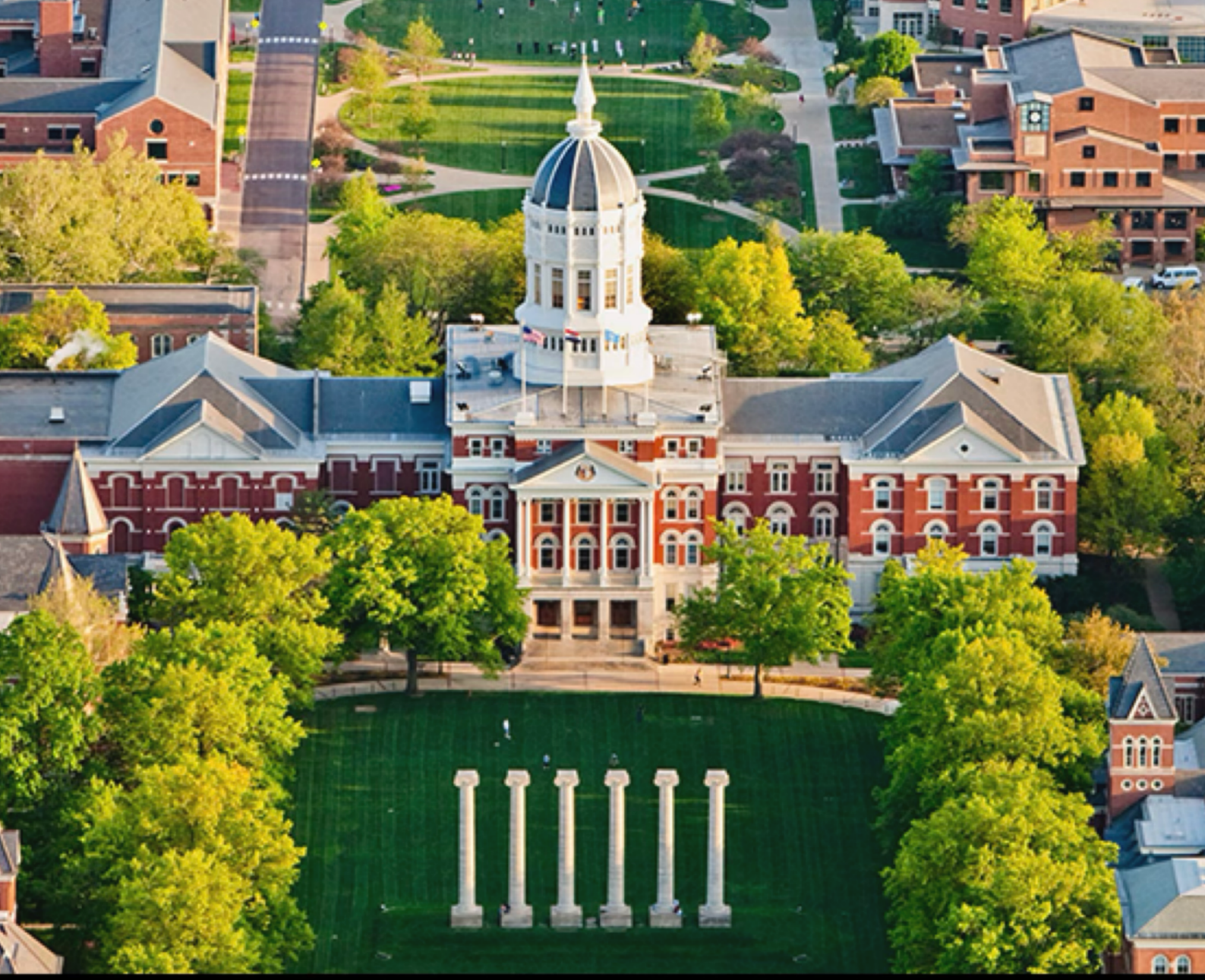

RCAF 2025

41st Research and Creative Activities Forum

BOOK OF ABSTRACTS

April 23, 2025

ABOUT RCAF

RCAF stands for Research & Creative Activities Forum, an annual event that offers an invaluable opportunity for graduate and professional students to showcase their academic projects and research. The conference has been designed to provide a platform for students to display their work and discuss their findings with a larger audience. RCAF aims to stimulate intellectual growth and inspire the next generation of researchers and academics. It is an ideal opportunity for students to get feedback, improve their presentation skills, and network with fellow researchers and professionals.

Since its establishment, RCAF has become a highly anticipated event that attracts Mizzou students from various fields of study. It offers a diverse range of presentations providing attendees with a comprehensive overview of current research trends and practices here at Mizzou. This year, the 41st RCAF conference features an array of research topics, from Social and Behavioral Sciences, Life Sciences, Physical Sciences and Mathematics, Engineering Science and Informatics, Artistic Expression, Applied Design and Humanities. This event promises to be stimulating and thought-provoking for all those involved.

RCAF 2025

41st Research and Creative Activities Forum

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RCAF 2025

41st Research and Creative Activities Forum

GPC PRESIDENT'S SPEECH

Dear Distinguished Colleagues,

As we conclude another remarkable academic year, I am filled with profound gratitude for the exceptional scholarship showcased at the 41st Research and Creative Activities Forum (RCAF). The dedication displayed by graduate and professional students exemplifies the innovative spirit that drives our university forward.

To our poster presenters, your research represents countless hours of dedication and intellectual curiosity. The numerous range of disciplines and methodologies displayed at the 41st RCAF demonstrates the breadth and depth of graduate and professional education at Mizzou.

This event would not be possible without our faculty judges who generously shared their expertise, mentorship, and feedback. Your commitment to nurturing the next generation of scholars deserves our deepest appreciation.

I extend special thanks to our tireless 2025 RCAF organizing committee and the 2024/2025 GPC Executive Board. I especially thank Ejike Iweha, our Director of Programming whose vision and execution made this forum a reality.

Our university administration and the Office of the Provost have provided unwavering support for graduate student research initiatives. We are equally grateful to the Graduate School, the Office of Research, our college deans, and the dedicated faculty and staff who work behind the scenes to create opportunities for scholarly engagement.

The 2024/2025 academic year has challenged us to think critically, collaborate meaningfully, and contribute substantially to our respective fields. As we celebrate today's achievements, we also look forward to the impact our research will have on addressing society's most pressing challenges.

Thank you for your contributions to our scholarly community.

In kindness,
Jessica Osaze
President, Graduate Professional Council (GPC)

ACKNOWLEDGEMENTS

The Graduate Professional Council is grateful to the following faculty, staff, and students for their invaluable support towards making this event a success.

Jeni Hart
Dean of the Graduate School and Vice Provost
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PANEL OF JUDGES – RCAF 2025

April 23rd, 2025

HUMANITIES

Ariel Fried
Debora Verniz

LIFE SCIENCES

Qian Li
David Bauer
Victor Outlaw
Enoch N'goma
Sandra Chrapah
Samuel Hockett
Anand Soorneedi

SOCIAL & BEHAVIORAL SCIENCES

Mansoo Yu
James Flink
Eileen Avery
Aaron Campbell
Yousef Alkilany

PHYSICAL SCIENCES & MATHEMATICS

Longo Li
Luke Kruse
Ellen Moore
Valerie Carroll
Divya Kandanool
Kanishka Sikligar

ENGINEERING SCIENCES AND INFORMATICS

Christopher O'Bryan

RCAF 2025

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LIFE SCIENCES

The Role of RECK in Metabolic Alcohol-associated Liver Disease (MetALD)

Elizabeth Fiechter[1]*, Ryan J Dashek[2,3,4,5], Christopher L Taylor[2,3,5], Grace M Meers[2,3,5], Bysani Chandrasekar[2,7,8,9], R Scott Rector[2,3,5,6]
[1]Comparative Medicine Program, University of Missouri-Columbia
[2]Research Service, Harry S Truman Memorial Veterans Medical Center, Columbia, MO
[3]NextGen Precision Health, University of Missouri, Columbia, MO
[4]Department of Veterinary Pathobiology, University of Missouri-Columbia
[5]Department of Nutrition and Exercise Physiology, University of Missouri-Columbia
[6]Division of Gastroenterology and Hepatology, Department of Medicine, University of Missouri-Columbia
[7]Division of Cardiology, Department of Medicine, University of Missouri-Columbia
[8]Dalton Cardiovascular Research Center, University of Missouri-Columbia
[9]Department of Medical Pharmacology and Physiology, University of Missouri-Columbia,
*Email: ef3k5@umsystem.edu

Metabolic alcohol-associated liver disease (MetALD) is a sub-category of steatotic liver disease (SLD) that results from metabolic dysfunction and chronic alcohol consumption. We have previously reported that RECK (REversion Inducing Cysteine Rich Protein with Kazal Motifs), a membrane anchored glycoprotein, exerts hepatoprotective effects in metabolic dysfunction-associated liver disease (MASLD; previously known as nonalcoholic fatty liver disease, or NAFLD). This study explored RECK's role in MetALD. We hypothesized that knocking out RECK in hepatocytes would exacerbate hepatic pathology in response to an acute ethanol/high fat diet challenge. Both the hepatocytespecific RECK knockout animals (RECKhep-/-), and littermate controls (RECKfl/fl) were challenged with an ethanol-containing liquid diet (n=7-9/group) following the NIAAA model of alcohol feeding (10 days + EtOH binge). Histology sections from RECKhep-/- animals displayed increased signs of fat accumulation (steatosis), inflammatory foci, and collagen deposition. qRT-PCR and Western blot analysis of whole liver tissue showed increased presence of proteins associated with inflammation as well as increased mRNA expression of genes associated with hepatic inflammation and fibrosis, including α-SMA ($p=0.108$), Col1a1 ($p=0.013$), TNF-α ($p=0.027$), IL-1β ($p=0.023$), and PDGFβ ($p=0.011$) in the livers of RECKhep-/- mice. These results support the hypothesis that hepatocyte-specific RECK knockout exacerbates hepatic pathology and confirmed that RECK plays a similar role in the liver for both MetALD and MASLD, suggesting RECK's potential as a therapeutic target for MetALD patients. Work was supported by R01DK130243-01A1 (RSR, BC).

Associations Between Cannabis Use Disorder and Psychiatric Outcomes: A Retrospective Cohort Analysis Using Electronic Health Records

Sri Aishitha Koduru*, Xing Song
Biomedical Informatics, Biostatistics, Medical Epidemiology, School of Medicine, University of Missouri
*Email: skrky@umsystem.edu

Background: Cannabis Use Disorder (CUD) is increasingly prevalent in the U.S., raising concerns about its impact on mental health. Prior studies suggest associations between cannabis use and psychiatric disorders, but large-scale real-world evidence is limited.

Objective: This study examines the relationship between CUD and psychiatric outcomes: depression, anxiety, and schizophrenia—using Electronic Health Records (EHR) from a large Midwestern academic healthcare system.

Methods: We conducted a retrospective cohort study using de-identified EHR data (2015–2019). CUD was identified using ICD-10 codes (F12), and psychiatric outcomes were defined as new diagnoses of depression (F32–F34.1), anxiety (F41), or schizophrenia (F20) after cohort entry. Patients with prior psychiatric diagnoses were excluded. The final cohort included 8,651 CUD patients (3.8%) and 219,118 non-CUD patients (96.2%). To improve comparability, the non-CUD population was randomly partitioned into 20 balanced subgroups. Covariates included age, sex, race, insurance status, and comorbidities (nicotine use, hypertension, diabetes, thyroid disorders, poverty). Multivariate logistic regression using scikit-learn was performed to estimate adjusted odds ratios (ORs).

Results: CUD patients showed significantly higher psychiatric outcome rates: depression (30.2% vs. 7.3%), anxiety (35.0% vs. 10.7%), and schizophrenia (6.5% vs. 0.28%) compared to non-CUD. Adjusted ORs revealed that CUD patients had 1.86–2.88 times higher odds of depression, 1.65 – 2.32 times higher odds of anxiety, and 2.40–5.00 times higher odds of schizophrenia. Additionally, comorbidities such as nicotine use (65.8% vs. 8.6%) and poverty indicators (10.9% vs. 0.36%) were significantly more prevalent in the CUD group.

Conclusion: Our findings demonstrate strong, independent associations between CUD and psychiatric disorders, particularly schizophrenia. Socioeconomic factors and nicotine dependence were significant confounders, with poverty substantially amplifying psychiatric risk. These results highlight the need for targeted screening and early intervention strategies for CUD patients in clinical settings to mitigate adverse mental health outcomes.

Photodistributed Toxic Epidermal Necrolysis Following Ultraviolet Radiation Exposure: A Case Report

Sahla Esam*, Benjamin Warren Casterline
Department of Dermatology, University of Missouri-Columbia
*Email: seb7z@umsystem.edu

Toxic epidermal necrolysis (TEN) is a severe, life-threatening condition characterized by detachment of the epidermis and mucosal surfaces affecting 30% or more of the total body surface area. The incidence of TEN is estimated to be about 1.9 per million adults annually (A Labib). This type IV hypersensitivity reaction is characterized by scattered, dusky, erythematous macules on the head, neck, and trunk, which may progress to the extremities in confluent patches and detach with lateral pressure known as a positive Nikolsky sign. The pro-inflammatory cytokines Tumor Necrosis Factor (TNF) and Interleukin-1 (IL-1) are noted in the pathogenesis of TEN, contributing to widespread skin detachment (Gatson). Drugs are implicated as the causative agent in as many as 80% of cases with anticonvulsants, antibiotics, and non-steroidal anti-inflammatory drugs (NSAIDs) being the most common drug classes (McKinley). In the case of ibuprofen, photosensitivity is caused by the molecule absorbing ultraviolet light, generating reactive oxygen species (free radicals) that damage the skin cells when exposed to sunlight. The cornerstone of treatment includes supportive care, fluid resuscitation, pain management, wound care, and nutritional support until epithelization of the affected skin has occurred (Bruggen). Photodistributed TEN has more recently been characterized as a unique subset of TEN. To date, thirteen cases have been reported (McKinley). While the initial distribution is sharply defined to photoexposed sites, the eruption ultimately spreads to photoprotected and mucosal sites. We describe the case of a 32-year-old woman who developed photodistributed toxic epidermal necrolysis 4 days after 1.5 hours of sun exposure. Prior to sun exposure, the patient took ibuprofen, DayQuil, and NyQuil for upper respiratory infection (URI) symptoms. Skin biopsy showed cytotoxic interface dermatitis, confirming the diagnosis of TEN. The patient was treated with etanercept, a TNF inhibitor, within 24 hours of admission. Additionally, she received wound care and fluid resuscitation in the intensive care unit and responded well to treatment. She was discharged fourteen days after admission with no adverse sequelae noted at one-month follow-up. The existing literature and our case lend more support to the idea that UVR and TEN are connected, despite a limited amount of documentation. Clinicians should consider this rare etiology and obtain a history of UVR exposure as UV irradiation of skin is thought to enhance IL-1. Furthermore, early identification of such triggers can expedite diagnosis, ensure timely specialized care, and may reduce the mortality rate.

Incorporation of Bone Formation Peptide into Nanofibrous Microspheres for Periodontal Bone Regeneration

Yingzi Li
Email: ylmpb@umsystem.edu

Objective: Periodontal bone regeneration is important in dentistry because periodontal bone defects are common in oral health. Biomimetic microspheres are attractive biomaterials for periodontal bone regeneration. In this study, we developed multifunctional injectable ECM-like nanofibrous hollow gelatin-based microspheres for periodontal bone regeneration. Specifically, bone formation peptide (BFP) was incorporated into the hollow microspheres, and E7 peptide that selectively binds bone marrow stem cells was coupled onto the surfaces of the microspheres. Furthermore, the multifunctional microspheres were injected into the defect and photo-crosslinked to form a 3D nanofibrous matrix that provides selective cell adhesion and sustained release of BFP from the microspheres.

Methods: BFP was encapsulated into calcium phosphate (CaP) nanoparticles and added to a 50% ethanol solution of gelatin methacryloyl (GelMA). Hollow microspheres (MS) were prepared using a double emulsion method, followed by a thermally induced phase separation process to form nanofibrous microspheres. The mechanical properties, encapsulation efficiency, BFP release, biocompatibility, and degradation were evaluated. In vitro biological assessments include cell attachment, adhesion, migration, proliferation, differentiation, and mineralization. Periodontal bone regeneration was tested in vivo.

Results: The mechanical strength of the MS 3D matrix increased as the MA concentration increased from 5% to 10%. Further increasing the amount of MA did not significantly affect the mechanical property of the MS 3D matrix. Crosslinking MS significantly increased the degradation time of the MS 3D matrix. After initial cell adhesion, the cells migrated into the porous MS 3D matrix at a rate of approximately 20.9 μm/h from 2 h to 12 h. In vivo experiment further showed that the MS 3D matrix significantly improved periodontal bone regeneration.

Conclusion: The biomimetic multifunctional MS 3D matrix serves as a promising cell carrier and drug delivery vehicle for periodontal bone regeneration.

One sentence summary: Multifunctional nanofibrous hollow gelatin-based microspheres self-assemble a 3D matrix with incorporated bone formation peptide, promoting enhanced periodontal bone regeneration through selective cell adhesion and sustained release, as demonstrated by improved in vivo outcomes.

Key Words: Nanofibrous Microspheres, Bone Regeneration, 3D Biomimetic Materials, Bone Formation Peptide

Advancing Electrochemical Gas Sensing: Deep Eutectic Solvents as Alternative Electrolytes

Mildred Emegha*, Gary Baker, Xiangqun Zeng
Department of Chemistry, University of Missouri-Columbia
*Email: mce2rk@umsystem.edu

The development of electrochemical gas sensors relies heavily on the choice of electrolyte, which influences sensitivity, selectivity, and long-term stability. Conventional liquid electrolytes often present limitations such as volatility, toxicity, and restricted electrochemical windows. Deep eutectic solvents (DES) have emerged as promising alternatives due to their unique physicochemical properties, including intrinsic ionic conductivity, wide electrochemical stability, and environmental sustainability. This study investigates the potential of DES as novel electrolytes for gas sensing applications, with a particular focus on their electrochemical characteristics in controlled environments. By tailoring DES composition, we explore their suitability in facilitating charge transfer and enhancing sensor performance. Preliminary electrochemical analyses suggest that DES-based electrolytes could offer improved stability and tunability for gas sensing applications. This work paves the way for further research into DES-based electrochemical systems, contributing to the advancement of sustainable and high-performance sensor technologies.

Compiling Superior Alleles of Agronomic Traits in Elite Rice Using Multiplex Prime Editing

Kanika Phagna[1], Ajay Gupta[1], Bo Liu[1], Bing Yang[1,2]*
[1]Division of Plant Science and Technology, University of Missouri, Columbia, MO
[2]Donald Danforth Plant Science Center, St. Louis, MO
*Email: kpdck@umsystem.edu

Traditional breeding and CRISPR/Cas9 genome editing have improved crops but struggled to efficiently modify multiple genes at once while avoiding unintended changes. Prime editing (PE), an advanced genome editing technology, enables precise DNA modifications without introducing double-strand breaks, reducing the risk of unintended mutations. Over the years, remarkable progress has been made in enhancing PE efficiency in plants. This advance has now paved the way for efficient multigene targeting, a breakthrough that we demonstrate in this study. Although the prospect of multiplex PE has been demonstrated in wheat for up to eight genes and in rice for up to four genes, this study focuses on developing and optimizing a multiplex PE system for elite rice varieties. We have selected key agronomic traits and aim to establish a system capable of editing up to 16 genes in combinations of 4, 8, 12, and 16 genes. To assess construct stability, we performed transformation and sequencing in *E. coli*, *A. tumefaciens*, and rice plants. Out of 174 transformed plants, 138 carried the PE cassettes, achieving a transformation efficiency of 79.31%. Further screening is underway to evaluate the efficiency of simultaneous multigene editing. Future studies will evaluate the editing efficiency and heritability of modifications, ensuring stable transmission across generations. Additionally, phenotypic assessments will be conducted for selected traits to validate the functional impact of these edits. Ultimately, this approach will push the boundaries of genome editing for crop improvement.

Implementing the Dairy Cow as a Novel Study Model to Uncover Cell Migration Pathways Dysregulated in Adenomyosis

Patricia Roa-Vidal[1*], Macy Markway[3], Joao G. N. Moraes[4], Matthew C Lucy[3], Amanda Patterson[2,3]

[1]Translational Bioscience Graduate Program, University of Missouri-Columbia

[2]Department of Obstetrics, Gynecology and Women's Health, University of Missouri-Columbia

[3]Division of Animal Sciences, University of Missouri-Columbia

[4]Department of Animal and Food Sciences, Oklahoma State University, Stillwater, OK.

