking and infiltration events are recorded and quantified by fitting attachment and detachment rate constants. By first characterizing the real-time immune-stromal interactions within our MPS, we intend to then validate therapeutic targets within the PDAC microenvironment, and discover drugs against them.

Author(s): Mariana Viso, Bhumi Suthar, David Oliver, Karthik Rajkumar, Anna Bianchi, Jashodeep Datta, Ashutosh Agarwal

Nadia Tanzeem

Ph.D. Student in Industrial and System Engineering

A Deep Variational Bayesian Approach to Sensor-Driven System Monitoring and Control

Pancreatic ductal adenocarcinoma (PDAC) is characterized by a dismal five-year survival rate of 12.5%, with a mere 1% increase in survival rate in the last decade. These bleak data highlight both the gap in knowledge for understanding PDAC chemoresistance, and the need to develop effective new tools to reverse it. Previous research, primarily driven by animal models, has suggested that chemoresistance arises from the polarization of cancer-associated fibroblast (CAF) into pro-inflammatory cells (iCAFs) within the stromal microenvironment of PDAC. Further, this polarization is driven by immune-interactions with myeloid-derived suppressor cells (MDSCs). However, these models, in addition to not being patient relevant, also do not allow real-time demonstration of the immune and stromal mechanisms of interactions of the tumor microenvironment.
We will present our ongoing efforts in developing an MPS to examine the polarization of CAFs as they interact with MDSCs, and their contributions to stromal remodeling and chemoresistance development. MPS is designed in SolidWorks after performing finite element based computational analyses to establish flow dynamics that enforce a laminar flow (a particular challenge for large clearance fluidics), while minimizing shear stress (for optimal cell viability). Flow dynamic predictions are confirmed by conducting particle imaging velocimetry. Concave shaped wells are milled into clear, bio-inert acrylic sheets to hold tumor/CAF spheroids. An interlocking top piece that contains fluidic channels for perfusion and introduction of immune cells. The pieces can be reversibly clamped for manual seeding and retrieval of spheroids, as well as for conducting perfusion and live imaging of dynamic cellular events. Dual reporter CAFs that switch fluorescence when they adopt inflammatory phenotype (iCAFs) are combined with tumor cells in optimized ratios to form spheroids, that then interact with live-tagged MDSCs that are fluidically introduced at physiologically relevant dosages. Positive and negative controls for polarization are conducted by flowing in cytokines that stimulate an inflammatory (IL-1β) or non-inflammatory (TGF-β) phenotype. MDSC trafficking and infiltration events are recorded and quantified by fitting attachment and detachment rate constants. By first characterizing the real-time immune-stromal interactions within our MPS, we intend to then validate therapeutic targets within the PDAC microenvironment, and discover drugs against them.

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Oriana Marrone Mantovani

Ph.D. Student in Biomedical Engineering

Hydrogel Platform for Localized Sustained Delivery of Clinically Relevant Costimulation Blocking Biologics for Immunomodulation in Allogeneic Cell Transplantation

Transplantation of allogeneic cells such as beta cell replacement therapy for type 1 diabetes and pluripotent stem cell-based therapies, require chronic systemic immunosuppression for long-term allograft survival. This causes general immunodeficiency and adverse events, which limits the applicability of these therapies. Therefore, we aim to develop implantable IgG-capturing enzymatically degradable polyethylene glycol (PEG) hydrogels to deliver IgG-based immunomodulatory biologics locally in the cell transplant site in a sustained and prolonged manner (>1 month) to prevent allograft allorejection with negligible systemic adverse effects. We tested the effect of in vitro polymer concentration, hydrogel degradability, and drug-gel binding on the drug release kinetics by fabricating (i) 5% vs. 10% PEGMAL hydrogels, (ii) fully degradable vs. half degradable vs. non-degradable hydrogels by utilizing crosslinkers with different sensitivities to cleavage by enzymes (MMPs) and PEG:crosslinker ratios, and (iii) passively loaded vs. drug-binding hydrogels, via IgG binding peptides. We incubated the hydrogels in enzyme solutions and quantified drug release over time via fluorescence quantification. We then computed cumulative and rate of drug release and fitted mathematical models to understand the effect of each parameter in drug release kinetics. Additionally, we investigated in vivo hydrogel degradation by co-implanting fully degradable fluorescently labelled hydrogels in B6 mice and quantifying graft site fluorescence decrease over time as an indication of hydrogel degradation. We found faster rate of FITC-IgG drug release from 5% compared to 10% PEGMAL hydrogels, as well as from fully degradable compared to half degradable hydrogels. Additionally, we found that hydrogels with passively loaded FITC-IgG achieve a biphasic first-order burst drug release kinetics, while drug-binding hydrogels achieve a zero-order constant drug release kinetics. Lastly, we found that in vivo hydrogel degradation occurs after 70 days post implantation. These results suggest that PEG hydrogel degradation can be tuned by varying polymer concentration, crosslinker type/concentration, and drug-gel conjugation to achieve the desired drug release kinetics. Additionally, they suggest that our proposed biomaterial platform could enable the sustained delivery of clinically effective IgG-based immunomodulatory biologics locally within the transplant site to increase safety and efficacy of allogeneic cell transplant-based regenerative medicine therapies.

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Ruby Taylor

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Inflammasome proteins as biomarkers of aneurysmal subarachnoid hemorrhage

Introduction:
Aneurysmal subarachnoid hemorrhage (aSAH) is a neurological emergency caused by intracranial aneurysm rupture, resulting in blood extravasation into the subarachnoid space. Brain injury as a result of aSAH is characterized by neuroinflammation, blood-brain barrier dysfunction, microvascular dysregulation, and cerebral hypoperfusion. Inflammasomes, large multiprotein complexes, play a role in the processing of the inflammatory cytokines interleukin (IL)-1β and IL-18 following the activation of the inflammatory caspase caspase-1. Pathological sequelae due to inflammasome activation contribute to poor outcomes following aneurysm rupture. We have previously shown that caspase-1, ASC and IL-18 are reliable biomarkers of injury severity (GCS) and outcomes (GOS-E) in the serum of patients with traumatic brain injury. However, whether these inflammasome proteins are reliable diagnostic (GCS) and prognostic (GOS-E) biomarkers of the inflammatory response in aSAH is yet to be determined. In this study, we provide receiver operator characteristic (ROC) curves following analyses of serum and CSF samples from patients with aSAH and from non-injured controls. In addition, we determine the sensitivity and specificity of inflammasome proteins to examine the potential of inflammasome signaling proteins as biomarkers of aSAH.
Methods:
Serum and CSF samples from fifteen patients with aSAH and samples from non-injured control donors were analyzed in this study. Samples were analyzed for the 1st, 4th, 8th, 11th, and 14th collection. Analysis of inflammasome protein concentration in serum and CSF samples were performed using the Ella System (Protein System) and Simoa analyzer. Data obtained were analyzed with Prism 10 software.
Results:
Protein levels of ASC, Caspase-1, IL-18, IL-6, and IL-1β are significantly elevated within 24 hours of aSAH when compared with control values. ROC curves, confidence intervals, sensitivity and specificity for each biomarker examined revealed that caspase-1 (0.98 area under the curve (AUC)), ASC (0.93 AUC), and IL-6 (0.98 AUC) in serum and ASC (0.91 AUC), IL-18 (0.93 AUC), and IL-6 (AUC 1.00) in CSF are promising biomarkers of aSAH pathology.
Conclusions:
These findings indicate that inflammasome proteins are excellent diagnostic and predictive biomarkers of aSAH.

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Salih Salihoglu

Ph.D. Student in Industrial and Systems Engineering

Load Forecasting for Device-Level Power Consumption: Leveraging Time-Dependent Neural Networks with Total Customer Power Consumption

This study presents an approach to understanding residential energy consumption through pattern analysis of electricity usage. Without prior knowledge of individual appliance energy requirements, a methodology is developed to infer operational periods of household appliances solely based on the overall consumption patterns observed. By employing advanced pattern recognition algorithms, this project categorizes distinctive energy consumption signatures, correlates them with probable appliance activity, and estimates the individual contributions of each appliance to the total load. The key objective is to construct a predictive model capable of anticipating appliance-level energy demands, contributing to more efficient energy management and conservation strategies in residential settings. The implications of this research extend to enhancing smart grid operations, promoting consumer awareness, and facilitating demand-side energy optimization. The outcomes of this project could impact energy consumption analytics, enabling power utilities to predict and plan for variations in energy demand, optimize load management, and design targeted energy efficiency programs.

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Sushil Pokharel

Ph.D. Student in Physics

Propagation of the COAM Matrix Elements of a Twisted Gaussian Schell-Model Beam in Vacuum

Beams that possess Orbital Angular Momentum (OAM) hold a distinctive significance in the realm of optics due to the ability of OAM to encode extra information in the spatial characteristics of light. When these beams are coupled with coherence, they can demonstrate distinctive and manageable interference patterns. The Coherence-Orbital Angular Momentum (COAM) matrix elements of an optical beam describe mode-to-mode OAM radial correlations. This approach is based on decomposing the beam's cross-spectral density in the Fourier spiral basis. We have derived an analytical expression for the COAM matrix of a Twisted Gaussian Schell-Model (TGSM) beam propagating in a vacuum, with the help of the Huygens-Fresnel integral. We then carefully analyzed the propagation characteristics of the complex-valued COAM matrix elements for the TGSM beam using our exact formulation. Additionally, we have shown how to recover the cross-spectral density of the TGSM beam from the OAM correlations, in an elegant symmetric form. Due to the unique properties of the TGSM beam, the analysis of their individual OAM correlations will deliver deep insight for their further application to imaging, laser communication, optical tweezers, and other modalities.

