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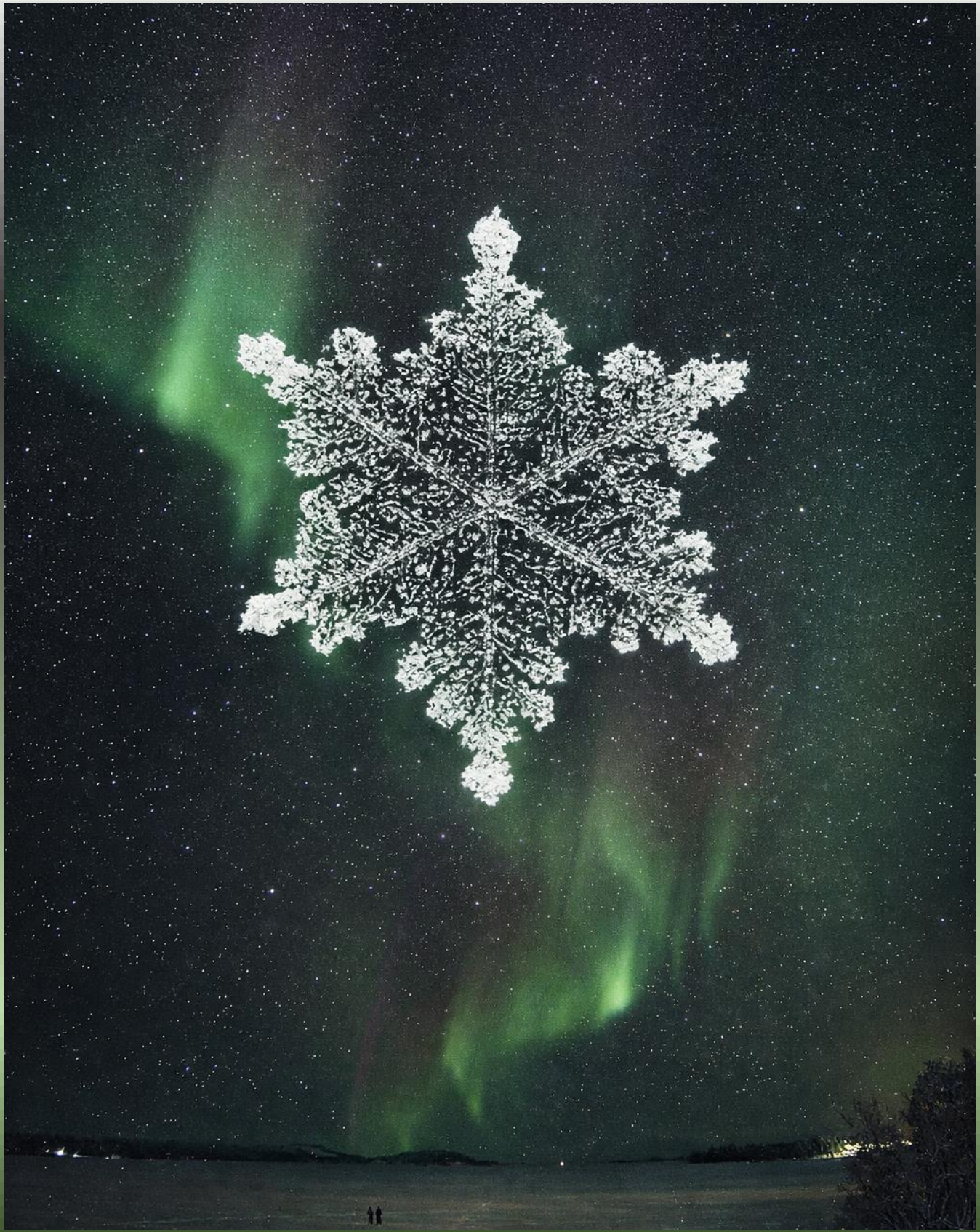

Journal of the Mississippi Academy of Sciences
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Northern Lights and Snowflake
One National Park in Finland: Nuuksion kansallispuisto
Photos were taken on Thursday, January 8, 2026 by Fan Chen-Hau

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NINETIETH ANNUAL MEETING

MARCH 19-20, 2026

Mississippi Gulf Coast Coliseum and Convention Center, Biloxi, MS

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FOURWAVES

Journal of the Mississippi Academy of Sciences

Volume 71 January 2026 Number 1

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90th Annual Mississippi Meeting at a Glance

March 18-20, 2026

Gulf Coast Coliseum and Convention Center, Biloxi, MS

Wednesday, March 18, 2026

3:00-5:00	Registration opens—Lobby area in front of Hall D
6:00-9:00	Board Meeting (invitees only)

Thursday, March 19, 2026

Morning

7:30-12:00	Registration- Lobby area in front of Hall D	Lobby Area Hall D
8:00-12:00	**Divisional Programs**	
	Agriculture and Plant Sciences-	Hall D Room 1
	Cellular, Molecular, and Developmental Biology	Hall D Room 3
	Chemistry and Chemical Engineering	Hall D Room 4
	Ecology, Entomology, Evolutionary Biology, and Zoology	Hall C Room 4
	Geology and Geography	Hall D Room 5
	Health Sciences	Hall B Room 2
	History and Philosophy of Science	Hall D Room 7
	Marine and Atmospheric Sciences	Hall D Room 2
	Mathematics, Computer Science, and Statistics	Hall D Room 11
	Neurosciences	Hall D Room 8
	Physics	Hall D Room 6
	Psychology and Social Sciences	Hall C Room 3
	Science Education	Hall D Room 12
8:00-10:10	Ecology and Evolutionary Biology Symposia (see program)	Hall D Room 6
10:20-12:00	Health Sciences Interactive Workshop (see program)	Hall B Room 3
12:00-1:00	**Mississippi INBRE Data Science Workshop**	Hall D Room 2
12:00-1:00	3rd Annual Women in Geology	Hall D Room 5
12:00-1:00	'Being a Scientist Panel'	Hall C Room 3

90th Annual Mississippi Meeting at a Glance

March 19-20, 2026

Gulf Coast Coliseum and Convention Center, Biloxi, MS

Thursday, March 19, 2026

Afternoon

12:00-3:30	Registration- Lobby area in front of Hall D	Lobby area Hall D
1:00-3:30	**Divisional Programs**	
	Agriculture and Plant Sciences	Hall D Room 1
	Cellular, Molecular, and Developmental Biology	Hall D Room 3
	Chemistry and Chemical Engineering	Hall D Room 4
	Geology and Geography	Hall D Room 5
	Health Sciences	Hall B Room 2
	History and Philosophy of Science	Hall D Room 7
	Mathematics, Computer Science, and Statistics	Hall D Room 11
	Neurosciences	Hall D Room 8
	Physics	Hall D Room 6
	Psychology and Social Sciences	Hall C Room 3
1:00-3:00	MS INBRE Data Science Analysis Team -**Bring Your Data See flyer at end of program (https://qrco.de/bgVpyO)**	Hall D Exhibit Area
1:00-3:00	Health Science Symposium	Hall B Room 3
1:30-3:00	MERIC Symposium	Hall C Room 4
3:30-5:00	MAS awards ceremony and Dodgen lecture	Hall B Room 5-6
5:00-7:30	Divisional Poster Session and Millsaps Scholar Poster Session	Hall C

90th Annual Mississippi Meeting at a Glance

March 18-20, 2026

Gulf Coast Coliseum and Convention Center, Biloxi, MS

Friday, March 20, 2026

7:30-12:00	Registration- Lobby area in front of Hall D	Lobby Area Hall D
8:00-12:00	**Divisional Programs** Agriculture and Plant Sciences- Cellular, Molecular, and Developmental Biology Chemistry and Chemical Engineering Geology and Geography Health Sciences room 1 Health Sciences room 2 History and Philosophy of Science Mathematics, Computer Science, and Statistics Neurosciences	 Hall D Room 1 Hall D Room 3 Hall D Room 4 Hall D Room 5 Hall D Room 6 Hall D Room 7 Hall D Room 12 Hall D Room 11 Hall D Room 8
10:00-12:00	Ecology and Evolutionary Biology Field Trip	Mississippi Aquarium
8:10-9:50	Health Sciences Symposium (See program for details)	Hall D Room 7
9:00-11:30	3 -minute oral competition, Mississippi INBRE Scholars	Hall D Room 2
11:30-2:00	PHIT/LSMAMP Symposium	Hall D Room 4
10:00-11:30	ALCORN MJAS High School Poster Competition	Hall C
12:00-2:00	MAS Scholars Award Ceremony	Hall D Room 2
1:00-3:00	Divisional Programs History and Philosophy of Science	Hall D Room 12

Mississippi Gulf Coast Convention Center
Biloxi, MS 39531

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Take the MS-67 S ramp to Biloxi
Continue onto MS-67 S (9.1 miles)
Exit onto MS-605 S (11.7 miles)

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If traveling from Starkville, MS Take US-45, I-59, and US49
Take US 45 (70 miles)
Then take the Exit onto I-20-W/I-59 South Toward Meridian
Continue on I-59 South (Look for signs Laurel/ New Orelans

Take exit 59 for US 98 E towards Lucedale/Mobile

Continue onto US 98 E/US98 BYP E and use the right lane to take the ramp to Gulfport

Merge onto I-49 South

Take the MS-67 S ramp to Biloxi
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Exit onto MS-605 S (11.7 miles)

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If Coming from the Lorman MS on Highway 61 S:
Take US 61 S to US 98

Merge onto I-55 South/ US-98 E toward McComb

Take exit 29 A Onto I-12 East toward Slidell

Take Exit 38 toward MS 605

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The Executive Director's Column

Ham Benghuzzi, Ph.D., FBSE, FAIMBE, FMAS

This year marks our 90th Annual Meeting, and as I reflect on this moment, I realize this year also places our gathering in a broader historical context. As the United States prepares to commemorate its 250th anniversary in 2026, we are reminded of the generations of scholars, educators, and innovators who helped shape the nation. Science has always been central to our country's progress, from early discoveries that transformed daily life to the modern research that powers medicine, technology, agriculture, and industry. MAS, now in its 90th year, stands proudly within that legacy. Our work as scientists, mentors, and educators contributes to the next chapter of America's story, ensuring that curiosity, evidence, and discovery continue to strengthen our state and our nation.

MAS's success begins with the leadership at the division level, and I would like to formally thank all the Division Chairs, Vice-Chairs, and Program Coordinators for putting together such an exceptional program and for their hard work in communicating with presenters. I know this is no easy task, and at times it can feel overwhelming. For all the students attending, please take a moment to thank your division chairs because a simple, kind word goes a long way.

I would like to express my heartfelt gratitude to our sponsors and exhibitors. The leadership at our institutions plays a crucial role in providing students across our great state and neighboring states with the opportunity to showcase their work. We are deeply grateful for the invaluable financial support and trust from the Research Consortium, Mississippi INBRE (University of Southern Mississippi), and the Department Chairs, Deans, and Vice Presidents for Research at Mississippi State University, Millsaps College, University of Mississippi Medical Center, Alcorn State University, LSMAMP (Jackson State University), MERIC, and our exhibitors. Their support has helped make this event both affordable and successful.

Let's show our appreciation by visiting the exhibit booths. When you return to your institution, please take a moment to thank your Department Chair, Dean, and Vice President of Research for their continued support of MAS. Share with your friends and colleagues the valuable opportunities you discovered and the engaging lectures you attended. Encourage your peers to get involved, join a division, and take on leadership roles.

Finally, let's work together as one unified team to further raise awareness of science and science education in our state. Mississippi is often recognized for its challenges, such as obesity, heart disease, and educational gaps, but it's time we strive to change that perception. As we approach the nation's 250th anniversary, there is no better moment to reaffirm our commitment to scientific progress, educational opportunities, and community impact. To do so, we must take pride in our work and reach out to share our discoveries and ideas with others

MISSISSIPPI ACADEMY OF SCIENCES AWARD WINNERS 2026

Dudley Peeler Award

Contribution to the Mississippi Academy of Sciences

Julie A. Pigza, Ph.D.

Associate Professor
Chemistry
The University of Southern Mississippi

Dr. Julie A. Pigza is an Associate Professor of Chemistry at the University of Southern Mississippi in Hattiesburg, MS. Her research focuses on using small, chiral molecules as organocatalysts to facilitate new bond forming strategies and to study the relevant interactions using computational chemistry. In addition to research, she is passionate about teaching upper-level chemistry courses and serving the university and discipline through various curriculum committees and service roles, including most recently as Chair of Undergraduate Council at USM, Board Member of the MAS, and Member-at-Large of the ACS Division of Organic Chemistry.

She received her Chemistry B.S. from Allegheny College in Meadville, PA in 2002 with her thesis focusing on the synthesis of substituted furans under the advisorship of Dr. S. Shaun Murphree. She obtained her PhD in 2008 and her training in total synthesis and interests in NMR spectroscopy under the tutelage of Dr. Jeffrey N. Johnston at Indiana University (currently at Vanderbilt University). In 2009, she completed a postdoc with Dr. Tadeusz S. Molinski at the University of California, San Diego where she developed strategies to synthesize non-natural amino acids. Her independent career began as an Assistant Professor at Queensborough Community College in Bayside, NY in 2010. There she fostered an active research group of freshmen and sophomore undergraduate students and secured funding from the ACS Petroleum Research Fund and as a co-PI on a multi-institution NSF-TUES grant. Dr. Pigza was recognized with the City University of New York (CUNY) Salute to Scholars Recognition in 2012.

She moved to USM in 2013, where her research in organocatalysis is generously supported by the NSF. Dr. Pigza has mentored students at all levels, including 5 graduate, 51 undergraduate, and 6 high school students. Students have been awarded with funding including graduate student stipend support through the NSF NRT, undergraduate support through research internships (St. Jude's, NSF REU) and internal research funding (Drapeau Center for Undergraduate Research). High school support has been received through the ACS Project SEED. Research students have given a total of 160 presentations at various conferences. Dr. Pigza has published 21 scholarly articles with 2 more in proof stages. Dr. Pigza has received various awards including a Teaching Excellence Award, an Undergraduate Research Mentorship Award, and was named Chemist of the Year by the Mississippi Local Section of the ACS in 2021.

Contribution to Science

Nacer Bellaloui, Ph.D.

Research Plant Physiologist
USDA-ARS
Stoneville, MS

Dr. Nacer Bellaloui is a Research Plant Physiologist at USDA-ARS at Stoneville, MS, USA, with Crop Genetics Research Unit. He received his Diploma of Higher Studies (bachelor's degree) in Plant Biology from the University of Constantine, Algeria in 1984; and his PhD in Plant Nutrition from the University of Leeds, UK in 1989. Dr. Bellaloui served as assistant professor in Algeria (Africa); visiting scientist at the University of Hohenheim (Germany); and visiting scientist at the University of California, Davis, CA. Dr. Bellaloui joined USDA-ARS in 2004 as a Research Plant Physiologist. The goal of his research is to identify the physiological and genetic mechanisms controlling soybean seed quality, composition, and mineral nutrition. During his scientific career, Dr. Bellaloui, with his collaborators, demonstrated for the first time that the micronutrient boron is mobile in transgenic crops containing the sugar alcohol sorbitol. With his collaborators, he quantified for the first time the effect of maturity genes on soybean seed protein, oil, sugars, and mineral nutrition. With his collaborators, he was able to identify new genomic regions (QTL) associated with seed protein, oil, fatty acids, isoflavones, and minerals in soybean. Dr. Bellaloui, with 34 years of research experience, is internationally recognized in the area of plant and grain nutrition, and authored and co-authored over 140 peer-reviewed articles. He is a life member of Mississippi Academy of Sciences, served as a Chair of Agriculture and Plant Sciences Division; serving as a chair of Advances in Agricultural Research Committee with Mississippi Academy of Sciences; received the Mississippi Academy of Science Fellow in 2024; serving as reviewer and editor of several national and international peer-reviewed journals. Dr. Bellaloui has communicated his scientific findings through peer-reviewed articles, presentations at national and international meetings, and stakeholder conferences.