*Email: pr7mr@umsystem.edu

Adenomyosis is a benign gynecological disorder characterized by ectopic endometrial glands and stroma in the myometrium. Symptoms associated with the disease are chronic pelvic pain, abnormal bleeding, and potential impact on fertility. Depending on study diagnostic criteria, patient prevalence ranges from 8.8% to 61.5% in women of reproductive age. As there is no cure for this disease and its pathogenesis is yet unclear, there is a definite need for further study. The predominating theory for its development is invasion of glands and stroma into the myometrium due to endometrial-myometrial interface (EMI) damage. However, in-depth functional investigations in women are limited due to ethical restrictions. Given the spontaneous occurrence of the disease in dairy cattle, histopathological similarities, and potential association with disruption of fertility, we propose the bovine as a study model of adenomyosis and present evidence of its utility. Using 10x Genomics Visium Spatial Gene Expression, *we provide the first spatially resolved transcriptomic analysis of the bovine uterus* revealing the primary uterine cell populations in control and adenomyotic uteri (n=1 each). We resolved deep glandular epithelium (GE; cluster 8), EMI mesenchyme (cluster 11), and sub-EMI myometrium (subEMI). Importantly, the subEMI exhibits condition-dependent transcriptomic profiles, resulting in distinct cell populations in control (cluster 12) and adenomyotic (cluster 9) tissue. We then employed Gene Ontology (GO) analysis to uncover differentially enriched processes between control and adenomyotic cell populations. Processes related to cell adhesion and apoptosis were downregulated in the deep GE and EMI, respectively, of adenomyotic samples. Interestingly, *WNT5B*, a promoter of cell motility through the WNT-planar cell polarity (PCP) pathway, was significantly upregulated in adenomyotic subEMI, whereas *SFRP2*, a WNT inhibitor, was down. Taken together, these preliminary data suggest that not only is the myometrium permissive to GE/stroma invasion, but it may also actively promote it through non-canonical WNT signaling. Ongoing studies aim to 1) establish the bovine as a model for adenomyosis allowing us to study disease progression and 2) investigate the WNT-PCP signaling pathway in disease pathogenesis.

Hypoxia-Tolerance of Neural Function after Hibernation in Bullfrogs: Responses to Graded Oxygen Deprivation and Tissue Metabolic Demand

Hafsa Yaseen[1], Joseph Santin[1]*
[1]Division of Biological Sciences, University of Missouri-Columbia
Email: santinj@missouri.edu

Neural circuit function is vulnerable to low oxygen levels; however, the adult American bullfrog *(Aquarana catesbeianus)* shows remarkable plasticity in response to hibernation, allowing neural networks to function ~20-times longer without oxygen by relying solely on anaerobic glycolysis. While past studies have focused on sudden and acute anoxia in natural environments, oxygen often changes more gradually, induced by slower changes in ambient conditions or local changes in tissue metabolism (*e.g.,* altered neural activity). Using graded oxygen reductions and a sensor for partial pressures of oxygen (pO_2), we monitored real-time changes in tissue pO_2 and correlated them rhythmic activity of in vitro brainstem preparations in control (n=6) and hibernating frogs (n=4). As oxygen levels were lowered in controls, tissue pO_2 dropped, and burst activity decreased in proportion. In addition, we identified that most brains have a critical tissue Po2 near 15-25 mmHg, below which activity became "seizure-like," highlighting a threshold for circuit failure in control frogs. To address how local changes in metabolic demands influence tissue Po2, we increased network activity by introducing isoproterenol, a β-adrenoreceptor agonist, which elevated burst frequency. This served to raise metabolic demand and accelerate oxygen depletion within the tissue (repeated measures ANOVA; $p<0.01$). Moreover, the frequency of non-respiratory (seizure-like) bursts also increased during isoproteronol treatment, which further contributed to the drop in tissue pO2. In contrast, tetrodotoxin (TTX), a sodium channel blocker that silences neural output, raised tissue pO_2 levels (repeated measures ANOVA; $p<0.01$) levels as a consequence of reduced energy consumption. Preliminary findings in 4 hibernators indicate that graded hypoxia elicits similar Po2 changes within the tissue as controls, but no changes in burst rate and no critical points that elicit seizure-like activity, even during anoxia (0 mmHg in tissue). These findings underscore the energy sensitivity of bullfrog neural circuits and suggest that this animal can dramatically reshape its oxygen demands while maintaining neural performance across a wide range of tissue Po2 values. Understanding the mechanisms underlying this adaptation not only provides insights into amphibian physiology but also has potential implications for medical research, such as developing strategies that induce similar types of plasticity that improves function during energy stress before ischemic strokes occur. Future work will access the activity-dependence of tissue Po2 in hibernators, as well as the mechanisms underlying this metabolic plasticity response.

Industrial Hemp Response to Nitrogen Applications

Anjeeta Nain[1*], Gurpreet Kaur[1,2], Kelly A. Nelson[2], Jennifer Miller[3] and Gurbir Singh[2]
[1]School of Natural Resources, University of Missouri
[2] Division of Plant Science and Technology, University of Missouri
[3]Hundley-Whaley Extension and Education Center, Albany, University of Missouri
*Email: fa7cp@umsystem.edu

With the increasing interest in industrial hemp (Cannabis sativa L.) as a versatile crop for both fiber and grain production, optimizing nitrogen (N) management has become critical for maximizing its productivity. Field experiments were conducted at two locations (Novelty, Albany) in northern Missouri to evaluate the effects of N application rates on industrial hemp growth, biomass, and grain yield. The experiment was set as a randomized complete block design with a split-plot arrangement and four replications. Main plots included four varieties (Puma, Yuma, Futura 83, Orion 33) and subplots were five N rates (0, 45, 90, 135, and 180 kg N ha⁻1). The plant biomass yield, grain yield, height, plant stand, and stem diameter were recorded to assess industrial hemp growth and production under different N rates. Pre-plant soil samples were collected from two depths (0–15 and 15-30 cm) to determine baseline soil N content. Post-harvest soil samples will be collected to assess residual N levels, allowing for evaluation of nitrogen-use efficiency and the environmental impact of N fertilization. At Novelty, nitrogen rates influenced all measured parameters. Grain yield and stem diameter were significantly affected by the interaction of cultivar and N rates. At Novelty, plant height and biomass were highest at 134 kg N ha-1, with grain yield for Orion peaking at 179 kg N ha-1 and for Futura 83 at 134 kg N ha-1. Nitrogen applications did not impact measured parameters at Albany.

Impact of Flooding Duration on Soybean Production in Northern Missouri

Manjot Kaur[1]*, Gurpreet Kaur[2], Kelly A. Nelson[2], and Gurbir Singh[2]
[1]Department of Natural Resources, University of Missouri-Columbia
[2]Division of Plant Science Technology
Email: mkhfn@umsystem.edu

Flooding is a severe abiotic stress after drought. Changing climatic conditions has increased the impact of waterlogging on crops, mainly soybeans, in recent. Flooding stress can cause a reduction in plant emergence, growth, plant height, branch number, pods per branch, dry matter production, seed size, and N and P concentrations. It also reduces biological nitrogen fixation by decreasing the activity of nitrogen-fixing bacteria and thus lowers the number of nodule formations. It causes leaf yellowing, leaf abscission, and stomatal closure in soybean plants. A field study was conducted at the University of Missouri's Lee Greenley Jr. Memorial Research Farm near Novelty, Missouri, in 2023 and 2024 to evaluate the impact of flooding stress duration on commercially available soybean varieties during their early growth stages. Twenty commercial varieties were tested in 2023, whereas twenty-two were tested in 2024. The main plots were flooding durations of 0 (no flood), 3, and 7 days, and the subplots were soybean varieties. Data collection included plant height, plant population, pods per plant, soybean yield, and seed quality. Results showed a reduction in soybean yield by 0.19 and 0.07 Mg ha^{-1} with each day of flooding in 2023 and 2024, respectively. In conclusion, flooding duration impacts soybean production by affecting overall plant growth and development.

Characterization of Chaperone-Dependent Proteasomal Degradation of Tau

Victoria Arkoh Koomson[1]*, Katherine Bailey[2], Xin Liu[1], Stephanie Gates[1]
[1]Department of Biochemistry, University of Missouri-Columbia
[2]Department of Biological Science, University of Missouri-Columbia
*Email: vak7hc@umsystem.edu

Tau is a microtubule binding protein in the axon of the neurons. During proteotoxic stress, tau is hyperphosphorylated and dissociates from the microtubules, forming neurofibrillary tangles (NFTs). Accumulation of NFTs is a hallmark of Alzheimer 's disease. HSP70, an ATP dependent chaperone associates with tau protein and its overexpression invitro has been shown to decrease tau aggregation. CHIP, a chaperone-associated E3 ubiquitin ligase, binds Hsp70 and facilitates the ubiquitination of Hsp70-bound substrates to promote proteasomal degradation. Bcl2-associated athogene-1 (BAG-1) is a cochaperone of Hsp70 and a nucleotide exchange factor that can bind to the 26S proteasome, therefore we aim to understand BAG-1's role in chaperone substrate specifically tau delivery to the proteasome. In this work, we have developed invitro ubiquitination assay using fluorescently labelled tau to see how cochaperones affect tau ubiquitination. Understanding this will give us the insight of how the chaperone complex affect tau downstream degradation.

Structural Characterization of TECPR1 and Its Interaction with Lipid Membranes in Non-Canonical Autophagy

Ernest Okertchiri*, Kelly Rockford, Clara Plass, Xin Liu, Adam Yokom
Department of Biochemistry, University of Missouri-Columbia
*Email: eaodhd@umsystem.edu

Non-canonical autophagy is a specialized degradative pathway that functions without some of the core components of classical autophagy. TECPR1 (Tectonin Beta-Propeller Repeat-Containing protein 1) has emerged as a key player in this process, however, its structural features and membrane interactions are poorly understood. To gain mechanistic insights, we have determined a 3.4 Å resolution structure using cryo-electron microscopy. Our model reveals the organization of TECPR1's multiple domains including its dysferlin domain which has been showed to interact with membranes. To further probe this, we performed liposome co-sedimentation to reveal a preference for sphingomyelin-rich membranes. By combining structural and biochemical approaches, this study will provide critical insights in TECPR1's role in non-canonical autophagy. These finding will lay the groundwork for future studies on TECPR1's role in cellular homeostasis, membrane remodeling and potential links with autophagy-related disorders.

B_3-Adrenergic Receptor Agonism Blunts Sympathetic Vasoconstriction in Healthy Young Females

Anna M. Gonsalves[1], Natasha G. Boyes[1], Dain W. Jacob[1], Brian Shariffi[1], Vina D. Vedala[1], Brian P. Bostick [3,4], Jacqueline K. Limberg[1,2]
[1]Department of Nutrition and Exercise Physiology
[2]Dalton Cardiovascular Research Center
[3]Department of Medicine - Division of Cardiovascular Medicine
[4]Department of Medical Pharmacology and Physiology
*Email: amgfb6@missouri.edu

Females are historically underrepresented in cardiovascular research; as a result, therapeutic approaches are derived from primarily male cohorts, leading to less effective treatments for female patients. Vascular β-adrenergic receptors (ARs) mediate blood flow and blood pressure responses to sympathetic nervous system activation. Preclinical studies show greater vascular β_3-AR expression as well as enhanced β_3-AR vasorelaxation in female compared to male rodents, indicating a unique potential for β_3-ARs to modulate blood flow in females. We hypothesized pharmacological activation of β_3-ARs would attenuate the peripheral vasoconstrictor response to acute sympathetic nervous system activation in healthy young females. Ten young healthy female participants (27±7 yr, 25±3 kg/m^2) completed two study visits randomized and blinded to oral placebo or Vibegron (75mg; a β_3-AR agonist). On each visit, participants completed a 5-min quiet rest followed by a 2-min cold pressor test (CPT) to achieve sympathetic activation. Forearm blood flow (FBF, venous occlusion plethysmography) and blood pressure (BP, finger photoplethysmography) were assessed. FBF was normalized for mean BP (forearm vascular conductance, FVC) and reported as both absolute values and relative (%) changes from baseline. On the placebo visit, sympathetic activation with CPT elicited robust decreases in absolute FBF (2.0±1.1 to 1.6±0.9 mL/dL/min; p=0.003) and FVC (2.4±1.3 to 1.7±1.1 mL/dL/min/100mmHg; p=0.001), confirming vasoconstriction with increased sympathetic activity. In contrast, the FBF (3.0±1.8 to 2.8±1.7 mL/dL/min; p=0.396), but not FVC (3.6±2.1 to 3.0±1.8 mL/dL/min/100mmHg; p=0.037), response to CPT was lost following Vibegron. When compared to placebo, Vibegron attenuated CPT-mediated relative reductions in FBF (-21.2±16.7 to -0.3±23.0%, p=0.016) and FVC (-27.3±17.4 to -11.2±18.6%, p=0.021). These preliminary data indicate β_3-ARs can restrain sympathetic-mediated vasoconstriction in this demographic. Based on the known role of estrogen in mediating β-AR signaling, future work will investigate the impact of menopause on this response.

Genome-Wide DNA Methylation Analysis of Uterine Endometrium in Dairy Cows with Early Postpartum Metritis

M.A. Afzal*, S.K. Sivasankaran, M.O. Caldeira, I. Sellmer Ramos, M.C. Lucy
Department of Animal Sciences, University of Missouri, Columbia
*Email: maabnt@umsystem.edu

Postpartum uterine disease has long-term detrimental effects on fertility. Our previous findings indicated that postpartum uterine disease alters the transcriptome of the uterine endometrium in mid-lactation cows. We hypothesized that these transcriptomic changes are driven by an epigenetic mechanism involving genome methylation. The objective was to assess genome methylation in the caruncular (CAR) and intercaruncular (ICAR) endometrium of cows that were previously diagnosed with metritis or remained healthy. First-parity Holstein cows diagnosed with clinical metritis (n=6) or identified as healthy (n=6) were studied. Cows were assigned to slaughter at approximately 80 d postpartum (n=6) or 165 d postpartum (n=6). DNA was extracted from CAR and ICAR endometrium using DNeasy Blood & Tissue Kit (Qiagen, Valencia, CA). A total of 24 DNA samples (6 metritis CAR, 6 metritis ICAR, 6 healthy CAR, and 6 healthy ICAR) were submitted to the MU Genomics Technology Core for wholegenome bisulfite sequencing (WGBS) generating 130–165 million paired-end reads per sample. Sequence quality was measured, and adapters and low-quality reads were removed. The processed reads were aligned to the Bos taurus reference genome (ARS-UCD1.3), using Bismark. Alignment yielded 60 to 72% uniquely mapped reads. These reads were subsequently used for DNA methylation calling in Bismark, followed by downstream analysis of differentially methylated sites (DMSs) and differentially methylated regions (DMRs) using MethylKit in R. Preliminary analyses, using hierarchical clustering, revealed two key findings. First, CAR and ICAR were clustered together, indicating that the two tissue types were highly similar. Second, no clear separation was observed between healthy and metritis cows across all samples, suggesting that global methylation was not affected by disease. However, these results do not rule out the possibility of differential methylation at specific CpG sites or genomic regions, which we will investigate through DMS and DMR analysis using an FDR threshold of $P < 0.05$. We aim to integrate methylome and transcriptome data to identify methylation differences that may drive transcriptomic changes linked to reduced fertility in cows with postpartum metritis.

Keywords: metritis, endometrium, methylome

Human-Induced Pluripotent Stem Cell-Derived Microglia: A New Model for Deciphering the Non-Cell Autonomous Pathology in C9ORF72 ALS

Silvano Bond
Department of Neuroscience, University of Missouri-Columbia
Email: Sbnf8@umsystem.edu

Objective: Amyotrophic Lateral Sclerosis (ALS) is a devastating neurodegenerative disorder characterized by the progressive degeneration of motor neurons, muscle atrophy, and eventual paralysis. Recent research underscores the multifaceted role of microglia—resident immune cells of the central nervous system—in ALS pathogenesis. Among the most well-known causes of ALS is a G4C2 repeat expansion in the first intron of the C9ORF72 gene, which in neurons disrupts Ca^{2+} homeostasis and mitochondrial function, induces endoplasmic reticulum (ER) stress, and activates the unfolded protein response (UPR) pathway, ultimately resulting in cell death. This study aims to establish an *in-vitro* model with the potential to generate groundbreaking insights and therapeutic strategies for ALS treatment.

Methods: Using induced pluripotent stem cells (iPSCs) derived from C9ORF72-ALS patients, isogenic controls and healthy controls, we have established hematopoietic stem cells, which robustly differentiated into microglia cells. These cells have been employed for studies in monocultures and co-cultures with induced neurons (iNeurons) for proteomic profiling and calcium imaging. This innovative model holds promise for shedding light on the non-cell-autonomous mechanisms underlying ALS development and progression.

Results: Through this innovative approach, we successfully generated microglial cells via the intermediate step of hematopoietic progenitor cells (HPCs), achieving high yield and efficiency. Each step of differentiation produced highly pure cells, as confirmed by immunofluorescence. Additionally, ongoing proteomic analyses are identifying altered signaling pathways resulting from the specific C9ORF72 genetic modification, potentially elucidating the role of aberrant microglia signaling in the development of ALS pathology.

Conclusion: By generating highly pure microglial cell lines from human fibroblasts, this study aims to uncover pivotal insights into the pathological mechanisms driving ALS progression. The findings from this innovative model are expected to translate into clinical applications through close collaboration with clinical partners, potentially improving the lives of ALS patients.

Impact Statement: Here, we describe the establishment of an innovative model generated from C9ORF72 ALS patients, isogenic controls and healthy controls. Importantly, this will allow to provide groundbreaking insight into the non-cell autonomous progression of ALS. By clearly defining the role of microglia in this pathology, this study holds the potential to pave the way for designing targeted therapies and treatments for ALS patients.

Characterization of Biopolymer Based Biodegradable Films with Antimicrobial Properties

Sumit Singh Sheoran
Department of Biological Engineering, University of Missouri-Columbia
Email: syhz@umsystem.edu

The global production of plastics, exceeding 460 million metric tons annually, is predominantly driven by single-use applications. Plastics, being non-biodegradable, have emerged as a significant pollutant, contaminating terrestrial and marine ecosystems. Furthermore, microplastic particles smaller than 5 mm have been detected in various human organs, including blood, lungs, placenta, and fetal tissues. Major sources include synthetic textiles, vehicle tires, food packaging, and personal care products. Packaging is very crucial for the food industry to keep food for longer without spoilage. To minimize the danger of plastic pollution and microplastics and keeping the food fresh for longer duration, biodegradable films with antimicrobial properties offer a promising alternative to plastic packaging. Whereas biodegradable films incorporate with antimicrobial compounds can be expensive. This study aimed to assess the potential of biopolymers along with bioactive compounds, for antimicrobial properties. The pH modifications were implemented to alter the molecular structure of proteins through unfolding and repolymerization processes. To develop strong biodegradable films, modern processing techniques such as ultrasonication and heat-induced stirring ensures uniform protein denaturation, improving the film mechanical properties, was implemented. Formulated films contained antimicrobial properties against *Bacillus subtilis* (Gram +ve) and *Escherichia coli* (Gram –ve). The resulting bioactive films had lower light transmittance, indicating enhanced UV barrier properties, offering protection against oxidative reactions. All developed films demonstrated good mechanical strength and thermal stabilities. Formulated films demonstrate exceptional suitability for laser engraving applications. Whereas utilizing bioactive compounds from natural sources such as colored corn can be a cost-effective option.

Inhibition of AP Endonuclease-1 by O-Benzylhydroxylamine through the Formation of a Covalent Adduct with Abasic Sites in DNA

Don Pivithuru Liyanarachchi[1], Tanhaul Islam[1], Kent S Gates[1,2]*
[1]Department of Chemistry, University of Missouri-Columbia
[2]Department of Biochemistry, University of Missouri-Columbia
*Email: gatesk@missouri.edu

DNA lesions are a common occurrence in cells with Abasic (AP) Sites being one of the common lesions observed. These AP sites can arise from the spontaneous removal of the nitrogenous base from the nucleotide in the DNA strand. The Base Excision Repair (BER) pathway recognizes and processes these AP sites, ensuring DNA integrity. APE1 (AP Endonuclease-1) is a crucial enzyme involved in the repair of abasic (AP) sites in DNA. APE1 cleaves the DNA strand at the AP site, allowing subsequent repair steps to proceed in the BER pathway. Thus, APE1 inhibitors have a remedial importance as possible chemotherapeutics or enhancers. A possible inhibition mechanism for APE1 is to block its access to the AP site in DNA. Here, we react DNA oligos containing AP sites with O-Benzylhydroxylamine (OBHA). Gel analysis and Mass spectrometry performed on OBHA-reacted oligos show the generation of a covalent adduct between OBHA and the AP site, capping the reactive end of the AP site. Incubating OBHA-capped AP sites with biologically relevant concentrations of APE1 shows that the capping obstructs the mechanism of APE1 thus leaving the damaged DNA unprocessed and inhibiting the continuation of the BER pathway. The successful inhibition of the action of APE1 by OBHA opens possibilities that could suggest its use as a novel treatment against cancer.

Bridging the Gaps: How K-12 Outreach Programs Can Help Diversify Orthopaedics

Abdoulie Njai
Email: aonggb@health.missouri.edu

Introduction: The Bridging the Gaps initiative was started in February 2023 at the University of Missouri Department of Orthopaedic Surgery to offer K-12 students a chance to explore the field of orthopaedics. This study aims to highlight the impact of the program over its first three years of implementation.

Methods: We adopted a comprehensive recruitment strategy, capitalizing on partnerships with offices of higher education, local educational districts, organizations with a focus on Science, Technology, Engineering, and Mathematics (STEM), community centers, religious groups, and youth sports programs. All participants were required to complete pre-event and post-event surveys.

Results: Over the last 3 years, 181 students have participated in the Bridging the Gap Outreach Day. 69.1% of participants were female. Black or African American participants were the largest group represented at 34.3%. This was followed by White or Caucasian, who comprised 30.4%. The next largest group was Asian with 24.9%. Most students are in grades 6-8, comprising 68.9% of the total. The program has demonstrated remarkable effectiveness in reducing students' lack of confidence, with initial hesitation decreasing from 28% to 0% in 2023, 36% to 0% in 2024, and 23.3% to approximately 3% in 2025. Throughout these years, BTG has maintained strong positive outcomes in encouraging higher education pursuits, with 84.4%, 95.55%, and 91.7% of students reporting increased likelihood to consider college in respective years. The program's impact on medical career interest has remained robust, with 95.6%, 86.67%, and 87.1% of students expressing increased interest in medical careers across the three years.
Understanding of the orthopedic surgery pathway has been consistently high, with over 95% of students reporting improved comprehension each year. Notably, the program has successfully facilitated mentorship connections, with 81.8%, 93.2%, and 84.5% of students finding potential mentors in the field. Participant satisfaction metrics underscore the program's sustained success, with remarkably high rates of students expressing interest in repeat attendance (95.6%, 98.78%, and 95.2%) and willingness to recommend the program to peers (100%, 100%, and 96.4% across respective years).