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Kayla Minesinger

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Characterizing Translational Rodent Noise Exposures in a Novel Dynamic, Ambient Noise Delivery Chamber

Background: Acoustic overexposure is known to cause mechanical and structural damage to the vital structures of the inner ear, leading to transient or permanent impairment of auditory and, in more intense exposures, vestibular function. In order to understand and mitigate damage associated with noise-induced hearing and vestibular loss, there is a pressing need to design and validate preclinical models in controlled environments. Therefore, to recapitulate translational exposures, we have developed an innovative rotating housing system for noise delivery to awake rodents.
Methods: A circular housing chamber was designed and assembled forming four individual housing cells secured with a removable wire mesh lid. Four speakers were mounted above the chamber to deliver continuous ambient noise. The noise delivery system was then calibrated and validated using a sound level meter (Convergence Instruments, [Quebec, Canada]) placed in four different positions within one cell for repeated trials to characterize noise dosage. Male Brown Norway rats (n=4) were exposed to broadband (4-16 kHz) noise at 110 dB SPL for 1 hour to induce permanent sensorineural hearing loss (SNHL). Auditory brainstem responses (ABRs) and cervical vestibular evoked myogenic potentials (cVEMPs) were collected at baseline and at time points up to 28 days following noise. Hypothesis testing was conducted to examine longitudinal differences in auditory and vestibular function with age-matched controls (n=4).
Results: During the noise validation stage, we established that each cell received an average dose of 112.56 dB +/- 1.47. Auditory deficits consistent with permanent threshold shifts were experienced by all rats in the experimental group, exemplified by day 28 post-noise ABR thresholds. There was a significant difference between noise-exposed and control thresholds observed at 4, 8, 16, 24, and 32 kHz ($p < 0.01$) at day 28. Similarly, cVEMP assessments in the noise-exposed group demonstrated temporary shifts in threshold, amplitude, and latency at both 1 kHz and 8 kHz with complete recovery by day 28 post-noise. Overall, ambient noise exposure in this novel chamber was well tolerated by all animals, regardless of group.
Conclusion: Our novel noise delivery system reliably and reproducibly induced auditory and vestibular deficits associated with acoustic overexposure in Brown Norway rats following ambient noise exposure.

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Mertcan Daysalilar

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Quantifying the Effects of Human Factors on Each Stage of the Operating Room Process Flow

Background: Efficient operating room (OR) management is pivotal to ensuring adequate utilization of OR capacity and consequently improving the financial value of surgical care. Prior research has sought to quantify the variability in aggregate efficiency metrics, such as total OR time, accounted for by human factors. The primary objective of this study is to perform a more fine-grained analysis that quantifies the effects of human factors on several efficiency metrics taken at different points in the OR process flow. The secondary objective of this study is to assess differences in efficiency, and their contributing factors, between inpatient and outpatient OR suites.
Methods: Data were gathered from the ambulatory (AMB OR) and inpatient (MAIN OR) surgery suites at the University of Miami Hospital between 2019 and 2023. Nine efficiency metrics were included that span the OR process flow, from first case start time lag and OR setup duration to cleanup duration and next case start time lag. A linear mixed modeling approach was utilized to quantify the amount of variability that four primary factors – procedure type, primary surgeon, responsible anesthesia provider, and primary circulator nurse – account for in each efficiency metric. Separate analyses were performed on the AMB OR and MAIN OR.
Results: Preliminary results show that the contributions of certain human factors on each efficiency metric are significantly higher than what is reported in the literature, which largely states the overwhelming effect of procedure type and underwhelming effects of human factors on aggregate OR efficiency metrics. Moreover, preliminary results show higher adjusted $RR2$ values for the MAIN OR models than for the AMB OR models. However, procedure type appears to account for more of the variation and the human factors account for less, indicating that the increased number of procedure types in the MAIN OR may be a more substantial driving factor for the efficiency metrics.
Conclusions: Our study underscores the importance of taking a more fine-grained approach to assessing the impact of human factors on the OR process flow. Such analyses can lead to more targeted changes that improve OR process efficiency and yield more cost-effective operations.

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Jiye Lee

Ph.D. Student in Nursing Science

Objective Measurement of Language in the Preschool Classroom and Home

Language development occurs in macro-scale environments, which affect children's language exposure and use. The home and preschool are two salient environments in which children spend a large portion of their waking day. Although the language environment in each context has been studied before, they have rarely been compared. Our research is the first to compare language environment between preschool and home in families affected by significant social adversity.

Automated tools, such as the Language Environment Analysis (LENA) System, has expedited child language environment research by automatically distinguishing and quantifying children's vocal environments. Using LENA, we quantified adult words (AWC), child vocalizations (CVC), and conversational turns (CTC) occurring between an adult and a child in the classroom (N=12; M=36.9 months (SD=3.3)) and at home (N=12; Mean age=21.2months (SD=10.38)). We specifically focused on language experiences over multiple classroom (85 observations; M=29.12hrs/child (SD=9.84); M=7.08 recordings/child (SD=2.68)) and home (99 observations; M=29.58hrs/child (SD=28.39); M=8.25 recordings/child (SD=3.47)) observations. All children were diagnosed with developmental delay and/or autism and from low-SES backgrounds enrolled in interventional classrooms in Miami, FL.

There were no mean differences of AWC, CVC, and CTC for the children in the two contexts. However, there was significantly higher variance in AWC at home ($F(11,11)=3.43$, $p=0.0317$). There was no significant difference in variances of CVC ($F(11,11)=1.723$, $p=0.381$), and CTC ($F(11,11)=2.54$, $p=0.137$). ICCs showed more consistency of AWC and CTC at home than in the classroom, while there was more consistency of CVC in the classroom. Children showed more consistency-specifically in their exposure to adult language and turn-taking-at home than in preschool; however, children showed more consistency in their vocal production in the classroom. There was greater variance of adult words at home, in which some children were more consistently exposed to greater number of adult words than others.

Early language environment is a robust predictor of later educational, cognitive, and psychosocial outcomes. Our research suggests that interventional classrooms may especially benefit children who are receiving less language stimulation at home, while encouraging all children to simply talk more to meet their language and, ultimately, developmental milestones.

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Santhan Chandragiri

Postdoctoral Associate

Effects of 3D confinements on the trajectories of microswimmers

Fluid flows generated by microswimmers' ciliary beating determine microswimmers' motion at low Reynolds numbers (<< 1). The trajectories of three-dimensional (3D) microswimmers can be influenced by confinement (i.e., the presence of walls), and the degree of confinement: strong versus weak. We numerically study the problem of confinement by modelling three types of squirmers (pusher-, puller-, and neutral-type) in 3D channels under three different conditions: no confinement, weak confinement, and strong confinement. Our results suggest that the presence of confinement results in a more linear trajectory than no confinement. In weak confinement, pusher-type squirmers (e.g., E. coli) exhibit oscillatory trajectories spanning the entire cross-section of the channel. However, the puller- (e.g., Chlamydomonas) and neutral- (e.g., Volvox) type squirmers show directed motion near the centre of the channel in weak confinement. We then carry out a detailed study of parameters that can influence squirmer trajectories including the nature of squirmer, size of channel, aspect ratio of channel, and ratio of squirmer size to channel size. Our goal is to group the above parameters into a landscape of energy injection versus energy dissipation and ultimately develop comprehensive phase diagrams that quantify trajectories of microswimmers.

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Melissa Ruszczyk

Postdoctoral Associate

Physicochemical dynamics of substrates for enhanced coral growth in laminar flow conditions

Decreasing ocean pH contributes to declines in coral reefs. Hybrid reef structures integrate artificial and biological components to combat reef loss and restore reef structures along coastlines. Manmade components are designed to immediately serve as an artificial reef. Meanwhile, biological components, including outplanted and recruited corals, populate and transition the structure from purely artificial to hybrid. Two design elements which can be tuned to aid coral growth, expediting this transition, are the substrate's chemical composition and surface topography. We test four different chemical compositions and two different surface topographies of cement tiles to see how these substrates affect surface pH in static and laminar flow conditions representing the diffusive boundary layer around corals (Reynolds number, Re = 100-1000). Chemical composition varies with the amount of sodium bicarbonate or sodium carbonate, and surface topography is either flat or features a 3 x 3 grid of cylindrical indentations. Results from pH me series are combined with 2-dimensional particle image velocimetry (PIV) measurements of surface topography to describe how chemical composition and surface topography interact to create various chemical and physical landscapes for juvenile corals within the boundary layer. Surface measurements of tiles in flow show that one composition of sodium carbonate increases local pH, while the other three compositions decrease local pH. However, if les are allowed to diffuse, all four compositions increase local pH. PIV on tiles with indentations in flow suggest that the current topography does not provide any hydrodynamic benefits (i.e., vortices) which may keep pH changes at the surface of the le. However, indentations may serve as regions protected from the flow where the local pH may be affected solely by diffusion, providing an environment where newly setled coral may experience the ini al benefits of the tile's chemical composition.