MAS Early Career Award

Prakash Kumar Jha, Ph.D.

Department of Plant and Soil Sciences
Mississippi State University, Mississippi State, MS

Prakash Kumar Jha is an Assistant Professor of Agricultural Climatology in the Department of Plant and Soil Sciences at Mississippi State University, where his research, teaching, and service focus on advancing agroclimatology, agronomic modeling, and climate-smart decision support for agriculture. He earned his Ph.D. in Crop and Soil Sciences from Michigan State University, following an M.S. in Environmental Sciences from the Indian Agricultural Research Institute and a B.S. in Agricultural Sciences from Banaras Hindu University. Dr. Jha's research integrates crop and hydrological models, climate models, remote sensing, and AI/ML approaches to address climate

variability, crop productivity, water use efficiency, and sustainable intensification. His work spans both U.S. and international agroecosystems, with a strong emphasis on translating modeling science into actionable tools for producers, extension specialists, and policymakers. He has published extensively in leading journals (>50), with >3,000 citations, and serves as an Associate Editor for *Agronomy Journal* and *Scientific Reports*.

Teaching and mentorship are central to his academic mission. At Mississippi State University, he teaches Agricultural Climatology and Soil–Plant–Atmosphere Relationships, and has advised and mentored Ph.D., M.S., postdoctoral, and undergraduate researchers. His mentoring philosophy emphasizes interdisciplinary training, quantitative skills, and professional development aligned with the evolving needs of agroclimatology and agronomic modeling communities. He is a recipient of the 2025 Early Career Scientist award from the American Society of Agronomy. Dr. Jha has a strong and sustained record of service to national societies, demonstrating leadership at every career stage. Dr. Jha contributes broadly through editorial roles, serving as a journal reviewer and on grant review panels, and through leadership in international scientific networks. His service philosophy centers on building inclusive, interdisciplinary communities, strengthening links between climate science and agronomy, and supporting early-career researchers and students. As a life member and Liaison for Agriculture Innovation and Technology at the Mississippi Academy of Sciences, Dr. Jha actively supports entrepreneurship and startup ecosystems by fostering strong researcher–industry partnerships that translate scientific innovation into climate-smart agricultural solutions.

Mississippi Academy of Sciences Fellows 2026

Bindu Nanduri, Ph.D.

Professor, Department of Comparative Biomedical Sciences
College of Veterinary Medicine
Mississippi State University

Bindu Nanduri is a Professor in the Department of Comparative Biomedical Sciences in the College of Veterinary Medicine at Mississippi State University, Mississippi State, MS. She is a member of two multistate USDA projects: NC1170, focused on poultry, and NRSP8, focused on animal genomics. Additionally, she is a past president of the Mid-South Computational Biology Society (MCBIOS). With a strong background in biochemistry, molecular biology, genomics, and computational biology, Dr. Nanduri has directed or co-directed several federal research and training grants from organizations including the NIH, NSF, USDA-ARS, and NIFA. Her interdisciplinary research has led to the development of computational pipelines and bioinformatics databases for analyzing genomic data. Her biomedical research primarily explores the relationship between polyamine metabolism and bacterial pathogenesis. Notably, she was the first to report molecular pathways affected by altered polyamine homeostasis in Streptococcus pneumoniae, leading to decreased virulence in murine infection models. Throughout her career, Dr. Nanduri has mentored numerous undergraduate, graduate, and post-doctoral scientists and has published over 100 peer-reviewed articles in veterinary, biomedical, and engineering journals. She is also a founding member of a national team of scientists dedicated to advancing bioinformatics education through a ‘No Boundary Thinking’ approach, which emphasizes fostering diverse disciplinary perspectives during problem definition. At Mississippi State, she has contributed to the development and administration of a graduate program in Computational Biology. Moreover, her involvement with the Mississippi Academy of Sciences, facilitated through MSU's CVM COBRE outreach efforts, has strengthened the collaborative ties between the College of Veterinary Medicine and the Academy.

Martha Mondoa-Tchounwou, Ph.D.

Director, CSET Student Support Services
College of Science, Engineering and Technology
Jackson State University, Jackson, MS

Martha Tchounwou is a senior executive in STEM higher education with over 20 years of experience in leading large-scale, federally funded initiatives focused on workforce development, student success, and increasing participation in science and engineering. She currently serves as the Director of Student Support Services and the Statewide Program Director for the Louis Stokes Mississippi Alliance for Minority Participation (LS-MAMP) at Jackson State University, where she oversees collaborative operations across ten institutions. As a Co-Principal Investigator on multiple NSF and NIH grants, Dr. Tchounwou has secured and managed more than $12.5 million in external funding that supports undergraduate research, graduate fellowships, mentoring, and professional development. She has facilitated research training for over 600 students and has contributed to the graduation of more than 220 master's and doctoral STEM scholars. Additionally, she founded the CSET Scholars Academy and the Girls STEM Summer Enrichment Program, both of which are sustainable models that promote equitable access from pre-college through graduate education. As an NSF reviewer and published scholar, her work emphasizes metacognition and data-driven strategies that enhance STEM workforce readiness, foster institutional collaboration, and promote inclusive excellence.

Robert Waltzer, Ph.D.

Professor and Chair of Biology
Belhaven University, Jackson, MS

Robert Waltzer is a Professor of Biology and Chair of the Biology Department at Belhaven University. Dr. Waltzer was born and grew up in Philadelphia, PA. He received a B.A. in Biology (with Honors) from the University of Delaware and a Ph.D. in Anatomy, with a focus on Neuroanatomy, from The Ohio State University. He has been at Belhaven for over 32 years, where he has taught numerous classes in Human Biology and Biomedical Sciences. Prior to that, he taught at The Ohio State University, Wheaton College, Triton College, and College of DuPage. He has 12 peer-reviewed research publications in Neuroscience, 1 book chapter, and 13 conference presentations. Early on in his career, he developed an interest in the boundaries between philosophy and science. He has pursued that interest by giving presentations at the Mississippi Academy of Sciences. where he has given eleven presentations in the Division of History and Philosophy of Science, two in the Cell, Molecular, and Developmental Biology division, and has published a chapter in a book. Having supported the Division of the History and Philosophy of Science since its inception over 25 years ago, he has been serving as Chair or Vice-Chair of the division for the last 7 years. His current interests focus on properties of proteins that have multiple conformations, built-in timers, and work together in complex sets, as occurs in muscles. He has been a member of the Mississippi Academy of Sciences for over 30 years. He has also been a member of the Society for Neuroscience. He has been listed in the acknowledgements of the last 4 Editions of “Histology: A Text and Atlas”. He has been married to Nina Page Waltzer for over 16 years. He resides in Jackson and attends Pear Orchard Presbyterian Church, where he is a piano accompanist for a children’s choir.

Fellows of the MAS

2021 (Inaugural Fellows)
- Ham Benghuzzi
- Ken Butler
- Joseph Cameron
- Zelma Cason
- Olga McDaniel
- Girish Panicker
- Babu Patlolla
- K. Raja Reddy
- Remata Reddy
- James Stephens
- Shelly Tucci
- Francis Tuluri
- Md. Zaman

2022
- Rob Rockhold
- David Swanson
- Juan Silva
- Timothy Ward

2023
- Alex Acholonu
- Renee M. Clary
- Mohammed Elasri
- Larry McDaniel

2024
- Nacer Bellaloui
- Lir-Wan Fan
- Jamil Ibrahim
- Ping Zhang

2025
- Shrinidhi Ambinakudige
- Angelia Garner
- David Dockery
- James Starnes

2026
- Bindumadhavi Nanduri
- Martha Tchounwou
- Robert Waltzer

Call for MAS Fellow 2027 (FMAS)
Become a Fellow: How to Apply for FMAS
https://msacad.org/wp-content/uploads/2024/08/Call-for-MAS-Fellow.pdf

Are you Eligible for FMAS?

5-year consecutive membership required to apply
MAS seeks candidates from a broad array of science and engineering backgrounds. Fellows represent the spectrum of career stages – from doctoral graduates to faculty on sabbatical and retired scientists, and private as well as scientists in federal labs – from academia, federal researchers and industry to nonprofit organizations.

How to Apply
Online application at MAS website (PDF fill-able application form)
https://msacad.org/wp-content/uploads/2023/01/MAS-Fellow-FILLABLE-Form.pdf
Deadline Nov 15, 2026
Please send the completed application to Dr. Raja Reddy, Chair of FMAS Committee (krreddy@pss.msstate.edu)

2026 Dodgen Lecture

Thursday, March 19, 2026

(Immediately following the 3:30 awards ceremony)

"Conducting Drug Development Research at an Academic Medical Center"

Given By

Gene "Lee" Bidwell, PhD

Associate Vice Chancellor for Research
University of Mississippi Medical Center
Jackson, MS

Dr. Bidwell is currently Professor of Neurology and Associate Vice Chancellor for Research at the University of Mississippi Medical Center (UMMC). Dr. Bidwell completed his undergraduate degree from the University of Mississippi in Oxford in 2002. He completed the Ph.D. program and a postdoctoral fellowship in Biochemistry at UMMC, during which time his research was focused on the development of novel cancer therapeutics and tumor-targeted drug delivery systems. Dr. Bidwell joined the faculty as an Assistant Professor in the Department of Neurology in 2011. He has since been promoted to the rank of tenured Professor and began serving as Associate Vice Chancellor for Research in 2023. His lab's research interests include targeted drug delivery and the development of therapeutic proteins. Current areas of focus in Dr. Bidwell's lab include drug delivery during pregnancy, delivery of neurotrophic or anti-inflammatory agents to the brain for therapy of neurological disorders or ischemic stroke, and therapeutic angiogenesis for kidney disease. His lab is developing carriers that can be fused to therapeutic agents to target them to specific organs in the body, including the brain and the kidney, or to prevent them from crossing the placenta and reaching the baby during pregnancy. Dr. Bidwell is an author on 65 scientific manuscripts and an inventor on 8 issued patents and 3 pending patent applications. Dr. Bidwell is currently the Principal Investigator on an NIH R01 grant and an NIH Phase II Small Business grant, and his research has been continually funded by NIH since 2014. His research program has also been supported by the American Heart Association, the Department of Defense, and industry sponsors.

Thursday, March 19th, MAS Symposia

INBRE Data Science Workshop

12:00 P.M. (Room D2)

Workshop Coordinators: Yufeng Zhang, Ph.D., and Jingyi "Catherine" Shi, Ph.D.

Workshop Committee: Tristan Clemons, Ph.D., Michael Garrett, Ph.D., Felix Twum, Ph.D., and Alex Flynt, Ph.D.

https://msinbre.org/event/dsw-2026/

12:00 pm – 12:10 pm: Welcome & Opening Remarks

12:10 pm – 12:25 pm: Invited Talk:

"Novel Medical AI: Preterm Labor Prediction"

Benjamin F. Dribus, Ph.D.
Director of Artificial Intelligence, Chair of Mathematics, Medical Research
William Carey University
Email: bdribus@wmcarey.edu

Dr. Dribus is Director of Artificial Intelligence at William Carey University, where he also serves as Chair of the Math Department and Research Associate with the College of Osteopathic Medicine. He holds a patent on a novel AI architecture called sparse local highly connected artificial neural networks (SLC networks). He is a member of the Foundational Questions Institute (FQxI). He recently obtained an NIH funded grant through the MS-INBRE network to develop medical applications of his invention.

Speech Abstract: Preterm labor remains difficult to predict reliably and plays a significant role in maternal and neonatal health outcomes. Moderate to severe preterm labor (PTL), defined in the present study as labor onset before 34 weeks gestational age (GA), is associated with high incidences of adverse events. Roughly 5% of non-induced pregnancies examined in the present study ended in PTL, signifying hundreds of thousands of cases nationally per year. While interventions to address PTL can be effective, many cases remain unanticipated and fail to receive timely treatment. This suggests that PTL often depends on complex multivariate interactions that elude simple algorithms. Artificial intelligence (AI) offers promising methods to address this problem. In this study, we introduce an individualized, noninvasive, cost-effective AI-based PTL prediction tool to enhance current standards of care. This tool leverages ensembles of novel neural networks to output a running risk index optimized to each individual patient's symptoms, risk factors, and stage of pregnancy. It consistently outperforms simpler statistical and machine learning methods under equivalent conditions, achieving roughly 83% balanced accuracy on the validation data.

12:25 pm – 12:40 pm: Invited Talk:

"From Data to Discovery: Computational Mining of Chemical Datasets for Consumption Safety and Forensic Pharmacology"

Scoty Hearst, Ph.D.
Assistant Professor,
Mississippi College
Email: shearst@mc.edu

Dr. Scoty Hearst received his PhD in Biochemistry from University of Mississippi Medical Center. He is currently an Assistant Professor in the Chemistry and Biochemistry Department at Mississippi College.

Dr. Hearst's research uses analytical chemistry and biochemistry techniques to connect wildlife and the environment to public health. His projects include zoonotic disease surveillance in Mississippi wildlife and surveillance of environmental contaminants of human health concern in aquatic and terrestrial species and their environments. For additional details see the following webpages:
https://www.mc.edu/academics/departments/chemistry/
https://www.instagram.com/mc_chemistry_outdoors/

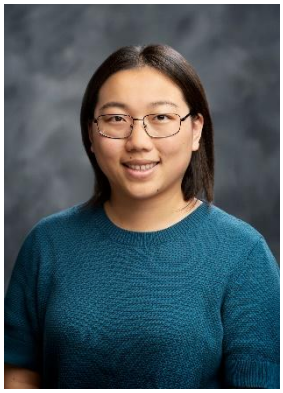
Abstract

From Data to Discovery: Computational Mining of Chemical Datasets for Consumption Safety and Forensic Pharmacology

Scoty Hearst and Trent Selby
Chemistry and Biochemistry Department, Mississippi College, Clinton, MS

AI is transforming modern STEM by enhancing research, education, and automating tasks. AI can aid in scientific discovery through data analysis. This allows for greater innovation in scientific fields. We are currently using AI and computational analysis to find patterns and trends in large analytical chemistry data sets. Using WEKA software coupled with toxic metal analysis, we were able to answer questions concerning consumption safety of fish from the Mississippi River and gluten-free cassava root products. These data sets analyzed by AI revealed how toxic metals influence consumption safety. GCMS analysis is a common tool used in forensic pharmacology to identify drugs, poisons, and their metabolites in biological samples. However, GCMS analysis often results in thousands of compounds per sample making analysis an enormous task. Using ChatGPT coupled with GCMS analysis of forensic samples, we were able to identify medical related compounds in human remains to determine medical treatment strategies and cause of death. Overall, computational analysis and AI can streamline data-intensive tasks to enhance discovery of patterns and trends in large analytical chemistry data sets.

12:40 pm – 12:50 pm: Data Science/AI Training



"A Quick Start to Machine Learning"

Speaker and Workshop Co-Chair: Jingyi "Catherine" Shi, Ph.D.
Assistant Professor of Statistics, Department of Mathematics and Statistics, Mississippi State University, Mississippi State, MS
Associate Director, Data Science Core, Mississippi INBRE

Email: js5328@msstate.edu

Speech Abstract

WEKA is an open-source, GUI-based machine learning tool developed by the University of Waikato, New Zealand. Dr. Shi previously introduced WEKA during the 1st Data Science Workshop at the 88th Annual MAS Meeting and received highly positive feedback. Due to continued interest in the tool, she will reintroduce WEKA at the 90th Annual MAS Meeting for new attendees and anyone seeking a practical, beginner-friendly entry point to machine learning. WEKA is available for download at https://ml.cms.waikato.ac.nz/weka/.