Discussion/Conclusion: This event highlights the ability of K-12 outreach programs to foster a love of medicine among young students who may not get that early exposure elsewhere. By providing hands-on experiences and opportunities to connect with orthopaedic surgeons, students can develop a deeper understanding and appreciation for medicine, inspiring them to pursue further education and possibly a career in orthopaedics.

Dermatologic Care for Diverse Populations: Enhancing Primary Care Accuracy of Skin Conditions in Minority Populations

Travis Jackson*[1], Kostandin Valle[1], Mollie Henry[1], Mirna Becevic[1,2]
[1]University of Missouri School of Medicine
[2]Missouri Telehealth Network, University of Missouri-Columbia
Email: twjkmb@umsystem.edu

Background: Primary care providers (PCPs) play a large role in diagnosing and treating dermatologic conditions. However, they often face challenges in accurately identifying skin conditions, particularly in minority populations with darker skin tones. Studies have shown that there is a disproportionate rate of misdiagnosis when it comes to dermatologic conditions in individuals with darker skin tones. One reason for this may be a lack of direct education on how skin conditions can present in individuals from minority populations.

Materials and Methods: The Extension for Community Healthcare Outcomes (ECHO) program was created to bridge these gaps by offering PCPs access to specialty dermatologic care through telemedicine. ECHO sessions contain educational didactic sessions along with direct telemedicine consults where PCPs can ask questions about their patients when it comes to diagnosis and treatment of certain conditions. During the ECHO sessions, PCPs diagnostic accuracy of the patient cases they present is measured against the specialty panel of dermatologists. Most of the PCPs who attend these sessions come from resource-limited areas, where access to specialized care can be limited.

Results: Previous concordance studies comparing the diagnostic accuracy of PCPs to dermatologists found accuracy rates of 40-50%. Other studies have shown that diagnostic accuracy when it comes to diagnosing skin conditions in individuals with darker skin tones, is close to 20%. This drop in diagnostic accuracy highlights a significant gap in dermatologic education being provided to PCPs.

Discussion: The low diagnostic accuracy of PCPs, particularly for dermatologic conditions in individuals with darker skin tones, is a reason for educational interventions. One potential solution is to incorporate more educational content focused on skin conditions in individuals with darker skin tones into ECHO group sessions. This could increase exposure and understanding for both PCPs and specialists. Given that most ECHO participants are PCPs resource-limited regions of Missouri, an increase in didactic exposure on this topic could lead to improved diagnostic accuracy and better patient outcomes in these diverse populations.

Rurality and COVID-19 Vaccine Hesitancy in the United States: A Meta-Analysis

Arthur Zacharjasz
Sinclair School of Nursing, University of Missouri-Columbia
Email: azghk@missouri.edu

Introduction: Understanding vaccine hesitancy for the 46 million Americans living in rural areas is crucial for public health and future pandemic preparedness. Rural residents face unique challenges, including limited healthcare access and increased vulnerability to COVID-19 complications. The purpose of this meta-analysis was to identify how living in rural areas influences the likelihood of COVID-19 vaccine hesitancy among U.S. individuals compared to urban areas.

Sample: This analysis included eight cross-sectional studies with a total of 854 rural individuals identified as vaccine hesitant.

Methodology: A literature search was conducted across multiple databases and grey literature sources. Studies published between 2020 and 2024, conducted in the U.S., and included quantitative measures of COVID-19 vaccine hesitancy were included. A random-effects model was used to account for between-study variance.

Results: Significant difference in vaccine hesitancy between rural and urban populations was found. A mean effect size of 0.691 (95% CI [0.486, 0.981], $Z = -2.068$, $p = 0.039$) indicated higher vaccine hesitancy in rural areas. The high I-squared statistic (89%) suggested substantial heterogeneity among studies.

Discussion: These findings demonstrate a significant difference in COVID-19 vaccine hesitancy between rural and urban U.S. populations. Factors contributing to hesitancy included government mistrust, concerns about vaccine safety, and socioeconomic factors. The wide prediction interval (0.206 to 2.317) emphasizes the variability of rurality's impact on vaccine hesitancy across different settings. Despite limitations such as the small number of included studies and the absence of randomized controlled trials, this meta-analysis provides valuable insights for rural and public health.

Light-Mediated Synthesis of Azepine-Linked Peptide Macrocycles

Hossein Heidarzadeh Vazifehkhorani*, Hassan Seyrani, Madelynn J. Wyatt,
Victor K. Outlaw
Department of Chemistry, University of Missouri-Columbia
*Email: azghk@missouri.edu

Conformationally constrained macrocyclic peptides exhibit improved stability, target affinity, and cell permeability compared to their linear counterparts, making them excellent candidates for drug development. This unique class of compounds holds significant pharmaceutical promises, and has been used medicinally as anticancer, antimicrobial, antiviral, antifungal, and immunosuppressant drugs. Consequently, numerous peptide cyclization methods have been developed to optimize these properties. In this work, we introduce a straightforward, visible light-induced cyclization method that selectively creates a covalent bond between a seven-membered ring ketenimine intermediate and a lysine residue, yielding an azepine-linked cyclic peptide. We successfully synthesized a library of cyclic peptides ranging from 4 to 10 residues with good to moderate isolated yields. To further demonstrate the chemoselectivity of this method, several cyclic peptides containing various reactive side chains were synthesized and isolated, also achieving good to moderate yields, which solidify our hypothesis that this methodology is selectively forms covalent bond between ketenimine intermediate and lysine sidechain. Additionally, we tested the compatibility of our method with a more complex 13-residue p53-derived peptide, which resulted in successful cyclization. Finally, three cilengitide-type cyclic peptides containing RGD residues were designed and synthesized using our method and are set to be evaluated for anti-cancer activity. Each starting linear peptide, and its corresponding cyclic product was characterized by highresolution mass spectrometry, and purity was confirmed through analytical HPLC. H1NMR experiment was conducted for one of the Linear peptides and its cyclic peptide counterparts, which is consistent with the expected structure of resulting cyclized form of linear peptide. We also conducted hydrolysis and protease stability studies on one of the synthesized cyclic peptides to assess its resilience against hydrolytic and enzymatic degradation. Under a spectrum of conditions—pH levels acidic (pH 4) and basic (pH 9), as well as elevated temperatures 45oC and 60°C—the peptide exhibited exceptional stability against hydrolysis, with no detectable degradation observed over a 24-hour period. Of greater significance, the enzymatic stability studies, employing Proteinase K as the protease enzyme, substantiated the hypothesis that cyclic peptides possess higher resistance to proteolytic cleavage compared to their linear analogues. Specifically, when subjected to Proteinase K, a potent serine protease, the cyclic peptide demonstrated markedly reduced degradation rates relative to linear counterparts. This enhanced durability underscores its potential as a robust candidate for applications requiring sustained bioactivity, such as orally administered therapeutics or prolonged systemic circulation.

Investigating The Role Of N370 Glycosylation In SARS-Cov-2 Cryptic Lineages

Barikisu Anna Ibrahim*, Marc Johnson
Department of Molecular Microbiology and Immunology, University of Missouri-Columbia
*Email: baipf4@missouri.edu

Wastewater surveillance has emerged as a critical tool for tracking the evolution of SARS-CoV-2, enabling the identification of novel viral lineages that might go undetected through clinical sampling. Our lab has leveraged this approach to uncover unique SARS-CoV-2 lineages exhibiting highly divergent spike sequences, many of which were detected over multiple months, suggesting prolonged infections from people, according to our ribosomal sequence analysis. Specific mutations such as A372T—which introduce glycosylation motifs similar to those found in bat coronaviruses that infect the gastrointestinal (GI) tract—have been identified in these cryptic lineages. This indicates a form of reversion to these bat coronaviruses and a change in tissue tropism to the GI tract for prolonged periods. We hypothesize that these cryptic lineages are adaptations to selective pressure in the GI tract's distinct environment, characterized by variations in pH, digestive enzymes and a broad array of cellular receptors. To test this hypothesis, we isolated cryptic lineages directly from wastewater samples and conducted functional assays to investigate the impact of the A372T mutation on spike protein behavior. Our data indicate that A372T enhances spike protein fusogenicity in cells with undetectable ACE2 expression, which may facilitate the virus's persistence in GI tissues. This finding offers insights into how cryptic lineages adapt and evolve within specific tissues, extending our understanding of viral evolution beyond antibody evasion. Our research underscores the importance of wastewater surveillance in uncovering and characterizing these hidden viral dynamics, which may have significant implications for public health and viral evolution.

Therapeutic Potential of Tongue Exercise on Tongue Force During Swallowing in a Rodent Model of Hypoglossal (XII) Motor Neuron Loss

Grace O. Oti[1], Apaala Basak[2], Grace Eason[3], Kate Osman[4], Caulin Drago[5], Lauren Smith[6], Catherine L. Smith[1], Amy N. Keilholz[1,7], Teresa E. Lever[1,4,8], and Nicole L. Nichols[1,8,9]*
[1]Department of Biomedical Sciences, University of Missouri-Columbia
[2]Department of Chemical and Biomedical Engineering, University of Missouri-Columbia
[3]Department of Speech Language and Hearing Sciences, University of Missouri-Columbia
[4]Department of Otolaryngology–Head and Neck Surgery, University of Missouri-Columbia
[5]Department of Biological Sciences, University of Missouri-Columbia
[6]Department of Animal Sciences, University of Missouri-Columbia
[7]Department of Veterinary Pathobiology, University of Missouri-Columbia
[8]Dalton Cardiovascular Research Center, University of Missouri-Columbia
[9]Department of Medical Pharmacology and Physiology, University of Missouri-Columbia
*Email: nicholsn@missouri.edu

Neuromuscular disorders (e.g., progressive bulbar palsy and amyotrophic lateral sclerosis) are characterized by the degeneration of motor neurons (e.g., hypoglossal; XII) and skeletal muscles. Loss of XII lower motor neurons (LMN) causes tongue weakness that compromises critical upper airway functions (i.e., swallowing and breathing), which significantly impairs quality of life while also increasing the risk of malnutrition, dehydration, and aspiration pneumonia. However, there are currently no effective therapeutic interventions targeting these deficits in affected patients to improve quality of life. To explore potential treatments, we developed a rodent model of XII axis dysfunction by administering intralingual injections of cholera toxin B conjugated to saporin (CTBSAP). This approach selectively induces XII LMN loss, simulating tongue weakness and upper airway dysfunction, independent of systemic disease effects. Our past studies show that a low-repetition/high-resistance tongue exercise paradigm mitigates deficits in tongue function (motility via videofluoroscopy and lick force via lickometer) in CTB-SAP rats. However, the impact of tongue exercise on tongue force/strength during swallowing remains unexplored. Thus, the goal of this study was to use acute superior laryngeal nerve electrical stimulation in anesthetized rats to evoke repetitive swallowing while using a tongue strain gauge to measure tongue force/strength following a tongue exercise vs. sham exercise protocol. We hypothesize that tongue exercise will enhance tongue force/strength during swallowing in CTB-SAP rats. To study this, adult male rats were intralingually injected with either CTB-SAP or control (CTB unconjugated to SAP) and assigned to sham exercise or exercise protocols (n=9-10/group). Swallows were evoked across ascending (10, 20, 30, and 40 μA) and descending amplitudes (40–10 μA) to determine the optimal stimulus intensity for maximal swallow output. Thus far, our data demonstrate that the number of evoked swallows did not differ between groups ($p>0.05$), and threshold stimulation (10 μA) elicited fewer swallows compared to suprathreshold intensities ($p<0.05$). MATLAB coding is now underway for synchronous EMG, tongue strain gauge, and respiratory recordings to quantify swallow rate, tongue force/strength, and swallowing-breathing coordination. If our hypothesis is correct, our findings would provide further evidence that our tongue exercise paradigm may provide a viable dysphagia therapeutic approach to enhance the quality of life and nutritional status of patients with neuromuscular diseases. Further research is needed to elucidate the underlying mechanism(s) of tongue exercise (e.g., BDNF-dependent mechanisms are currently being studied), and to explore the translation of these findings into clinical practice.

4D Printing of a Bio-adhesive Shape Memory Elastomer for Soft Electronics

Sonia Norouzi Esfahany[1], Alireza Mahjoubnia[1], Zehua Chen[2], Yuchao Wu[1], Wen Zhao[3], Hanwen Zhang[2], Caixia Wan[2], Shi-you Chen[3], Zheng Yan[2], Jian Lin[1,2]*
[1]Department of Mechanical and Aerospace Engineering
[2]Department of Chemical and Biomedical Engineering,
[3]Department of Surgery, School of Medicine, University of Missouri-Columbia
[1]Authors equally contributed to the work.
*Email: linjian@missouri.edu

Tissue adhesive materials used in biomedical applications require a delicate balance of stretchability, adhesion, flexibility, and responsiveness to physiological conditions. We present a novel bio-adhesive shape memory elastomer (SME) engineered for such demands, fabricated via high-resolution digital light processing (DLP) 3D printing. This SME is made from a ink formulation of N-vinylpyrrolidone (NVP), dodecyl acrylate (DA), and a custom-designed crosslinker, poly(ethylene glycol-co-dodecanedioic acid) diacrylate (AcP). AcP's amphiphilic structure enables fine-tuning of hydrophobic and hydrophilic interactions, enhancing both the mechanical resilience and tissue adhesion. The resulting poly(AcP-DA-NVP) network exhibits exceptional mechanical properties, including up to 700% stretchability, 18.5 MPa tensile strength, and Young's modulus of 24 MPa. Its adhesion strength reaches up to 600 kPa on dry and wet biological substrates. The material also demonstrates tunable shape memory behavior with transition temperatures ranging from 10–60 °C, offering thermal responsiveness suitable for on-skin applications. The synergy of wet-resilient adhesion, mechanical robustness, shape programmability, and biocompatibility positions this SME as a versatile platform for next-generation soft electronics, wearable devices, and biomedical implants.

3D-Printing Anthropomorphic Human Phantoms from Polymer Solutions

Mujtaba Rafique Ghoto[1]*, Hayden Daubert[1], Christopher S. O'Bryan[1]
[1]Department of Mechanical and Aerospace Engineering, University of Missouri-Columbia
*Email: mgmx6@missouri.edu

Phantoms are model systems made from synthetic materials that replicate the structural and material characteristics of biological tissues, providing test environments for a variety of applications ranging from medical imaging to ballistic testing. Hydrogels, such as agar or gelatin, are often used to mimic the material properties of soft tissues, due to their high-water content and low moduli. However, replicating the internal structural complexities of human tissues with these polymeric materials remains challenging as they are often cast as fluids into predefined molds before undergoing bulk gelation. Thus, new manufacturing methods are necessary to fabricate anthropomorphic phantom models from tissue-like hydrogels that capture the internal structural morphologies of human tissue. Here, we design photo-crosslinkable poly(vinyl alcohol) polymers with mechanical, thermal, and electromagnetic properties that mimic those of soft tissue. Moreover, we use embedded 3D-printing and support baths of packed granular hydrogel particles to precisely place these polymers in their fluid phases into geometrically complex shapes before inducing gelation. The rheological properties of the PVA solution are tuned independently of the shear modulus of the crosslinked PVA hydrogel networks to increase the viscosity ratios of the ink and support material and control the resulting filament shape.

Genome-Wide Investigation of Recombination in the Presence of B Chromosomes

Malika Sharma[1]*, Hua Yang[1], Jian Liu[2], Frimpong Boadu[2], Jianlin Cheng[2] & James Birchler[1]
[1]Division of Biological Sciences, University of Missouri-Columbia
[2]Department of Electrical Engineering and Computer Science, University of Missouri-Columbia
*Email: msb92@missouri.edu

B chromosomes (B) are supernumerary, dispensable chromosomes found in many species, including maize. Although not essential for development, B chromosomes have cytologically and genetically been shown to increase the rate of meiotic recombination, particularly in heterochromatic regions, indicating that they are not biologically inert. This study investigates the effect of B chromosomes on the maize genome across six BC1 populations. They are reciprocal crosses of (B73/W22 0B) X B73, (B73/W22 2-3B) X B73, and (B73/W22 6B) X B73. We aim to know whether the genome-wide crossover distributions are affected by the presence of B chromosomes, whether higher B chromosome number has a stronger effect than the lower B copy, whether B chromosomes affect interference, and whether this chromosome preferentially affects different regions of the genome such as heterochromatin. Through this analysis, we will identify genetic variants and chromosomal regions where crossover frequencies vary with the presence of B chromosomes. This work provides insight into the role of B chromosomes in influencing recombination and shaping the genomic landscape of maize.

Optical Imaging of Articular Cartilage Abstract

Alyssa Ashford
Email: aavxm@umsystem.edu

Articular cartilage maintains joint integrity within the knee by reducing friction and assisting in transmission and distribution of loads. Osteoarthritis (OA) is a condition characterized by cartilage degeneration leading to pain, swelling, and disability, while representing a substantial financial burden. Radiographs are most commonly used to evaluate the presence and progression of OA, which can reveal various structural changes within the joint. Moreover, standard radiographs, magnetic resonance imaging, and arthroscopy enable visualization of cartilage surfaces and presence of any macroscopic changes. Optical imaging technologies represent nondestructive and noninvasive imaging modalities that allow for evaluation of microscopic changes in articular cartilage, such as fibrillations, clefts, collagen disorganization, and matrix degeneration. Numerous optical imaging techniques exists, including optical coherence tomography (OCT), polarized-sensitive optical coherence tomography (PSOCT), and Raman spectroscopy (RS). These technologies have the potential to detect early, and potentially modifiable, changes in articular cartilage prior to symptomatic development, which may guide future cartilage research and management of OA. However, limitations in current technologies exist, including a limited depth of visualization, lack of quantitative metrics for cartilage assessment, and inadequate standardization of grading systems for optical imaging.

Understanding the Influence of Advanced Practice Registered Nurses in High-Performing Nursing Homes

Veronica Thompson*, Amy Vogelsmeier, Alisha H. Johnson
Sinclair School of Nursing, University of Missouri-Columbia
*Email: vtrvc@missouri.edu

Background: There is nationwide interest in improving nursing home (NH) resident outcomes. The employment of advanced practice registered nurses (APRN) in NHs has been shown to improve key resident outcomes such as reducing hospitalizations, increasing advanced directives, and increasing resident/family satisfaction. Despite this evidence, there has been minimal research as to ***how*** APRN practice affects these outcomes. This study is guided by Donabedian's Structure-Process-Outcome conceptual model.

Methods: Case study analysis was conducted across five datasets from two high performing NHs who participated in an eight-year Missouri Quality Initiative project aimed at reducing hospitalizations by employing APRNs. Using deductive thematic analysis, we identified key themes focused on understanding how APRN participation in NH structures and processes influenced outcomes.

Results: APRNs provided proactive healthcare, advocated for improved communication, and acted as mentors to other staff. Proactive healthcare included advanced care planning, care coordination, medication reviews, forming partnerships, and participating in quality improvement initiatives. APRNs advocated for improved communication through conversations and the use of documentation forms. They mentored staff through leadership skills, hands-on education, and acting as cheerleaders. Positive support or lack of support from others also affected the APRNs ability to influence outcomes.

Conclusions: APRNs positively influence NH outcomes at both the resident care and facility-level. Being proactive, providing clear communication, and acting in both a leadership and educator role impacts NH residents and the entire healthcare team caring for them. These findings are valuable to stakeholders who would like to create effective care models within NHs for improved residential care.

Cuscuta: A Parasitic Plant for Decoding Plant-to-Plant Communication

Supral Adhikari, Lydia Phillips, Demi White, So-Yon Park*
Division of Plant Science and Technology, University of Missouri-Columbia
*Email: parksoy@missouri.edu

Cuscuta has served as a valuable model plant for the exploration of plant-plant interactions and molecular trafficking because molecules, including RNAs, DNAs, and proteins, are bidirectionally exchanged between host and *Cuscuta*. To understand the function of mobile molecules, we developed Agrobacterium-mediated *Cuscuta* transformation using *35S:RUBY*. The stably transformed and regenerated RUBY *C. campestris* plants produced haustoria, the signature organ of parasitic plants, and these were functional in forming host attachments. Furthermore, the RUBY is not only a useful selectable marker for the *Agrobacterium*-mediated transformation but also may provide insight into the movement of molecules from *C. campestris* to the host during parasitism. Thus, this innovative approach opens new possibility for using parasitic plants to improve the insight of plant-plant interactions. By leveraging *Cuscuta* as a model system, we can gain unprecedented insights into the complex world of inter-plant communication and molecular exchange.

Emergency Medical Services Transport Dynamics in a Tourism Hotspot: A Six-Year Retrospective Study of Traumatic and Atraumatic Emergency Department Transport Trends from Lake Regional Health System Emergency Department in Osage Beach, MO

Mattaline Killingsworth[1]*, Jacob Quick[2], Makinley McCaffrey[2], Chelsea Candee[2], Faith Coombs[2]
[1] University of Missouri School of Medicine
[2] Lake Regional Health System, Osage Beach, MO
*Email: mpk4q3@umsystem.edu

Introduction: In tourist destinations, seasonal population changes can impact local emergency departments and emergency medical services (EMS), including interfacility emergent transfers. This study evaluates the impact of tourism on interfacility transfers from Lake Regional Health System to tertiary facilities. We aimed to determine transport volumes throughout the year to guide staffing and resource allocation, and hypothesized additional staffing would be needed during peak tourism months due to influx of visitors to the area.