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Bikram Shrestha

Ph.D. Student in Physics

Flow fields of spherical and non-spherical ciliated marine larvae under squeeze-confinement

DCiliated marine invertebrate larvae swim and feed in a viscous low Reynolds number (< 1) environment in the ocean. Larvae swim in three-dimensions (3D) using ciliary bea□ng, resul□ng in complex flow fields that are challenging to quan□fy in experimental studies. The conven□onal microscopic imaging configura□on of trapping larvae in between a glass slide and cover slip induces a quasi-two-dimensional (2D) confinement. We systema□cally quan□fy the fluid dynamical effects of 2D squeeze-confinement on flows generated by ciliated larvae at low Reynolds numbers (< 1). We explore both spherical and non-spherical larval morphologies in our study. Spherical morphologies include coral larvae and non-spherical morphologies include sea star and sea urchin larvae. We vary the confinement parameter – the gap between the glass slide and cover slip (h) – and observe changes in the number of vor□ces, vortex size, and intensity. Across both morphologies, increasing confinement (smaller h) increases the number of vor□ces that form and decreasing confinement (larger h) gives rise to a pair of counter rota□ng vor□ces. Our results are broadly applicable for quan□fica□on of the fluid dynamical effects of 2D squeeze confinement for ciliated larvae with a variety of morphologies.

Author(s): Bikram Shrstha

GRADUATE + POSTDOCTORAL

RESEARCH SYMPOSIUM

Oral Presenters

Art and Humanities

David Ramos

Master's Student in Wind Conducting

This is My Gift to You... An Analysis of Leo Brouwer's "CanciÃ³n de gesta" and New Perspectives on its Performance Today

In 1980, a package arrived from Cuba addressed to Robert Boudreau, Director of the American Wind Symphony Orchestra (AWSO). Composer Leo Brouwer (b. 1939) had gifted his first and only work for winds and percussion: *Canción de Gesta (Epopeya del "Gramma," la nave llena de Futuro)* (1979). The same year, thousands of Cubans fled their country on rafts and vessels from Cuba's Mariel Harbor, leaving the Communist Party of Cuba behind in search of a better life in the United States. While unrelated, these two historical moments are connected by one common event captured by the words of poet Pablo Neruda – Fidel Castro's infamous 1959 sea voyage from Mexico to Cuba.

Dedicated to Boudreau, the AWSO, and the vessel they performed on, *Canción de Gesta* is a tour de force that expertly uses texture, rhythm, and quotation, to guide listeners on an epic journey across open waters. While projected to "become an important work in the repertoire of the wind ensemble," (Perry, 1985), *Canción de Gesta* has received little attention amongst university wind bands (CBDNA, 2000-23; Scott ,2009). Based on the "double wind orchestra" model of the AWSO (Olfert, 1992), the piece unintentionally leaves out common wind instruments like saxophone and euphonium, posing a challenge for ensembles interested in programming the work. Furthermore, its ties to Castro and the Cuban Revolution can be disconcerting to audience members who experienced the negative impact of this political shift firsthand (Ackerman, 1998; Latell, 2008), a connection that is often gone unmentioned in concert programs (Quevedo, 2021).

In this paper, I discuss ways in which *Canción de Gesta* can reach wider audiences. After a brief introduction to Brouwer and the AWSO, I propose the creation of a re-orchestrated edition of *Canción de Gesta* that allows for greater accessibility to modern wind ensembles. Furthermore, by connecting this work with the resulting mass migration of the 1980s, I suggest ways in which the act of programming this piece cultivates conversation across generations of Cubans and Cuban Americans, both older – those who lived through the Revolution – and younger – those with a nuanced view of their Cuban heritage.

Author(s): David Ramos

Gabriel Das Chagas Alves Pereira Souza

Ph.D. Student in Linguistic, Cultural, and Literary Studies

The Myths of Whiteness in Brazil, Colombia, and the United States: Transnational Black Readings of the Americas

During the first half of the twentieth century, white supremacy promoted several forms of racism in different parts of the Americas. With the formal abolition of slavery in the second half of the nineteenth century, new kinds of segregation emerged across the continent, such as the Black Codes in the United States and the federal support of white immigrants in Brazil. In my research, I look at this historical moment, interweaving the works of three Black writers: Lima Barreto (1881 – 1922) from Brazil, Langston Hughes (1901 – 1967) from the United States, and Manuel Zapata Olivella (1920 – 2004) from Colombia. Drawing on Maurice Berger's concept of "myths of whiteness," but expanding the scope of the term, I examine how these authors used first-person narratives in colonial languages (Portuguese, English, and Spanish, respectively) to develop anti-colonial projects when institutions of white supremacy tried to maintain the power structures of slavery. Based on an intersectional approach beyond the oft-studied constructions of gender, race, and class, I focus on other social markers, such as disability, sexuality, and place of origin. In this reading, I consider the racialized components of the medical discourse of sanity and madness in Brazil, the dominant discourse of heteronormativity in the United States, and the exclusionary discourse of the American Dream in Colombia/Latin America. Thus, I analyze Barreto's diaries as a Black psychiatric patient institutionalized in an asylum, Hughes' ambiguous expression of sexuality in his autobiographies, and Olivella's accounts as a Black Colombian traveling in the United States. As such, I look holistically and multilingually at the Americas to investigate three specific myths of white supremacy: "Blacks are mad," "queers are unnatural," and "the US is a land of equal opportunities." My project, therefore, makes an interdisciplinary contribution to the study of the Americas, interweaving Comparative Literature and Global Black Studies. Seeking an interdisciplinary approach, I pay specific attention to the intersections between Critical Race Studies, Disability/Madness Studies, Gender and Sexuality/Queer Studies, and Transnational/Diaspora Studies.

Author(s): Gabriel Das Chagas

Kate Arnold

Ph.D. Student in Teaching and Learning

Leo and Layla Meet Ron DeSantis

PragerU Kids is a massive media library that was approved for use in Florida public schools in July 2023. Founded in 2011, the platform claims to teach history, civics, financial literacy, global issues, and the Bible toward the goal of countering the “dominant left-wing ideology in culture, media, and education."

My research contends that the approval of PragerU Kids videos as instructional materials violates protocols in Florida House Bill 7 1006.31. This bill mandates that instructional materials must be “accurate, objective, balanced, [and] noninflammatory.” As support for this claim, I show that PragerU Kids does not meet three of the criteria for instructional materials outlined in the bill, namely, that content (a) is factually accurate, (b) is presented objectively, and (c) does not solicit Social Emotional Learning.

I analyzed episodes of the Leo and Layla’s History Adventures series, a cartoon in which siblings travel through time to meet historical figures. The cartoon is targeted to upper elementary-aged children. Through a rigorous and systematic content analysis, I found only four episodes that met the criteria outlined in the bill. Consequently, I argue that PragerU Kids should not have been approved for use in Florida public schools.

I then use Social Dominance Theory to hypothesize why PragerU Kids was approved in spite of its violation of the bill. I argue that PragerU’s goal is to perpetuate pro-colonizer, White Supremacist Hierarchy-Enhancing Legitimizing Myths (HE-LMs). HE-LMs are beliefs and ideologies that provide justification for social practices that maintain or increase social among social groups. Specifically, PragerU Kids intends to persuade viewers that early settlers were kind and fair to the indigenous people, slavery was not all that bad, and the US was a benevolent actor in global affairs such as the Cold War. The Leo and Layla series also uses their history lessons to push alt-right perspectives about current events, such as Black Lives Matter protests and masking during Covid-19.

I conclude that PragerU Kids is a dangerous platform and advocate for its removal from the list of approved instructional materials in Florida.

Author(s): Kate Arnold

Marcia Fanti Negri

Ph.D. Student in Modern Languages and Literatures

WeMigration: Re-mapping Womenâ€™s Voices in Brazilian Contemporary Writing

This research explores inverted migration as a subversion of patriarchal norms and concepts of femininity, masculinity, voice, space and time in three Brazilian contemporary literary works. My main objective is to re-map the feminine voice by focusing on how poetics reveal questions related to the performativity of gender, race and social class in the context of Brazil. I utilize theoretical concepts by Gloria Anzaldúaa (2007), Audre Lorde (1984), bell hooks (2000), Julia Kristeva (1982), Lelia Gonzales (2020) and Djamila Ribeiro (2018),seminal to my analysis of feminine writing and epistemology. I will present on the methodological approach that I use to discuss representations of northeast Brazil and the “nordestina” (the northeastern woman) in female writing based on field work (TINKER/UMIA FRG 2023) and literary analysis. I will focus on chapters one and two of my dissertation, “Re-Mapping the Battle: Women’s Voices, Memory and Identity in Marilene Felinto’s The Women of Tijucopapo,” “Rísia and Macabéa: transfigurations of the female body in Clarice Lispector’s The Hour of the Star, respectively, where I explore how language functions as a de-structuring element in those narratives, focusing on linguistic subversion as a strategic tool to unveil the oppressions of patriarchy in the cultural context of Brazil. Through close reading, s I bring together questions related to language and affect, as well as the abject and the liminal to analyze the formation of a feminine self (Anzaldúa 2007) from a counter-narrative perspective. Furthermore, this dissertation project sets forth ideas I aim to develop in future research on the Transatlantic Afro Lusophone world. Ultimately, this project will contribute to and dialogue with conversations/projects geared towards social justice.