12:50 pm – 1:00 pm: Open Discussion

For additional information on the Workshop please see information at the end of the journal

Thursday, March 19th, MAS Special Symposium Hall B Room 5

"Unlocking the National I-Corps Pathway: Mid-South Hub Informational Session"

Latane E. Brackett, III, MBA, CEFP, SHS
NSF I-Corps Hub
Jackson State University

Latane Brackett is an extraordinary leader at the intersection of innovation, technology commercialization, and workforce development. As Innovation Programs Manager at Jackson State University, Latane is a catalyst for transformative change, shaping the future of industry-academic partnerships at the local and national level. He brings more than three decades of diverse experience spanning senior leadership in the private sector, advisory and coaching roles within top national labs and federal agencies, and hands-on innovation coaching for the NSF I-Corps and the DOE Energy I-Corps programs.

Latane's impact is distinguished by his work as a national instructor for NSF I-Corps Hubs, guiding entrepreneurial teams through the commercialization process with strategic vision, empathy, and an authentic commitment to inclusion. His expertise covers operations, supply chain, innovation management, and program strategy for Fortune 500 companies and cutting-edge research organizations alike. Through roles as an executive coach, advisory board member, and national reviewer for innovation programs, Latane has a proven record of empowering high performance teams to achieve measurable impacts in technology advancement and market adoption.
As mentor to I-Corps teams, Latane not only offers rigorous commercialization and business guidance but also inspires a sense of purpose and resilience that is crucial for transformative ventures. His ability to bridge complex industry challenges with actionable solutions makes him uniquely qualified to support ambitious, multidisciplinary teams advancing the frontiers of life science, advanced manufacturing, AI education, workforce development, and scalable industry collaboration.
Latane earned a Bachelors of Science in Electronics Engineering from Norfolk State University in 1990 and a Masters in Business Administration from Texas A&M Commerce in 2003.

Friday, March 20th, MAS Special Symposium

Hall D Room 4

AGENDA

JSU 1877 COLLEGE OF HEALTH SCIENCES Public Health Informatics and Technology

PHIT: LSMAMP

FRIDAY, MARCH 20, 2026

11:30 A.M. - 12:30 P.M.

Mississippi Academy of Sciences/Biloxi, Mississippi Convention Center

Purpose: To establish clear grant-writing goals, identify priority funding opportunities, and develop a strategic plan to strengthen proposal development and increase external funding success.

01 WELCOME AND OPENING REMARKS (10 MINUTES)

- Introductions
- Overview of meeting purpose and expected outcomes

02 FUNDING LANDSCAPE OVERVIEW (15 MINUTES)

- Federal agencies (NSF, NIH, DOE, USDA, DoD)
- State, foundation, and industry opportunities
- Upcoming deadlines

03 GRANT WRITING GOALS DISCUSSION (20 MINUTES)

- Short-term goals (6–12 months)
- Long-term goals (2–5 years)
- Collaborative opportunities

04 PRIORITY GRANT AREAS (15 MINUTES)

- Research and innovation
- Education and workforce development
- Student success initiatives
- Community engagement

05 NEXT STEPS AND ACTION ITEMS (10 MINUTES)

- Confirm priority opportunities
- Establish proposal teams
- Develop grant submission calendar
- Schedule follow-up meetings

EXPECTED OUTCOMES

- Clearly defined grant-writing goals
- Identified funding priorities
- Proposal development teams assigned
- 12–24 month grant submission plan

Friday, March 20th, MAS Symposia

MAS Scholar Symposium

Sponsored by Mississippi INBRE, Millsaps College, and Tougaloo College

Friday, March 20, 2026
12:00 P.M. (Room D2)

90th Annual Mississippi Academy of Sciences Meeting March18-20, 2026

Mississippi Coast Coliseum and Convention Center
Biloxi, MS

The MAS, in its commitment to recognizing and promoting novel student research, would like to announce the following prestigious awards:

1. Mississippi INBRE Graduate/Post Graduate Scholars Symposium

Honoring Excellence in Science in Mississippi
Symposium Chair: Dr. Kelly Lucas | Program Coordinator, Mississippi INBRE
The University of Southern Mississippi, Hattiesburg, MS
Symposium Co-Chair: Dr. K. Raja Reddy, Mississippi State University (krreddy@pss.msstate.edu)
Moderators: Dr. Sarah Radencic Lalk and Dr. Naflath Thenveettil, Mississippi State University

Sponsored by the Mississippi IDeA Network of Biomedical Research Excellence (INBRE), this symposium is intended to promote and recognize meritorious research conducted by graduate students. Mississippi INBRE is a network of colleges and universities throughout Mississippi with the goal of enhancing biomedical research infrastructure, funding, and training opportunities to better the development of the next generation of researchers

in Mississippi. Funded by the National Institutes of Health and housed at The University of Southern Mississippi, the mission of Mississippi INBRE is to reach out to Mississippians in order to improve health throughout the state and to engage talented researchers and students in biomedical research projects that will increase the state's research competitiveness as well as impact the health of citizens of Mississippi.

Criteria for Selection of recipients:

1. Each division chair(s) and vice chair(s) will score the **top 10% of graduate/post graduate student abstracts** to represent their division and present in the sponsored lunch award symposium, on Friday, March 20st from 12:00 – 2:00 pm. **Student's name must appear as first author on the abstract and must present in their division.**
2. After presenting in their division, the candidate students will agree to present their **abstract** in a **rapid fire 3-minute oral presentation** on Friday, March 20st at noon. The first author must be present to compete and presentation by a co-author will not be accepted.
3. One slide Power point poster must be uploaded on the MAS website no later the 3/15/2026 at 5 PM to be included in the competition and sent to Judges for initial screening.
4. On Friday 3/20/2026 the top ten candidates will receive awards as follows: 1st Place: Certificate plus $250; 2nd Place: Certificate plus $200; 3rd Place: Certificate plus $150; 4th Place: Certificate plus $100; and honorable mention for 5th – 10th winners. Each selected candidate will receive a complementary one-year membership to MAS in addition of certificate of achievement. (Must be present at the awards ceremony to qualify for awards or certificates)

2. Millsaps Undergraduate Scholars Symposium

Honoring Excellence in Science in Mississippi
Symposium Chair: Timothy J. Ward | Associate Dean of Research, Millsaps College
Event Coordinator: Sarah Ageli| MAS Executive Assistant
Millsaps College, Jackson, MS

This symposium is intended to expand the scope and depth of opportunities for undergraduate student researchers to meet other student researchers and their mentors, and to provide a dedicated venue to disseminate and present their research. Participation in undergraduate research increases self-confidence, independence, and critical thinking skills. Presenting one's results at conference symposia develops communication and presentation skills. These experiences create and foster a life-long quest for research and discovery. The sponsor of the symposium is Millsaps College. Candidates in science and engineering research may be selected by their division chairs and approved by MAS to compete for these outstanding awards.

Criteria for Selection of recipients:

1. Each division chair(s) and vice chair(s) of the 14 divisions will score the **top 10% of undergraduate student abstracts** to represent their division and present in the Millsaps sponsored lunch award symposium, "Honoring Excellence in Science in Mississippi," on Friday, March 20st from 12:00 am – 2:00 pm. **The Student's name must appear as first author in both abstract and poster.**
2. After presenting in their division, the candidate students will agree to present their **posters** in the poster symposium following the Dodgen event on Thursday, March19th around 4-7 PM (see program for more detatils). Failure to physically present their poster and be present on Thursday 3/21/2026 disqualify the selected candidates from competing in the symposium. First author must be present to compete and a presentation by a co-author will not be accepted.
3. Candidates presenting on Thursday and fail to attend the awards event on Friday will be disqualified and the awards will be moved to next score in line (must attend both events: Thursday evening and Friday event).
4. On Friday 3/20/2026 all candidates will receive scholar recognition certificates. The top ten candidates will receive awards as follows: 1st Place: Certificate plus $250; 2nd Place: Certificate plus $200; 3rd Place: Certificate plus $150; 4th Place: Certificate plus $100; and honorable mention for 5th – 10th winners. Each selected candidate will receive a certificate of achievement. (Must be present at the awards ceremony to qualify for awards or certificates)

Mississippi Academy of Sciences

Mississippi Junior Academy of Science (MJAS)

Since the 1950's, the Mississippi Academy of Sciences (MAS) has sponsored a Junior Academy of Sciences. The Junior Academy exists primarily to serve pre-college schools in the state of Mississippi. We provide professional scientists who serve as delegates and judges in STEM (Science, Technology, Engineering, and Mathematics). The delegates attend events, interview students and evaluate their research projects. We provide Certificate awards based on achievement, as well as feedback to students and teachers for improving scientific research quality. The US government and local governments have been increasingly recognizing the strategic importance of STEM education. The Junior Academy serves to support this national interest.

Currently the Junior Academy partners with the American Junior Academy of Science and the American Association for the Advancement of Science (AAAS) in its Senior Scientist and Engineers STEM Volunteer Program in the local area. The Junior Academy also partners with Sigma Xi in its new publication initiative, Chronicle of the New Researcher . Students are invited to submit research articles for publication to JMAS.

What is The MAS Junior Academy of Sciences (MJAS)?

Junior Academy members are elite high school students and mentors who are dedicated to designing innovative solutions to society's greatest scientific challenges!

How does it work?

Each year, the MAS Academy of Sciences selects a cohort of passionate high school students to become part of The MAS Junior Academy MJAS), who join a dynamic network of like-minded peers and mentors. JMAS enables students and STEM professionals to collaborate as they compete in project-based challenges focused on the various scientific ields. In addition to competing in global challenges, students develop STEM and research experience such as leadership, communication, and collaboration.

Major Prestigious Award for MJAS
Saha Junior Academy of Sciences Research Award (JASRA)

This award is established in memory of the late Dr. Sukumar Saha, whom served as President for MAS as well chairing of various MAS standing committees including Delegate for JAS. He was instrumental in reviving and promoting JAS at MAS for several years.

Purpose: One of The MAS essential goals is to promote student research activities at all academic levels. The award is granted in recognition of high school students who performed an outstanding research activity while maintaining high GPA in academic setting. It is granted to Juniors or seniors with an average of "A" grades in challenging science courses and who also scored highly in a national standardized test.

Criteria of Selection: The major criterion for selection of award winner is in the devotion of students' substantial time in and outside the school duties. The research project of candidates is judged by members of MAS scientists and the award winners are recommended by the MAS awards committee (Standard rubric criteria) to MAS council for final approval.

There will be one or maximum two high school students can be awarded annually. The awards include monetary, plaque, complementary registration to annual meeting and one-year complementary membership.

The recipients will be invited to Awards ceremony and be recognized at Dodgen event during the annual meeting. Failure to attend the event will forfeit the award.

Responsibilities of MJAS Delegate:

The delegate of MJAS is appointed by MAS council and serve as a member of the board. The major responsibilities of MJAS delegate are:

1. **To serve as a liaison officer between MAS and national junior academy of science**
2. **Recruitment of high school student researchers to present at MAS annual meeting and the MAS Summer Research Symposium**
3. **Coordinate with the MAS executive director to raise funds for MAS-JAS**
4. **Report progress during the four MAS board meeting during the year.**
5. **Attend and supervise the high school poster presentations at the MAS annual meeting and the MAS Summer Research Symposium**
6. **Communicate information related to the MS State Science Fair and MAS program committee.**

ALCORN MJAS Scholars Symposium

Honoring Excellence in Science in Mississippi Symposium

Chairman: Dr. Babu Patolla, Alcorn State University

Coordinator: TBA,

This symposium, sponsored by Alcorn State University, is intended to expand the depth of opportunities for high school student researchers to meet other student researchers and their mentors. Furthermore, the goal is to provide a dedicated venue for high school students to disseminate and present their research activities. The candidates in science and engineering research may be selected by their division chairs and approved by MAS to compete for these outstanding awards.

Criteria for Selection of recipients:

1. Each division chair(s) and vice chair(s) of the 13 divisions will score the **top 10% of high school student abstracts** to represent their division and present in the Alcorn-sponsored lunch award symposium, "Honoring Excellence in Science in Mississippi," on Friday at the annual meeting. The s**tudent's name must appear as the first author on both the abstract and poster.**
2. After presenting in their division, the candidate students will agree to present their **posters** in the poster symposium either following the Dodgen event on Thursday at the annual meeting (see program for more detatils) and on Friday morning. Failure to physically present their poster and be present will disqualify the selected candidates from competing in the symposium. The first author must be present to compete and presentation by a co-author will not be accepted.
3. Candidates presenting their poster but fail to attend the awards event on Friday will be disqualified and the awards will be moved to next score in line (must attend both events).
4. On Friday, the top ten candidates will receive awards as follows: 1st Place: Certificate plus $200; 2nd Place: Certificate plus $150; 3rd Place: Certificate plus $100; 4th Place: Certificate plus $100; and honorable mention for 5th – 10th winners. Each selected candidate will receive a certificate of achievement. (Must be present at the award ceremony to qualify for awards).

DIVISIONAL SYMPOSIA AND WORKSHOPS

Thursday, March 19, 2026

ECOLOGY, ENTOMOLOGY, EVOLUTIONARY BIOLOGY, and ZOOLOGY SYMPOSIA

8:00 am – 10:40 am

Hall C Room 4

***Organizers*: Dr. Nina Baghai-Riding[1] and Dr. Seung-Joon Ahn[2]**

[1]Delta State University, [2]Mississippi State University

Nina Baghai-Riding, Ph.D., Professor in Biology and Environmental Sciences, Delta State University, Cleveland, MS.

Title: *"Palynology of the Late Cretaceous Booneville Dinosaur Site in Mississippi, U.S.A."*

An important faunal assemblage has been recovered from a site near Booneville, Mississippi that includes the most complete dinosaur remains in Mississippi, consisting of a partial skeleton of an adult hadrosaurs, as well as a dentary of a young hadrosaurs. Other faunal remains include turtles, sharks, crocodilians, sea turtles, ammonites, saltwater clams, and more. These remains are in the lower Coffee Formation. The sediments consist of interlaminated carbonaceous clays, silts, and fine-grained sands. A rich and diverse palynoflora is associated with this site. Palynomorphs include assorted fern spores, gymnosperm and angiosperm pollen, algal cysts, and dinoflagellate theca. Approximately 100 palynomorph taxa so far are identified. Dr. Nina Baghai-Riding will discuss palynomorph species that have ecological significance and stratigraphic importance from the Booneville, MS locality.

Dr. Nina Baghai-Riding is a Professor in Biology and Environmental Sciences at Delta State University. She teaches courses in environmental science, plant science, geology, and non-majors biology. She also manages the herbarium at Delta State University, which contains more than 17,500 specimens. Dr. Baghai-Riding received her Ph.D. from the University of Texas, in Austin in Botany, with emphasis on paleobotany and palynology. Her current research interests include the study of palynomorphs from The Jurassic Morrison Formation, Late Cretaceous, Tertiary and Pleistocene Formations in Mississippi, and Late Pleistocene ice age vertebrate fossils.

Scoty Hearst, Ph.D., Associate Professor in Chemistry and Biochemistry, Mississippi College, Jackson, MS

Title: "*None of these things are like the other: phenotypic variation among mosquitoes"*

Hearst's lab is funded by MSINBRE. Recent completed projects include: "Fish as environmental sentinels for metal contaminants of human health concern in the Lower Mississippi River", "Internal and external spatial analysis of trace elements in local crayfish", "Evidence of SARS-CoV-2 Antibody in Mississippi White-Tailed Deer", "Zoonotic Baylisascaris procyonis Infection in Raccoons, Mississippi, USA, 2023–2024", "Identifying Potential Super-Spreaders and Disease Transmission Hotspots Using White-Tailed Deer Scraping Networks", and "Expanding CWD disease surveillance options using environmental contamination at deer signposts". Current ongoing projects include: "Measuring Toxic Metal Contaminates of Human Health Concern in Central Mississippi Lakes", "Identifying Pesticides in Local Produce," "Charactering Fish Parasites with Zoonotic Potential in Central Mississippi Lakes," and "Identifying Compounds of Human Health Concern in Illicit Gas Station Products".