Methods: Utilizing retrospective EMS transfer data from 2019 – 2024, monthly transfer volumes were recorded and categorized by reason for transfer (trauma, medical, surgical, psychiatric, or any reason) and location of transfer. Statistical differences between monthly transfer volumes and seasonal transfer volumes during the high season of May through September vs. the low season of October through April were analyzed.

Results: Findings revealed marked seasonal variations in EMS transfers from Lake Regional Health System. Low season monthly transport volumes to any facility (mean = 96.86) were significantly lower than high season monthly transport volumes (mean = 116.37; $p < 0.01$, 95% CI [10.79, 28.23]). Regarding reasons for transfer, the mean interfacility transfers of trauma patients saw the greatest difference between the high and low season (16.35 vs. 27.63, $p < 0.01$, 95% CI [6.49, 16.06]). Figure 1.

Conclusions: The statistically significant rise in transport volumes for any reason from Lake Regional Health System Emergency Department to any facility during high tourism months demonstrates the increased seasonal workload impact on both EMS agencies and the healthcare system. Additionally, the statistically significant rise in trauma related transport volumes indicates a need for allocation of resources specifically focused on trauma related care. Strategic allocation of resources including enhanced staffing, preparedness, and operational planning, during peak tourist months is essential to meet the increased demand demonstrated in this study.

Yittrium-90 Radioembolization of Unresectable Hepatocellular Carcinoma: A Single Center Experience

Mohanned Aqrabawi, Charles Kitley, Zain M. Khazi, Ryan M. Davis, Ambarish P. Bhat
Department of Radiology, University of Missouri-Columbia
*Email: mma2f3@umsystem.edu

Introduction: Hepatocellular Carcinoma (HCC) is the most common malignant tumor and is often unresectable due to poor liver function from pre-existing cirrhosis. As a result, the prognosis of unresectable HCC is extremely poor. Therefore, the purpose of this study was to assess overall survival (OS) and identify adverse predictors of OS at 12 months after Y-90 radioembolization for unresectable HCC.

Methods: Retrospective review of patients that underwent Y-90 radioembolization for unresectable HCC from 2018 to 2021 was performed. Basic demographics, comorbidities, radiation dose to tumor, disease status at 3, 12 and 24 months, tumor distribution, BCLC score, and laboratory data were gathered. Death during the follow up period or lost to follow up was also recorded. The primary endpoint was OS at 3, 12, and 18 months. Intergroup comparisons were performed using unpaired t-test (Welch's t-test) or Pearson's Chi-squared test for predictors of OS at 12 months. Kaplan Meier was used to model OS following Y-90 radioembolization. Statistical significance was set at p value <0.05.

Results: In total, 48 patients that underwent Y90 mapping for unresectable HCC were screened of which 4 patients (8.3%) passed away before undergoing Y90 radioembolization. Thus, 44 patients (39 Male, mean age 66.5 +/- 6.71 years) that underwent radioembolization were analyzed for this study. Technical success was achieved in 100% of cases. Thirteen patients (29.5%) underwent more than one Y90 radioembolization procedure. The OS rate was 91%, 70.5% and 43.2% at 3, 12, and 18 months. Univariate analysis identified hepatitis C infection ($p = 0.03$), elevated pre procedural alpha-fetoprotein levels ($p=0.02$), and diabetes mellitus ($p=0.03$) adversely predicts OS at 12 months.

Conclusions: Y-90 radioembolization is a safe and can prolong the OS of patient with unresectable HCC. HCC secondary to hepatitis C, elevated alpha-fetoprotein, and diabetes mellitus adversely impacts OS at 12 months after Y-90 radioembolization.

Monitoring LULC Change in Indravati Tiger Reserve: Implications for Tiger Movement and Habitat Fragmentation

Anam Ahsan[1]*, Sundeep Balaga[2], Dhamsheel Ganvir[3], Shehkar Kolipaka[4], Michael Byrne[5]
[1,5] School of Natural Resources, University of Missouri-Columbia
[2,3] Chhattisgarh Forest Department, Chhattisgarh, India
[4]Leo Foundation, Netherlands
*Email: a.ahsan@missouri.edu

Changes in land use and land cover (LULC) have a major impact on ecological connectivity and wildlife habitats, especially in protected areas like the Indravati Tiger Reserve (ITR), which is a vital home for the endangered Bengal tiger (Panthera tigris tigris). This work uses remote sensing and GIS-based analysis to examine the spatiotemporal dynamics of LULC change in ITR over the previous 15 years. The total study area of ITR is 5571.87 km² including its 10 km bufeer region . Forest cover in ITR declined from 4205.98 km² in 2009 to 3799.89 km² in 2024, indicating a significant loss of406.09 km² of forest area over this period. The non-forest area in and the tifer reserve increased from 1,365.43 km² in 2009 to 1,771.93 km² in 2024, indicating a significant rise of 406.5 km² over this period. The classification of LULC types, for classes that are mixed teak forest, moist mixed deciduous forest, dry mixed deciduous forest, sal forest , water bodies and non-forest class, was done using high-resolution satellite imagery and ground-truthing data. The findings reveal significant deforestation and encroachment, leading to increased habitat fragmentation and potential disruption of tiger movement corridors. The study emphasizes that habitat disruption is primarily caused by human-induced changes, such as road construction and agricultural encroachment, which presents difficulties for tiger mobility and conservation. Restoring degraded corridors, reducing conflict between people and wildlife, and improving habitat connectivity through landscape-level planning are some conservation ideas. In order to guarantee long-term tiger conservation and habitat integrity in ITR, our research offers crucial insights for adaptive management techniques.

PAI-1 As a Mediator of Fibrosis in Murine Sclerodermatous Chronic Graft Versus Host Disease

Sahra Gabure*, Vasantharaja Raguraman, Shanid Mohiyuddin, Senthilnathan Palaniyandi, Gerhard Hildebrandt
Department of Medicine, Division of Hematology & Medical Oncology, University of Missouri-Columbia
*Email: sgw8n@umsystem.edu

Hematopoietic stem cell transplantation (HCT) is increasingly used to treat hematologic cancers and is often the only curative therapy. HCT is limited by graft versus host disease (GVHD). Chronic graft versus host disease (cGVHD) affects half of patients who receive allogeneic HCT and it remains the leading cause of non-relapse mortality. Current treatment options for cGVHD fail to control complications for most patients and the use of second-line agents is empirical. The pathophysiology of cGVHD remains poorly understood, however it is characterized by extensive fibrosis, particularly in the skin. Previous research in our lab, using a murine model of cGVHD, showed that mast-cell deficient mice had improved clinical outcomes. Other studies indicate that PAI-1, an endothelial dysfunction marker, attracts mast cells to the skin and facilitates their interaction with fibroblasts. During HCT, endothelial dysfunction can be caused by conditioning and prophylactic regimens along with the early phase GVHD damage. In this study, our objective was to determine levels of endothelial cell biomarkers in skin tissue of cGVHD. To develop the cGVHD murine model, we conditioned recipient mice with irradiation. Bone marrow cells and splenocytes from donor mice were injected into recipients. Skin samples were obtained after 8 weeks, and immunohistochemistry analysis showed increased expression of PAI-1 and the adhesion molecules VCAM-1 and ICAM-1 in allogeneic groups when compared to syngeneic controls (p-values <0.05 considered significant). Toluidine blue, avidin, and trichrome staining were also significantly increased in allogeneic groups when compared to controls. The results show that endothelial cell activation and damage markers are upregulated in our murine model of cGVHD, along with mast cells. Future studies will determine the mechanisms behind their interplay to promote fibrosis of the skin. Understanding this interaction will provide insight into the pathophysiology of cGVHD and better guide both existing and future therapeutic strategies.

From Inferiority to Priority: The Untapped Potential of Fragmented Landscapes in Recovering Biodiversity

Alyssa Smolensky*, Samniqueka Halsey
School of Natural Resources, University of Missouri-Columbia
*Email: anshqh@umsystem.edu

Climate change, rapid population growth, and global development strain Earth's natural resources and threaten the welfare of humanity. Among such threats, biodiversity loss stands out as a foremost concern due to its inextricable links to human welfare. Declines in biodiversity represent an irreversible loss of ecosystems, populations, and genetic material which provide essential services that support human welfare across the globe. These essential services are disappearing at alarming rates as an unprecedented number of plant and animal species are threatened with extinction. To combat future biodiversity loss and transform converted lands back into healthy ecosystems, ambitious restoration targets have been identified by international agencies and coalitions. However, restoration projects often fail to fully reverse declines in animal biodiversity, instead only recovering 46 – 51% organism abundance and 27 – 86% species diversity.

The observed deficit indicates fundamental flaws or knowledge gaps in the ecological theories guiding restoration practices. One prominent theory for restoring fragmented landscapes is the Island Biogeography Theory (IBT), which is a seminal work in ecology for explaining patterns of biodiversity. The central principle, which states that island species richness depends upon the island's size and isolation from source pools, is widely believed to apply to habitat patches within a landscape mosaic. However, there are major knowledge gaps that undermine the theory's premise at the landscape-level, as well as its applications in restoration ecology. This presentation will explore three major knowledge gaps, as well as the implications for restoration science and potential strategies for improving biodiversity recovery rates.

Fighting Fate (Feline Aortic Thromboembolism): A Retrospective Look at Treatment and Outcomes

Scott Miller*, Hope Edwards, Amy Molitoris
University of Missouri College of Veterinary Medicine
*Email: cmyg4@umsystem.edu

Feline aortic thromboembolism (FATE) is a disease where a blood clot becomes lodged in the aortic trifurcation stymying blood flow. This retrospective study examines the treatment outcomes of patients diagnosed with FATE at the University of Missouri – Columbia Veterinary Health Center, its satellite hospitals, and affiliate clinics from January 2010 to March 2024. The study aims to identify commonalities in age, breed, and coat color among affected cats to better understand signalment. Additionally, diagnostics, treatment, and outcome of the hospital visit will be categorized and quantified to determine what modalities, if any, improved the outcome of patients. These findings are expected to provide a foundation of information to enhance current hospital protocols to improve the treatment outcomes of patients presenting with FATE.

Structural and Biochemical Characterization of p97/BAG-1 Complex Interaction

Lois Bansah, Xin Liu, Stephanie Gates*
Department of Biochemistry, University of Missouri-Columbia
*Email: sgates@missouri.edu

Cp97 is a member of the highly conserved ATPases Associated with various cellular Activities (AAA+) family. p97 extracts and unfolds ubiquitinated substrates from the ER lumen into the cytoplasm in a process termed Endoplasmic Reticulum Associated Degradation (ERAD). ERAD substrates are then delivered to the proteasome for degradation. Ufd1/Npl4 are cofactors of p97 that facilitate substrate binding and engagement in ERAD. While Ufd1/Npl4 are well-known for their role in p97-dependent ERAD, recent proteomics data identified a novel interaction between p97 and BAG-1, a nucleotide exchange factor and co-chaperone of Hsp70. BAG-1 regulates cell survival and protein stability by interacting with heat shock proteins, anti-apoptotic proteins, and the proteasome. BAG-1 is a promising cancer therapeutic target due to its role in promoting cell proliferation and preventing drug-induced apoptosis. The mechanistic details of how BAG-1 interacts with p97 and impacts ERAD remains unknown and requires further characterization. In our work, we aim to use in vitro biochemical techniques and single molecule cryogenic electron microscopy (cryo-EM) to study this interaction. Understanding this interaction will provide valuable insights into how molecular chaperones interact with and regulate p97 and its implication for ERAD.

SOCIAL AND BEHAVIORAL SCIENCES

Navigating Hostility: How American Journalists Experience and Manage Dark Participation

Zivile Raskauskaite
School of Journalism, University of Missouri-Columbia
Email: zr356@umsystem.edu

The expansion of journalism into digital spaces was expected to foster audience participation and strengthen democratic discourse (Singer et al., 2011). However, this promise has been overshadowed by the rise of dark participation—malicious audience behaviors such as online harassment, misinformation campaigns, and abusive commentary—that impact journalists' work environments (Quandt, 2018; Frischlich et al., 2019). While research has extensively documented audience incivility (Santana, 2015), there remains a significant gap in understanding how journalists perceive and respond to this phenomenon within the newsroom setting. This study advances the scholarly discussion by examining the impact of dark participation on journalists' work routines, autonomy, and psychological well-being, while also identifying coping mechanisms in an era of heightened political polarization.

Using an online survey of U.S. digital journalists (n=300), this research investigates the extent, forms, and consequences of dark participation. Findings indicate that online journalists frequently experience personal attacks and ideologically motivated abuse, with direct implications for professional identity, job satisfaction, and mental health (as also identified by Waisbord, 2020; Holton et al., 2021). Participants report engaging in self-censorship, altering coverage choices, or reducing engagement with audiences to mitigate threats. Moreover, the study highlights a gendered dimension, as women journalists face disproportionately higher levels of harassment (Lewis et al., 2020), contributing to professional burnout and attrition from the field.

This study makes a critical scholarly contribution by bridging research on dark participation and newsroom dynamics, offering empirical insights into how journalists navigate digital hostility. It also has direct industry implications, providing news organizations with data-driven recommendations for mitigating dark participation and creating safer, more supportive work environments, based on insights from journalists themselves. By highlighting journalists' experiences and identifying institutional gaps, this study informs policies aimed at safeguarding press freedom and strengthening democratic discourse in an increasingly polarized media landscape.

Keywords**:** journalism, dark participation, audience harassment, digital media

Role of Family Resilience, Parental Aggravation, and Adverse Childhood Experiences on School Readiness

Prabhath Pallewaththa*, Aida Ismailova, Sijia Zhao, Jessica Morrison, Louis Manfra
Department of Human Development and Family Science, University of Missouri-Columbia
*Email: pwpfqg@missouri.edu

Adequate childcare and early learning are essential aspects of school readiness. School readiness is critical for success in school among young children, and it provides vital foundations of physical health and motor development, socioemotional development, cognition and general knowledge, language development, and approaches toward learning (National Education Goals Panel, 1997). Literature also suggests that political, social, and economic factors influence school readiness. However, the impact of family-level factors on school readiness has been studied less. The present study attempts to explain the effects of family resilience, parental aggravation, and adverse childhood experiences on school readiness. This study is a secondary data analysis of the National Survey of Children's Health (NSCH) integrated data in 2019 and 2020. The sample size was 11,469 children aged 3 through 5 years. The mean age of the sample was 4.0 (Sd=0.81), and 52.47% were male. Exploratory and confirmatory factor analysis were conducted to identify latent variables for 19 items in the data set relevant to learning. The factorability of the items was tested through Bartlett's test of sphericity and item correlations. Kaiser Meyer-Olkin measure supports the sampling adequacy of the data. Based on the scree plot, parallel analysis, and meaning of full cross-loading across the items, two latent variables were identified: (a) language literacy and cognition, and (b) socio-emotional and physical learning. These two latent variables were used as measures of school readiness. The other exogenous variables used in the analysis were family resilience, parental aggravation, and adverse childhood experiences. Some items and variables were recoded as necessary. Structural equation modeling was conducted with the two identified latent variables and the other three variables. Since the items are ordinal, WLSMV estimation was applied with the oblimin rotation. Data were analyzed using R/RStudio 4.4.1. According to the results, adverse childhood experience has a significant negative association with language literacy and cognition ($b=-0.19$, $p<0.001$) and socio-emotional and physical learning ($b=-0.18$, $p<0.001$). Parental aggravation also shows a significant negative association with the two latent variables ($b=-0.12$, $p<0.001$, and $b=-0.43$, $p<0.001$, respectively). Family resilience shows significant positive associations with language literacy and cognition, and socio-emotional and physical learning (both $bs=0.06$, $p<0.001$). This analysis provides evidence of family-level factors significantly influencing school readiness and suggests parental aggravation has a particularly large negative effect on socio-emotional and physical learning. Therefore, it is crucial to incorporate family and parental factors into support programs and policies aimed at enhancing children's school readiness.

Effects of Multimodal Vocabulary Instruction on the Science Vocabulary Knowledge, Text Comprehension and Science Attitude of Middle School Emerging Multilingual Students with Reading Difficulties

Heba Abdelnaby
Department of Special Education, University of Missouri-Columbia
Email: hzadmb@missouri.edu

The study investigates the impact of multimodal vocabulary instruction on the science vocabulary knowledge, text comprehension, and science attitudes of middle school emerging multilingual students with reading difficulties (MLL-RD). This research aims to address the challenges these students face in understanding science texts, which are particularly difficult due to complex vocabulary and concepts. Students identified as MLL-RD often experience significantly lower scores in science assessments compared to their peers, making effective vocabulary instruction crucial for their success. The study targets 10 middle school MLL-RD students, including refugees and students with disabilities, who are enrolled in an after-school program. The intervention uses the Science Generation (SciGen) curriculum, which focuses on academic vocabulary (tier 2 and tier 3) and employs multimodal strategies such as multimedia materials, hands-on activities, language, and art-based scaffolds like blackout poetry. The study uses an ABAB group design, alternating baseline and intervention phase over two weeks. The research questions focus on the effects of multimodal vocabulary instruction on: (1) vocabulary acquisition, (2) science comprehension, (3) science attitudes, and (4) students' ratings of the intervention's effectiveness. Theoretical frameworks include the Lexical Quality Hypothesis, Vygotsky's learning theory, and Ladson-Billings' culturally relevant pedagogy. The lessons are structured according to the 5E model to promote deeper learning. The study employs diagnostic, performance, and non-performance measures. Pre- and post-assessments will evaluate vocabulary acquisition, comprehension and attitudes towards science using paired t-tests. The effectiveness of the intervention will also be measured through descriptive statistics of student responses regarding their engagement and interest in science. This research is significant as it seeks to improve science learning outcomes for emergent bilinguals with reading difficulties, particularly those from refugee families, who represent a growing percentage of public-school enrollment. By focusing on structured vocabulary instruction, the study aims to enhance the academic success of these students, contributing valuable insights into educational practices for diverse learners.

Keywords: Emergent Multilinguals, reading difficulties, struggling readers, refugees, vocabulary, reading comprehension

Phenomenological study: Understanding the Perceptions and Experiences of Teachers on Vulnerable Children Support

Ismailova A.*, Zhao S., Manfra L.
Department of Human Development and Family Science, University of Missouri-Columbia
*Email: aizgw@missouri.edu

Early childhood education (ECE) settings provide critical support for vulnerable children early in life. Vulnerability often stems from isolation and unmet basic needs, including emotional and economic security, protection, and attention. Additionally, issues such as inadequate housing, food insecurity, limited access to education, and poor health exacerbate children's physical and psychological risks (Richaud de Minzi et al., 2014). However, generalizing findings from one population to others can be problematic and ineffective (Garcia Coll et al., 1996; Johnson et al., 2003). Targeting specific groups may also lead to stigmatization or discourage families from disclosing their situations. Because vulnerability can sometimes be unseen, providing universal support in ECE settings benefits both dentified and unidentified vulnerable children (Karoly et al., 2005). This study explores teachers' capacity to recognize and address visible and hidden vulnerabilities in children.

Research Questions

1. What are teachers' prevailing philosophies regarding vulnerability in children?
2. What experiences inform their practices in supporting vulnerable children and families?
3. What challenges do teachers face in implementing supportive practices?

Method: This study employs a psychological phenomenology approach to gain an in-depth understanding of teachers' lived experiences through semi-structured interviews (Moustakas, 2009). Data were analyzed using Moustakas's (2009) four-step method, adapted for this research context. Teachers shared their beliefs, perceptions, and reflections, which were then examined in relation to the research questions. Relevant statements were grouped into themes and synthesized into a composite description representing shared meanings across Participants.

Conclusion: Findings indicate that teachers rely on knowledge of children's circumstances and collaboration with parents to guide their support strategies. However, challenges such as insufficient peer training and high staff turnover hinder effective implementation. Understanding these dynamics will help researchers develop more effective and cost-efficient tools to provide universal child support in ECE settings.

Bridging Gaps in Adaptive Apparel Design: Exploring Adaptive Apparel Design Challenges through User-Centered Design

Mackenzie Miller
Department of Human Development and Family Science, University of Missouri-Columbia
Email: mlmywd@missouri.edu

Introduction: Despite the global need for clothing that addresses the physiological and psychological requirements of over one billion people with disabilities (PWDs), it remains a significant challenge (Kosinski et al., 2018). In the mass-market apparel marketplace, ready-to-wear (RTW) options for PWDs are notably scarce (Carroll, 2015). While adaptive clothing specifically designed for PWDs exists (McBee-Black and Ha-Brookshire, 2021), it lacks mainstream acceptance (Morris, 2019) and is often criticized for being unfashionable and ill-fitting (Esmail et al., 2020). This study investigates obstacles faced by designers creating adaptive clothing and explores the potential of virtual reality garment software to enhance user-centered design with input from the intended users. Framed by the social model of disability (Oliver, 2018), which identifies environmental barriers as the primary impediment to full societal participation, this study adopts a user-centered design approach. Such a method emphasizes iterative prototyping and user testing (Imbesi & Scataglini, 2021), especially for marginalized populations with limited existing research (Wu & McBee-Black, 2022).