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Marilia Kamil

Ph.D. Student in Music Education

Instituto Baccarelli, Where Music Transforms: a Case Study of Music for Social Change

In the last decades, the idea of using music training for ameliorating social problems has gained special popularity. Prominent music organizations, such as the Los Angeles Philharmonic, have developed music programs focused on social change, targeting vulnerable children and youth. This practice started in Latin America and expanded, especially in Brazil, during the 1990s when government tax incentives in cultural grants became available for companies to invest in sociocultural programs. Since then, sociocultural music programs have been providing music instruction to brazilian children and youth in vulnerable situations with the aim of creating community, developing citizenship, inclusion, and social change. Some of these programs, such as the Instituto Baccarelli, have become role models for other sociocultural programs in Brazil due to its success in achieving music excellency and community engagement. Instituto Baccarelli started in 1996 with the initiative of a single individual, violinist and conductor Silvio Baccarelli, who wanted to provide opportunities to children and youth of a favela in São Paulo in the form of music instruction. This dissertation presents a case study of Instituto Baccarelli's program, in which I examined the pedagogical organization and its impact in the lives of its students. In addition, I aimed to discover if Instito Baccarelli promoted social change. Data were collected through field observations and interviews with music staff and students. My findings demonstrated that the success of the program stems from its organization, commitment, and ongoing improvement. Their pedagogical approach is progressive and student-centered, and teachers constantly evolve to better serve the students. Their community engagement has expanded since the pandemic by offering diverse services to match the demands of the local families, such as distribution of food, diapers, or connecting the community with services they need. All students, with no exception, agreed that their experience at Instituto Baccarelli was transformative and provided them with unique opportunities that contributed to their development. All teachers and students agreed that Instituto Baccarelli promotes social change. I hope these findings will contribute to the advancement of music practices with social aims and promote critical and scholarly discussions about social change.

Author(s): Marilia Kamil

Michael Sacks

Ph.D. Student in English

Mary Wilkins Freeman, The Yates Pride, and Neighborly Mutual Aid

In this presentation, I aim to address the following questions:
1. Who is Mary Wilkins Freeman?
2. How does The Yates Pride demonstrate Freeman's concept of neighborly mutual aid?
3. How is Freeman's work relevant to us today?

Mary Wilkins Freeman (1852 – 1930) is one of the most underrated writers in American literary history. Although not a household name, Freeman wrote numerous novels and short stories of exceptional quality. In her fiction, Freeman concentrates on rural life, depicting the small towns and villages of New England. In a number of works, Freeman explores the viability of neighborly mutual aid as a benefit to the rural villages of New England. Freeman's concept of "neighborly mutual aid" denotes a specific kind of activity. The word "mutual" suggests a two-way street; it indicates a give-and-take relationship in which people help each other; the aid is not one-sided.

The theme of neighborly mutual aid figures prominently in Freeman's The Yates Pride (1912). This novel, which remains one of Freeman's most obscure volumes, tells the story of Eudora Yates, a bachelorette in the latter part of middle age. When the self-reliant Eudora (who used to be wealthy) falls on hard economic times, she refuses to accept money from her friends. Insisting that she must earn her money, Eudora offers to do the laundry for her friends in order to earn money. By the end of the novel, Eudora gets married and adopts a baby.

The Yates Pride conveys several aspects of Freeman's intricate concept of neighborly mutual aid, such as the following: a desire to help those who have lost their money—without squandering it recklessly, an emphasis on independence and self-reliance, a belief in earning help rather than getting unearned help (thus making the aid "mutual"), and the value of helping children.

The Yates Pride demonstrates that everyone can contribute to society in some way. The novel also highlights the importance of paying taxes as a civic duty. The novel's happy ending showcases the life-changing benefits of successful neighborly mutual aid.

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Livia Helena De Moraes

Ph.D. Student in Music Education

Navigating Discord: A Qualitative Study on Divisive Concepts Laws in Florida from the Perspective of Music Educators.

The purpose of this study is to examine music teachers' perceptions of divisive concept laws (DCLs) and the impact of these laws on their practice. Teachers feel differently about these laws, but we do not know enough about the ways music teachers feel and how DCL might be affecting their work. Giving the novelty of these laws and policies, there is little we know about their impact, specifically on the music classroom and on music teachers. To better understand this issue, I employed a multi-case approach to investigate how the phenomenon of DCLs have been experienced and perceived by selected general music educators in Florida. Five cases, general music teachers from different elementary public schools in Florida, were selected as participants for this study. The primary source of data collection was interviews with participants. Other sources of data, such as the researcher's journals, artifacts, and informal communication with participants were also collected and analyzed. Results from both within-case and cross-case analysis were organized into four major themes: (a) perceptions of DCLs, (b) perceptions of DCLs changing school policies, (c) perceptions of DCLs impacting teaching practices, and (d) perceived mechanisms of support. Implications for music educators' conscientization and action related to DCLs will be discussed.

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Richard Carrillo

D.M.A. Student in Choral Conducting

A Conductor's Guide to Frank La Rocca's Mass of the Americas

Highlighting music from traditionally underrepresented communities, Frank La Rocca's Mass of the Americas for SATB choir, organ, strings, guitar, marimba, and handbells, premiered in its current version in 2019 at the Basilica of the National Shrine of the Immaculate Conception, in Washington, D.C. It was commissioned by the Archbishop of San Francisco, the Most Reverend Salvatore Cordileone. This work was written to commemorate the dual feasts of Our Lady of the Immaculate Conception (patroness of the United States) and Our Lady of Guadalupe (patroness of Mexico.) To honor the nature of these feast days, La Rocca uses Mexican folk and mariachi hymns as the source material for much of the music within the Mass, and includes the first known Ave Maria in Nahuatl, the language of the Aztec people. His musical influences included aspects of American sacred choral music, as well as significant Catholic composers from music history. My research will culminate in a dissertation and conductor's guide for La Rocca's Mass, including an in-depth look at the melodic source materials that make up the work.

In addition, the Tinker Field Research Grant supported my travel to Mexico City where I had the opportunity to consult and record a Nahuatl expert, resulting in a pronunciation guide for this indigenous language and particular text. I also researched historic Mexican texts, including a 1634 Nahuatl prayer book and the 1599 Valdez Codex, a source that contains the earliest recorded Nahuatl polyphonic music. Along with the culminating guide to the score, a subsequent performance took place this last October, providing the Florida debut of this work. This was performed by a festival choir of over one hundred singers from across the greater Miami area, including singers from the Frost School of Music and St. Thomas University, with a professional chamber orchestra. We performed LaRocca's Mass in its intended context as part of a Roman Catholic Liturgy. Over 800 people were in attendance to experience this new Mass with currently over a two-thousand views on YouTube. This type of exposure is integral to the effort of highlighting the music of these underrepresented communities.

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GRADUATE + POSTDOCTORAL

RESEARCH SYMPOSIUM

Oral Presenters

Health and Life Sciences

Barbara Marin

Ph.D. Student in Neuroscience

Implantation of Hydrogel Tube for Acute Facial Nerve Injury

Facial paralysis affects 23,000 people per year in the United States. It is a devastating condition that disrupts the ability to feel or move the muscles of the face altering the quality of life of patients. It can occur due to trauma, stroke, cosmetic procedures, or tumors. There are limited successful treatment options for facial paralysis. Surgical interventions try to reconnect the nerves that are lost with other working nerves to reanimate the side that is paralyzed. However, this approach has variable success rates. To address this gap, biomaterials which are, materials made to interact with biological systems to evaluate, treat, augment, or replace any tissue, organ, or function of the body; can be used to improve that connection by including factors that attract the cells needed to bridge the gaps. The goal of this application is to use a hydrogel tube to improve nerve growth after facial nerve injury in a rat model. The tubes are a scaffold that serve as a physical bridge across the injury. The tube will serve as a bridge that will allow the axons that are lost to grow through it to connect to the side that is paralyzed. Several parameters will be evaluated after treatment, such as, penetrating axon growth, what cells are present in the tubes, and recovery of face movement. It is anticipated that the tubes will increase the migration of the cells needed to reestablish the lost connection to the paralyzed side and improve the movement of the paralyzed face.