Dr. Scoty Hearst is a bioanalytical chemistry and Assistant Professor at Mississippi College in the Chemistry and Biochemistry Department. His research focuses on using analytical chemistry and biochemistry techniques to connect wildlife and the environment to public health. His projects include zoonotic diseases surveillance in Mississippi wildlife and surveillance of environmental contaminates of human health concern in aquatic and terrestrial species and their environments.

MC Chemistry Website: https://www.mc.edu/academics/departments/chemistry/; Instagram Page: https://www.instagram.com/mc_chemistry_outdoors/

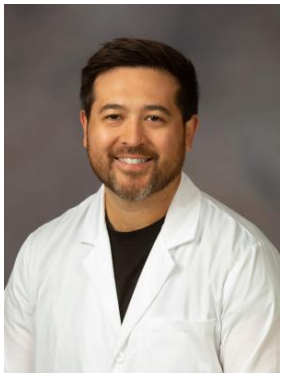
HEALTH SCIENCES

INTERACTIVE WORKSHOP

10:30 AM-12:30 PM

Room B 3

Moderators: Drs. D. Olga McDaniel and Lance Keller



Title of Presentation

Precision at the Core: Molecular Instrumentation Behind the Data

Jake R. Johnston, MS, MB(ASCP)
Laboratory Operations Manager
Molecular Pathology Specialist
Molecular and Genomics Core Facility (MGCF), CMB
University of Mississippi Medical Center

Jake R. Johnson, MS is a laboratory operations and genomics instrumentation specialist based in Mississippi at the University of Mississippi Medical Center. He earned a Bachelor of Science degree from Missouri Southern State University in 2011

and a Master's degree in Medical Science from Mississippi College in 2015. He serves as the Laboratory Operations Manager for the UMMC Molecular and Genomics Core Facility (MGCF), where he oversees the implementation and optimization of advanced molecular and next-generation sequencing platforms, including Illumina short-read systems, PacBio long-read (HiFi) sequencing, and Oxford Nanopore Technologies (ONT) workflows.

His work spans end-to-end NGS pipelines—from nucleic acid quality assessment and library preparation through sequencing execution, run-level quality metrics, and cross-platform data interpretation—supporting discovery research and translational genomics initiatives, with a focus on how instrumentation, chemistry, and workflow design shape data quality and biological insight.

Support
The UMMC Molecular and Genomics Core Facility (MGCF) is supported through multiple extramural funding mechanisms, including large center grants, NIH R01 awards, and the Department of Cell and Molecular Biology. This support enables the MGCF to offer highly competitive pricing to institutional and external researchers across Mississippi conducting genetic and genomic studies.

For additional information, please contact **Jake R. Johnson** at **jrjohnston@umc.edu .**

Title of Presentation

"Comprehensive Insights into Rat model for Preeclampsia Using Multi-Modal Transcriptomics"

Dr. Lavanya Challagundla, PhD, Assistant Professor

Department of Cell and Molecular Biology
University of Mississippi Medical Center
Director, Research Computing, Bioinformatics and Biostatistics Core, Molecular Center for Health and Disease

Dr. Lavanya Challagundla earned her PhD in Biological Sciences from Mississippi State University and has extensive experience in computational analysis of large genomic datasets and omics-scale data visualization. Her research at the University of Mississippi Medical Center (UMMC) has applied population genomic approaches to track the evolution and spread of epidemic lineage of bacterial pathogens such as CC5 and USA300 Methicillin-Resistant Staphylococcus aureus (MRSA). These are the two major distinct lineages of MRSA that are primarily a hospital associated strains common in America, and are known for their highly virulent characteristics, known for skin infection and also are spreading into healthcare settings.

Dr. Challagundla' expertise now spans a broad range of systems from infectious disease genomics to transcriptomic profiling in model organisms, metagenomics, and complex biological data analysis.

As part of her work, she is involved in developing advanced omics (like genomics, proteomics) and computational biology tools to support the Molecular Center for Health and Disease (MCHD) mission, which focuses on using molecular and physiological approaches to understand health, disease, and pathogen interactions, bridging the gap from molecules to the whole organism.

Dr. Challagundla has coauthored numerous peer-reviewed publications and presented widely at scientific meetings.

HEALTH SCIENCES

HEALTH SCIENCES SYMPOSIUM

1:30 PM -3:00 PM

Disease Diagnostics and Thearpies

Room: B3

Moderators: Drs. D. Olga McDaniel and Lance Keller

Theme: Pediatrics and Maternal-Fetal program

"Pregnancy: A Time of Missed Opportunity"

Dr. Miriam Hankins, MD, MS
Obstetrics & Gynecology,
University of Mississippi Medical Center

Dr. Hankins is a board-certified Obstetrician and Gynecologist originally from Shreveport, Louisiana. Before pursuing medicine, she had a career in dance that took her to New York City, later returning to Louisiana to earn her undergraduate degree in Biochemical Sciences and a Master's in Biological Sciences from Louisiana State University. She received her MD from Louisiana State University Health Sciences Center in Shreveport and completed her residency in Obstetrics and Gynecology there as well. In 2023, she moved to Jackson to begin a Maternal-Fetal Medicine fellowship at the University of Mississippi Medical Center, which she will complete this June.

Inspired by her own personal experiences, Dr. Hankins developed a passion for high-risk obstetrics and is dedicated to providing compassionate care to patients during challenging times. Outside of work, she enjoys spending time with her husband, four children, and two dogs, as well as traveling, baking, and volunteering through her church.

Project Baby Magnolia:

"A Genomic Research Program for Critically-Ill Newborns"

Dr. Douglas M. McLaurin, PhD

Postdoctoral Research Fellow, Department of Cell & Molecular Biology, University of Mississippi Medical Center

Dr. McLaurin is an academic researcher, specialized in Cell & Molecular Biology, focusing on Human genomics and genetics studies in population health and new born babies.

Previously he studied the role and novel functions of coilin in vertebrates in regulating the expression of immunity-related genes, which may lead to findings such as how coilin could regulate innate immunity in animals and humans.

Douglas received his Bachelor of Science in Biology from Jackson State University and his MS in Biological Sciences from Mississippi College, Clinton, MS.

As part of educational and professional training, in 2024, Douglas attended prestigious two week the

Victor McKusik course in Human Genetics and Genomics Program, held at the Jackson Laboratory, in Bar Harbor, Main, where he trained in a wide range of topics in human genomics, including genes, variant discovery and medical genetics diagnosing of rare diseases.

In 2025, he participated in the IDeA State Consortium (ISCORE-RC), training in Clinical Trials, and the Coordinator Development Program. Dr. McLaurin's Scientific and Genomics contributions addresses demanding National and Global health Challenges. Some of which are in the area of human heart failure studies in the general population, known as "the All of US Research Project". His projects are aimed at developing discovery tools towards exploring human genome variants in the pediatric population, implementing optical genome mapping for detecting structural variants for the identification of rare diseases.

His projects are aimed at developing discovery tools towards exploring human genome variants in the pediatric population, implementing optical genome mapping for detecting structural variants for the identification of rare diseases.

Dr. McLaurin is an active academician with published work and citations. He has received multiple awards and honors. He served as a panel reviewer for L.C. Dorsey Research Honor Society. In addition, he has actively served the community.

DIVISIONAL SYMPOSIA AND WORKSHOPS
Friday, March 20, 2026

ECOLOGY AND EVOLUTIONARY BIOLOGY
FRIDAY 10:00-12:00

FIELD TRIP TO THE Maritime &Seafood Museum (see flyer at the end of the journal issue)

***Organizers*: Dr. Nina Baghai-Riding and Dr. Seung-Joon Ahn**

HEALTH SCIENCES
SYMPOSIUM II-
9:15-11:15 AM
Room: D7

Theme: Infectious Diseases and Vaccines: A New Twist

Title of Presentation: Cytokines and viral infections

Dr. Fengwei Bai
Professor
School of Biological, Environmental, and Earth Sciences,
University of Southern Mississippi, Hattiesburg, Mississippi.

Prof. Fengwei Bai earned his PhD in Genetics from Fudan University, MS from Ocean University of China, and did his postdoctoral training at Yale University School of Medicine, USA. His long-term research goal is to apply this knowledge to the rational design of effective vaccines or therapeutics to prevent the transmission of viral pathogens.

Dr. Bai's research interests are to understand how viruses are recognized by the host's innate immune system and how innate immunity initiates and generates protective adaptive immunity. His research is focused on advances in virus-host interactions, viral pathogenicity, and antiviral drug development. This includes research topics mainly associated with the pathogenesis of mosquito-transmitted flaviviruses and alphaviruses, such as the West Nile virus, Zika virus, dengue virus, and chikungunya virus, and the development of novel diagnostic methods and antivirals.

Dr. Bai's pioneering work in antiviral investigations lay the foundation for new therapeutic interventions against emerging viral diseases that threaten U.S. health security. One of the highlights of his laboratory work is the development of novel nanocomposite drug delivery systems for SARS-CoV-2 infections, where his laboratory identified a promising delivery platform significantly more efficient than Remdesivir (an antiviral medication), used for the treatment of COVID-19 caused by the SARS-CoV-2 virus, while maintaining cellular safety.

Dr. Bai's research is funded by NIH and various research foundations. Dr. Bai is managing the USDA-certified Biosafety-Level 3 (BSL3) cell culture and animal research facilities, and collaborations from academia and industry are welcome!

For a detailed publication list, please visit
https://www.ncbi.nlm.nih.gov/myncbi/fengwei.bai.1/bibliography/public/

Title of Presentation: The First Step to Preventing Pneumococcal Disease is the First Step

Dr. Justin A. Thornton
Professor
Department Biological Sciences,
Mississippi State University

Dr. Thornton received his Bachelor of Science in Microbiology in 2000, from the University of Southern Mississippi. Then he moved to Jackson Mississippi attending the University of Mississippi Medical Center (UMMC), establishing in the Department of Microbiology, where his research interest in pathogenesis of *Streptococcus pneumoniae* started.

Justin received his Doctor of Philosophy in 2005 from the UMMC, then his post-doctoral fellowship from St. Jude

Children's Research Hospital, focusing on host-pathogen interactions of *Streptococcus pneumoniae.* 2005-2010.

In 2011, Dr. Thornton accepted a faculty position at the Mississippi State University, where he started his research program and teaching activities. Dr. Thornton has been studying *Streptococcus pneumoniae* infections for over 20 years. During such time he has examined numerous aspects of pneumococcal biology, virulence, and prevention strategies. Despite robust vaccination programs, pneumococcal infections account for more than 500,000 deaths worldwide and roughly 250,000 hospitalizations in the United States every year.

Research in Thornton's laboratory has focused on mechanisms of bacterial pathogenesis and host immune responses to understand how humans prevent and clear pneumococcal infections. By identifying which conserved pneumococcal antigens produce the most robust and effective antibody responses, it is possible to formulate a broadly protective protein-based vaccine.

Dr. Thornton's lab is currently working to target colonization, the prerequisite step to invasive disease, in hopes of developing a better pneumococcal vaccine with global implications.

Dr. Thornton's research is funded by NIH and various research foundations particularly, the NIH- Center for Biomedical Research Excellence in Pathogen-Host Interactions.

Dr. Thornton has over 50 peer-reviewed publications in scientific and medical journals. Dr. Thornton's laboratory is always open for a potential graduate student that are genuinely interested in research, as well as looking for new collaborations, so feel free to contact him.

Presentation Title: Chagas Disease: "Advances and Challenges in Chagas Disease Diagnosis"

Claudia Patricia Herrera, Assistant Professor
School of Public Health and Tropical Medicine
Tulane university

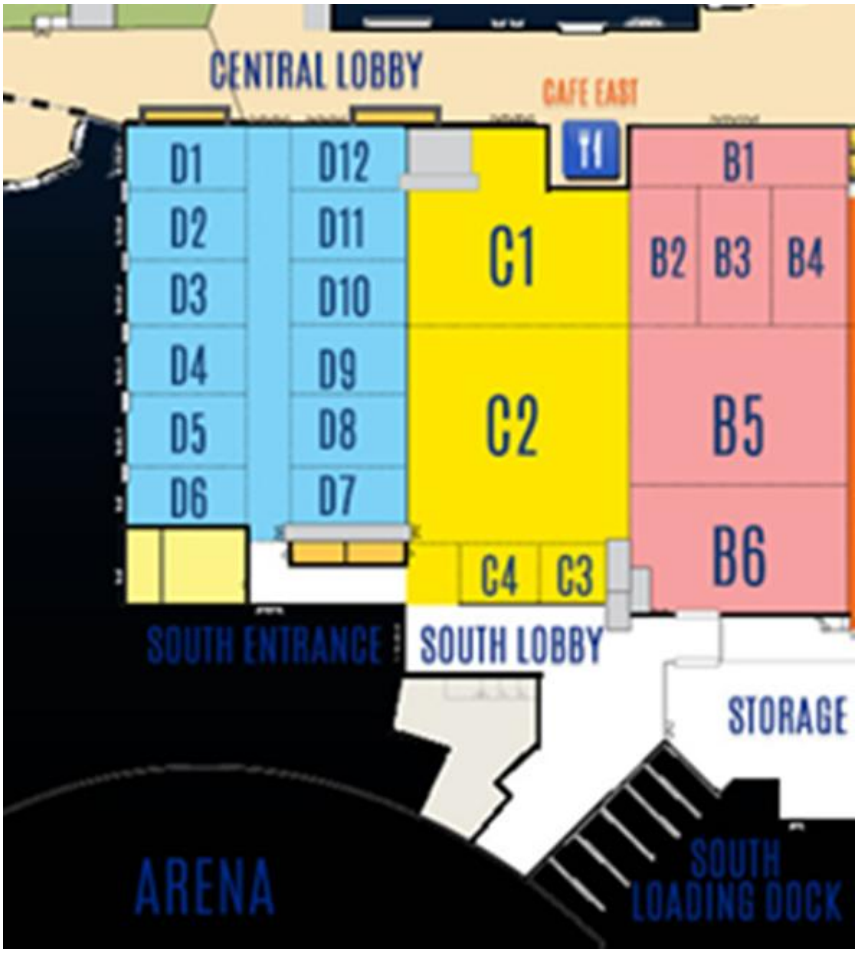
Dr. Claudia Herrera has been a researcher at Tulane University since 2015. She is a microbiologist with expertise in several specific areas including immunology, molecular biology, epidemiology, molecular genetics and phylogenetics of parasites. She received her bachelor of Science in Microbiology from the Los Andes University, Bogota-Colombia. She also received her MSc in microbiology and a PhD in biology from the Los Andes University, Bogota-Colombia. Then she studied human and animal parasitology at the Valencia University in Spain where she earned her master/DEA degree.

Dr. Herrera, has many years of experience in serological diagnosis and molecular parasitology. Currently she is focused on the epidemiological spread of Chagas disease. Chagas disease is an insect borne parasitic infection caused by *Trypanosoma cruzi* and is commonly transmitted by the kissing bug. Chagas disease is endemic to Latin America and likely under reported in the United States. Increased rates of isolation in the United States has risen concerns over the disease and increased local research efforts.

Through integration of serological, genomic, and population-based techniques Dr. Herrera has been able to provide much needed surveillance of this commonly overlooked disease. Along with this, other researchers in the group are examining possible vaccine targets to prevent the future spread of Chagas disease. This research expands the ability to accurately monitor and possibly prevent this disease.

Dr. Herrera has received several research awards throughout her career. She is currently Principal Investigator of an NIH NICHD-funded R01 on congenital Chagas disease, focused on developing and validating diagnostic tools for early detection in maternal and infant populations. In addition, she serves as Co-Chair of the U.S. Chagas Disease Research Consortium and holds leadership roles in professional societies, reinforcing her standing as a national and international leader in Chagas disease research.