Literature Review: Designing for PWDs poses challenges due to differing body compositions (Carroll, 2015), limited profitability, and minimal training in adaptive design (Kosinski et al., 2018; McKinney & Eike, 2024). Virtual reality garment simulation—using 3D software to design and test garments on customizable avatars—offers a promising solution (Huang & Huang, 2022; Jevsnik et al., 2017), yet limitations persist, including a lack of seated or asymmetrical avatars and reliance on body scanning (Luu & Zhang, 2021).

Methods: Using semi-structured interviews with two adaptive apparel designers, this qualitative study explored lived experiences, current practices, and views on virtual garment simulation. Themes included frustrations with fit and assumptions about PWDs' capabilities. Kate noted, “So many people just…can’t wear pants at all. It’s like, literally not even an option for them.” Kelsey emphasized, “It’s the biggest struggle but also the most important… it is really frustrating.” Designers expressed a need for independence in clothing design: “They totally can…That’s so important to us. You can do things on your own. “Participants expressed interest in virtual fittings but noted limitations. “I can only get what I see on camera. Which…isn’t that much,” Kate explained. While excited about the potential for customizable avatars, Kelsey warned, “Sometimes things get funky when you put a number…it doesn’t like… But it’s definitely a tool to look into.” This study highlights the need for expanded virtual tools and broader research into inclusive design practices.

Keywords: adaptive clothing, disability and fashion, user-centered design, virtual garment simulation, inclusive design

Migration and Development: The Role of Education in Shaping the Socio-Economic Impact of Remittances in Sub-Saharan Africa

Annabella Saikoom-Dadzie
Truman School of Government and Public Affairs, University of Missouri-Columbia
Email: aszb4@missouri.edu

This study investigates the mediating role of education in amplifying the socio-economic impact of remittances, challenging the prevailing view that remittances significantly reduce poverty but fail to drive economic growth or productive investment. It argues that overlooking education as a key mediator provides an incomplete understanding of remittances' transformative potential for poverty alleviation and GDP growth. Unlike previous research that often frames education as a dependent variable, this study positions it as a critical mechanism through which remittances contribute to long-term development. Using time-series data from 1990 to 2023 and an Autoregressive Distributed Lag (ADL) model for Kenya, Ghana, and Nigeria, the analysis explores how remittance inflows, particularly in contexts with weak government institutions, enhance access to education. This accessibility fosters human capital development, encouraging innovation and skilled labor that drives economic growth. The findings propose that remittances invested in higher levels of education—tertiary in particular—promote productive behaviors and long-term socio-economic benefits, contrary to claims that remittances do not contribute to productive investment. The study hypothesizes that individuals with higher education levels are more likely to channel remittances into innovative and productive activities, thereby generating both poverty alleviation and sustained economic growth. This research provides fresh insights into the developmental potential of remittances, emphasizing the overlooked yet pivotal role of education in unlocking their full socio-economic benefits.

Exploring Rural Science Teacher Agency in Addressing Gender and Sexual Diversity-Inclusive Teaching

Austin Gaskin[1]*, Gary Wright[2]
[1]Department of Music Education, University of Missouri-Columbia
[2]Department of Learning, Teaching & Curriculum, University of Missouri-Columbia
*Email: ajgntd@umsystem.edu

Science teacher agency is an important factor in science teachers' implementation of science education reform. Understanding how rural science teachers develop their science teacher agency in addressing gender and sexual diversity (GSD) can help identify support for successfully enacting GSD reform. However, research on rural science teacher agency about GSD-inclusive science teaching, particularly in restrictive, anti-LGBTQ states, remains nascent. The purpose of this qualitative study was to explore the ways in which 14 secondary science teachers in rural public schools of State X exercised their agency in fostering GSD-inclusive classrooms following participation in a gender and sexual diverse science teaching (GSDST) professional development (PD) opportunity. Data were generated from semi-structured, individual interviews and classroom observations and analyzed through inductive and deductive thematic analysis. Drawing on science teacher agency as an analytical framework, the causes, barriers, and capacities of the teachers for GSD reform are identified. The participants' motivations to participate in the PD and begin to integrate GSD science teaching were influenced by internal and external factors and dispositions. These factors and dispositions included beliefs about science teaching and science epistemologies, teacher age, school culture, administrative support, identities as lifelong learners and reflective practitioners, and the desire to make their classrooms more inclusive. The barriers to implementing GSDST included local barriers such as beliefs about their job responsibilities and appropriateness, and concerns about parental pushback. Institutional barriers included time constraints, standardization, district and state policies, and school location. Lastly, the individual capacities to enact change through GSD-inclusive education displayed on individual and institutional or community levels. Individual capacity consisted of a range of proactive, cautious, and constrained capacities in accordance with varying levels of administrative space while institutional or community capacity was demonstrated through involvement with LGBTQ+ school and community organizations such as a school's Gay Straight Alliance (GSA) and Parents and Families of Lesbians and Gays (PFLAG) and leveraging science education standards as a means of protection and validity. By addressing the unique motivators and barriers faced by teachers who want to support and affirm GSD within these spaces, as well as their capacity to sustain change, this study provides valuable insights into fostering more inclusive and supportive science classrooms and equipping science teachers with the knowledge, skills, and agency to create affirming spaces for gender and sexually diverse students.

Keywords: Rural, Science Teacher, Agency, Gender and Sexual Diversity, LGBTQ

Care Receipt and Self-Perceptions of Aging: The Mediating Role of Perceived Loss of Control

Getrude Nyang'au
Department of Human Development and Family Science, University of Missouri-Columbia
Email: gknrhq@missouri.edu

Self-perceptions of aging are important indicators of health and well-being in later life, but we know much less about the precursors of these perceptions. Scholarly evidence suggests that caregiving may be one such precursor, however, research predominantly focuses on the perspectives of caregivers, largely overlooking those of the care recipients. Therefore, the current study aims to extend the existing literature by examining the cross-sectional association between receiving care with activities of Daily Living (ADLs) and instrumental activities of daily living (IADLs) and negative self-perceptions of aging via a perceived loss of control. We used the 2018 wave of the Health and Retirement Study (N = 3894, 59% women; ages 50-102, M = 68.78 [SD = 10.55]). Analyses were conducted in Mplus with bias-corrected bootstrap confidence intervals, controlling for gender, race, age, and ethnicity. With perceived loss of control in the model, there was a significant direct effect from care receipt to negative self-perceptions of aging (b = 0.58, p < .001). The significant indirect effect through perceived loss of control (b = 0.38, 95% CI [.32, .44], p < .001) indicated that receiving care was associated with higher levels of perceived loss of control (b = 0.87, p < .001), which was in turn associated with more negative self-perceptions of aging (b = 0.43, p < .001). These findings point to the importance of a sense of control in a care-receiving context for reducing negative perceptions of aging, ultimately promoting later life health and overall well-being.

Exploring the Role of Family Engagement in High School Dropout Prevention in Paraguay. Parental Perspectives and Experiences. A Phenomenological Approach

Mariam Lujan Benitez Gomez
College of Education and Human Development, Department of Educational, School & Counselling Psychology, University of Missouri-Columbia
Email: mlbvg7@umsystem.edu

High school dropout remains a critical issue in Paraguay, exacerbated by economic instability, family dynamics, and systemic challenges (INE, 2023). This phenomenological study explores the role of family engagement in preventing high school dropout, focusing on parental perspectives in rural Paraguay. Guided by social constructivism, semi-structured interviews with caregivers and thematic analysis were employed to identify key practices, barriers, and support mechanisms. Findings reveal that parents perceive themselves as central to their children's educational persistence, utilizing strategies such as monitoring, open communication, and providing incentives. Barriers include financial issues, work commitments, and students' responsibilities, often affecting their school engagement. Parents suggested greater school flexibility and financial assistance to alleviate these challenges. This research underscores the importance of integrating family-engagement strategies with institutional policies to reduce dropout rates. By addressing both personal and systemic obstacles, this study offers new perspectives for policymakers and educators looking to foster stronger family-school partnerships. Future research could explore longitudinal interventions to build a comprehensive understanding of effective dropout prevention strategies.

Keywords: family engagement, high school dropout, rural areas, Paraguay

Parental Intimate Partner Violence during Childhood and Adolescents' Behavioral Problems: The Mediating Role of Parents' Mental Health and Parenting Practices

Dewa Ayu Dwika Puspita Dewi*, Shinyoung Jeon, Brenda J. Lohman
Department of Human Development and Family Science, University of Missouri-Columbia
*Email: ipdncr@umsystem.edu

Increasing attention has been drawn to parental intimate partner violence (IPV) during childhood and its negative impacts on adolescents' behavioral problems, such as the development of externalizing and internalizing behaviors. However, the pathways to link the relationship are not clear, particularly in explaining the long-term effect of parental IPV on adolescents' behavioral problems. This study aims to understand the role of parental mental health and parenting practices in the relationship between parental IPV during childhood and two behavioral outcomes in adolescents. We included 2,765 parents-dyad who participated in the Future of Family and Child Well-Being Study (FFCWS). We used structural equation modeling (SEM) to run the actor-partner interdependence model (APIM) on R software to investigate the long-term effect of parental IPV victimization on adolescents' behavior problems through depression and parenting behavior as mediating factors and to understand the bidirectional relationship between mothers' and fathers' IPV victimization, depression, and negative parenting practices. We found that mothers' IPV victimization was directly related to adolescents' externalizing and internalizing behavior problems and indirectly through mothers' depression and negative parenting practices. Fathers' IPV victimization did not have a direct effect on adolescents' externalizing and internalizing behaviors, but it had a direct effect on their own depression and parenting behavior. Both mothers' IPV victimization and mothers' depression were related to fathers' negative parenting. The results of this study suggest that maternal and paternal mental health and negative parenting practices are central components to be addressed to reduce the risk of developing externalizing and internalizing behavioral problems in adolescents. Interventions need to focus on supporting the mental health of both mothers and fathers experiencing IPV and helping them develop less aggressive parenting practices, which in turn reduces the negative impacts on adolescents' mental health and deviant behaviors.

Keywords: parental IPV, internalizing, externalizing, adolescents

Combating AI-Generated Visual Disinformation through Fact-Checking: How Global Journalism Emphasizes the Meta-Competences of Algorithmic Literacy

Zhiting Zhang*, Linna Kong
School of Journalism, University of Missouri-Columbia
*Email: zzhmr@missouri.edu

With the rapid enhancement in the accessibility and usability of AI generation tools, an increasing volume of fabricated images proliferates online, fostering misunderstandings and inciting panic. With the rise of deepfake algorithms and machine learning capability in generating increasingly realistic images, more AI-generated images appeared addressing the Israel-Hamas war (Klepper, 2023), the Hawaii Maui wildfires (Oremus & Verma, 2023), and a synthetic image of a Ukrainian drone attack on Russia (Goldin, 2024). In the digital media era, where visual content spreads rapidly on each platform, the gatekeeping role of news organizations and their paradigm of verification is being undermined by the fast-paced culture of imagery (Nilsson, 2020), with the advent of generative AI image tools. The rapidly increasing amount of visual disinformation on various media platforms has required audiences to have more capability to identify it. Many scholars conceptualized this capability as algorithm literacy as a dimension of media and information literacy and defined it as a critical understanding of algorithms and social and ethical issues related to its usage (Frau-Meigs, 2024). Since news is still the leading source for global citizens to access the latest information and its role in democracy (Fleming, 2014), news can be a potential way to allow audiences to cultivate their algorithm knowledge and literacy. Considering the stabilizing force of journalism in maintaining democracy for the public, global media outlets have established dedicated fact-checkers to verify AI-generated visual disinformation. This study examined the role of journalistic fact-checking teams in analyzing AI-generated images, assessed the current algorithm literacy frameworks, and explored the need to incorporate visual algorithm literacy into these frameworks. Two main research questions are posed and assessed in this study: What are the content components of news articles addressing AI-generated visual disinformation released by fact-checking teams? How do newsroom-model fact-checkers emphasize three aspects of algorithm literacy in their fact-checking news articles about AI-generated visual disinformation? Through a textual analysis of 48 fact-checking news articles (N=48) from Reuters, DW, AP, and ABC, results revealed the lack of existing algorithm literacy frameworks on visual aspects and the potential function of fact-checking news in educating mass audiences' algorithms literacy, including its visual aspect. We discuss the implications for future visual literacy scale designs and news as a potential approach to combat visual misinformation.

Missouri Elementary Music Teachers' Perceptions of General Music Approaches and Their Preparation to Teach Elementary Music: A Pilot Study

Jason J. Han
School of Music, University of Missouri-Columbia
Email: jasonhan@missouri.edu

This descriptive study was designed to investigate Missouri elementary music teachers' preferences for and implementation of general music approaches, and teachers' perceptions of their preparation to teach elementary general music. Participants were elementary music teachers from a Midwestern city (N = 11), who were contacted through emails found in school district directories. A Qualtrics survey was sent out to participants' email addresses with one reminder two weeks later. Descriptive statistics indicated that Kodaly (M = 42.73, SD = 32.89) and Orff Schulwerk (M = 41.82, SD = 34.01) were the approaches that Missouri elementary music teachers implemented the most in their classrooms. Out of all the categories, teachers felt the most prepared about teaching instruments (M = 4.36, SD = 1.75), and they felt the least prepared about utilizing Dalcroze Eurhythmics (M = 2.18, SD = 1.17). Open-ended comments indicated that teachers believed their preparation programs focused on secondary music education more than elementary music education. Some teachers continued to grow their expertise in elementary music by going to workshops and professional development events.

Synthetic Speech, Real Consequences: AI-Generated Hate and the Constitution

Pranaav Jadhav
School of Journalism, University of Missouri-Columbia
Email: pjwqg@missouri.edu

The rapid rise of artificial intelligence (AI) has transformed the landscape of free expression, particularly through its capacity to generate hate speech at unprecedented scale and sophistication. This study examines whether AI-generated hate speech—algorithmic outputs lacking human intent—merits the same First Amendment protections as human-authored expression, a question increasingly urgent as synthetic content, like an AI-altered 1939 Adolf Hitler speech that garnered millions of views in 2023, amplifies societal harm. Unlike human speech, AI outputs stem from tools devoid of moral agency, challenging traditional constitutional doctrines that prioritize speaker autonomy. This paper investigates this tension through a qualitative textual analysis of ten recent court cases at the intersection of technology, online speech, and the First Amendment, including *Gonzalez v. Google LLC* (2023), *Andersen v. Stability AI* (2024), and *Moody v. NetChoice* (2024). The analysis reveals three key judicial themes: (1) courts protect copyright and privacy rights, potentially limiting AI-generated hate speech that infringes these domains; (2) Section 230 immunity shields platforms from liability for hosting such content, though exceptions like *Doe v. Twitter* (2021) suggest statutory carve-outs; and (3) platforms' editorial discretion, upheld against governmental interference, empowers them to remove AI-generated hate without state mandates. Synthesizing these findings with scholarship from Danielle Keats Citron, Robert Chesney, and Jack Balkin, the study argues that AI-generated hate speech occupies a constitutional gray zone. Its mechanistic origin and amplified harm potential—exemplified by hyper-realistic deep fakes—may justify diminished protection compared to human speech, aligning it more closely with regulable categories like commercial expression or conduct. Drawing on C. Edwin Baker's framework, which ties First Amendment safeguards to individual autonomy, and Alexander Meiklejohn's emphasis on democratic deliberation, this paper contends that AI's lack of intent and political agency weakens its claim to full constitutional protection. Yet, dissenting judicial voices and platform immunity complicate this stance, hinting at a future where AI speech might inherit human protections by proxy. This predictive analysis concludes that AI-generated hate speech warrants a refined legal framework—one balancing free expression with harm-based limits—to address its unique risks. By bridging legal precedent, theory, and policy, this study contributes to the evolving discourse on technology and constitutional law, urging courts and lawmakers to adapt First Amendment principles to the realities of synthetic speech.

“I Think They Just Pile Stuff Up on Teachers,” A Found Poem About the Teacher Attrition Crisis

Breanna Prater
Department of Communication, University of Missouri-Columbia
Email: brp2hz@missouri.edu

This found poem represents the qualitative findings from a mixed methods study on teacher burnout, attrition rates, and resilience. Sixty-seven current and past K-12 educators filled out a survey with open-ended questions and validated survey measures. Within these survey responses, all participants shared the struggles they experienced working in education and discussed strategies they used to mitigate burnout. The researcher created this found poem using direct quotes and intentionally arranging phrases and stories from their survey responses (Olson et al., 2024; Prendergast, 2015). A research poem was chosen to represent this data because it allows the participants to authentically use their distinctive voices to describe their lived experiences as educators (Faulkner, 2018; 2019; 2021; Prendergast, 2006; 2009; 2015). The six groupings of five stanzas identify the themes that emerged for thirty total stanzas. The six major themes presented in this study are problems with other teachers and mentors, lack of parental support, student misbehavior, threats to school safety, lack of administrative support, and unrealistic demands. Teachers' survey responses and shared stories highlighted effective and ineffective school policies and individual coping strategies.

Keywords*:* found poem, poetic research methods, teaching, burnout, lived experiences.

The Impact of Nicu Bad News Delivery on Parental Understanding and Coping

Wendy Adjeley Adjei
Department of Communication, University of Missouri-Columbia
Email: waa5xr@umsystem.edu

Delivering bad news in the Neonatal Intensive Care Unit (NICU) is a delicate process, with far-reaching effects on maternal coping and understanding. Studies indicate that approximately 10-15% of newborns require NICU admission, with many cases involving critical or life-threatening conditions (Lau & Morse, 2001). Additionally, research suggests that 30-70% of NICU parents experience significant psychological distress, including anxiety, depression, and post-traumatic stress disorder (Pace et al., 2020). Despite the availability of NICU support programs, many mothers report poor or insufficient explanations, difficulty understanding medical language, and lack of emotional support from healthcare providers (Guttmann et al., 2024). These challenges are especially pronounced in the first 24-48 hours, when uncertainty and distress are at their peak (Guttmann et al., 2024). These findings emphasize a communication gap in how life-altering medical news is delivered, potentially impacting mothers' ability to cope and make informed decisions about their newborn's care. The Transactional Model of Stress and Coping by Lazarus and Folkman (1984) will be used in this research to analyze how mothers process, interpret, and respond to the stress of receiving bad news in the NICU. Using a qualitative research design, this study employs semi-structured interviews with mothers who have experienced receiving difficult news in the NICU. 20 participants are selected through purposive sampling to ensure diversity in racial, ethnic, and socio-economic backgrounds, as well as variations in NICU experiences. Thematic analysis is used to identify patterns in how mothers interpret and emotionally respond to difficult medical updates, as well as the role of communication in shaping their coping strategies. By addressing provider-mother communication, this study seeks to inform the best practices for delivering sensitive information in ways that foster trust, clarity, and emotional resilience. The goal is to improve communication strategies in high-stakes neonatal care, ensuring that mothers receive the support they need during one of the most challenging moments of their lives.

Trust is a Work in Progress A Case for Predictive Reliability in Media Transparency on Social Media

Shantell Agoreyo
School of Journalism, University of Missouri-Columbia
Email: shantellagoreyo@missouri.edu

Social media has transformed the way we see and consume news. As Reuters institute puts it, there has been a 'platform reset' transforming how audience interact with news, with a survey record that shows that 72% of people in the US get their news from social media (Newman, 2024) . This was however not the case during the last half of the 20th century when journalism was disengaged in the matter of audience interaction, as news was only one way: media to the audience (Batsell, 2015) , with the nature of social media not well understood (Lewis & Molyneux, 2018) . However, media innovation has opened doors for the re-examination of the relationship between journalism and its audience as people can choose what news to consume (Hanusch & Tandoc, 2019; loosen & Schmidt, 2012) . There is now a demand for the media to reflect trust and transparency in news gathering and dissemination on social media, and despite journalism's repositioning in the digital sphere, there has been a significant erosion of trust in the US media, with public confidence reaching alarming lows. A recent example is the controversial CBS interview with Kamala Harris on 60 Minutes, where they were accused of selectively editing portions of her responses before sharing them on social media, without prior disclosure, further eroding confidence in journalistic integrity. This also led to a 10-billion-dollar lawsuit by Donald Trump and a request to air the raw unedited footage to the public. Karlsson (2020)'s transparency model (1) disclosure transparency which suggests news producers explain how news is selected and produced, (2) participatory transparency which invites users to participate in stages of news production, and the latest , (3) ambient transparency, which refers to techniques or tools that news producers incorporate around (news) content, enabling consumers to assess and derive new interpretations of news stories by linking the content with its context, is often used by scholars as a framework for looking at transparency. I therefore argue for a supported lens for disclosure transparency- predictive reliability, which takes a proactive stance by anticipating potential issues and providing audiences with clear expectations of journalistic practices *before* trust concerns arise. This lens offers a fresh look on transparency by ensuring that media outlets do not merely correct errors after the fact or disclose biases in response to audience queries but instead *anticipate* them and prepare audiences for potential challenges in news coverage, specifically high stakes news. This paper contributes to existing literature on trust and transparency in digital journalism.