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Benjamin Minch

Ph.D. Student in Marine Biology and Ecology

Exploring Viral Diversity inside Deep Sea Brine Pools

Deep-sea brine pools are rare, extreme environments with hypersaline conditions that are teeming with life on the ocean benthos. Despite their small size and distribution, brine pools represent important ecosystems to study as they can give insight into the limits of life as well as the possibility of life on other planets due to their analogies to icy moon subsurface oceans. A distinguishing feature of many brine pools is the presence of thick microbial mats at the interface between the brine and surrounding sediment. While the bacterial and archaeal communities have received moderate attention, little is known about the viral communities and their interactions with host populations in these environments. To bridge this knowledge gap, metagenomic and metatranscriptomic data from three distinct sites within the NEOM Red Sea brine pool system were leveraged to gain insights into the active viral ecology around the pools. Here, we report a remarkable diversity of active viruses of all nucleic acid types, phylogenetic histories, and genome sizes that infect prokaryotic and eukaryotic hosts in this environment. These include giant viruses (NCLDVs), RNA viruses, jumbo phages, Polintons, Polinton-like viruses (PLVs), and virophages. Site specific differences in viral community composition and infection strategy were also observed with lysogenic phages seeming to dominate in the bacterial mat further away from the pool's center. Through host matching, viruses infecting metabolically important bacteria and archaea were observed including a linkage between a jumbo phage and a key manganese oxidizing and arsenic metabolizing bacteria. Overall, these findings shed light on the importance of understanding the ecology of these environments to learn more about how viruses and their hosts adapt to extreme conditions on a micro-scale. We hope to inspire further research into viral communities in extreme environments to understand the role of viruses in determining the limits of life on this planet, and the possibility of life beyond it.

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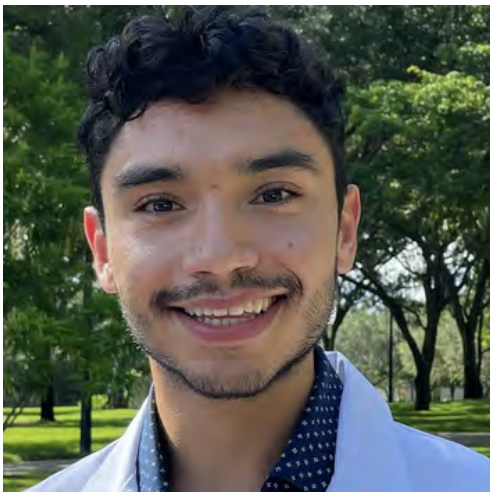

David Tovar Castro

Ph.D. Student in Biochemistry and Molecular Biology

Novel Nanodrug Platform for Pharmacologically Inducing Therapeutic Hypothermia (TH) After Traumatic Brain Injury (TBI)

Therapeutic hypothermia (TH) has gained widespread recognition as a neuroprotective strategy for mitigating secondary injury mechanisms resulting from traumatic brain injury (TBI). TBI occurs when an external force impacts the skull, causing damage to the brain. TH tackles the complexities of TBI by modulating neuropathological responses. Our approach utilizes intranasal delivery of nanoscale vanilloid drugs, specifically olvanil, to induce brain hypothermia through the activation of the transient receptor potential vanilloid 1 (TRPV1).

Through a bottom-up synthesis, we prepared nanoolvanil, demonstrating its ability to bind to TRPV1 and activate the receptor, as evidenced by calcium influx assays. Toxicity studies revealed minimal impact on cell proliferation and indicated antioxidant effects in vitro. In vivo experiments employed a custom 3D-printed intranasal spray (INS) to deliver nanoolvanil.

Characterized by dynamic light scattering (DLS), nanoolvanil exhibited an average size of 82.53 nm, a polydispersity index (PDI) of 0.25, and a zeta potential of -28.05 mV—suitable for blood-brain barrier transport. TRPV1 activation studies showed a 34% calcium influx post-injection and nanoolvanil significantly increased cell proliferation. In vivo, the 3D-printed INS successfully delivered nanoolvanil at 5 mg/kg, leading to a temperature reduction of ~2 °C for up to 100 minutes.

The synthesized nanoolvanil, falling within the optimal size range, effectively activated TRPV1 with minimal impact on cells. In vivo studies using our customized 3D-printed INS demonstrated successful head and body temperature reduction, highlighting the potential of this nanodrug delivery system for therapeutic hypothermia in TBI cases.

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Francisco Cardozo Macias

Ph.D. Student in Prevention Science and Community Health

Evaluating the Impact of Marijuana on Adolescent Aggression: A Population-Based Study in Colombia

Introduction: The relationship between marijuana use and adolescent aggression presents a complex and conflicting landscape. While some analyses suggest mechanisms through which marijuana may influence brain function and physiological effects, potentially linking it to aggression, other evidence points to a negligible impact of marijuana use on criminal and problematic behaviors. This dichotomy highlights significant gaps in our understanding of the role of psychoactive substances, such as marijuana, on adolescent behavior. Our study aims to address these inconsistencies by proposing a to study this relationship.
Methods: We used data from the National Study of Psychoactive Substance Consumption in Adolescents in Colombia, 2016, which included 80,018 adolescents. Participants were categorized into three groups: Exclusive Marijuana Users, Initial Marijuana Users (those who began drug use with marijuana), and Latest-initiation Marijuana Users (those for whom marijuana was the most recently initiated drug). These groups were compared with two control groups: students who used drugs other than marijuana, and those who did not use any drugs. We conducted logistic regressions, controlling for demographics, academic history, and parental education level.
Results: Students with no history of drug use reported lower levels of harassment (-19%), group aggression (-8%), individual aggression (-13%), and victimization (-8%). However, when comparing students who used only marijuana with those who used drugs other than marijuana, no significant differences were observed for victimization (AOR=0.66, 95% CI 0.40-1.05), group aggression (AOR= 0.76, 95% CI 0.41-1.31), and individual aggression (AOR=0.82, 95% CI 0.48-1.35). A significant difference was found for harassment (AOR=0.39, 95% CI 0.25-0.60). Subgroup analysis revealed increased odds of individual aggressive behaviors among students whose most recent initiation was marijuana (AOR=1.18, 95% CI 1.05-1.32) and lower levels of victimization (AOR=0.83, 95% CI 0.67-1.03).
Conclusions: This study contributes to the debate on marijuana's impact on adolescent aggression. Our findings reveal an association between substance use, including marijuana, and aggression in this demographic. Intriguingly, the effects are less pronounced when comparing adolescents exposed solely to marijuana against those exposed to multiple drugs, underscoring the complex interplay of substance use and behavior. This research is especially pertinent given the ongoing trend of marijuana legalization across various countries.

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McKenzie Zapata

Master's Student in Marine Biology and Ecology

The Effects of Red Tide Events on Elasmobranchs and Upper-level Teleosts Abundance, Diversity and Community Structure

The objective of this study is to assess the impacts of red tide events on elasmobranchs (sharks, skates, and rays) and upper-level teleosts (bony fish), specifically focusing on abundance, diversity, and community structure. Commonly known as Florida Red Tide, these events result from harmful algal blooms (Karenia brevis) and pose a global threat to marine ecosystems, necessitating a comprehensive understanding of their effects of marine life. Using the Before-After-Control-Impact with Temporal Pairing (BACI-P) framework, we conducted extensive field surveys and data analysis to investigate the consequences of red tide events on elasmobranchs and upper-level teleosts. Data were drawn from the GulfSPAN (Gulf of Mexico Shark Pupping and Nursery) project and FIM (Fisheries-Independent Monitoring) surveys in Tampa Bay, FL spanning 2017-2021. By using the BACI-P analysis, we paired temporal observations before and after red tide events in control (non-affected) and impacted (affected) groups, allowing a robust comparison. Our analysis revealed shifts in species composition and alterations in the diversity of elasmobranch and teleost communities during red tide events. The intricate relationships between different species within these ecological groups were illuminated through BACI-P's temporal pairing, emphasizing the vulnerability of these marine organisms to ecological disturbances. The study contributed valuable insights into the ecological consequences of red tide on elasmobranchs and upper-level teleosts, underscoring the significance of considering both taxonomic groups in the broader context of harmful algal bloom research for effective marine ecosystem management.

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Christian McDonald

Ph.D. Student in Microbiology & Immunology

A Cancer Virus Hijacks an Ancient Cellular Protein

TKaposi´s Sarcoma (KS) herpesvirus (KSHV) is one of seven viruses on Earth known to cause cancer in humans. KSHV infection precedes the development of KS, an AIDS-defining illness. Although observable declines in AIDS-associated KS in western countries have been recorded since the advent of antiretroviral treatment (ART), over 50% of patients on ART do not exhibit total remission. Patients with KS present with lesions throughout the body but are prevalent in tissue that are insufficiently oxygenated, also known as hypoxic regions. The possible association between hypoxia and KS development has driven research which have shown that hypoxia promotes the replication of KSHV. Specifically, previous work from our laboratory has revealed an interplay between KSHV infection and hypoxic cellular response mechanisms. Our laboratory´s research has demonstrated that KSHV infection is able to facilitate the formation of the hypoxic translation initiation machinery for the synthesis of viral proteins. My dissertation aims to understand the role of eIF5B, another crucial component of the hypoxic translation machinery. This translation factor is preferentially used for translation initiation in hypoxia over the canonical eIF2. Utilization of eIF5B may confer KSHV with a previously undescribed viral strategy to bypass host stress and antiviral responses during infection. In the current project we use two human cellular models and one mouse cell model to explore the role of eIF5B in the hypoxic translation machinery usurped by KSHV. Collectively, this study implicates a critical role for eIF5B in KSHV lytic replication and pathogenesis in our human cell models. Moreover, KSHV viral oncogenic mechanisms are impacted upon genetic silencing of eIF5B in our mouse cell model. Findings from this research will provide more insight into how the hypoxic translation machinery plays a role in viral oncogenesis and KS disease progression after KSHV infection. Furthermore, we aim to identify novel therapeutic targets that can be used in curative treatments for patients afflicted with KS.