Mississippi Coast Coliseum and Convention Center Floor Plan



NOTES

Key to Abbreviations

O = Oral Presentation
P = Poster Presentation
1st number is Division

1	**Agriculture and Plant Science**	
2	**Alcorn State University/MAS Junior Academy**	**High School**
3	**Cellular, Molecular, and Developmental Biology**	
4	**Chemistry and Chemical Engineering**	
5	**Ecology, Entomology, Evolutionary Biology, and Zoology**	
6	**Geology and Geography**	
7	**Health Sciences**	
8	**History and Philosophy of Science**	
9	**Marine and Atmospheric Sciences**	
10	**Mathematics, Computer Science, and Statistics**	
11	**Neuroscience**	
12	**Physics and Engineering**	
13	**Psychology and Social Sciences**	
14	**Science Education**	

2nd number is the Abstract Number within oral presentations (O) or poster sessions (P)
Eg., O4.04 = oral presentation (O) number 4 in the division of Chemistry and Chemical Engineering (4)
Eg., P6.01 = poster presentation (P) number 1 in the division of Geology and Geography

Agriculture and Plant Sciences

Chair: Shankar Ganapathi Shanmugam

Mississippi State University

Vice-Chair: Emran Ali

Alcorn State University

Thursday, March19, 2026
MORNING
Hall D Room 1
8:00 Welcome and Opening

O1.01

8:15 - Management of *Rotylenchulus reniformis* on Sweetpotato using Non-fumigant Nematicides and Bio-Nematicides

Faria Noshin, Chang Liu

Mississippi State University, Mississippi State, MS

Sweetpotato (*Ipomoea batatas* [L.] Lam.) is an economically and nutritionally important crop vulnerable to significant yield and quality losses from plant-parasitic nematodes, particularly reniform nematode (*Rotylenchulus reniformis*). These nematodes are widespread, persistent in soil, and difficult to control due to their broad host ranges and limited host resistance. Traditionally, nematode suppression in sweetpotato has relied on chemical fumigants such as 1,3-dichloropropene, metam sodium, and dazomet. In the past decade, several non-fumigant nematicides—including fluopyram, fluazaindolizine, fluensulfone, and oxamyl—have become available, though they have been rarely tested against reniform nematode. However, increasing regulatory restrictions and environmental concerns have stimulated interest in reduced-risk products and integrated approaches. Bio-nematicides—such as Majestene, azadirachtin, ecozin, NemaClean, and Monterey—offer environmentally compatible alternatives, though efficacy varies and is generally lower than synthetic standards. This greenhouse study compared the effectiveness of selected non-fumigant synthetic nematicides and bio-nematicides for reniform nematode management in sweetpotato. Treatments included Ecozin, Majestene, Velum Prime, Vydate, Nimitz, Salibro, Azaguard, Monterey, NemaClean, and an untreated control. Reniform nematode counts were recorded two months after treatment application. Ecozin, Majestene, and Velum Prime achieved the greatest reductions, producing the lowest nematode counts. Moderate suppression was observed with Vydate, Nimitz, Salibro, and Azaguard, whereas Monterey and NemaClean were the least effective. Untreated controls had the highest population levels. All treatments significantly reduced nematode numbers compared to the control, and notably, Ecozin and Majestene outperformed some synthetic nematicides in suppressing reniform nematode populations. Results indicate that certain bio-nematicides can provide effective nematode suppression comparable to conventional chemical nematicides in greenhouse conditions. The superior performance of Ecozin and Majestene highlights their potential as components of integrated nematode management strategies, contributing to reduced chemical reliance and more sustainable sweetpotato production systems.

O1.02

8:30 Optimizing CERES-Maize for Accurate Simulation of Corn Phenology and Yield under Mississippi Conditions

Ruchita Bhattarai, Prakash K. Jha

Mississippi State University, Mississippi State University

Corn (Zea mays L.) remains a cornerstone crop for food, feed, and biofuel systems in the United States, yet its productivity is increasingly challenged by climate variability and resource limitations. In Mississippi, the absence of cultivar-specific modeling and optimization strategies limit efforts to develop resilient production systems. This study optimized the CERES-Maize model to improve simulation accuracy for corn phenology and yield under local conditions. Two hybrid cultivars (DK 70-27 and DK 70-45) were evaluated using field experiments conducted in 2024 and 2025 at North Farm, Starkville, MS, and across MAFES trial sites. Genetic coefficients were estimated using GENCALC and GLUE, and model performance was assessed using R2 , RMSE, MBE, and d-index. The calibrated model achieved high accuracy (R2 > 0.90, d-index > 0.90), demonstrating its potential as a robust decision-support tool for crop management and adaptation strategies in Mississippi corn production systems.

O1.03

8:45 Evaluation of Critical Nitrogen Requirements for Commercial Tomato Production in MS

Prakash Khanal, Ibukun Timothy Ayankojo

Department of Plant and Soil Sciences, Mississippi State University, MS

Ensuring nitrogen (N) applications targeting the optimum rate is critical in tomato production because N requirements in tomato production may vary depending on the soil type, location, climate, and cultivation practices. Despite tomato being a major vegetable crop in MS, information on the N requirements for commercial production in the state is limited. Therefore, a two-year open-field study was conducted in 2024 and 2025 to determine the critical nitrogen rate for commercial tomato production under the northeast Mississippi growing

conditions The study evaluated six N application rates (0, 67, 101, 135, 202 and 269 kg ha-1) arranged in a randomized complete block design with four replicates per treatment. Red Deuce variety of tomato was planted, and nitrogen was applied at 50% pre-plant (33-0-0) and 50% fertigation (15.5-0-0). Both potassium and phosphorus were the same for all treatments and applied at 100% pre-plant using 0-0-60 and 0-46-0 respectively. Results obtained in both years indicated that higher N application rates significantly increased total fruit yield, total marketable yield, fruit sizes and total biomass. The highest total marketable yield was obtained at 269 kg N ha^{-1}, reaching 71.58 t ha^{-1} in 2024 and 47.50 t ha^{-1} in 2025, mainly due to increased extra-large and large fruit yield. However, medium-sized fruit yield was not significantly affected by nitrogen application rates in either year. Total biomass was highest at 269 kg N ha^{-1}, with 6.96 and 4.96 t ha^{-1} in 2024 and 2025, respectively. Tissue N concentration from leaf samples collected at different weeks during the growing seasons also increased with N rate and was consistently higher at 269 kg N ha^{-1}, supporting the production of higher marketable yield and biomass. Based on the results obtained, the critical N application rate for open-field fresh-market tomato production in northeast MS could be up to 269 kg ha-1.

O1.04

9:00 - Phytoremediation Potential of Nerium oleander for Heavy Metal-Contaminated and Saline Soils

Zavier Smith, Naira Ibrahim

Jackson State University, Jackson, MS

Nerium oleander, a salt- and drought-tolerant shrub, has shown potential for use in phytoremediation of degraded soils. This study aimed to evaluate the capacity of *N. oleander* to remediate soils co-contaminated with heavy metals and salinity. Two treatment groups were established: (1) soils amended with arsenic (As), zinc (Zn), and cadmium (Cd) at three concentrations (10, 50, and 100 ppm) combined with sodium chloride (NaCl) to simulate salt intrusion, and (2) soils amended with the same heavy metals without NaCl. Plants were grown in pots for the experimental period, and soil and plant samples were collected at harvest. Metal concentrations in roots, stems, and leaves were analyzed to assess uptake, accumulation, and translocation patterns.

We anticipate that *N. oleander* will demonstrate high tolerance to both heavy metals and salinity, with greater accumulation of As, Zn, and Cd in roots than in stems and leaves, suggesting its role as a phytostabilizer. The presence of NaCl is expected to alter metal bioavailability, potentially affecting uptake and translocation, with variable responses depending on the metal type and concentration.

These findings are expected to highlight the potential of *N. oleander* for use in the remediation of heavy metal-contaminated and saline soils. The study contributes to understanding the plant's resilience and its capacity to mitigate co-occurring soil stressors, offering a sustainable approach for land restoration in affected regions such as coastal areas.

O1.05

9:15 A Benchmark Study for Delta Region Food-Water Nexus: An Integrated Modelling Approach

Prathiksha Raghava, Drew Gholson, Prakash Kumar Jha

Mississippi State University, Mississippi State, MS

Groundwater depletion in the Mississippi Delta has intensified due to climate variability, fragmented management practices, and the expansion of irrigation-dependent cropping systems. Addressing these challenges requires a systems-level understanding of both the supply side (groundwater storage and recharge) and the demand side (crop evapotranspiration and irrigation needs) of the food-water nexus. This study develops an integrated, spatially explicit benchmarking framework that combines remote sensing, crop modeling, and groundwater simulation to evaluate resource-use efficiency across the Delta.

We quantify long-term patterns in land-use change, interannual and seasonal groundwater variability, and crop water demand using datasets such as GRACE-derived groundwater storage, CHIRP/PRISMA rainfall, USDA CropScape crop distribution, and SSURGO soil properties. Field-scale evapotranspiration (ET) analysis is conducted for cotton fields, using satellite-based ET products to characterize seasonal water use and identify water-demand hotspots across major cotton-growing areas. Crop water requirements and yield responses are simulated using the DSSAT crop model, while aquifer behavior under varying pumping rates is assessed with a MODFLOW groundwater model configured for Delta soils, climate, and well dynamics. These benchmarks support the development of equitable, climate-resilient strategies, including a potential farmer credit or incentive system that rewards water-saving practices and adoption of efficient irrigation technologies

O1.06

9:30 Evaluation of Soil Organic Carbon Mapping Through Spectral Reconstruction: Bridging the Gap Between Multispectral and Hyperspectral Remote Sensing

Abhishek Panchadi[1], Bipin Bastakoti[1], Prachi Singh[1], Nuwan K Wijewardane[2], Prakash Kumar Jha[1]

[1]Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS, [2]Department of Agricultural & Biological Engineering, Mississippi State

University, Mississippi State, MS

Soil organic carbon (SOC) is fundamental to soil health and represents a significant component of the global carbon cycle. While hyperspectral remote sensing offers powerful capabilities for SOC estimation by detecting organic matter absorption features, operational applications are constrained by limited satellite availability and revisit frequency. This study explored the potential of spectral reconstruction to overcome these limitations by transforming readily available Sentinel-2 multispectral imagery into EnMAP-like hyperspectral data using the Universal Pattern Decomposition Method (UPDM). Soil samples (n=93, 0-20 cm depth)were collected in Mississippi during April 2025 and paired them with both actual EnMAP imagery and reconstructed hyperspectral data. Results demonstrated a strong comparability between reconstructed and observed hyperspectral data, with band-to-band correlations exceeding 0.90 and consistent spectral signatures. Random forest model trained on reconstructed imagery achieved SOC prediction performance nearly equivalent to the one using actual EnMAP data (ΔR^2 = 0.051; ΔRMSE = 0.004%). SHAP analysis identified shortwave infrared bands as the most influential predictors, consistent with known organic matter absorption characteristics. Our findings suggest that spectral reconstruction can offer a viable pathway to expand the spatiotemporal coverage of hyperspectral based SOC monitoring. This approach will have practical implications for precision agriculture, carbon accounting, and land management strategies in regions where spaceborne hyperspectral coverage remains sparse.

O1.07

9:45 Can Tailwater Recirculation in Row Rice Reduce Water and Methane Fluxes without a Yield Penalty?

Oluwadamilare Oloyede[1], Pankaj Prashad Joshi[1], Dave Spencer[1], L. Jason Krutz[1], Pradeep Wagle[2], Madhav Dhakal[1]

[1]Mississippi Water Resources Research Institute, Mississippi State University, Mississippi State, MS, [2]Oklahoma and Central Plains Agricultural Research Center, USDA-Agricultural Research Service, El Reno, OK

Continuous flooding, a traditional method of irrigation in rice production, places a high demand on freshwater, increases water loss through evapotranspiration (ET), and significantly contributes to the atmospheric methane (CH_4) concentration. Irrigation practices that discontinue flooding, such as intermittent flooding and furrow irrigation, can reduce ET and CH_4 emissions, ultimately making irrigated rice production sustainable. Field trials were initiated in April 2025 at farmers' fields in the Mississippi Delta to (i) quantify and compare ET under different irrigation systems - continuous flooding and recirculating row rice (furrow irrigation with end-blocked automated tailwater recirculation system), (ii) evaluate these irrigation systems on CH_4 emissions, and (iii) compare rice growth and yield under these irrigation systems. Treatments were replicated three times in a randomized complete block design. Carbon dioxide (CO_2) and water (H_2O) fluxes were measured using open-path (wavelength modulation spectroscopy, LI-7500DS, LICOR Inc.) gas analyzers, and methane flux was measured using open-path (non-dispersive infrared spectroscopy, LI-7700, LICOR Inc.) gas analyzers in eddy covariance systems on the fields. Growth and developmental data were collected bi-weekly, and yield data were collected at physiological maturity. The results showed a significant decrease in diurnal ET and daily ET over the growing season ($p < 0.001$), as well as an 11.2% increase in water use efficiency under recirculating row rice. However, seasonal CH_4 emission was at par. Thus, the results indicate that tailwater recirculation in row rice reduces water loss (ET) and improves productivity without compromising growth and yield; however, it may not reduce methane emissions.

10:00 BREAK

O1.08

10:15 Combined Heat and Drought Stress Effects on Rice During Flowering

Jyothi Prakash Horatti Palakshappa, Alekhya Chakravaram, Manoj Kumar Reddy Allam, Raju Bheemanahalli Rangappa

Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS

Rice (*Oryza sativa* L.) exhibits different sensitivity to heat and drought at various growth stages. While earlier research focused on phenotyping and developing individual stress-tolerant rice genotypes, a more comprehensive understanding of the combined effects of stress has been overlooked. Therefore, understanding how different reproductive traits and the yield potential of rice respond under stress conditions helps decode the complex interactions between genotypes and stresses. This study aimed to evaluate the response of twenty genetically diverse rice genotypes during flowering under different conditions: (i) control (CNT): a daytime temperature of 32 °C under flooded conditions; (ii) DS: 32 °C during the day, with irrigation withheld for 14 days, followed by re-flooding; (iii) HS: a daytime temperature of 38 °C under flooded conditions; and (iv) DS+HS: a 38 °C daytime temperature with drought. Traits related to escape, avoidance, and tolerance, focusing on their physiological and reproductive responses. Results showed that DHS exerted the most severe effects on plant growth and yield traits compared with individual stresses. Stomatal conductance and transpiration were elevated under heat

stress relative to the control but significantly decreased under combined stress (44% and 46%) and drought stress (37% and 40%) compared with the control. Combined stress increased the chlorophyll index by an unusually high amount (60%) compared to the control, indicating a metabolic imbalance. The yield loss was more significant under combined stress (up to 90%), followed by drought (up to 55%), and was least affected by heat alone (up to 37.82%). This study demonstrates that tolerance to individual stressors is insufficient to maintain productivity under combined stress. Therefore, future rice breeding programs must focus on resistance to the combined stresses.

O1.09

10:30 Morpho-Physiological Responses of Corn to Early-Season Waterlogging

Dingiswayo Mwanza, Chami Rampati Dewage, Mohan K Bista, Renganathan Vellaichamy Gandhimeyyan, Raju Bheemanahalli

Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS

Severe soil saturation from waterlogging (WL) greatly impacts seedling emergence, resulting in weak growth. WL can prevent crops from reaching their full genetic potential due to reduced soil oxygen availability in the root zone. The yield loss from WL varies across species and crop growth stages. Understanding the tolerance of corn to WL is vital for sustainable production. This study evaluated the impact of different WL durations to identify the threshold period for screening WL stress at the V3 seedling stage. In this study, WL treatments were applied for periods ranging from 0 to 7 days. A range of physiological parameters, pigments, and morphological traits (both shoot and root) were collected for 7 days post-treatment. Results indicated that increased WL duration led to significant declines in the chlorophyll index, transpiration, and biomass accumulation. The adverse effects were markedly more pronounced in D58VC74 compared to B73, which consistently demonstrated superior performance. To establish a threshold for phenotyping WL tolerance, we utilized different regression models to identify the point at which biomass was reduced by 50% relative to the control. Threshold indicated that a 5-day WL duration can be used to differentiate between sensitive and tolerant genotypes, whereas 7 days of WL can help identify more tolerant genotypes during the early establishment stage. This threshold was used to screen WL tolerance in commercial corn hybrids. These results suggest that hybrids are sensitive to WL; there is a need for new genetic resources to improve resilience against WL.