What Drives Credibility Judgment Toward Health Disinformation in Deepfake Videos? Perspectives of Information Quality, Media Richness and Health Anxiety

Linna Kong*, Zhiting Zang
School of Journalism, University of Missouri-Columbia
*Email: linnakong@missouri.edu

Deepfake health disinformation videos are proliferating on social media platforms, raising serious concerns about the dissemination of misleading health information. Between August 2023 and October 2024, numerous news outlets (e.g. DW, New York Post, and SciTechDaily) have highlighted the growing phenomenon of deepfake doctors spreading health disinformation on platforms like TikTok, with such content often reappearing within days despite efforts to remove it (e.g., Thoms, 2023; Swartz, 2024; Stokel-Walker, 2024). Advancements in deepfake generation tools have made it easier than ever for non-experts to create high-quality disinformation (Akhtar et al., 2024). Thus, social media remains a major information source for the public, where visually persuasive health misinformation poses significant risks, as research shows that false information spreads more readily than accurate information, increasing public exposure to disinformation and potentially leading to harmful health choices (Vosoughi et al., 2018; Heley et al., 2022). As a new form of video-based visual disinformation, deepfake health videos have seen limited research on the factors influencing their credibility judgment. Gaps remain in assessing how characteristics like media richness and information quality impact credibility judgments, especially given that previous findings on online health information credibility have been inconsistent (Zhao et al., 2024). Emotional factors, including health anxiety, have been shown to influence credibility perceptions; individuals with high health anxiety often exhibit increased trust in health-related content, regardless of its accuracy (Laato et al., 2020). This study seeks to address these gaps by examining the factors that drive credibility judgments toward deepfake health disinformation videos, with a specific focus on the roles of media richness and information quality, grounded in the Heuristic-Systematic Model (HSM). The HSM, a dual-processing model posits that credibility judgments are made through both heuristic (quick, cue-based) and systematic (deliberative, content-based) processing, allowing individuals to assess information with varying levels of cognitive effort (Chaiken, 1980). Building on Metzger's (2007) dual-processing model of credibility assessment, which integrates personal factors and environmental cues, this research explores how heuristic cues (media richness) and systematic cues (information quality) influence credibility judgments of deepfake health videos. The study hypothesizes that media richness (H1) and information quality (H2) will both positively impact perceived credibility, with health anxiety moderating the influence of these factors (H3a, H3b).

To empirically test these hypotheses, we implemented a 2 × 2 between-groups experimental design manipulating information quality (high vs. low) and media richness (high vs. low) within deepfake videos. The topic, "Is plant-based milk healthier than dairy milk?" was chosen as it reflects common, everyday misconceptions that often go unverified through scientific sources. Unlike prominent issues like genetically modified foods, this niche food safety topic helps control prior specialized knowledge, allowing participants' credibility judgments to remain more objective. Leveraging DFaker technology within the FaceSwap tool, the experiment created realistic deepfake videos featuring Dr. Karan Rajan, a known science communicator on TikTok, to enhance the plausibility and engagement of the experimental stimuli. The preliminary experiment was conducted after the application was approved by the Institutional Review Board. In this pre-experiment, 80 college students (20 per group) were

randomly assigned to one of the four experimental groups: High Information Quality & High Media Richness ($M = 5.8$, $SD = 0.6$) High Information Quality & Low Media Richness ($M = 5.2$, $SD = 0.7$) Low Information Quality & High Media Richness ($M = 4.3$, $SD = 0.8$) Low Information Quality & Low Media Richness ($M = 3.8$, $SD = 0.9$). The ANOVA results show a significant main effect of information quality on credibility ($F(1, 76) = 16.24$, $p < 0.001$) and a significant main effect of media richness on credibility ($F(1, 76) = 10.57$, $p = 0.002$). An interaction effect between information quality and media richness was also observed ($F(1, 76) = 4.32$, $p = 0.041$), indicating that higher media richness can further enhance credibility judgments for high-quality information. Participants with high health anxiety demonstrated varied credibility perceptions across conditions, especially in the high-quality information and high-media-richness condition, where health anxiety significantly increased credibility ratings ($M = 6.2$ vs. $M = 5.4$). Even in the low-quality information and low-media-richness condition, high-anxiety participants rated credibility slightly higher ($M = 4.2$ vs. $M = 3.5$). Health anxiety showed a significant moderating effect ($\beta = 0.31$, $p = 0.015$), particularly in high media richness scenarios. The experimental materials were refined based on the pre-experiment results to ensure that the manipulated levels of information quality and media richness align consistently with participants' perceived information quality and media richness during the formal experiment. Through this dual-processing lens, our study advances understanding of how individuals assess the credibility of deepfake health disinformation and what personal and environmental factors shape these judgments. By emphasizing algorithmic literacy and health information literacy, this research aims to offer strategies for enhancing resilience against health disinformation, thus fostering safer online health information environments.

Lessons Learned from a Global Outbreak: PPE Access and Use in Nursing Homes during the COVID-19 Pandemic

Melissa Taylor*, Anna Jones, Steven Miller, Linda Anderson, Lori Popejoy, Amy Vogelsmeier
*Email: mltbh3@umsystem.edu

The COVID-19 pandemic brought about unprecedented challenges to nursing homes (NHs) with one particular challenge related to access and use of personal protective equipment (PPE). The purpose of this analysis is to explore PPE access and use by NH staff, residents, and visitors during the COVID-19 pandemic. Approach: As part of a larger study to develop recommendations to improve NHs' ability to respond to infectious disease outbreaks, interviews were conducted with leaders, staff, and residents/families from 24 Missouri NHs. The objective of these interviews was to understand the NHs response to COVID-19. Then a systematic review was conducted of existing evidence published between 2020 and 2023 specific to NHs and COVID-19. For this analysis, we focused on interview data and systematic review data specific to PPE access and use. Analysis We synthesized interview data previously coded by the primary study team as it related to each NH's PPE access and use. For the systematic review, we examined 31 research articles and determined what barriers existed in acquiring PPE supply and the frequency of supply shortage in nursing homes. Additionally, how staff were trained on proper PPE use was evaluated. The data were also reviewed to determine if NHs had innovative methods for providing care during PPE shortages. Findings Findings identified all 24 NHs experienced PPE shortages due to supply chain issues, requiring them to rely on other resources such as corporate support, state agencies, and local community members. PPE use was inconsistent across nursing homes despite federal mandates. Staff resistance to PPE use and challenges for residents with dementia and those with hearing impairment were noted. Maintaining adequate PPE supply was a significant challenge. For the systematic review, 31 articles were reviewed including 26 primary studies and 8 articles from grey literature. Studies identified that a streamlined system for acquiring necessary PPE during an infectious disease outbreak was lacking for NHs and resulted in a significant negative impact on PPE supply and use. Implications Future efforts should include assuring NHs have adequate PPE supply and are aware of resources to maintain supplies. Staff, residents, and families should be involved in the implementation process when PPE is necessary for infectious disease outbreaks. Special consideration should be given to NH residents most challenged by the use of PPE.

ARTISTIC EXPRESSION

Writing Queerness through Art Experiences

Julia Talen
Department of English, University of Missouri-Columbia
Email: jtfwh@umsystem.edu

As a poet and lyric essayist, I've used language and visual arts as a means to explore my personal queer identities. My hybrid manuscript Source Arroyos, which I will present parts of, asks how do museum spaces, sculpture, paintings, and art archives help us understand ourselves, the queer timeline, nonlinear love and gender fluidity? For example, I use Gego's kinetic sculptures to think through the end of a sapphic break up, Isama Noguchi's sculptures to consider the subscapes of gender, and Walter de Maria's Earth Room to think through queer time. Throughout my presentation, I will discuss my writing and research processes, and how I use experiences in museums, in places, and with art to open up the ekphrastic essay. Audience members will learn the value of onsite field work in the humanities and will hopefully be inspired to utilize spaces and designs to engage their own writing practices.

CROWNSHY: a novel (~~in stories~~)

Kayla Cayasso
Department of English, University of Missouri-Columbia
Email: cayassokg@missouri.edu

"CROWNSHY: a novel in stories" is a creative dissertation that explores the relationship between Black Americans and themes of silence, home, and storytelling as ancestral, anticolonial historiography. A fictionalization of the author's familial escape from enslavement, the novel follows three wives and their descendants as their families are unknowingly braided together across Reconstruction and Jim Crow America. In exploring silence, characters keep secrets, forget truths, stoke lies, and bite their tongues in the process of surviving, thriving, and finding happiness. Across the various 19 th and 20 th century settings and milieus, concepts of home and domesticity are constantly challenged and redefined, with close eyes on the insidious, patriarchal nature of colonialism and how, even in Black spaces, colonial sentiments manage to endure and take new shape.

From a pair of seamstresses in north Florida who are hiding something scandalous from their neighbors, to a snake-catcher for a fraudulent, turn of the century revivalist cult in the Midwest, to a fading silent film star in the Hollywood Hills with secrets that threaten to hurl her back into complete obscurity, this host of interconnected characters chase joy, fulfillment, and belonging in the face of violence and intergenerational trauma, and what they're willing to sacrifice to reach fulfillment haunts them across time and space.

This creative dissertation draws on contemporary craft and narrative theory, like Richard Bauman's theory of verbal art as cultural performance, as well as critical writings in literary and affect theory, such as Hortense Spillers' concepts of flesh versus body and her hieroglyphics of the flesh, and Sadiyah Hartman's theory of critical fabulation, among others, to examine the relationship between characters' psychology, their shared and inherited trauma, and the innate human drive to share stories.

In examining the intersection of Blackness, silence, and concepts of home, the novel questions the characters' understanding of themselves, their pasts, and their linked history. Composed in-part using family histories, archival and genealogical records, and material histories, this author blends her academic foundations in African American Studies with her academic specialty in Fiction, and challenges traditional boundaries of genre and narrative theory. Further, this project asks readers to interrogate their own relationship with known, omitted, censored, and hidden histories; to turn toward the holes in our shared memories, rather than turn away

HUMANITIES

Persephone In the Twenty-First Century: Adaptation of A Myth

Erica Rose Hampton
Department of Classics, Archaeology, and Religion, University of Missouri-Columbia
Email: erhym4@umsystem.edu

The mythology of Demeter and Persephone has been used as a storytelling model for women since the Homeric Hymn to Demeter, circa 7th century BCE. Out of all the Homeric literature, this hymn highlights the experiences of women, and some scholars, such as Suter, have argued that the poem was potentially composed by a woman; the piece engages with issues plaguing the Ancient Greek woman: a lack of agency in marriage, the loss of friendships and family once a marriage takes place, and the problems of a political system that empowers men at the expense of women. Throughout all of this, the importance of the bond between mother and daughter is showcased as having power and being able to overcome at least some of these societal disadvantages. However, in modern interpretations of the myth, it is not the story of the mother that takes precedence; instead, many modern interpretations focus on the second story found in the Homeric Hymn to Demeter—Persephone and her romance with Hades. As a result, Demeter's role in many of these interpretations is diminished. In Lore Olympus, Demeter's love for her daughter is even turned into a toxic foil that Persephone and Hades must overcome to achieve happiness. I argue that the modern eye emphasizes the masculine and feminine dynamic of the spousal dynamic at the expense of the matriarchal dynamic of the mother-daughter relationship to highlight Persephone's agency. This allows authors writing for a young adult audience to make Persephone's search for independent agency more relatable. However, as recently as the 1990's, authors such as Rita Dove used Persephone to engage with missing-children ads and more heavily relied on the pathos evoked by Demeter's feeling of loss. For this poster presentation, I would like to present a sample of modern literature showcasing the Demeter and Persephone story and examine the various ways that the original mythology in the story has been adapted for a twenty-first century audience. Especially important are the changes made to Persephone in order to allow her to have more agency in her own story. Her myth also allows for the opportunity to engage with issues facing modern women, such as date-rape drugging, abduction, and sexual trauma alongside questions surrounding mother-daughter relationships. I will showcase literature that engages with these issues and discuss the role ancient mythology can play in aiding audiences with arriving at a deeper understanding of modern issues.

Hey Girlie, Want to Sell Your Soul? How the U.S. Can Counteract Predatory Cult Activities Through the Lens of Fraudulent Business Schemes

Georgia Bronson
School of Law, University of Columbia-Missouri
Email: glbbnb@umsystem.edu

This research examines the similarities between pyramid/Ponzi schemes and New Religious Movements (NRMs), analyzing their legal frameworks, psychological manipulation tactics, and economic impacts. It explores how both entities exploit vulnerable populations through comparable recruitment strategies, while highlighting key differences in legal protections, particularly religious freedom provisions that benefit NRMs despite similar fraudulent financial activities. First, the research analyzes pyramid and Ponzi schemes in the United States. Despite minor operational differences, these fraudulent business models share a common legal framework and recruitment tactics. The research analyzes the three-pronged recruitment strategy employed by these schemes: creating a false sense of entrepreneurship ("girl boss"), manipulating victims through gaslighting techniques, and gatekeeping vital financial information. Mathematical analyses demonstrate the inevitable failure of these models. Statistical evidence reveals that economically vulnerable communities with high unemployment, limited community engagement opportunities, and economic stress are particularly susceptible to these fraudulent operations. The 2008 recession and COVID-19 pandemic significantly increased pyramid scheme activity, confirming that these operations deliberately target isolated and vulnerable populations. Next, the research examines the structural parallels between pyramid schemes and NRMs, commonly known as cults. The research demonstrates how both entities target those seeking belonging, particularly during periods of social and economic instability. While pyramid schemes promise financial returns, NRMs often promise spiritual salvation—both requiring continuous financial commitment. A significant distinction emerges in their legal treatment: while pyramid schemes face regulatory scrutiny, NRMs often operate with First Amendment protections that complicate prosecution. The research concludes that communities vulnerable to pyramid schemes likely face similar susceptibility to predatory NRMs, as both employ identical recruitment strategies targeting individuals with high vulnerability indices. This correlation suggests that economic instability and social isolation serve as primary environmental factors enabling both forms of exploitation to flourish simultaneously. This paper proposes a two-pronged approach to address this growing threat. The first advocates for proactive governmental measures utilizing the Social Vulnerability Index to identify at-risk communities and implement targeted protective policies. This approach would enable authorities to allocate resources effectively, particularly during economic downturns. The second solution addresses the regulatory gap concerning religious organizations by requiring all entities seeking tax exemption under IRS §501(c)(3) to formally register and disclose financial information. This registration system would create accountability while respecting First Amendment protections, as it would apply uniformly to all tax-exempt organizations. The paper argues that these solutions would provide a comprehensive framework to combat predatory organizations that exploit vulnerable populations.

Dialogue between People with Different Moral Expressions and LLMs on Abortion: A Natural Language Processing Analysis of Human-AI Interactions

Daiyi Jiang
School of Journalism, University of Columbia-Missouri
Email: djkgg@umsystem.edu

The purpose of this study is to explore whether there are hidden biases and inequities in Large Language Models (LLMs) and under what situations they would be evoked. Using the "abortion" topic as an entry point, the study based on Moral Foundations Theory (MFT) and uses targeted participatory crowdsourcing to allow participants from different groups to debate with GPT. This study uses Natural Language Processing (NLP) and basic statistic to analyze the relationships and differences between participants and GPT on their moral expressions under five moral dimensions. Through moral expression quantification, topic modeling, correlation analysis, multiple linear regression, repeated measures ANOVA, and cosine similarity analysis, this study evaluates the consistency, differences, and preference tendency of the expressions of GPT and participants on the five moral dimensions.The results indicate that the moral responses of GPT show a general "structural pandering effect" that is consistent with the participants' moral expressions. However, the pandering is not balanced across moral dimensions and has a structural influenced by the specific issue. In abortion issue, the GPT is most aligned with participants on the Harm/Care and Degradation/Sanctity dimensions, showing a significant structural preference. In addition, as the topic transitioned from individual rights to collective norms and social responsibility, the moral expression of GPT shows a leftward liberal expression, which causes a greater deviation from the moral expressions of participants. This finding suggests that the moral expressions of GPT have the ability to mimic human expressions, but also unavoidably influenced by the values implicit in their training corpus and activated in specific topics.

Grief, Betrayal, and Resilience: A Psychological Study of Ramatoulaye in *So Long a Letter*

Medinat Ajoke Oyedele
School of Languages, Literatures, and Cultures, University of Missouri-Columbia
Email: mao3vr@umsystem.edu

In many African societies, particularly in Senegal, women are traditionally expected to embody endurance, patience, and self-sacrifice, especially within marriage. Polygamy, deeply rooted in Senegalese culture, often places women in emotionally challenging positions, where societal expectations discourage expressions of personal dissatisfaction. Psychological theories, particularly those related to grief, trauma, and cognitive dissonance, provide a lens through which Ramatoulaye's emotional journey in Mariama Bâ's *So Long a Letter* can be analyzed. The novel captures the psychological impact of betrayal and grief, illustrating how firmly established cultural constraints shape women's emotional responses and limit their ability to assert personal agency. Critics have examined *So Long a Letter* as a feminist and postcolonial critique of patriarchal traditions, yet fewer studies have focused on the psychological consequences of polygamy and abandonment. This research situates Ramatoulaye's experience within the framework of psychological resilience, emotional suppression, and adaptive coping mechanisms. It explores how betrayal affects her sense of identity, leading her through the stages of grief denial, anger, bargaining, depression, and acceptance while simultaneously analyzing how Senegalese cultural expectations prevent her from fully embracing autonomy. This study employs close textual analysis to examine Ramatoulaye's psychological journey. This approach will be integrated in the methodology. This strategy will provide a comprehensive understanding of the character's emotional experiences within her cultural context. A close reading of the text will facilitate a thematic analysis that identifies and interprets patterns related to grief, betrayal, internal conflict and to examine how Ramatoulaye processes emotional pain and internal conflict, constrained by social norms that equate endurance with virtue. The study also draws on Elizabeth Kubler-Ross's model of psychosocial development, which explains how individuals navigate key psychological and social conflicts across different life stages, shaping their identity and self-concept. In this study, the theory is used to analyze how Ramatoulaye's crisis of identity and self-worth emerges from her husband's betrayal. Her struggle reflects the tension between personal emotions and cultural conditioning, as societal pressure forces women to suppress psychological distress rather than seek personal liberation. Cultural constraints play a decisive role in Ramatoulaye's response to betrayal. While grief and emotional turmoil are natural psychological responses, Senegalese societal norms dictate the boundaries of acceptable female behavior. She is expected to endure, suppress her resentment, and maintain her role as a mother and widow with dignity. Unlike Aissatou, who defies tradition by rejecting polygamy and seeking independence, Ramatoulaye remains bound by cultural expectations that discourage emotional autonomy. Her eventual refusal to remarry signals a subtle act of resistance, but it remains confined within the limits imposed by her society.

Keywords: Psychosocial development, identity, cultural conditioning, liberation

Moral and Epistemic Harms of Gratitude Traps

Temitope Falokun
Department of Philosophy, University of Missouri-Columbia
Email: tgf69d@missouri.edu

Cases of manipulation often involve intentional attempts to influence targets' beliefs or behaviors without applying rational persuasion or coercion. Extant philosophical literature on manipulation focuses on several forms of manipulation including gaslighting, guilt tripping, and negging. In this paper, I investigate a novel form of manipulation unexplored in philosophical literature—Gratitude Traps. A gratitude trap occurs where a manipulator offers the target an initial favor before requesting the target's performance of an act the target would otherwise not perform, such that the target's performance of that act entails showing gratitude to the manipulator for their initial favor. I examine the conceptual foundations of gratitude traps, propose necessary and sufficient conditions for their occurrence, and argue for their moral and epistemic harms. Investigating how manipulation and gratitude intersect advances ongoing philosophical research on the ethics of interpersonal influence.

Keywords: Favor, Gratitude, Manipulation, Reciprocity, Interpersonal influence

Dialogue between People with Different Moral Expressions and LLMs on Abortion: A Natural Language Processing Analysis of Human-AI Interactions

Daiyi Jiang
School of Journalism, University of Missouri-Columbia
Email: djkkk@umsystem.edu

The purpose of this study is to explore whether there are hidden biases and inequities in Large Language Models (LLMs) and under what situations they would be evoked. Using the "abortion" topic as an entry point, the study is based on Moral Foundations Theory (MFT) and uses targeted participatory crowdsourcing to allow participants from different groups to debate with GPT. This study uses Natural Language Processing (NLP) and basic statistics to analyze the relationships and differences between participants and GPT on their moral expressions under five moral dimensions. Through moral expression quantification, topic modeling, correlation analysis, multiple linear regression, repeated measures ANOVA, and cosine similarity analysis, this study evaluates the consistency, differences, and preference tendency of the expressions of GPT and participants on the five moral dimensions. The results indicate that the moral responses of GPT show a general "structural pandering effect" that is consistent with the participants' moral expressions. However, the pandering is not balanced across moral dimensions and has been structurally influenced by the specific issue. In the abortion issue, the GPT is most aligned with participants on the Harm/Care and Degradation/Sanctity dimensions, showing a significant structural preference. In addition, as the topic transitioned from individual rights to collective norms and social responsibility, the moral expression of GPT shows a leftward liberal expression, which causes a greater deviation from the moral expressions of participants. This finding suggests that the moral expressions of GPT can mimic human expressions but are also unavoidably influenced by the values implicit in their training corpus and activated in specific topics.