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GRADUATE + POSTDOCTORAL

RESEARCH SYMPOSIUM

Oral Presenters

Social and Behavioral Sciences

Cristina Fayad Martinez

Ph.D. Student in Environmental Engineering

Evaluation of New Method to Obtain Mass and Particle Size of Dust on Childrenâ€™s Hands

Dust is a heterogenous mixture of materials that serves as a significant repository of harmful chemicals. Children represent a vulnerable popula□on to dust exposures; however, to date, no direct measurements are available for both the mass of dust and par□cles sizes found on children's hands a□er natural play ac□vi□es. The objec□ve of this study was to evaluate a new method to measure the dust loading on children's hands, by region (North Carolina, Florida, Arizona), age groups (six months to six years), and social demographics (gender, race, ethnicity), as well as to document the par□cle size distribu□on of the collected dust. The method in ques□on determines the volume of par□cles washed off children's hands using a Coulter Counter, followed by mul□plying the par□cle volume by the density of dust (measured at 1.58 g/cm3 on average) collected from the home and analyzed through a pycnometer. Using the es□mated dust density coupled with the volumetric measurements, the dust loadings obtained through our methodology (range of 0.01 µg/cm² to 398.2 µg/cm²) are consistent with values presented in other studies. Addi□onally, the overall median dust loading on children's hands was 6.67 µg/cm2, with only a significant difference by race; however, such differences were directly linked to region, homes with carpets, and household income. These results are intended for integra□on to the Dust Inges□on Children Study (DIRT) which includes a modeling effort to further compute the risk of children to household contaminants within the home. Lastly, the majority of par□cles from children's hand rinses had a par□cle diameter (D90,vol of 35 µm) smaller than the 250 µm diameter currently recommended by US EPA guidelines for soil and dust sampling. The overes□ma□on of par□cle size by the guidelines poten□ally results in the underes□ma□on of children's exposures. Efforts are needed to align the actual par□cle size distribu□ons to those recommended for modeling purposes.

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Giorgio Cartechini

Postdoctoral Associate

Understanding Acute Oral Mucositis in Head and Neck Cancer Patients Undergoing Proton Therapy: a Comprehensive Physical and Biological Investigation

Oral mucositis is one of the most frequent and impairing acute side effects of radiotherapy in the treatment of Head and Neck (H&N) malignancies, affecting nearly 100% of patients and significantly impacting the quality of life. Proton therapy is a well-established technology in radiotherapy, whose benefits stem from physical and biological properties. Protons exhibit maximal dose deposition in a localized region near the end of their range, resulting in superior normal tissue sparing compared to conventional photon (x-rays) radiotherapy. In addition, protons are at least 10% more effective than photons in inducing biological damage at the same delivered dose.

The oral cavity is the organ at risk for oral mucositis and despite the enhanced oral cavity sparing offered by proton therapy, up to 70% of patients still experience oral mucositis. This high incidence restricts the full potential of proton therapy in effectively treating H&N cancers. Currently, the only countermeasure for mitigating oral mucositis is to set dose constraints to oral cavity, extrapolated from clinical photon therapy outcomes, using as a scaling factor a generic single value of the proton biological effectiveness.

This work aims to characterize oral mucositis occurrence in H&N patients by analyzing the link between the dose and proton biological effectiveness, from which tailored constraints for proton therapy can be obtained. Our study includes 62 patients treated with protons and 100 with photon radiotherapy at the Sylvester Cancer Center (Miami, FL).

Despite the reduced oral cavity dose in proton plans, both mild and severe oral mucositis occur earlier in proton-treated patients than in photon-treated ones. This phenomenon is attributed to the interplay among dose, enhanced proton biological effectiveness, and organ volume effects.

The findings confirm our hypothesis that constraints derived from photon data significantly overestimate the oral cavity dose achievable with protons, leading to poor normal tissue complication control.

This research highlights the necessity of accurately characterizing proton energy deposition and its correlation with patient toxicities to refine dose and biological constraints during treatment plan optimization. Photon constraints serve as a general guide but consistently overestimate the deliverable dose in proton therapy, particularly for controlling oral mucositis toxicity.

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Maxwell Tsipoaka

Ph.D. Student in Chemical Engineering

Tailoring Metal Borohydrides for Enhanced Hydrogen Storage via Mo2N-Catalyzed Activation

Metal hydrides for on-board hydrogen storage play a key role in future conversion of the world to a “hydrogen economy”. Nano-structuring these materials proves an effective strategy which can simultaneously enhance their ab/de-sorption thermodynamics and kinetics. However, strategies to combine catalysis and nanoconfinement for controlling factors governing their interfacial hydrogen uptake and release processes are still lacking. In this study, we show how thermal emitting method can be used for generating Mo2N sites to create electron-deficient boron and N-vacancies in inert boron nitride host for LiBH4 activation. The generated Mo2N sites resulted in a shift of the electronic band structure of the host which weakened the Li-B bond of nanostructured LiBH4 species. We demonstrate the tailoring of a strong Mo2N–DBN hybrid structure and clarify the mechanistic origin of its activity. Both experimental results and DFT investigations indicate a long-range interaction of Li in the immobilized nanohydride with B atoms, which optimizes the adsorption energy for absent LiBH4 phase transition and melting upon cycling. This study provides an approach to finely control the host–guest nanointerface interactions of metal borohydride and scaffolds at the atomic level and is expected to guide smart thermodynamic or kinetic alteration of solid-state hydride materials.

Keywords: Density functional theory, Hydrogen economy, adsorption, storage, interfacial charge transfer, nanointerface interactions, electronic band structure, nanoconfinement, thermodynamic or kinetic alteration.

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Monu Verma

Postdoctoral Associate

NST-Former: Multi-level Spatiotemporal Transformer for Early Prediction of Neoadjuvant Systemic Therapy Response

Neoadjuvant Systemic Therapy (NST) serves as the primary strategy to mitigate tumor burden and metastasis, providing avenues for potential breast-conserving surgery in breast cancer treatment. Evaluating Pathological Complete Response (pCR) to NST before surgery is crucial for shaping personalized treatment strategies and predicting patient prognosis. In breast cancer, time is a critical factor, and NST, while not guaranteeing 100 percent success, underscores the importance of timely decisions. In this context, predicting NST outcomes before initiating therapy based on prior clinical information (including pathological test results, demographics, and patient history) and imaging data (MRI, mammograms, and ultrasound) holds significant potential. Such predictions can empower oncologists and radiologists to consider alternative therapies, recognizing the time sensitivity in breast cancer treatment.

In existing literature, some studies employing radiomics methodology have shown promise in predicting pCR by extracting features computationally from breast MR images. Despite their potential, radiomic studies face challenges due to the limited reproducibility of radiomic features influenced by variations in radiomics software and MR acquisition parameters.

To address the limitations of previous studies, deep learning emerges as a promising solution. Deep learning methods offer the advantage of automatically extracting a comprehensive set of features from a dataset, minimizing the need for extensive human intervention. While few approaches utilize the benefits of deep learning, they often rely on manual segmentation during image preprocessing, requiring precalculation of tumor volume or functional tumor volume before input into a deep learning model. This additional preprocessing step is costly. Therefore, we propose a spatiotemporal transformer model (NST-Former) aimed at predicting NST outcomes directly from the raw DCE-MRI images, allowing the model to learn relevant cancerous features through back-propagation. The primary objective of this work is to synergize the advantages of large visual models with neoadjuvant systemic therapy to predict patient survival. The proposed model represents a promising advancement in predicting NST outcomes, offering potential benefits in refining treatment strategies and improving patient prognostication in breast cancer healthcare scenarios.

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Nima Khodadadi

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Meta-Heuristic Optimization: Effective Machine Learning Techniques for Concrete Structures

A fundamental aspect of nature-based systems is the ability to optimize. Similarly, since ancient times humans have had a tenancy to naturally focus on optimizing their activities making them more feasible, economical, functional, and practical. Analogously in structural engineering design "structural optimization" is a simulation-driven design technique that identifies and explores high-potential designs, while also rejecting low-potential ones early in the design phase, aiming to solve problems of structural design.

However, such optimization methods have not been widely used in the design of concrete structures. This is in part be due to the design and construction of concrete structures involves complex processes, and optimization techniques face serious challenges.

Nevertheless, modern meta-heuristic methods of optimization, can provide higher-level procedures or heuristic designed to find, generate, tune, or select a heuristic (partial search algorithm) that may provide a sufficiently good solution to an optimization problem or a machine learning problem. In Machine Learning, historical data is used to teach and train the system developed, in order to be able to better predict future behavior. In meta-heuristic approaches, the need to have historical data is not necessary. Instead, the system generates random data and uses them to find an optimal solution that satisfies all the constraints. This iterative process continues until the algorithm reaches a defined criteria.