O1.10

10:45 Differential Responses of Leaves, Bracts, and Bolls in Cotton Drought Adaptation

Mohan K. Bista, Bala Subramanya Sivarathri, Nisarga Kodadinne Narayana, Raju Bheemanahalli

Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS

Optimizing physiological performance is crucial for improving lint yield and fiber quality of cotton (*Gossypium* spp.) under drought conditions. Although extensive research has been conducted on drought-induced physiological traits, key yield-determining organ-level physiological differences remain poorly understood. In this study, ten cotton genotypes were subjected to two soil moisture regimes: (i) control (CNT) at 100% evapotranspiration, and (ii) drought stress (DS) at 40% of CNT during the reproductive phase. Following a 14-day drought exposure, we assessed key physiological traits, including stomatal behavior, and anatomical characteristics of leaves and bracts, along with tissue temperature measurements (in both leaves and bolls). Our findings revealed no significant changes in bract physiology or pigment profiles across the various irrigation treatments. However, differential responses were observed in stomatal dynamics; notably, the bract stomatal density remained constant while a 16% reduction in leaf stomatal density was recorded under DS. Furthermore, DS-stressed plants exhibited more pronounced temperature differences in leaves compared to bolls, suggesting a preferential thermal protection mechanism for the latter under DS stress. Leaf physiological parameters were significantly impacted, with stomatal conductance diminishing by 80% under DS, along with a 30% reduction in leaf expansion and a 16% decrease in bract expansion compared to CNT. This study also addressed the drought-induced effects on yield and fiber quality traits, as well as the functional interrelationship between agronomic traits and organ-level physiological traits, which will be discussed.

O1.11

11:00 Seed Priming Enhances Soybean Resilience During Drought Conditions

Bala Subramanyam Sivarathri[1], Chami Rampati Dewage[1], Mohan K. Bista[1], Corey J. Bryant[2], Raju Bheemanahalli[1]

[1]Plant and Soil Sciences, Mississippi State University, Mississippi State, MS, [2]Delta Research and Extension Centre, Mississippi State University, Mississippi State, MS

Depleting groundwater resources, coupled with prolonged dry spells during the growing season, impacts the physiology, growth, and yield. Drought stress during the early stages of growth can create a stress memory that improves its resilience. Furthermore, priming with biostimulants may enhance the mitigation of drought stress effects and improve memory, growth, and development. The objective of this study was to investigate the effect of seed priming with biostimulants and early drought stress on the physiology, growth, and yield of soybeans. Seeds were primed with ten commercial biostimulants and exposed to two moisture conditions: a control (CNT, 100%

irrigation) and drought stress (DS, 50% irrigation) at the V4 stage for 14 days. Drought stress negatively affected physiological traits, including stomatal conductance (68%), transpiration (28%), and morphological parameters, such as plant height (20%) and leaf area (46%). Conversely, it favored root growth as reported by an 18% increase in the root-to-shoot ratio. A subset of drought-stressed plants was then reverted to control conditions to quantify the yield differences. Physiological traits showed greater improvement compared to control plants, and morphological traits partially recovered from drought stress. The root-to-shoot ratio decreased by 15%, indicating an increase in biomass allocation to shoot growth during the recovery period. Seed priming with biostimulants, followed by drought stress and subsequent recovery, resulted in a substantial increase in seed number (23%) and seed weight (16%). Overall, these results suggest that priming improves the resilience of soybeans to drought stress.

O1.12

11:15 Developing Integrated Machine Learning and Geospatial Framework for Net Carbon Storage Assessment in Mississippi

Bipin Bastakoti, Abhishek Panchadi, Prakash Jha, Nuwan Wijewardane

Mississippi State University, Mississippi, MS

Traditional methods used to measure soil carbon stocks across various land uses are time-consuming, rely heavily on assumptions, and cannot be easily scaled. Despite the rapid growth of the carbon credit market, most crediting systems still depend on comparing project baselines and classifying credits by crop type or management practice rather than by actual measured carbon stocks. This creates a clear need for a more transparent, data-driven approach to quantify carbon storage across landscapes. In this study, we present an integrated framework that uses remote sensing and AI/ML tools to estimate net carbon stocks. We analyzed 148 sites spanning multiple land-use categories. Aboveground and belowground biomass were estimated from NASA's GEDI LiDAR data, soil organic carbon (SOC) was obtained from the RaCA dataset, and dead organic matter was quantified following IPCC protocols. These carbon pools were incorporated into the InVEST Carbon Storage Model, and the model outputs were further enhanced using environmental, climatic, and topographic predictors within machine learning algorithms. Net carbon emissions were derived from GOSAT L2 observations and eddy covariance flux tower data. The difference between modeled carbon storage and measured emissions was used to formulate a new Carbon Sustainability Index (CSI). Forests recorded the highest CSI (0.56), followed by millet (0.40), sunflower (0.39), shrubland (0.31), pasture (0.28), hay (0.25), and peanuts (0.21). Major crops such as cotton, winter wheat, soybean, corn, and rice showed comparatively lower CSI values of 0.13, 0.13, 0.12, 0.08, and 0.06, respectively. Overall, this framework offers a scalable and evidence-based approach for carbon accounting, improving credit accuracy and providing valuable insights for policy and climate resilience planning.

O1.13

11:30 Morpho-physiological Responses of Soybean Genotypes to Salt Stress

Chami Rampati Dewage, Bala Subramanyam Sivarathri, Raju Bheemanahalli

Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS

Soil salinity is a major abiotic stress that restricts soybean productivity by impairing germination, growth, and yield. This study aimed to identify soybean genotypes exhibiting salt tolerance across early growth stages and to assess how tolerance changes with increasing salinity levels. Experiments were conducted at the germination and early seedling stages using sodium chloride (NaCl) concentrations of 0-20 dSm^{-1} for germination and 0-10 dSm^{-1} for seedling growth. Increasing salinity caused a significant reduction in radicle length and seedling biomass, while mean germination time showed a positive relationship with salinity, indicating delayed germination under stress. Although germination percentage was not significantly affected, radicle length and dry weight declined by approximately 8% and 22% at 6 dSm^{-1} NaCl and by more than 50% at 12 dSm^{-1} NaCl. Early vegetative traits, including leaf area, shoot biomass, root weight, total root length, and surface area, decreased with increasing salinity, along with lower stomatal conductance, evapotranspiration and lower efficiency in photosystem. In contrast, anthocyanin content increased significantly with higher salt concentrations, suggesting enhanced pigment accumulation as a protective stress response. Based on biomass performance at both germination and seedling stages, LS5009XS and 48X45RR2X exhibited superior tolerance compared to other genotypes. Threshold salinity levels of 20 dS m^{-1} for germination and 6 dS m^{-1} for early growth were identified as effective for screening and discovering salinity tolerant soybean genotypes. Overall, these findings highlight distinct physiological and morphological adaptations among soybean genotypes, providing a foundation for future phenotyping and breeding efforts to enhance salt tolerance.

O1.14

11: Natural Cowpea Variation: Decoding the Secret to High Yield

Sujan Poudel, Lekshmy V. Sankarapillai, Dingiswayo Mwanza, Raju Bheemanahalli

Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS

Cowpea (*Vigna unguiculata* (L.) Walp) is a valuable

legume crop recognized for its nutritional benefits and environmental adaptability. Understanding genotypic variation in physiological and morphological traits is crucial for improving productivity under diverse environments. Despite a diverse germplasm collection, current commercial cultivars exhibit limited genetic variability, resulting in less stable yields under environmental fluctuations. Therefore, harnessing the existing genetic variation within germplasm collections presents an opportunity to identify and integrate traits that contribute to yield stability under suboptimal conditions. In this study, we evaluated 195 cowpea genotypes for yield potential and other yield-determining traits. Results revealed significant variation in pigments, phenological stages, and yield-related parameters. Flowering initiation ranged from 33 to 73 days, while physiological maturity occurred between 47 and 98 days among genotypes. Yield traits also exhibited considerable variability, with pod length ranging from 10 to 23 cm pod^{-1}, and final seed weight ranging from 3 to 81 g $plant^{-1}$. A strong positive linear relationship was observed between pod weight and seed weight ($R^2 = 0.92$, $p < 0.001$). Furthermore, genotypes were categorized using K-means clustering based on all measured traits. The resulting clusters exhibited significant differentiation in physiological and morphological characteristics and displayed notable variability in yield potential. Notably, genotypes with larger trifoliate leaf area and stronger antioxidant systems demonstrated enhanced canopy cooling and higher yield potential. This classification highlights distinct performance groups and provides a framework for selecting superior genotypes for breeding programs.

O1.15

12:00 Cultivar and Substrate Effects on Growth and Fruit Quality of Organic Strawberries in Soilless Systems

Jingyi Wu[1], Ziyu Xu[2], Tongyin Li[2], Guihong Bi[2], Qianwen Zhang[1]

[1]Truck Crops Branch Experiment Station, Mississippi State University, Mississippi State, MS [2]Plant and Soil Sciences, Mississippi State University, Mississippi State, MS

Strawberry is one of the most widely consumed berry crops and has considerable nutritional and commercial importance. It provides essential nutrition like folate and vitamin C and is notable for their high content of bioactive compounds. These nutritional advantages have supported the global expansion of strawberry production, particularly in soilless systems. Cultivar selection is a critical component of strawberry production because genetic variation affects plant growth, yield, and fruit quality. Additionally, substrate nature plays an important role by regulating water and nutrient availability in the root zone, thereby influencing the synthesis of biochemical compounds. However, systematic comparison of performance of different strawberry cultivars across soilless substrates is limited. Thus, this study aims to investigate how different substrate combinations and day-neutral strawberry cultivars affect plant growth, quality and overall organic strawberry production. Three commercial day-neutral cultivars including Albion, Mara des Bois and San Andreas, were grown in two organic soilless substrate mixtures: coco coir: coir chips (6:4), and coco coir: perlite (6:4). Plants were arranged in a completely randomized design with twenty-four replicates per treatment in a greenhouse. Organic fertilizer Sustane 8-2-4 was applied to the plants as needed during the experiment. The results indicate that the interaction between cultivars and substrate was significant for single fruit weight and leaf number. The combination of Mara des Bois with coir-chip mixture resulted in the highest leaf number among all treatment combinations. Strawberry cultivars were the dominant factor shaping plant growth, fruit quality, and physiological responses. Mara des Bois showed the most vigorous vegetative growth, producing highest canopy width with an average of 39.29 cm, and generating more runners (20.50 per plant) than other cultivars. Albion shows the highest Brix value (12.48 %). Substrate effects were relatively consistent. The coir-chip mixture produced significantly higher relative chlorophyll content in leaves, higher brix and acidity in fruit, and higher substrate EC than the coir-perlite mixture. Our findings revealed that 'Mara des Bois' exhibited the most vigorous growth in organic soilless production, while 'Albion' produced the best flavor. Furthermore, the coir-chip substrate performed better than the coir-perlite mixture, successfully promoting vegetative growth and improving fruit flavor in the organic strawberry plants.

O1.16

12:15 Assessing Physiological and Yield Responses of Rice Under Multiple Stresses

Alekhya Chakravaram[1], Manoj Kumar Reddy Allam[1], Jyothi Prakash Horatti Palakshappa[1], Will Eubank[2], Raju Bheemanahalli[1]

[1]Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS, [2]Delta Research & Extension Center, Mississippi State University, Stoneville, MS

Abiotic stressors have a major effect on the growth and production potential of rice. Identifying stress-resilient rice cultivars requires an understanding of how yield-related characteristics respond to these stressors. In this study, seven rice genotypes were exposed to four conditions until maturity: control (32°C, flooded), drought (32°C, 50% water of control), salinity (32°C, 8 dS/m NaCl), and heat stress (38°C, flooded), with a common night temperature of 24°C. Salinity significantly reduced transpiration and stomatal conductance by over 85%, leading to a 45% decrease in panicle weight and grain yield. Drought stress resulted in a 37% reduction in these parameters, while heat

stress caused a 28% decline in grain yield, despite an observed 8% increase in photosynthetic traits. Genotypic variations and decline were prominent in leaf pigment measurements taken 7 to 21 days after stress, with the most significant chlorophyll reduction (46.5%) occurring under salinity conditions at 14-21 days post-stress. Furthermore, spikelet fertility varied, with the greatest reduction observed under salinity (~32%), followed by drought (~27%) and heat (~12%). These findings underscore the importance of understanding diverse genotypic responses to abiotic stressors, providing valuable insights for breeding climate-resilient rice varieties.

12:30 LUNCH

Thursday, March19, 2026
AFTERNOON
Hall D Room 1
1:10 Opening Remarks

O1.17

1:15 Fire in the Orchard; Isolation, Characterization, And Management of *Erwinia amylovora* Causing Fire Blight on Pear in Mississippi

Abdul-Lateef Popoola, Emran Ali[1], Sumyya Waliullah[1]

Alcorn State University, Lorman, MS

Erwinia amylovora, the causal agent of fire blight, is a destructive pathogen of global economic importance to pome fruit production. Although the disease is acknowledged in Mississippi's agricultural extension, a critical gap exists in the scientific record, with no formal reports on the pathogen's isolation or characteristics from the state. This study aimed to provides the first scientific documentation of *E. amylovora* isolation and characterization in Mississippi, antimicrobial sensitivity, and in vitro efficacy test of 6 essential oils (Palmarosa, Oregano, Clove, Red thyme, Black seed, and Cinnamon oil) against *E. amylovora* isolates. Five bacterial isolates were recovered from symptomatic pear trees in a Mississippi orchard. Identification was confirmed using a polyphasic approach, including biochemical tests (catalase-positive, oxidase-negative, levan-positive) and species-specific molecular amplification. Pathogenicity for all isolates was unequivocally verified by fulfilling Koch's postulates on immature pear fruit. In vitro sensitivity assays against streptomycin, the primary bactericide for fire blight control, revealed a significant finding: four of the five isolates (80%) were resistant. All of the essential oil tested show a significant inhibition zone at the lowest concentration compared to the positive control (streptomycin). Cinnamon oil showed highest level of inhibition at all level of concentration, followed by Oregano and Clove essential oil. This study not only constitutes the first report of the isolation and characterization of pathogenic *E. amylovora* in Mississippi but, more critically, provides the first evidence of streptomycin-resistant populations and the sustainable alternative management strategy using essential oil. This discovery has urgent implications for disease management strategies in the region, indicating a possible future risk of control failure with streptomycin and necessitating an immediate re-evaluation of spray recommendations**.**

O1.18

1:30 Integration of a Cost-Effective Homemade Spore Trap with Molecular Diagnostics for Cucurbit Downy Mildew

Md Tahsinul Anwar, Sumyya Waliullah, Emran Ali

Alcorn State University, Lorman, MS

Cucurbit downy mildew, caused by *Pseudoperonospora cubensis*, is a devastating disease affecting cucurbit crops worldwide, leading to significant yield losses. Early detection and effective disease management strategies are crucial for mitigating its impact. This pathogen, classified as a biotrophic oomycete, disperses through wind currents during warm, humid summers, making its timely detection essential. Over the past two decades, shifts in pathogen populations and reduced fungicide efficacy have highlighted the importance of molecular characterization and epidemiological studies. In this study, we evaluate the efficacy of a cost-effective homemade spore trap for monitoring airborne *P. cubensis* spores and its integration with molecular detection techniques such as polymerase chain reaction (PCR). Airborne sporangia were collected from two southwestern counties in Mississippi and amplified using *P. cubensis*-specific molecular markers. Our preliminary results indicate that the homemade spore trap functions as a cost-effective tool for monitoring, successfully capturing spores in high-risk periods. Furthermore, molecular diagnostic techniques confirmed the pathogen's presence with high specificity and sensitivity. To build upon these findings and facilitate rapid on-site diagnostics, we have also developed primers for Loop-mediated isothermal amplification (LAMP), which are now ready for field implementation**.** Our study contributes to the development of an accessible bio-surveillance system for *P. cubensis*, aiding in the timely application of fungicides and improving management strategies for airborne phytopathogens in vegetable crops.