Epistemic Solutions from the Non-Oppressed

Alice Nyarko[1]*, Temitope Falokun[2]
[1,2]Department of Philosophy
*Email: aynqkm@umsystem.edu

Critics of systemic oppression argue that the non-oppressed suffer from *situated ignorance,* hindering their understanding of the social realities of oppression. Relatedly, standpoint epistemologists argue that the phenomenological experience of oppression confers a contingent epistemic advantage on the oppressed. While having epistemic advantages justifies deference to the oppressed, recent arguments hold that deference can hinder the non-oppressed from offering epistemic solutions to systemic oppression. This dialectics motivates the central question of this paper: are epistemic solutions from non-oppressed exhaustive? We answer in the negative by arguing that the structural vantage point of the non-oppressed can atone for the epistemic blind spots of the oppressed. Together with the contingent epistemic advantage of the oppressed, the structural vantage points of the non-oppressed offer supplementary epistemic solutions to systemic oppression

Keywords: deference, epistemic advantage, epistemic blindspots, epistemic solutions, systemic oppression

Healthcare BIM: A Computational Compliance Checking and Visualization Framework to Enhance Accessibility in Healthcare Facilities

Md Obidul Haque, Jong Bum Kim, Debora Verniz
*Email: mdobidulhaque@missouri.edu

Ensuring accessibility in healthcare facilities is essential for fostering inclusive and user-friendly environments. However, traditional compliance verification methods in Building Information Modeling (BIM) are often manual, time-consuming, and highly dependent on expert knowledge, increasing the likelihood of errors and inefficiencies. This study introduces a Computational-Compliance-Checking framework that integrates automated rule interpretation and interactive visualization to enhance the accuracy and efficiency of accessibility assessments in hospital buildings. The proposed approach automates the identification and evaluation of design elements against the accessibility requirements outlined in the Americans with Disabilities Act (ADA), thereby minimizing human error and expediting the compliance verification process. The proposed framework employs visual programming and algorithm-driven rule mapping to systematically collect, filter, and assess key architectural components, such as restrooms, corridors, and door clearances. By embedding regulatory logic directly into BIM workflows, the system enables realtime compliance checking, ensuring that potential violations are detected early in the design process. The study demonstrates the framework's effectiveness through a case study on restroom accessibility, where BIM-integrated rule-based analysis is applied to validate compliance with ADA standards. The method allows for dynamic visualization of compliance outcomes, offering an intuitive and user-friendly interface that enhances spatial awareness for architects, designers, and stakeholders. Key expected outcomes include a significant reduction in the reliance on expert intervention while maintaining high precision in accessibility assessments. The automation of rule-checking not only streamlines the verification process but also facilitates a more data-driven and systematic approach to accessibility compliance. Additionally, the integration of immersive visualization techniques such as augmented reality (AR) provides an interactive platform for stakeholders to better understand accessibility constraints and make informed design modifications. This approach fosters proactive decision-making by allowing designers to simulate and evaluate accessibility conditions before construction, reducing costly revisions in later project stages. By integrating rule automation and interactive visualization into BIM workflows, this research advances Computational-Compliance-Checking methodologies, ultimately improving accessibility in hospital design. Beyond healthcare, the findings offer valuable insights for improving accessibility compliance in other sectors within the architecture, engineering, and construction (AEC) industry. The proposed framework sets the foundation for future developments in AI-driven compliance checking, enhancing the efficiency, accuracy, and usability of accessibility assessments in BIM-integrated workflows.

Keywords: Healthcare Facilities, BIM, ADA, Computational-Compliance-Checking, Visualization

PHYSICAL SCIENCES AND MATHEMATICS

Progress Towards a Mechanistic Understanding of Candida Albicans Virulence Factor Candidalysin Polymerization

S. L. Nickles[1], T. Rodriguez Garcia[2], K. G. Schaefer[1], C. M. Russel[2], R. J. Pyron[2], E. A. Conley[1], F. N. Barrera[2], G. M. King[1,3]
[1]Department of Physics and Astronomy, University of Missouri-Columbia
[2]Department of Biochemistry and Cellular and Molecular Biology, University of Tennessee, Knoxville
[3]Department of Biochemistry, University of Missouri-Columbia
*Email: slnhff@umsystem.edu

Candida albicans is a commensal fungus that can causes epithelial infections and life-threatening invasive candidiasis. The fungus secretes candidalysin (CL), a peptide that causes host cell damage and immune activation by permeation of epithelial membranes. The mechanism of CL action involves strong peptide assembly into polymers in solution. The ends of linear CL polymers can join, forming loops that become pores upon binding to membranes. CL polymers constitute a therapeutic target for candidiasis, but little is known about mechanistic details of CL self-assembly. We have examined the assembly mechanism of CL using biophysical tools, including atomic force microscopy. This single-molecule method revealed that CL polymerization involves a convolution of four processes. Self-assembly begins with the formation of a basic CL subunit that acts as the polymer seed. CL polymerization proceeds via addition of subunits, and as polymers grow they can curve and form loops. Additionally, secondary polymerization can occur and cause branching. Interplay between the different rates of these reactions determines the distribution of CL particle types, indicating a kinetic control mechanism. This presentation will summarize recent work in this direction which was recently published [J Biol Chem 300, 107370 (2024); PMID: 38750794]. We will also discuss ongoing work focused on identifying the role the CL termini play in the polymerization reaction(s) and subsequent membrane damage. Taken together this work elucidates key physical attributes underlying CL self-assembly and evokes potential pharmaceutical development.

Polycationic Nanoclay Strategies for the Efficient Sorption of the Anionic Dye Congo Red from Aqueous Solutions

Angira Roy[1], Piyuni Ishtaweera[1], Veerapat Jakdejchai[2], Natakrit Boonrukvanit[2], Nathaniel E. Larm[3], Gary A. Baker[1]*
[1]Department of Chemistry, University of Missouri-Columbia
[2]Department of Chemistry, Chulalongkorn University, Bangkok, Thailand
[3]Department of Chemistry, United States Naval Academy, Annapolis, MD
*Email: bakergar@missouri.edu

This study investigates the adsorption efficiencies of positively charged organo-functionalized polyionic nanoclays (PINC) for the removal of Congo Red, a model anionic dye, from aqueous solutions. Three PINCs - N-methyl-N-propylimidazolium chloride, [Im31]Cl, N-methyl-Npropylpyrrolidinium chloride, [Pyrr31]Cl, and N-propylpyridinium chloride, [Py3]Cl —were assessed based on their unique physicochemical properties under varying dye concentrations, contact times, and temperatures. Kinetic studies demonstrated that the pseudo-second-order model provided the best fit for adsorption data, with significantly enhanced adsorption capacities at higher temperatures. [Pyrr31]Cl exhibited the highest dye removal capacity (2932 mg g^{-1} at 50 ºC), while [Im31]Cl and [Py3]Cl showed marked improvements in adsorption with increasing temperature. Further advancements were made using the [Im31]Cl-graphene oxide ([Im31]Cl-GO) composite and N-decyl-N-propylimidazolium chloride PINC ([Im3,10]Cl), both of which demonstrated exceptional performance in terms of dye removal efficiency for low dye concentration from aqueous media. The [Im3,10]Cl PINC achieved complete dye removal within just 5 minutes at 50 ºC, while the [Im31]Cl-GO composite exhibited near-total dye removal at concentrations as low as 0.15 mg L^{-1}, highlighting their potential for scalable, high-efficiency wastewater treatment. Recyclability studies further confirmed the sustained performance of [Im31]Cl-GO over multiple adsorption cycles, making these materials promising candidates for environmental remediation.

Orbital Edelstein Effect in Monolayer Transition Metal Dichalcogenides

Tapesh Gautam*, S. Satpathy
Department of Physics & Astronomy, University of Missouri-Columbia
*Email: tgv4d@umsystem.edu

The Edelstein effect consists of the non-equilibrium accumulation of magnetization in response to an electric field in systems with broken inversion symmetry. The spin Edelstein effect (SEE) is a well-established phenomenon, where the magnetization comes from the spin moments. The orbital Edelstein effect (OEE) is the orbital counterpart, where the magnetization comes from the orbital moments rather than the spin moments. Here, we predict the existence of a large OEE in monolayer transition-metal dichalcogenides (TMD) in the presence of a symmetry-breaking perpendicular electric field. The predicted OEE is substantially larger than the SEE. The effect should exist both in doped insulating TMDs such as MoS2 as well as in metallic TMDs such as NbSe2, where a Fermi surface already exists without doping. Analytical expressions for both spin and orbital Edelstein effect are derived for the TMDs, and their magnitudes calculated using density-functional theory by taking MoS2 as an example. Our work suggests the TMDs to be prime candidates for studying the OEE. Our results are relevant for spin-injection experiments, where the Edelstein effect plays a role.

JWST Revealing the Shape and Size of Dwarf Galaxies from 12 Billion Years

Gourab Nandi*, Yicheng Guo
Department of Physics and Astronomy, University of Missouri-Columbia
*Email: g.nandi@mail.missouri.edu

We study the size and morphology of dwarf galaxies (stellar mass of 108 to 109.5 solar mass) at high-redshift ($0 \leq z \leq 4$) by using the NIRCam broad-band images from the JWST Advanced Deep Extragalactic Survey (JADES) and the Cosmic Evolution Early Release Science Survey (CEERS). Dwarf galaxies are fundamental to our understanding of galaxy formation and evolution as they are sensitive probes of the physics of dark matter halos and the mechanisms that regulate galaxies' star formation and shape. In this work, we analyze the stellar morphology (half-light radius, S´ersic index, axial ratio, etc.) of $\gtrsim$ 40, 000 dwarf galaxies complete to 28 ABmag in F444W to as early as 1.5 Gyrs after the Big Bang. It hence places strong constraints on models of galaxy structure formation. By exploring the size–mass relation and the redshift evolution of its slope and scatter, we find that star-forming galaxies are well represented by a single power law on the size-mass plane over the entire redshift range. Conversely, the stellar mass-size relation is steep for quiescent galaxies with stellar masses $\gtrsim$ 1010M⊙ and flattens at lower masses. As a result, two separate power laws are preferred for the stellar mass–size relation of quiescent galaxies. We find no strong redshift dependence in the slope of the relation of star-forming galaxies as well as of high mass quiescent galaxies. We also show that star-forming galaxies with stellar masses $\geq$ 108M⊙ and quiescent galaxies with stellar masses $\gtrsim$ 1010M⊙ have undergone significant size growth since $z \sim 4$, as expected; however, low mass quiescent galaxies have not.

Insulator-Metal Transition and Magnetic Crossover in Bilayer Graphene

Amarnath Chakraborty[1]*, Aleksandr Rodin,[2, 3, 4] , Shaffique Adam[4,5] and Giovanni Vignale[6]
[1]Department of Physics and Astronomy, University of Missouri, Columbia
[2]Yale-NUS College, 16 College Avenue West, 138527, Singapore
[3]Centre for Advanced 2D Materials, National University of Singapore
[4]Department of Materials Science and Engineering, National University of Singapore
[5]Department of Physics, Washington University-St. Louis
[6]The Institute for Functional Intelligent Materials (I-FIM), National University of Singapore
∗Email: achakraborty@mail.missouri.edu

In-plane magnetic fields offer a relatively unexplored opportunity to alter the band structure of stacks of 2D materials so that they exhibit the desired physical properties. In a bilayer system, for instance, the vector potential associated with the in-plane magnetic field can have opposite signs in the two layers, while remaining constant in each layer; leading to non-trivial modifications of the band structure when interlayer coupling is considered. We focus, on the simplest model of a non-twisted, Bernal-stacked graphene bilayer [1–4] and show that it can be driven through a transition from a gapped insulator to a compensated semimetal by the application of a very strong in-plane magnetic field combined with a vertical displacement field [5]. Our study of the magnetic response reveals that the orbital magnetic susceptibility changes from diamagnetic to paramagnetic around the transition point. We discuss several strategies to observe the IM transition, switch the diamagnetism, and more generally control the band structure of stacked 2D materials at experimentally accessible magnetic fields.

Who Dissolves, Who Dies, Who Tells Your Story: Quantifying Bias in Acid Extraction of Small Shelly Fauna

Clare Mate
Department of Geology, University of Missouri-Columbia
Email: c.mate@missouri.edu

Acid maceration is a widely used technique for extracting Small Shelly Fauna (SSF) from their host matrix, eUectively isolating fossils with insoluble or secondarily mineralized hard parts. However, the preferential dissolution of calcareous components introduces potential biases in faunal recovery, impacting paleoecological and biostratigraphic interpretations. To assess the extent of this bias, we analyzed eleven samples from the Mernmerna Formation (Cambrian Series 2, Stage 3) in the Ikara-Flinders Ranges, South Australia. Petrographic thin sections and acid-extracted residues were used to compare SSF assemblages before and after acid maceration. Fossils were categorized by mineralogy and higher-order taxonomy through point counting and manual segmentation, enabling a direct evaluation of taxonomic and compositional shifts introduced by extraction. Statistical analysis of taxon abundances across methods provided a quantitative measure of extraction-induced bias. Our results reveal systematic losses associated with standard acid maceration techniques, emphasizing the need for methodological refinements to improve SSF recovery. This study provides a framework for assessing extraction biases across diverse geological settings, oUering insights to enhance the accuracy of paleoecological reconstructions and biostratigraphic analyses.

Organic Ferroelectric Transistors as Synaptic Devices for Neural Image Recognition Networks

Arash Ghobadi[1*], Evan Restuccia[1], Suchismita Guha[1],[2*]
[1]Department of Physics and Astronomy, University of Missouri-Columbia
[2]MU Materials Science and Engineering Institute, University of Missouri-Columbia
*Email: guhas@missouri.edu

Synaptic devices have attracted significant attention for their ability to emulate biological neural functions, specifically in their ability to mimic the neurons in the brain. Combined with polymer ferroelectric dielectrics, organic field-effect transistors are promising candidates for both electrical and photonic synapses to emulate important functions of biological synapses. Two distinct copolymers of poly(vinylidene fluoride) (PVDF) with trifluoroethylene and hexafluoropropylene, PVDF-TrFE and PVDF-HFP, are utilized as ferroelectric dielectrics due to their precise polarization control, non-volatile polarization hysteresis, and multiple conduction states. Using a donor-acceptor copolymer, DPP-DTT, as the active semiconductor layer, bottom-gate, top-contact transistors are fabricated with externally poled and unpoled layers of PVDF-TrFE and PVDF-HFP with operating voltages less than 10 V. On average, the poled PVDF-TrFE FETs show improved transistor characteristics with carrier mobilities > 1 cm2 /Vs. The individual transistors are evaluated in a system level network for image recognition. The synaptic response of these devices is quantified using key metrics such as the dynamic range and nonlinearity of the analog channel conductance modulation, which are then employed to simulate the neural network behavior. The accuracy of the network in recognizing a set of handwritten digits is used to assess the effectiveness of these devices in neuromorphic architectures. The results are analyzed in terms of the poling condition of the ferroelectric dielectric, the margin of conductance modulation, and the nonlinear weight updates.

Assessment of Silvicultural Management Practices on Ground Flora in Woodland Silvopasture Establishment in the Missouri Ozarks.

Emmanuel Barffour Oppong Adjei*, Gatlin Buntin, Dusty Walter, and Ashley Conway-Anderson
School of Natural Resources, University of Missouri-Columbia
*Email: eogkn@missouri.edu

Oak woodlands in Missouri have experienced significant decline due to fire suppression and agricultural conversion. In response, land management agencies are prioritizing restoration efforts. Woodland silvopasture, an approach integrating livestock grazing with existing low-density forests, could be an achievable intervention for land managers as the ecological goals align well with oak woodland and savannah restoration. Mimicking historical disturbances such as wildfires and grazing by large herbivores, woodland silvopasture employs a combination of practices like tree harvesting, midstory vegetation removal, and controlled burns to increase forage growth. A long-term study site at Wurdack Extension and Education Center (Cook Station, MO) is examining the effects of restoration management as a method of silvopasture establishment on plant community structure and composition. Data were collected in fixed area plots for three different treatment regimes: timber harvest (TH), timber harvest with midstory removal (TH+MSR), and timber harvest, with midstory removal and prescribed burn (TH+MSR+RXB). Preliminary raw data show the effect of harvesting alone (TH) contributed to an increase in understory graminoids (211.90%), forbs (102.23%), and woody shrubs (88.53%). The TH+MSR treatment shows a greater increase in graminoids (326.14%), but less of an increase in forbs (87.59%) and woody shrubs (28.03%). The TH+MSR+RXB treatment resulted in the least noticeable change from baseline, with graminoids increasing 116.60%, forbs increasing 62.43%, and woody shrubs only increasing 45.95%. The presence of fern and vine was negligible for all treatments. These preliminary results could suggest that all silvicultural interventions will shift floral understory communities toward a more herbaceous composition, a positive outcome for both woodland restoration and silvopasture establishment. Additionally, there may be differences in the number and type of treatments on the overall community outcome, which will continue to be examined further. These findings underscores the potential of woodland silvopasture as a feasible approach to restoring and maintaining Missouri's oak woodlands for land managers with livestock.

Unravelling the Survival of Ancient Tube-Building Organisms Across the Ediacaran-Cambrian Transition

Haley Vantoorenburg, Natalia Bykova, Tara Selly, Olev Vinn, Jim Schiffbauer
Department of Geology, University of Missouri-Columbia
*Email: hnvn6z@umsystem.edu

Fossils from the early Cambrian (Terreneuvian) blue clays of Estonia challenge long-standing assumptions about the evolutionary transition across the Ediacaran–Cambrian boundary (~539 Ma). These fossils are Cloudinomorphs from the Lontova formation, ancient tube-building organisms that were the earliest animals to build mineralized shells. Mineralized shells paved the way for the predator-prey arms race that characterizes the Cambrian Explosion, Earth's most significant evolutionary event. Scientists believed that these early shelled animals, along with other charismatic Ediacaran Biota, disappeared at the end of the Ediacaran period. However, recent discoveries including these pyritized fossils from Estonia's Lontova Formation and similar examples from China, indicate that cloudinomorphs persisted into the early Cambrian. This suggests a much more complicated ecological transition between the Ediacaran and Cambrian than previously described. To refine our understanding of this critical period of early animal evolution, we need to examine the structure, preservation, and ecology of these fossils. We have used advanced imaging techniques, such as high-resolution micro-CT (μCT) and scanning electron microscopy (SEM) to analyze the fine details of these fossils and their preservation. Early results have already revealed three distinct preservation types for these fossils and previously undetected fibrous structures that vary in density throughout the samples. Additionally, mineral deposits identified through SEM, such as gypsum and halite, are already reshaping interpretations of the environment in which these fossils were originally buried. These observations provide new insight into the conditions that allowed cloudinomorphs to persist in the early Cambrian. By combining μCT imaging, SEM analysis, and traditional light microscopy, we aim to resolve long-standing taxonomic questions about these fossils and reconstruct the ecological landscape of the Baltic Basin at this critical moment in evolutionary history. The results of this study will shape interpretations of the resilience of Ediacaran cloudinimorph fauna during the ecological upheaval leading into the Early Cambrian. It will shed light on how these organisms survived dramatic environmental changes and refine models of resiliency during a pivotal period in Earth's history.

ENGINEERING SCIENCES AND INFORMATICS

A Self-calibrated, Wearable Vital Sign Monitoring Device Enabled by Edge Computing

Malinda Jayathilake[1], Morgan Miller[2], Richard Byfield[3], Jian Lin[1]*
[1]Department of Mechanical and Aerospace Engineering, University of Missouri-Columbia
[2]Laser Graphictronics LLC, Columbia, MO
[3]Moberly Area Community College, Columbia, MO
*Email: linjian@missouri.edu

The application of wearable technology in healthcare is revolutionizing personalized and proactive medical care. Continuous vital sign monitoring plays a crucial role in early disease diagnosis and prevention; however, many existing wearable solutions face challenges such as poor sensor signal quality and dependency on cloud connectivity, which raises data security and latency issues. This study presents a flexible wearable sensing device equipped with four MAX30101 photoplethysmogram (PPG) sensors and an edge computer utilizing a pre-trained Bayesian optimization model for self-calibration. Unlike conventional devices, the proposed system performs real-time, on-device processing, eliminating reliance on external networks and enhancing user privacy and responsiveness. Optimal sensor parameters are identified, ensuring high-quality pulse waveforms, with 90% of the data achieving optimal calibration. HR and RR are directly extracted from PPG signals, while BP is estimated from pulse wave velocity and other predictors (age, gender, HR, weight, and height) using a multilayer perceptron model. Testing on 30 adults (aged 17–50) with varying skin tones demonstrated average differences of 2.21 BPM for HR and ±1.35 BrPM for RR, with systolic and diastolic BP predictions achieving R^2 scores of 0.95 and 0.90, respectively. The device autonomously calibrates within 60 seconds, enabling accurate, real-time vital sign monitoring. By addressing key limitations in existing wearables, this solution not only facilitates early diagnosis and improved cardiovascular health management but also paves the way for next-generation, privacy-preserving healthcare technologies.

Keywords: Bayesian optimization, Edge computing, Photoplethysmography, Self-calibration, Vital signs, Wearable

Activities of Daily Living Recognition for Aging Adults Using Non-wearable FIBARO Sensors and Deep Learning Algorithms

Nader Abdalnabi[1], Venkatanand ram Addepalli[1], Shraboni Sarker[2], Erich Kummerfeld[4], Praveen Rao[1,2], Knoo Lee[1,3]
[1]Institute for Data Science and Informatics, University of Missouri-Columbia
[2]Department of Electrical Engineering and Computer Science, University of Missouri-Columbia
[3]Sinclair School of Nursing, University of Missouri-Columbia
[4] Institute of Health Informatics, University of Minnesota, Twin Cities
*Email: nabdalnabi@umsystem.edu

The field of Human Activity Recognition (HAR) has gained significant momentum as sensors—both wearable and non-wearable—become increasingly cost-effective, easy to install, and capable of delivering accurate measurements. This is particularly relevant given the projected doubling of the global population aged 65 and older by 2060, placing substantial strain on healthcare systems and exacerbating costs linked to aging-related conditions, including Alzheimer's Disease and Related Dementias (ADRD). An HAR system can monitor patient activities outside medical facilities, providing valuable insights for assessing health interventions, therapy progress, and aiding clinical decisions. In addition, traditional diagnostic methods for health monitoring are often costly and invasive. There is a need for non-invasive, passive in-home remote sensor systems for continuous and accurate health tracking. In this study, we explore an affordable HAR framework for continuous, non-invasive monitoring of Activities of Daily Living (ADLs) in real-life home environments. ADLs were Sleep, Eat, Cook, Wash dishes, Toilet, Enter_Home, Leave_Home, Watch_TV and Other_Activity. By installing MU FIBARO sensor systems in the homes of aging participants over a three-month period and recruiting volunteers to provide ground-truth ADL annotations, we collected a robust dataset for training deep learning models. We then employed two advanced architectures—Long Short-Term Memory (LSTM) networks and Transformer-based models—to accurately classify and predict future ADLs. Our results highlight the Transformer's superior performance, reaching peak accuracies of up to 93% and achieving high precision, recall, and F1-scores across multiple ADLs with the most frequent predicted activities were "Sleep," "Other activity," and "Watch TV". Moreover, augmenting the dataset further enhanced model performance on underrepresented activities, indicating strong potential for real-world deployment. These findings underscore the value of remote sensor technologies, coupled with state-of-the-art deep learning, to enhance elderly care and support independent living by enabling timely interventions and reducing the overall burden on healthcare resources.