Meta-heuristic algorithms are traditionally used in non-deterministic polynomial-time based problems, where for a given time and effort obtaining a “good” solution is preferred to an “optimum” one. To this end, meta-heuristic algorithms help select the optimal parameters for machine learning and deep learning techniques to train and improve the model's performance.

Concrete structures optimization often aims to minimize costs, including those related to concrete material, reinforcement, formwork, and construction. In some cases, the geometry and shape of structures can also be optimized. This work provides a comprehensive literature review on this topic, discussing practical and appropriate concrete structures optimization algorithms, aimed to introduce these tools for practitioners. A wide variety of available meta-heuristic algorithms will be defined and presented. Lastly, while the work highlights the shortage of optimization cases and research in concrete structures optimization, it also identifies the significant potential and effectiveness of meta-heuristic optimization techniques applied to concrete structures.

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Nkosi Muse

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Understanding land surface temperature as a measure of urban heat exposure in a diverse, subtropical urban region

Land surface temperature (LST) is an important variable that significantly impacts lower atmospheric processes. Because it has been found to be well correlated with surface air temperature (SAT), the temperature one feels outdoors, it has been widely used as a measure of spatiotemporal heat exposure. LST's accuracy as a measure of heat exposure, however, can vary across space and time—this variability is less understood in subtropical urban regions that experience seasonally wet and chronically humid climates. Therefore, for matters of urban planning and even human health, it is important to understand LST's spatiotemporal patterns, as well as the influence that atmospheric, biophysical, and even socioeconomic variables may have on its usefulness as a measure of heat exposure in the subtropics. The purpose of this research is to quantitatively explore and identify these patterns and factors through heat mapping and statistical analyses, using the case of the Florida peninsula and its most urbanized and populous county, Miami-Dade. Spatial analysis reveals an extensive surface urban heat island phenomenon, driven by increased urban development and decreased greenness. We establish an LST climatology, showing that LST in Miami-Dade County unexpectedly peaks in April/May, in contrast to SAT which peaks in July/August. Such a contrast also highlights a seasonal disparity in LST's use as a measure of urban heat exposure (strongest correlations with SAT in winter: $R = 0.87$, $p < 0.01$; weakest in summer and autumn: $R < 0.4$, $p < 0.01$). The relationship between LST and SAT at nighttime, however, is significant during summer ($R = 0.75$, $p < 0.05$)—indicating the important role that LST has in maintaining increased evening urban heat exposure when daytime heating factors are is absent. Increased moisture also has a noticeable impact on the diurnal cycle of LST, in which differences between daytime and nighttime LST values decrease with an increase in air moisture ($R = -0.2$, $p < 0.05$). The results of this work have major implications on heat adaptation policy, across a region that experiences an inequitable, chronic heat threat, further intensified by climate change.

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Paul Wojtal

Ph.D. Student in Ocean Sciences

Marine microbial importance to oceanic carbon export determined through compound specific isotope and enantiomer analyses

Phytoplankton form the base of marine food webs in the surface ocean and contribute substantially to suspended and sinking particulate organic matter (POM) throughout the water column, thus sequestering carbon in the deep sea. Bacterial biomass additionally contributes significantly to these particle pools. The fate of this material – for instance, the depth at which it is oxidized to CO2 – ultimately affects global climate and the carbon cycle. However, it has been difficult to link the biological origins of POM, such as proportional contributions of phytoplankton and heterotrophic bacteria, to its fate, due largely to significant transformation processes occurring as POM moves downward. To more closely examine the origins of POM, we present the results of multiple geochemical and isotopic measurements of sinking particles from sediment traps and size-fractionated particles from in situ filtration between the surface and 500 m in the subarctic Pacific, collected as part of the NASA EXPORTS (EXport Processes in the Ocean from RemoTe Sensing) program. From these particles, we examine the carbon isotope composition of amino acids, the relative concentration of D and L enantiomers of alanine, and the carbon isotope composition of phytol, cleaved from chlorophyll. In combination with our previous results of nitrogen isotopes of amino acids, we use the D and L enantiomer ratios and the carbon isotope compositions of essential amino acids to estimate the proportional contribution of bacteria to four different POM size fractions and particles in sediment traps over depth. We additionally use the δ13C value of phytol to distinguish photosynthetic carbon originating in different depth zones of the surface ocean, noting a 10‰ shift in the δ13C values of phytol between these zones. Finally, we employ multivariate analysis to distinguish different sources of POM at different depths and in different particle pools to better understand how different sources of POM impact the carbon that is sequestered in the deep ocean. We aim to determine which sources of carbon are the most important to POM in the deep ocean, thus fueling deeper communities and contributing to carbon sequestration.

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Sadegh Tale Masoule

Ph.D. Student in Civil and Architectural Engineering

Machine Learning for Sustainable Infrastructure: Molecular Design of Nonionic Polymers as Admixtures

Traditionally, the design of chemical admixtures for concrete involves experimental modification of the polymer molecular structure in the laboratory, measurement of physico-chemical properties, and incorporating and testing the polymer in concrete. This process is costly, time-consuming and limits the ability to fine-tune the molecular properties that optimize the admixture's performance. In this work, machine learning has been utilized to identify the most influential molecular properties that affect the air-entraining performance of nonionic polymers in concrete. Furthermore, multi-scale relationships are established between the molecular properties of nonionic polymers, the physico-chemical properties of these polymers in cement pore solution, and the air-entrained microstructure in hardened cement paste. The findings will help explain the underlying mechanisms of air-entraining in cementitious materials, as well as aid in the selection and design of high-throughput admixtures.

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Sofiane Amroun

Ph.D. Student in Civil Engineering

Mechanochemical Activation of Basaltic Fines and Clays to Produce Low-carbon Cement Replacement Materials

Concrete is the second most used material in the world; the first one being water. It is made using coarse and fine aggregates, water, and, most importantly, cement, which acts as a binder. The production of cement is responsible for 5-8% global man-made CO2 emissions. This is one of the reasons why cements are commonly partially replaced with other materials called supplementary cementitious materials (SCMs). Fly ash, slag, and silica fume are industrial wastes which are widely used as SCMs. One of the main issues with SCMs is their scarcity, and reduced availability, when compared to cement's increasing demand. On the other hand, basaltic fines and clays are two promising sources of SCMs due to their worldwide availability. However, these materials need to be activated/processed to be used as they are otherwise unreactive. A typical way of doing so is thermal activation (TA), where these materials are exposed to high temperatures in a furnace. A novel alternative to TA is mechanochemical activation (MCA), where raw materials are exposed to high-energy grinding which alters their structures making them more reactive and feasible to use as SCMs. The aim is to reduce the energy needed to produce these SCMs which will further decrease cement carbon footprint and lower costs. In this project, we used multiple experimental to characterize the basaltic fines and clays before and after activation. We have shown that MCA is a viable alternative to TA to produce SCMs. Also, varying the powder/grinding media ratio was found to be an important parameter in this process. Future work will focus on further characterization of the materials and further optimization of MCA using grinding aids, lower grinding times, and lower grinding speeds.

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Ph.D. Student in Civil Engineering

Composition-Structure Relationships for Calcium Aluminosilicate Glasses

Concrete is the second most used material in the world; the first one being water. It is made using coarse and fine aggregates, water, and, most importantly, cement, which acts as a binder. The production of cement is responsible for 5-8% global man-made CO2 emissions. This is one of the reasons why cements are commonly partially replaced with other materials called supplementary cementitious materials (SCMs). Fly ash, slag, and silica fume are industrial wastes which are widely used as SCMs. One of the main issues with SCMs is their scarcity, and reduced availability, when compared to cement's increasing demand. On the other hand, basaltic fines and clays are two promising sources of SCMs due to their worldwide availability. However, these materials need to be activated/processed to be used as they are otherwise unreactive. A typical way of doing so is thermal activation (TA), where these materials are exposed to high temperatures in a furnace. A novel alternative to TA is mechanochemical activation (MCA), where raw materials are exposed to high-energy grinding which alters their structures making them more reactive and feasible to use as SCMs. The aim is to reduce the energy needed to produce these SCMs which will further decrease cement carbon footprint and lower costs. In this project, we used multiple experimental to characterize the basaltic fines and clays before and after activation. We have shown that MCA is a viable alternative to TA to produce SCMs. Also, varying the powder/grinding media ratio was found to be an important parameter in this process. Future work will focus on further characterization of the materials and further optimization of MCA using grinding aids, lower grinding times, and lower grinding speeds.