O1.19

1:45 Development of QPCR Markers for the Rapid Detection of Toxigenic *Aspergillus flavus* in Peanuts

Md Mostafa Masud[1], Sumyya Waliullah[2], Emran Ali[1]

[1]Department of Agriculture, Alcorn State University, Lorman, MS, [2]Department of Biology, Alcorn State University, Lorman, MS

Aflatoxin contamination caused by *Aspergillus flavus* is directly and indirectly linked to human food chains, poses

significant health hazards to humans and livestock. An early detection of toxin-producing *A. flavus* is crucial for managing this disease. In this study, we developed a molecular marker for the rapid and accurate detection of aflatoxigenic *A. flavus*. We collected 104 peanut samples from different locations across Mississippi and identified *A. flavus* through specific primers (FLA1/FLA2). Four genes (*aflD*, *aflR*, *aflP*, and *aflQ)* were selected from the aflatoxin biosynthesis gene cluster and subsequent primers were designed based on the target region, followed by primer optimization and validation. Based on the developed markers, we employed RT-PCR and RT-qPCR assays to validate the markers, including gene expression and quantification. Our results indicated that all the isolates belong to *A. flavus*, showing a sharp band at 490 bp. We also found different gene expression and quantification patterns throughout the four genes among all our isolates using our developed markers. Our developed marker system successfully distinguished toxigenic and atoxigenic *A. flavus* isolates with high specificity and sensitivity. Our correlation study between gene expression results and the aflatoxin production indicated the ability to produce specific derivatives by a specific gene. This molecular diagnostic approach allows for rapid screening of contaminated peanut samples, enabling early intervention and improved management strategies. Overall, the findings of this study contribute to the establishment of a reliable, cost-effective, and high-throughput detection system for aflatoxin contamination, promoting food safety and sustainable peanut production.

O1.20

2:00 Pathogenicity of *Didymella americana* Isolated from Watermelon

Prachi Bista, Lewis Brooks, Emmanuel Clark, Frank Mrema, Idowu Atoloye, Bed Prakash Bhatta

Alcorn State university, Lorman, MS

Didymella americana is a fungal pathogen that causes leaf spot and leaf blight diseases. It has been reported to infect lima bean, table beet, corn, wheat, lilies, and tea crops. Leaf spots were observed on symptomatic watermelon leaves during a recent field research trial. After isolation, phenotyping, and sequencing, the causative fungus was identified as *D. americana* (GenBank: PV754059). Further greenhouse studies were conducted in a completely randomized design using predetermined fungal spore concentration to assess the pathogenicity of *D. americana* on five watermelon genotypes (PI 560013, WUCH Hybrid, Charleston Diploid, PI 189225, and Jubilee) and host crops (table beet, soybean, tomato, sweet corn, and lima bean). Disease severity and incidence were recorded two weeks after inoculation. Results indicated that the popular watermelon cultivar 'Jubilee' was the most susceptible, whereas the wild (PI 189225) showed high resistance. Likewise, tomato and beet root were also severely affected by this pathogen. However, soybean, sweet corn, and lima bean showed tolerance to this pathogen. Koch's postulates were confirmed by isolating fungus from the symptomatic leaves of the inoculated plants and sequencing the isolated daughter strains of the fungus. This study revealed that *D. americana* is pathogenic on watermelon, table beet, and tomato. This is the first study to report pathogenicity of *D. americana* on watermelon and tomato. Further studies include fungal inhibition tests using conventional and organic fungicides. These findings are important in developing resistant cultivars and determining effective disease management strategies against emerging fungal pathogens such as *D. americana*.

O1.21

2:15 Drought Tolerance in Rice: Connecting Aboveground and Belowground Traits

Manoj Kumar Reddy Allam, Naflath Thenveettil, Raja Reddy, Raju Bheemanahalli

Mississippi State University, Mississippi State, MS

Rice (*Oryza sativa* L.) is a crucial part of the global food supply. Drought stress has significantly reduced rice yields and threatened worldwide food security. This issue is becoming more serious due to global climate change. Drought tolerance is a complex trait, and traditional breeding methods have had limited success. Using molecular markers is a practical way to speed up ongoing marker-assisted breeding programs. In this study, we evaluated 192 diverse rice *japonica* genotypes to identify genetic regions linked to drought tolerance during the vegetative stage. Seedlings were exposed to drought stress from 21 to 45 days after sowing. We recorded multiple morphological, physiological, and photochemical traits. The short duration of DS had a significant impact ($p<0.001$) on morphological and physiological characteristics. On average, shoot dry weight dropped by 52%, leaf area by 48%, and shoot height by 35% compared to the control, while tiller number decreased by 28%. Chlorophyll-related indices showed moderate but significant reductions of 12-20%. A genome-wide association study is being performed using 4.2 million single-nucleotide polymorphisms (SNPs) to map genetic regions associated with drought tolerance.

O1.22

2:30 Regenerative Management: A Promising Practice for Mitigating Greenhouse Gases in Corn

Pankaj Prashad Joshi, Oluwadamilare Oloyede, Dave Spencer[1], Madhav Dhakal

Mississippi Water Resources Research Institute, Mississippi State University, Mississippi State, MS

Corn relies heavily on intensive tillage, which deteriorates soil structure and depletes soil organic carbon (SOC). Tillage significantly contributes to atmospheric greenhouse gas (GHG) concentration, especially nitrous oxide (N_2O). Management practices that protect and

enhance SOC sequestration and reduce mineralization of nutrients may mitigate GHG production. A plot-scale field experiment was initiated in 2024 to investigate the effects of tillage (no tillage-NT and conventional tillage-CT) and cover crops (CC) (winter wheat, Austrian winter pea, and no cover crop) on seasonal carbon dioxide equivalent (CO_2e) emission, yield-scaled emissions (YSE), and yield of corn. Treatments were arranged in a split-plot design with tillage as the main plot and were replicated four times. Weekly to biweekly measurements of soil N_2O, carbon dioxide (CO_2), and methane (CH_4) fluxes were taken using LICOR trace gas analyzers and smart flux chambers. Results showed Pea-CC in CT has greater above-ground biomass (AGBM) (96.76%) and N concentration (697.7%), respectively, compared to Wheat-CC in NT. N concentration in Pea-CC in CT was greater (107.7%) than Pea-CC in NT. CN ratio was 17.17% greater for Wheat-CC than Pea-CC. Seasonal N_2O emission was lower (70.2%) in NT No-CC compared to CT with Pea-CC. However, CT with Wheat-CC and NT with Pea-CC had comparable emissions with NT No-CC. CO_2e and YSE were comparable across treatments. Further, yield was similar across treatments. Overall, regenerative management practices reduce GHG without a corn yield penalty.

O1.23

2:45 Stage-Specific Cotton Yield Modeling Using UAV Multispectral Imagery and Radial Basis SVM

Jephthah Marfo[1], Shrinidhi Ambinakudige[1], Nisarga Narayana[2], Ardeshir Adeli[3], Cary McCraine[4], Raju Bheemanahalli[2]

[1]Department of Geoscience, Mississippi State University, [2]Department of Plant and Soil Sciences, Mississippi State University, [3]United States Department of Agriculture-Agricultural Research Service, [4]Geosystems Research Institute, Mississippi State University

Cotton is a globally important crop and a major raw material for the textile industry, serving as a vital economic resource for farmers. Accurate and timely yield prediction is crucial for optimizing crop management decisions, enhancing resource allocation, and improving overall profitability. This study evaluates stage-specific cotton yield modeling using unmanned aerial vehicle (UAV) multispectral imagery and a radial basis function support vector machine (SVM-RBF). Research was conducted in 2024 on experimental cotton plots at Mississippi State University in Starkville, Mississippi. UAV-based multispectral data were collected weekly throughout the growing season using a five-band sensor with Red, Green, Blue, Red-edge, and Near-Infrared (NIR) reflectance bands. Vegetation indices (VIs) derived from the imagery were analyzed to identify the most informative reproductive growth stages and spectral predictors for yield estimation. The VIs were used to train and evaluate an SVM-RBF model to assess its ability to predict final lint yield. The SVM-RBF model consistently showed high predictive accuracy, especially during the flowering and boll development phases. The lowest RMSE (115.11 kg/ha), the lowest MAE (89.28 kg/ha), and the highest R^2 (0.913) were 94 days after planting (DAP). Conversely, the poorest results were obtained at 60 DAP, with an RMSE of 229.39 kg/ha, an R^2 of 0.587, and an MAE of 173.79 kg/ha. These results highlight that the period between peak flowering and boll development is ideal for predicting cotton yield. This approach demonstrated the effectiveness of non-linear kernel-based SVM models in capturing complex relationships between spectral data and cotton yield. The findings highlight the critical growth stages and key spectral indicators that most strongly influence yield predictability, providing insights for improving remote sensing-based cotton yield forecasting and supporting data-driven agricultural management.

O1.24

3:00 Evaluation of Nitrogen Fertilizer on Nutrient Loads in Surface Runoff

Lane Galloway[1], Dave Spencer[1], Zach Reynolds[2]

[1]Mississippi Water Resources Research Institute, Mississippi State, MS [2]Chicot Irrigation, Hollandale, MS

Incorrect amounts of fertilizer applied to a field can limit crop productivity and negatively affect runoff water quality. The objective of this research is to determine the relationship between N rate and transport in runoff and examine variable-rate application of N on net returns and runoff. Water runoff N dynamics were analyzed at the Black Belt Branch Experiment Station in Brooksville, MS. Total N in runoff for both urea and urea ammonium nitrate (UAN) fertilizer increased linearly as N application rate increased. Implementation of on-farm research experiments evaluating variable-rate application of N and monitoring nutrient transport in surface runoff is ongoing. Preliminary data on grower net returns will be presented.

O1.25

3:15 Overexpression of At2GMG1 Enhances Growth and Alters Carbon Allocation by Reducing Starch Accumulation in Arabidopsis thaliana

Sharnali Das, Ling Li

Mississippi State University, Mississippi State, MS.

The nuclear gene At2GMG1 was functionally characterized in *Arabidopsis thaliana* to assess its role in growth regulation and carbon metabolism. Transgenic overexpression (OE) lines of *At2GMG1* exhibited significantly enhanced vegetative growth under standard conditions, including larger rosette size, increased shoot biomass, early flowering, and greater overall vigor compared to wild-type (WT) plants. Biochemical assays revealed a marked reduction in starch accumulation in OE lines. Starch staining confirmed the reduction in starch accumulation in leaf tissues. In contrast, total soluble

protein content was elevated in OE plants, indicating a metabolic shift from carbon storage to protein synthesis. These results suggest that *At2GMG1* acts as a positive regulator of growth and carbon and nitrogen allocation toward protein, enhancing biomass production and protein accumulation at the expense of starch reserves. This study highlights *At2GMG1* as a potential target for improving growth and metabolic efficiency in plants.

THURSDAY, March19, 2026

EVENING

Hall B

3:30 DODGEN LECTURE /AWARDS CEREMONY

THURSDAY, March19, 2026

EVENING

Hall C

5:00-7:30 Reception and General Poster Session

(Immediately following Dodgen Event)

All posters should be placed in the poster all by 12:00 pm on Thursday, March 19, 2026

Odd poster numbers will be presented from 5 -6

*Even poster numbers will be presented from 6-***7**

P1.01

Reliability and Analytical Methods: Identifying, Optimizing, and Monitoring the Production Returns of Soybeans in the United States.

Erasmus Tetteh-Bator[1], Chris Tsokos[2]

[1]Jackson State University, Jackson, MS, [2]University of South Florida, Tampa, FL

The United States relies heavily on the soybean industry to support its agricultural economy, as it is the second most valuable crop in the United States. To attract more investors and become the world's top soybean producer and exporter, it is crucial to develop reliable strategies for maximizing soybean production returns.

The study developed a real data-driven analytical model that identifies six significant individual contributable factors and five significant contributable interaction terms that accurately predict the production returns of soybeans in the United States with at least a 97% degree of accuracy.

We rank the identified significant factors (individual and interactions) based on their percentage contribution to the overall production returns of soybeans. Given information on the set of real values of the significant identified contributable factors, can we predict with at least 97% accuracy the returns of soybean production.

We utilized the desirability function approach to perform surface response optimization analysis to determine the optimal combination of the attributable factors or risk factors that maximize the desired outcome/target value of the production returns of soybeans in the United States.

P1.02

In vitro Propagation of *Stevia rebaudiansa* and Evaluation of its Antimicrobial Activity Against Plant Pathogens

Kumudini Talari, Emran Ali

Alcorn State University, Lorman, MS

Stevia *rebaudiana* Bertoni is known for producing natural sweeteners and is esteemed for its *steviol* glycosides, which provide a safe alternative to artificial sugars. Stevia's traditional propagation faces challenges due to poor seed germination and low survival rates, making efficient in vitro propagation methods essential. This research aimed to establish a dependable tissue culture protocol for Stevia *rebaudiana* and assess its antimicrobial properties against prevalent plant pathogens. Nodal segments and shoot tips were cultured on Murashige and Skoog (MS) medium supplemented with BAP (1-2 mg/L) and NAA (0.1-0.5 mg/L) under controlled conditions (25 ± 2°C, 16-hour photoperiod, and 60-70% relative humidity). Within four weeks, multiple shoots were produced, and rooting was successfully achieved on MS medium containing IBA (0.5-1.5 mg/L). The regenerated plantlets acclimatized effectively in greenhouse conditions, exhibiting high survival rates. The interaction with pathogens was evaluated by inoculating in vitro-grown plantlets with Fusarium *oxysporum* and Pseudomonas *syringae*, and disease responses such as wilting, necrosis, and enzyme activities (POD, PAL, SOD) were documented. Methanolic and aqueous extracts of Stevia leaves were tested against Xanthomonas campestris, Rhizoctonia *solani,* and Alternaria *alternata* using well diffusion and minimum inhibitory concentration (MIC) assays. The extracts demonstrated significant antimicrobial activity, suggesting the presence of bioactive compounds that inhibit pathogens. These results establish a standardized micropropagation protocol and highlight the antimicrobial potential of Stevia *rebaudiana*, thereby supporting its use in sustainable agriculture and natural plant disease management.

P1.03

The Effects of LED Light Supplementation on Growth and Photosynthetic Traits of Greenhouse Lettuce

Olugbenga Agunbiade, Timothy Ayankojo

North Mississippi Research and Extension Center, Mississippi State University, MS

In MS, the winter season reduces lettuce growth by up to 30% due to shorter daylight and occasional snow events. Artificial lighting, especially LEDs, can supplement

natural light in greenhouses, offering advantages such as adjustable light quality and photoperiod control. However, growers face challenges in optimizing LED light spectra and duration for lettuce growth and yield during winter. Thus, this study investigated how LED spectral composition and application timing (day or night) affect lettuce growth and quality in North Mississippi. We hypothesized that LED light supplementation, especially at higher red light, will enhance greenhouse lettuce growth and harvest quality. The experiment was initiated in November 2025 at a greenhouse (equipped with a nutrient film technique (NFT) hydroponic system and LED lighting) at the North Mississippi Research and Extension Center in Verona, MS. In this study, light quality and timing of application were evaluated using different LED spectral compositions (red-blue ratio at 0.5, 1.0, 1.5, 2.0, and NOLIGHT) in lettuce cultivars (Ruby and Green Forest). The time of application for each spectral composition was defined as either daytime supplement (from 6 am to 6 pm) or nighttime supplement (from 6 pm to 6 am). The study was arranged in a split-plot design with light quality as the main factor and time of application as the secondary factor. All treatments were replicated 4 times for both daytime and nighttime applications. Preliminary results show that all light supplements increase SPAD compared to NL. Green Forest consistently had higher chlorophyll content than Ruby across all treatments at two weeks after transplanting. Among the light supplements used, NIGHT_RB_2.0 (mean value of 50.31) had the highest chlorophyll content, followed by NIGHT_RB_1.0 (mean value of 48.23), while NOLIGHT (mean value of 33.39) had the lowest SPAD. This study shows that light supplementation with a higher red-blue ratio, especially at night, could boost chlorophyll content and enhance greenhouse lettuce growth in winter.