Evaluation Of Rhizosphere Health at Postharvest with Manure Application and Cover Crop Practices

Manobendro Sarker[1,5], Donna Brandt[2], Timothy Reinbott[3], Morgan Davis[4], Teng-Teeh Lim[1,5]*

[1]Chemical and Biomedical Engineering, University of Missouri-Columbia
[2]Soil Health Assessment Center, University of Missouri-Columbia
[3]Field Operations, Agricultural Experiment Station, University of Missouri-Columbia
[4]School of Natural Resources, University of Missouri-Columbia
[5]Plant Science & Technology, University of Missouri-Columbia
*Email: limt@missouri.edu

Soil health is essential for sustainable agriculture production, with the rhizosphere playing a pivotal role in microbial abundance, nutrient cycling, and plant nutrient availability. In collaboration with the Missouri N340 cover crop cost-share program, a field experiment was conducted at a university farm to assess the impacts of agricultural management practices. This study specifically focused on evaluating the health of the corn rhizosphere. Phospholipid fatty acid analysis (PLFA) results indicated that postharvest microbial biomass, comprising arbuscular mycorrhizal fungi and various bacteria, was higher in fields that received manure application and cover crop practices (CCPs), although the differences were not statistically significant. Metabolomics analysis further revealed that the peak areas of known metabolites across several chemical groups were relatively higher ($p<0.05$) in plots with manure application, regardless of the CCPs. Notably, the peak area of metabolites was higher ($p<0.05$) for plots with CCPs than nonCCPs. This suggests that manure and CCPs may enhance rhizosphere health, potentially boosting weed and disease resistance. Visually, enhanced growth and distribution of corn roots were observed in plots with manure application and CCPs. Although not significant, corn dry root biomass was 13.02% higher with manure application than inorganic fertilizer application, regardless of CCPs. This ongoing field experiment aims to further evaluate the long-term effects of these management practices on soil health and crop yield.

Keywords: corn plots, organic fertilizer, soil microbiome, metabolomics, PLFA, root biomass

Shape-Aware Atmospheric River Detection Using Procrustes Loss in Deep Learning

Souvik Bag[1]*, Likun Zhang[1], Giri Gopalan[2], Christopher K. Wikle
[1]Department of Statistics, University of Missouri-Columbia
[2]Statistical Sciences Group, Los Alamos National Labratory, Los Alamos, NM
*Email: sbk29@umsystem.edu

Atmospheric Rivers (ARs) play a crucial role in Earth's hydrological and climatological systems by driving water vapor transport, precipitation, and extreme weather events. Accurate detection of ARs is essential for understanding their impact, particularly under changing climate conditions. Traditional heuristic-based detection methods often yield inconsistent results. While deep learning approaches, especially Convolutional Neural Networks (CNNs), have demonstrated strong performance in semantic segmentation tasks, enabling accurate and scalable AR detection. But commonly used loss functions such as cross-entropy and dice loss fail to account for the shape, size, and precise location of ARs during model training. This leads to inaccurate predictions with distorted AR shapes and rotations, which are critical for meaningful analysis. To address this limitation, we propose a novel Procrustes transformation-based loss function that explicitly penalizes shape and size discrepancies between the predicted and ground truth AR segments. Our method significantly reduces the Procrustes distance between predictions and true AR structures. We further compare its performance against traditional pixel-based and boundary-based loss functions, demonstrating improved shape consistency and prediction accuracy.

Keywords: image segmentation, Procrustes based loss, atmospheric river, Convolutional Neural Network

Large-Scale DEM Simulation of CT-Scanned Sand Grains for Powder Spreading in Binder Jetting

Ibrahim Al Qabani
Department of Mechanical Aerospace Engineering, University of Missouri-Columbia
Email: ina3fy@umsystem.edu

Predicting the feasibility of introducing raw sand to binder jetting technology (BJT) requires an accurate analysis of its spreadability, particularly when using traditional spreading mechanisms such as a counter-roller. Spreadability is assessed through powder bed density (PBD) and layer uniformity, necessitating both physical and numerical studies for validation. Unlike conventional discrete element method (DEM) studies that rely on simplified multi-sphere particle reconstructions or focus on small-scale spreading, this study integrates high-resolution sand grain geometries—captured via industrial X-ray Computed Tomography (CT) scanning—into Altair EDEM for large-scale powder spreading simulations. The simulation leverages high-performance computing (HPC) with GPU clusters to realistically model 500,000 grains using detailed 3D STL files for accurate shape representation. A set of 30 CT-scanned sand grains was selected at random and used to represent the grain geometry in the simulation, striking a balance between shape realism and computational efficiency.

Keywords: Binder jetting technology (BJT), powder bed density (PBD), Computed Tomography (CT), discrete element method (DEM), high-performance computing (HPC), additive manufacturing (AM).

Investigation of Single-Event Transient Effects in Enhancement-Mode p-GaN-AlGaN/GaN HEMTs for Space Applications

Showmik Singha*, Md Maruf Hossain, and Syed Kamrul Islam
Analog/Mixed Signal VLSI and Devices Laboratory, Department of Electrical Engineering and Computer Science, University of Missouri-Columbia
*Email: ssqk4@umsystem.edu

The growing need for high-performance, radiation-hardened electronics in space applications has driven interest in wide-bandgap semiconductors like gallium nitride (GaN) [1]. GaN high-electronmobility transistors (HEMTs) offer exceptional breakdown voltage, thermal stability, and resilience to extreme environments, making them promising candidates for space-based power and RF applications [2]. However, despite their robustness against total ionizing dose (TID) effects, GaN HEMTs remain susceptible to single-event effects (SEEs), which can degrade performance or lead to device failure in radiation-intensive environments. This study utilizes Technology Computer-Aided Design (TCAD) simulations to analyze single-event transient (SET) effects in enhancement-mode p-GaN-AlGaN/GaN HEMTs. The impact of drain bias voltage and heavy-ion linear energy transfer (LET) on transient current responses is investigated, revealing that increased drain voltage amplifies charge collection, resulting in higher peak currents. Likewise, higher LET values generate more electron-hole pairs, extending transient pulse widths and intensifying SET effects. These findings enhance the understanding of charge collection dynamics in GaN HEMTs under space radiation conditions, aiding the development of more resilient semiconductor devices for space applications.

EPSILON: Adaptive Fault Mitigation in Approximate Deep Neural Network using Statistical Signatures

Khurram Khalil*, Khaza Anuarul Hoque
Department of Electrical Engineering and Computer Science University of Missouri-Columbia, USA
*Email: khurram.khalil@missouri.edu

The increasing adoption of approximate computing in deep neural network accelerators (AxDNNs) promises significant energy efficiency gains. However, permanent faults in AxDNNs can severely degrade their performance compared to their accurate counterparts (AccDNNs). Traditional fault detection and mitigation approaches, while effective for AccDNNs, introduce substantial overhead and latency, making them impractical for energy-constrained real-time deployment. To address this, we introduce EPSILON, a lightweight framework that leverages precomputed statistical signatures and layer-wise importance metrics for efficient fault detection and mitigation in AxDNNs. Our framework introduces a novel non-parametric pattern-matching algorithm that enables constant-time fault detection without interrupting normal execution while dynamically adapting to different network architectures and fault patterns. EPSILON maintains model accuracy by intelligently adjusting mitigation strategies based on a statistical analysis of weight distribution and layer criticality while preserving the energy benefits of approximate computing. Extensive evaluations across various approximate multipliers, AxDNN architectures, popular datasets (MNIST, CIFAR-10, CIFAR-100, ImageNet-1k), and fault scenarios demonstrate that EPSILON maintains 80.05% accuracy while offering 22% improvement in inference time and 28% improvement in energy efficiency, establishing EPSILON as a practical solution for deploying reliable AxDNNs in safety-critical edge applications.

Keywords: Approximate Computing, Deep Neural Networks, Fault Tolerance, Energy Efficiency, Fault Detection.

Rubber-Modified Asphalt Life Cycle Analysis: Economic, Environmental, and Performance Implications

Fatemeh Kazembabaei*, William G. Buttlar
Department of Civil Engineering, University of Missouri-Columbia
*Email: fkbq2@missouri.edu

In the past five years, significant research has been conducted on rubber-modified asphalt (RMA), which has led to the construction of several demonstration projects in Missouri, such as Stadium Boulevard on Route 740 in Columbia, I-155 in Hayti, and a residential street in Kansas City (Buttlar et al., 2023). RMA is a sustainable road construction technology that utilizes recycled end-of-life tires (ELTs) to enhance traditional asphalt pavements (Presti, 2013; Zhou et al., 2023). This innovative approach not only addresses pressing environmental concerns related to tire waste but also contributes to improved pavement durability and lifecycle performance (Bilema et al., 2023; Cao et al., 2025). It has become increasingly common in the asphalt industry to use dry-process rubber technology due to its enhanced resistance to rutting, cracking, and pavement raveling (Picado-Santos et al., 2020; Ghabchi et al., 2021). These benefits make dry-process RMA an ideal alternative to conventional asphalt mixtures, particularly if rubber-modified asphalt is used (Buttlar & Rath, 2021). The objective of this study is to synthesize and critically evaluate the existing literature on RMA technologies, focusing on their implications for environmental sustainability, economic feasibility, and pavement performance (Gettu & Buttlar, 2024). A central objective is the development of a comprehensive life cycle assessment (LCA) framework tailored to RMA systems' unique characteristics. In this paper, we focus on the establishment of robust and process-specific life cycle inventories (LCIs) for both wet and dry RMA production methods to overcome the existing limitations in available datasets (Cao et al., 2025; Ghabchi et al., 2021). Accurate LCIs are essential for assessing the cradle-to-grave impacts of RMA mixtures and enabling meaningful comparisons with conventional hot mix asphalt (Zhou et al., 2023). Additionally, the environmental assessment examines emerging concerns such as the potential release of 6PPD-quinone (6PPD-Q), a toxic transformation product from tire rubber, into stormwater runoff, highlighting the need for integrated risk assessments in future RMA applications (Zhang et al., 2024). Using recent advances in pretreatments and production techniques (Li et al., 2024), the research aims to promote the adoption of RMA as a circular, climate-resilient paving method.

Keywords: Rubber-modified asphalt (RMA), Life cycle assessment (LCA), Crumb rubber, End-of-life tires (ELTs), 6PPD-quinone (6PPD-Q), Life cycle inventory (LCI), Environmental impact

Deep Learning in the Field: Vision Transformers and CNNs for UAV-Based Soybean Canopy Analysis

Emma Bennet
Department of Computer Science, University of Missouri-Columbia
Email: enb7x6@umsystem.edu

Precision agriculture is an emerging transformative approach for enhancing global food security through optimization of crop yields, minimization of waste, and reduction of environmental impacts. By leveraging remote sensing technologies such as unmanned aerial vehicles (UAVs) in conjunction with artificial intelligence (AI), data-driven decisions can be made to tailor-fit farming practices to the specific needs of each part of a field, increasing eEiciency and sustainability. Leaf Area Index (LAI) is a key trait that reflects canopy solar radiation acquisition, the primary process for plant growth and development, is closely related to crop performance and yield. Traditional LAI measurement methods are labor intensive, limited in scale, and typically performed using hand-held devices. This study investigates the potential of artificial intelligence and machine learning (AI/ML) approaches in precision agriculture. Specifically, we develop Convolutional Neural Networks (CNNs) and Vision Transformers (ViTs), to estimate LAI from point cloud data collected via UAV. UAV-based point cloud oEers a scalable and eEicient alternative, capturing dense 3D representations of crop fields. Data for this project was collected and processed at the University of Missouri Bradford Farms. Over a two-month growth cycle, point cloud data was collected and constructed across 96 samples per field over 6–7 time points, covering two distinct row spacings (76 cm and 38 cm). Ground-truth LAI measurements were obtained using a ceptometer (Meter LP-80) and aligned with corresponding point cloud regions. From the raw point cloud data, for each LAI sampled region, we generated three heatmaps corresponding to point cloud height map, density, and a color channel derived vegetation index respectively. Our work introduces a novel application of vision transformers (ViTs) to this bespoke precision agriculture regression problem, leveraging their ability to capture long-range dependencies in unordered point cloud data. Results demonstrate that the proposed ViTs and CNNs based approaches not only drastically reduce manual labor but also outperform current state-of-the-art methods, achieving significant improvements for point cloudbased LAI prediction for soybean.

Evaluation of Predictive Models for Optimized Droplet Classification in Inkjet Printing

Dilruba Alam*, Shahrin Akter*, Mohammad Haider*
Department of Electrical Engineering and Computer Science, University of Missouri-Columbia
*Email: mhaider@missouri.edu

Inkjet printing technology is emerging as a promising alternative to traditional silicon-based semiconductor fabrication, offering advantages such as a simplified manufacturing process, cost efficiency, environmental sustainability, while maintaining competitive performance in sensing and computing applications. However, the effective printing relies on an iterative, time-consuming trial-and-error approach to optimize key parameters for precise droplet formation. To overcome this limitation, this study develops a machine learning-based classification model to enhance efficiency and accuracy in droplet formation along with ink flow. Multiple machine learning algorithms, including Linear Discriminant Analysis, Support Vector Machine, Random Forest, Decision Tree, and KNearest Neighbors, are implemented using voltage, frequency, and meniscus as input features. After hyperparameter tuning, model performance is ranged from 73\% to 98\%, with the Decision Tree model achieving the highest accuracy of 98.46\%. Based on this result, the optimized parameters from the Decision Tree model are applied to classify droplets, which ensures better quality inkjet printing.

Next Generation Power Electronics Using AlN/β-Ga_2O_3 HEMTs Designed by TCAD for High Power Low Leakage and Robust Operation

Md Maruf Hossain*, Showmik Singha, Sazia Eliza, Syed Kamrul Islam
Department of Electrical Engineering and Computer Science, University of Missouri-Columbia
*Email: mh5md@umsystem.edu

High Electron Mobility Transistors (HEMTs) are pivotal in high-power and high-frequency electronics due to their ability to support fast and efficient electron transport via a two-dimensional electron gas (2DEG) at heterojunction [1]. GaN-based HEMTs are already commercially deployed in RF amplifiers, compact power adapters, and energy-efficient power converters [2] [3]. However, they face limitations including gate leakage, thermal management issues, and reliability concerns under harsh conditions.

The AlN/β-Ga_2O_3 heterostructure emerges as a superior alternative, leveraging ultra-wide bandgaps 6.2 eV for AlN and 5.3 eV for β-Ga_2O_3 alongside excellent thermal and electrical properties [4]. This material system supports higher breakdown voltages, stronger electron confinement, and significantly lower off-state leakage current, enhancing energy efficiency and enabling robust operation under extreme conditions [5]. The high conduction band offset and spontaneous polarization in AlN induce a strong 2DEG without intentional doping, while AlN's thermal conductivity and β-Ga_2O_3's high critical electric field (~8 MV/cm) enable stable operation under high voltage and temperature stress [6].

In this work, we present a TCAD-based simulation of an AlN/β-Ga_2O_3 HEMT structure featuring a 20 nm AlN barrier atop a 40 nm undoped β-Ga_2O_3 channel, grown on a GaN substrate. The simulated energy band diagram reveals strong 2DEG confinement and a high Schottky barrier, promoting excellent electrostatic control and minimizing leakage current during the off-state. Models include quantum confinement, impact ionization, and interface traps for accuracy.

The device demonstrates promising results: a threshold voltage of −12.4 V (depletion-mode), peak transconductance of 0.65 S/mm, and saturated drain current behavior across varying gate biases. C–V analysis at 1 MHz shows low parasitic capacitance and reliable gate control, validating its suitability for high-frequency performance. The modeled HEMT achieves a specific on resistance (Ron) of 0.1 mΩ·cm² and an off-state breakdown voltage exceeding 900 V—yielding a record power figure-of-merit (PFoM) of ~8172 MW/cm².

Beyond traditional applications, AlN/β-Ga_2O_3 HEMTs are promising for extreme environments such as space (radiationhardened systems), high-temperature industrial electronics, high-voltage EV drivetrains, modern power grids, and ultracompact, power-dense electronics. With inherently low leakage, excellent scalability, and thermal robustness, this architecture is positioned to lead the next generation of high-efficiency wide-bandgap semiconductor devices.

High-Resolution Ground NO2 Estimation using Deep Learning and Satellite Remote Sensing

Solaiman Khan, Anes Ouadou, Xing Song, Grant J Scott
*Email: sknnh@umsystem.edu

Nitrogen dioxide (NO_2) is a harmful air pollutant linked to a range of health problems, including respiratory diseases and lung infections. Traditional NO2 monitoring relies heavily on costly and sparsely distributed ground-based sensor networks. This research explores the integration of multispectral imagery from Sentinel-2 and atmospheric data from Sentinel-5P to estimate highresolution ground-level NO2 concentrations at city and neighborhood scales.

We propose a two-stream deep learning model that is flexible in data input, capable of operating with either Sentinel-2 data alone or a combination of Sentinel-2 and Sentinel-5P data. The model employs a ResNet50 backbone for feature extraction from Sentinel-2 and a lightweight CNN for Sentinel-5P, with feature-level fusion for NO2 estimation. Experimental results demonstrate that combining both satellite sources yields improved model performance compared to using Sentinel- 2 alone. Model evaluation is conducted across three temporal aggregation levels: daily, monthly, and quarterly. Among these, quarterly estimates show the highest reliability, followed by monthly, while daily predictions exhibit greater variability due to short-term fluctuations in NO2 levels. This study reinforces the potential of combining remote sensing data with deep learning for air quality monitoring, particularly in regions lacking dense ground sensor coverage.

Keyword: Air Pollution; Air Quality; NO2; Remote Sensing; CNN; ResNet50.

Developing a Translational Approach to Manage Dysphagia in ALS using Optogenetic Neuromodulation

Apaala Basak*, Caulin Drago, Sophia Kington, Grace Eason, Kate L. Osman, Nicole L. Nichols, Ilker Ozden, Teresa E. Lever
*Email: abpk6@missouri.edu

Objective: Dysphagia, one of the most severe symptoms in ALS patients, increases mortality risk eightfold due to malnutrition and aspiration pneumonia. It initially manifests as tongue weakness, progressing to atrophy and paralysis as hypoglossal motor units (XII MUs) degenerate. There is a pressing need for treatments that delay or halt XII MU degeneration to preserve tongue and swallowing function. We propose optogenetic neuromodulation as a treatment targeting XII MUs with high temporal and spatial resolution. We hypothesize that optogenetics can slow XII MU degeneration, providing a neuroprotective effect on the tongue muscles.

Methods: Using a translational mouse model of ALS (SOD1-G93A), we developed both surgical and non-surgical optogenetic stimulation (opto-stim) protocols for targeted delivery of adeno-associated virus (AAV) mediated excitatory opsin channelrhodopsin (ChR2) into XII MUs. The surgical approach involved stereotaxic injections into the brainstem hypoglossal nucleus (HGN; n=60; 46 SOD1-G93A, 14 littermate controls; either sex) to directly stimulate and record neural activity using a custom-made implantable optrode (optical fiber + electrode). The non-surgical approach involved intramuscular tongue injections (n=11, 4 SOD1-G93A at disease onset, 7 littermate controls; either sex) in lightly anesthetized mice to retrogradely transfect XII MUs.

Results: All SOD1 mice demonstrated robust functional (tongue protrusion via HGN or tongue surface opto-stim) and histological (ChR2 in XII MUs) opsin expression in HGN-injected animals. Intralingual injections (midline injections to the tongue base and blade) evoked tongue surface contractions in anesthetized mice when stimulated with a hand-held optical device. However, results from intralingual injections were suboptimal compared to direct HGN injections.

Conclusion: Our results are promising, demonstrating that the peripheral-based optogenetic stimulation approach was effective in SOD1 mice after clinical disease onset (mirroring ALS onset in humans) with axonal transport deficits. We are currently developing strategies to enhance opsin expression through retrograde transfection to the HGN via intralingual injections.

ABOUT GPC

The Graduate Professional Council (GPC) is the official student government for all graduate, professional, and post-baccalaureate students at the University of Missouri (MU) in Columbia, Missouri. Since 1982, it has represented all the departments of the Graduate School and the schools of Business, Public Affairs (previously Public Administration), Law, Medicine and Veterinary Medicine. GPC is the voice of graduate and professional students to many of the decision-making bodies at MU, including the Board of Curators and numerous faculty committees. Another function is the development of events such as the Research and Creative Activities Forum to showcase the innovations and talents of graduate and professional students. GPC also brings you captivating social events to give you an opportunity to meet fellow graduate and professional students.

The Graduate Professional Council is the representative umbrella organization for all graduate and professional students to the administration of the University and UM Board of Curators. Although the school councils have influence on the decisions of the individual schools, only GPC has influence in general policy decisions by the University or UM System affecting all graduate and professional students (issues such as fees, tuition, and health insurance).

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