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GRADUATE + POSTDOCTORAL

RESEARCH SYMPOSIUM

Oral Presenters

Physical Sciences and Engineering

Eddie Wintergalen

Ph.D. Student in Environmental Science and Policy

Trans-sector Livelihood Resilience in an Urban Small-Scale Fishing Community

Many coastal small-scale fishing (SSF) communities in low and middle-income countries are experiencing urbanization due to global development and migration patterns. Scholars have documented how processes related to urbanization present SSF communities with a unique series of opportunities and challenges. However, it is still poorly understood how SSF communities perceive and pursue resilience while adapting to these changing conditions. To address this gap, we conduct ethnographic research among the members of an urban fishing cooperative in Cancun, Mexico. Using a grounded theory analytical approach, we find that four factors related to Cancun's urbanization have incentivized local fishers to adopt a trans-sector perspective of livelihood resilience through which they view fishing as a lucrative but fleeting opportunity, with some actively planning a transition to non-fishing livelihoods. These four factors are the depletion of local fisheries, rising land values, the proliferation of non-fishing livelihood opportunities, and regional migration patterns. Whether the cooperative's fishers ultimately prove resilient to the stresses of urbanization depends upon the degree to which local governance and support systems align with this perspective and the community's ability to navigate the evolving set of incentives that push and pull them away from the fishing sector. By contextualizing these findings within the broader literature on SSFs and urban development, we develop a heuristic to hypothesize to what extent these findings are generalizable beyond the study context. We argue that these findings highlight pathways to livelihood resilience for fishers who participate in urban SSFs that are at risk of collapse, challenging previous paradigms of livelihood resilience that predicate resilient outcomes on sustained production within agricultural, pastoral, or SSF systems. If researchers confirm these findings on a broader scale, policymakers and development practitioners who wish to bolster livelihood resilience within similar communities could work to align support programs with this trans-sector perspective.

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Postdoctoral Associate

Racial and Ethnic Disparities in High-Quality Breast Cancer Care within Contexts of Facility- and Area-Level Factors

Background. Racial and ethnic disparities in breast cancer survivorship emerged simultaneous to dissemination of effective screening tools and therapies. Differences in access to and quality of breast cancer care contribute to survival disparities and evidence suggests structural racism – not race – is the root cause. Neighborhood factors (e.g., residential segregation, poverty) and characteristics of healthcare facilities (e.g., patient volume) have demonstrated associations with quality of care and survival time among breast cancer patients. Together these data indicate an opportunity to mitigate racial-ethnic disparities in breast cancer outcomes through improving the quality and accessibility of cancer care.

Purpose. We examined racial and ethnic differences in guideline-recommended breast cancer care within the contexts of where patients sought care and where they live.

Methods. Data from women diagnosed with invasive breast cancer at 66+ years of age from 2000-2017 were examined using SEER-Medicare. Associations between race and ethnicity and guideline-concordant diagnostics, locoregional treatment, systemic therapy, documented stage, and oncologist encounters were estimated using multilevel logistic regression models to account for clustering within facilities or counties.

Results. Black and American Indian/Alaska Native women had consistently lower odds of guideline-recommended care than non-Hispanic White women (Diagnostic workup: ORBlack 0.83 (0.79-0.88), ORAIAN 0.66 (0.54-0.81); known stage: ORBlack 0.87 (0.80-0.94), ORAIAN 0.63 (0.47-0.85); seeing an oncologist: ORBlack 0.75 (0.71-0.79), ORAIAN 0.60 (0.47-0.72); locoregional treatment: ORBlack 0.80 (0.76-0.84), ORAIAN 0.84 (0.68-1.02); systemic therapies: ORBlack 0.90 (0.83-0.98), ORAIAN 0.66 (0.48-0.91)). Commission on Cancer accreditation and facility volume were significantly associated with higher odds of guideline-concordant diagnostics, stage, oncologist visits, and systemic therapy. Black residential segregation was associated with significantly lower odds of guideline-concordant locoregional treatment and systemic therapy. Rurality and area SES were associated with significantly lower odds of guideline-concordant diagnostics and oncologist visits.

Conclusions. This is the first study to examine guideline-concordance across the continuum of breast cancer care from diagnosis to treatment initiation. Disparities were present from the diagnostic phase and persisted throughout the clinical course. Facility and area characteristics may facilitate or pose barriers to guideline-adherent treatment and warrant future investigation as mediators of racial-ethnic disparities in breast cancer care.

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Nona Kiknadze

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Expanding the Horizons of Flourishing: Integrating Cultural Diversity into Psychological Models

Modern scholarship on flourishing approaches the question of what it means to live well from a universalist perspective that assumes that there is a single, overarching model of what flourishing looks like across cultures, thereby under-emphasizing cultural differences and homogenizing the lived experience of diverse individuals. The question of what components make up flourishing has major theoretical implications for how society should function, and it is of critical importance to examine the context of these assertions. Several Western assumptions underly the flourishing literature, such as individualism, neglect of personal duty and responsibility, and disregard for religion and spirituality. A comprehensive understanding of flourishing in diverse populations requires integrating sociocultural meaning systems and different philosophical, religious, and political traditions. In calling out these weaknesses I underscore the need for researcher reflexivity and the importance of incorporating differing cultural perspectives into broad psychological claims of what it means to live well.

This talk will highlight findings from two major research initiatives. The first is a grounded theory study that employed qualitative interviews with psychologists from underrepresented cultures to explore the dimensions of flourishing. This research reveals a dynamic interplay between culturally specific and universal elements of well-being, challenging the dominance of Western-centric models. Further, the presentation will outline an innovative new course at the University of Miami, designed based on these novel research findings. This course integrates a scholarly examination of flourishing with practical applications tailored to enhance the well-being of a culturally diverse student body. The program is crafted to present flourishing as an inherently social and moral pursuit through underscoring the importance of interdependence, community, and the broader macroenvironment, with the goal of expanding flourishing science beyond the individualistic Western paradigms that dominate the current psychology literature.

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Particulate Matter Exposure is a Driving Factor of Oxygen Desaturation in Blacks with Central Sleep Apnea

Introduction: Exposure to particulate matter (PM) in the home environment is a modifiable risk factor for oxidative stress, a common and burdensome symptom of Central Sleep Apnea (CSA), a condition characterized by the brain temporarily not sending signals to the muscles that control breathing during sleep. Although previous research has established a greater likelihood of adverse health outcomes given environmental exposure, the effects of specific air pollutants have not been distinguished from other neighborhood factors. Moreover, recommendations to reduce exposure to PM have not been included in CSA treatment. This study aims to contribute to the development of predictive models that account for the impact of environment on severity of CSA symptoms among Black Americans.

Methods: Data were collected from 168 Blacks (69% female and 31% male, Mage 47.60 ±16.459yrs) that were enrolled in two NIH-funded community-based sleep studies, ESSENTIAL and MOSAIC. Sleep environment PM levels were assessed objectively with the IQAir device for a period of 7 days. During the same period, SleepImage ring devices were used to measure the number of paused breathing events during a sleep period and a score was generated based on the qualifying events of oxygen desaturation. Analyses of correlation matrices were conducted to explore the associations between CSA and PM exposure. Descriptive statistics were analyzed, and a regression analysis was performed to understand the association between CSA and PM. Analyses were performed using SPSS29.

Results: Exposure to PM 2.5 (fine inhalable particles with diameters measuring 2.5 micrometers and smaller) was highly correlated with Central Sleep Apnea (sAHI Central), with at least 10 qualifying events of 3% oxygen desaturation ($r(165)=.465, p<.001$) and 4% oxygen desaturation ($r(165)=.473, p=<.001$) during a sleep period. Regression analysis further revealed significant association between PM 2.5 and sAHI Central [$\beta= .032$; $p< .001$]. The model adjusted for age, sex, and an existing Sleep Apnea diagnosis.

Conclusion: Findings suggest that exposure to PM is a driving factor in oxygen desaturation in Blacks. These findings present an opportunity to influence population health by contextualizing the relationship between CSA and environmental factors among Black Americans.

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Marina McLerran

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A Measure of Expression in Instrumental Performance

In the Western Classical tradition, instrumental music educators have emphasized the importance of expression in performance. However, due to the typical use of vague language to describe expression in existing performance assessment measures, there is not a widely accepted theoretical structure of the phenomenon. Instead, instrumental musicians are often assessed using vague criteria that do not correspond to specific techniques or provide useful performance feedback. Due to the absence of clearly defined components, music researchers have been hesitant or unable to investigate expression as a performer-created phenomenon. The development of a literature-based theoretical structure of expression would encourage an enhanced understanding of the performer's process in the facilitation of expressive performances and allow for the refinement of existing performance assessment measures. Therefore, the purpose of this study is to create and pilot a measure of expressive performance by small instrumental ensembles. An exploratory factor analysis (EFA) will be used to examine the latent variables that contribute to the perception of expression in instrumental performance. Based on a review of the literature and music performance assessment measures, the seven expected factors that contribute to the perception of expression in instrumental performance are (a) style, (b) Western performance behaviors (i.e., "appropriate" for the work and the context), (c) personalization, (d) variations in timing, (e) variations in dynamics, (f) performer movement and posture, and (g) performer use of eyes and facial expressions. These underlying factors have been organized into three expected latent variables of expression in instrumental performance: (a) musical interpretation—style, Western performance traditions, and personalization, (b) phrasing—timing and dynamics, and (c) visual performance—performer movement, posture, eyes, and facial expressions. After the created measure is pilot-tested, the strength of the hypothetical structure will be examined using confirmatory factor analysis (CFA). The inter-judge reliability and criterion validity of the measure will be evaluated using Cronbach's alpha, ANOVA, Spearman-Brown prophecy formula, and stepwise multiple regression.

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