P1.04

Harnessing the Effectiveness of Biostimulants to Alleviate Reproductive Stage Heat Stress in Soybeans

Vijaykumar Hosahalli[1], Bala Subramanyam Sivarathri[1], Corey Bryant[2], Prakash Jha[1], Raja Reddy[1], Raju Bheemanahalli[1]

[1]Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS, [2]Delta Research and Extension Center, Mississippi State University, Mississippi State, MS

The exposure of soybean plants to heat stress significantly compromises crop yields, particularly during the reproductive stages. Plant biostimulants have gained prominence in recent years for their role in mitigating the negative effects of abiotic stresses such as heat stress. However, selecting the most effective biostimulants to alleviate heat stress remains a challenge, given the diverse array of available products. A comprehensive field study was undertaken to assess the efficacy of various commercial biostimulants on heat stress tolerance in soybeans during the reproductive stages (R1-R8). Thirteen biostimulant treatments, including untreated and treated check, were applied individually or combined with a polymer as per the manufacturer's recommendations. Plants grown under optimal conditions were subjected to heat stress during the R1-R8 stage in field conditions using a custom-built movable tunnel to measure the biostimulants-induced differential physiological and yield responses. Heat-stressed plants exhibited significantly higher stomatal conductance and transpiration under heat stress than the control in both years. In contrast, the chlorophyll index decreased. On average, seed yield decreased by 8% in 2023 and 25% in 2024 under heat stress compared to control. Initial findings suggest biostimulants may play a minor role in alleviating stress during the reproductive and grain-filling stages by modifying physiological traits. Overall, the negative impact of heat stress was more significant than the alleviating influence of biostimulants. Further research is needed to determine the cultivar-specific optimal concentrations of biostimulants for enhancing soybean stress tolerance.

P1.05

Towards Sustainability: Investigating Insect Frass Potential as a Biofertilizer through Soil Microbial Dynamics

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An increasing global food demand, and the need for sustainable agricultural practices, has led to shift towards using insects as feed and food. Insect frass, a by-product of insect rearing industry. Insect frass, as an organic carbon source with its associated rich microbial composition, can serve as effective biofertilizers to improve soil health and promote beneficial plant-microbe interactions, thereby increasing plant growth. This study characterized insect frass associated microbiome, using amplicon sequencing by targeting 16S-V4 (bacterial) and ITS2 (fungal) region. Further, this study investigates the effect of different types of insect frass on soil characteristics and the microbial community changes in potted soil amended with insect frass used to grow corn plants. Four different insect frass types (variants of the Black Soldier Fly and Cricket) were applied at varying rates (56-280 kg Nha^{-1}) in a potted experiment, where untreated soil and mineral fertilizer

served as two controls. Various plant growth parameters were measured, and data was subjected to analyses of variance (ANOVA) at α = 0.05 using RStudio. Results showed, among insect spp., soil amended with Cricket frass exhibited the highest microbial α diversity which differed significantly with varied diet sources. Additionally, the most abundant bacterial phylum was 'Firmicutes' particularly in Black soldier fly frass. Plants treated with insect frass showed enhanced nutrient uptake, notably nitrogen. Additionally, soil amended with insect frass showed lower soil C/N indicating increased mineralization. The study concludes that insect frass shows promise as a soil amendment, effectively supplying plant nutrients. However, future research should be done to standardize application rate to prevent microbial shifts and nutrient imbalances.

P1.06

Evaluation of Co-application of Biochar and Cow Manure Compost for Improving the Soil Health of a Poor Alfisol.

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A major restriction facing crop cultivation in the southeastern part of United States is soil degradation. Soil degradation occurs when soil health and fertility decrease, accelerated by anthropogenic activities, such as excessive use of synthetic fertilizers, which leads to chemical and biological changes in the soil. The purpose of this research is to investigate the effects of cow manure compost-biochar mixture (CMBC) on physical, biological, and chemical soil health indices, and agronomic performance of okra (*Abelmoscus esculentus*)in an Alfisol in Mississippi. A randomized complete block design with three replications was established. The treatments include control, cow manure compost, cow manure compost mixture with biochar, and NPK fertilizer. Soil samples were collected from 0-10 and 10-20 cm depth. Physical soil health indicators (bulk density, aggregate stability, water infiltration rate), chemical (pH, electrical conductivity, soil organic matter), and biological(microbial biomass carbon, enzyme activities, potentially mineralizable nitrogen, soil respiration, earthworm population)were measured. Preliminary results indicate improvement in selected soil health indicators. The results could be useful for farmers considering approaches to rebuild soil organic matter on their land.

P1.07

282 - Can Deep Geospatial Embeddings be used for High-Resolution Soil Organic Carbon Retrieval in Agricultural Fields?

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As a primary component of soil quality and a significant reservoir for global carbon, spatial monitoring of Soil Organic Carbon (SOC) is critical. Operational SOC monitoring is often hindered by the cost and spatial limitations of ground-based sampling. This study evaluates a novel approach, utilizing Deep Geospatial Embeddings (GE) which is a pre-learned, compact feature space to efficiently model SOC concentration, thereby offering a highly scalable solution. Ninety-three topsoil samples (0-20 cm depth) were collected in an agricultural research plot in Mississippi and have been lab-analyzed for SOC concentration. For each precise sample location, a 64-dimensional GE Vector (derived from a state-of-the-art foundation model) was extracted, summarizing multi-sensor, multi-temporal conditions at high resolution. Machine learning regression models will be trained on these samples using the GE features as predictors. To ensure the final model is both efficient and robust, optimization techniques will be employed to identify the most predictive and parsimonious subset of features. This work will demonstrate that GEs offer an efficient, highly predictive, and interpretable pathway for operational, high-resolution SOC monitoring in precision agriculture and carbon accounting initiatives.

P1.08

Advancing Agricultural Land-Use Mapping in the Mississippi Delta Through EnMAP Hyperspectral Imagery and SAM Segmentation

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Accurate and up-to-date agricultural land classification is essential for monitoring crop dynamics and supporting sustainable land management in the Mississippi Delta, one of the most productive agricultural regions in the United States. Conventional classification approaches often struggle to capture the fine-scale spectral variability of heterogeneous croplands. This study develops an advanced hyperspectral-driven workflow using EnMAP imagery integrated with the Segment Anything Model (SAM) to improve agricultural land delineation across the Delta region of Mississippi. EnMAP's high spectral resolution enables discrimination of subtle crop and soil features, while SAM provides flexible, prompt-based segmentation that adapts to complex field boundaries and mixed land-use patterns. The workflow includes preprocessing of EnMAP data, segmentation of agricultural parcels using SAM, and supervised classification of crop types using machine-learning algorithms. Results demonstrate that the EnMAP-SAM approach enhances boundary precision, reduces

classification confusion among spectrally similar crops, and provides a scalable method for hyperspectral agricultural monitoring. The proposed framework highlights the potential of combining next-generation hyperspectral missions with foundation-model segmentation tools to advance agricultural land-use mapping and support data-driven decision-making in dynamic agroecosystems such as the Mississippi Delta.

P1.09

Developing a Model to Estimate Evapotranspiration and Greenhouse Gas Fluxes in Rice Using Machine Learning and Remote Sensing

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Measurement of evapotranspiration (ET) and greenhouse gas (GHG) fluxes from irrigated rice systems is critical in understanding the ecological footprint of rice production. However, direct measurements of ET and GHG fluxes can be time-consuming, labor-intensive, and expensive. Remote sensing (RS) offers an alternative to measuring ET and GHG fluxes. Field trials were conducted from April to September 2025 at farmers' fields in the Mississippi Delta to estimate ET and GHG (CH_4 and CO_2) fluxes from two irrigation systems in rice - continuous flooding versus recirculating row rice (furrow irrigation with end-blocked automated tailwater recirculation system). Treatments were replicated three times in a randomized complete block design. An eddy covariance (EC) system was installed in each treatment plot to measure fluxes throughout the rice growing season. Spectral data will be collected from Landsat 8, MODIS, and Sentinel (i) to optimize existing models to predict ET and CH_4 and CO_2 fluxes from the rice canopy; (ii) develop a model to predict these variables by using machine learning methods to analyze the remotely sensed data and ground reference data from EC systems. The developed model will be used to map ET and GHG emissions on a regional scale. This study aims to demonstrate reduced methane emissions in rice production as influenced by tailwater recirculation, and to develop strategies for quantifying and monitoring the ecological footprint of rice production under different irrigation systems in the humid region.

P1.10

Electrochemical Biosensors for Next-Generation Food Packaging and Food Safety Monitoring

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Electrochemical biosensors in food packaging are gaining significant interest in rapidly enhancing food safety worldwide. Their integration into food packaging can monitor and sense early signs of food spoilage or freshness. This study aims to develop a next-generation biochar-based electrochemical immunosensors immobilized with *biotin labeled anti-E. coli polyclonal antibodies* (pAbs) to detect foodborne pathogen cells, *E. coli* O157:H7, in packaged foods. Biochar is a cost-effective, highly porous, carbon-based renewable material with a functionalized surface, which can be used in electrochemical immunosensors to provide better electrode coating and sensor's interface. The measurements for each step of the immunosensor development process were performed within 30 min using linear sweep voltammetry and chemical impedance analyzer. The biochar coated electrode decreased the impedance of the immunosensor down to 3.4 kΩ when compared to a bare electrode. The application of the linker to the biochar and the immobilization of the anti-*E. coli* pAbs onto the linker increased resistance difference of the immunosensor from 0.1 to 0.44. The binding of anti-*E. coli* pAbs with *E. coli* O157:H7 resulted in a significant increase in the impedance from 5.2 to 8.5 kΩ. The microstructure of the biochar on the electrode and the successful binding of *E. coli* cells onto biochar was confirmed using scanning electron microscopy. This research suggests that a novel biochar-based immunosensor could be developed for improved sensor properties with high sensitivity and selectivity to detect foodborne pathogens in food packaging.

P1.11

Impact of Drought Stress on Rice During Vegetative Growth

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Water deficit conditions are affecting plant growth and development, leading to reduced rice productivity. However, improving rice productivity requires time to sustain food security under an ever-increasing world population. Therefore, this study characterized 20 genotypes for traits associated with drought tolerance during the vegetative stage under 100% irrigation (control) and 40% irrigation (drought). Drought stress imposes alterations in crucial growth and morpho-physiological processes, including germination, plant height, number of tillers, leaf area expansion, dry matter accumulation, and distribution. Results showed that drought stress had severe effects on plant growth and morphophysiological traits compared with the control condition. The drought stress significantly reduced leaf area, electron transport rate, plant height, and photosystem II efficiency, while leaf

temperature remained consistently higher under stress. Pigment traits, however, did not differ significantly between treatments. Quantifying drought stress effects on plant traits and physiological changes can aid in selecting and breeding drought-tolerant genotypes.

P1.12

Early-Season Waterlogging Tolerance of High-Yielding Corn Hybrids

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Waterlogging has become one of the major abiotic stressors causing significant production losses. It severely disrupts morphological and physiological processes, leading to decreased nutrient uptake, limited vegetative growth, and lower yields. Identifying tolerant corn hybrids is essential for sustainable agriculture under unpredictable production conditions. We hypothesized that some high-yielding corn hybrids might possess innate tolerance to waterlogging (WL), enabling them to survive under suboptimal conditions. To test this, we evaluated 22 corn hybrids under control and WL conditions to analyze variations in physiological, pigmentation, and morphological traits. Combining different plant response measurements helped distinguish tolerant hybrids from susceptible ones under WL conditions. A short period of WL exposure caused a substantial reduction in plant height (36%) and leaf area (67%). Additionally, WL conditions resulted in significant decreases in shoot biomass (42%) and root biomass (42%), with root mass being more affected, decreasing by 14% more than shoot biomass. The chlorophyll index decreased by 42%, whereas flavonoid content increased in several genotypes. This suggests that corn with higher chlorophyll levels may have greater growth potential. However, a weak correlation was observed between treatments for the same traits, emphasizing the importance of carefully selecting genotypes that combine high growth rates with WL tolerance. Preliminary multi-trait stress tolerance index analysis helped identify tolerant hybrids among susceptible ones.

P1.13

Exploring Pollen Pistil Interactions Under Drought in Cotton

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The reproductive stage in cotton (*Gossypium* spp.) is highly sensitive to drought. However, the roles of drought-stressed pollen and pistils in fertilization and post-zygotic development remain largely unresolved. In this study, reciprocal crosses were made using a combination of pollen and pistil under control (C) and drought (D) conditions during sporogenesis through gametogenesis: D♀×D♂ (C1), D♀×C♂ (C2), C♀×D♂ (C3), and C♀×C♂ (C4). Results showed the highest boll retention rate in C4 (62%), followed by C3 (56%), C2 (48%), and C1 (42%), indicating that the pollen-pistil interaction is key for successful fertilization. Low germination rates of stressed pollen did not translate into fewer seeds, indicating a higher sensitivity of pistils to drought than pollen. In contrast, yield traits, including seed yield, lint yield, seed index, and lint index, were categorized by maternal growing environment. Crosses with D♀ were similar to each other and inferior to those with C♀. Drought-stressed maternal plants showed reduced chlorophyll and impaired physiology (low stomatal conductance, transpiration, and electron transport rates), compared with control plants. The results were consistent across cultivars, with no significant interaction. Our initial results reveal that drought-induced pistils affect the post-zygotic traits, such as the development of healthy embryos, seeds, and fibers. In contrast, paternal stress might be primarily crucial in determining boll retention rates without significantly altering seed or fiber traits in developing bolls. Overall, the results suggest that breeding strategies aimed at improving pistil tolerance, coupled with high boll retention, can enhance yield and quality under drought conditions.

P1.14

Can Seed Priming Improve Drought Stress Tolerance in Soybean?

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Rainfall variability across the season has a significant impact on soybean growth, development, physiology, and yield. Incorporating biostimulants into agronomic management strategies could provide avenues for improving plant tolerance to abiotic stressors. The right product with the right application method, such as seed priming, further enhances metabolic activities and improves seedling establishment and early vigor. The primary objective of this study was to investigate the impact of seed priming with biostimulants on reducing drought stress during the vegetative stage. Seeds were primed with ten commercial biostimulants and exposed to two moisture conditions: a control (CNT, 100% irrigation) and drought stress (DS, 50% irrigation) at the V4 stage for 14 days. Short-term physiological effects included reduced stomatal conductance (68%) and transpiration (28%). While morphological traits showed a substantial reduction in plant height (20%), leaf area (46%), shoot and root biomass by 37% and 25% respectively. Furthermore,

stressed plants prioritized root growth over shoot growth, as indicated by an 18% increase in the root-to-shoot ratio. Later, a subset of plants subjected to drought stress was then reverted to control conditions until harvest. Similar traits were quantified after 14 days of recovery, and, conversely, the physiological and morphological traits showed recovery. In contrast, plants favored shoot growth, as demonstrated by a 15% decrease in the root-to-shoot ratio. Seed number (23%) and seed weight (16%) showed an increase in recovered plants compared to the control. In conclusion, seed priming with biostimulants is a proven agronomic method for enhancing drought tolerance and promoting physiological recovery, ultimately leading to higher soybean yields.

P1.15

Seed Priming with Acetic Acid Improves Vegetative Growth and Grain Yield of Soybean Grown on Non-irrigated Sites

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Drought is a major environmental factor limiting crop productivity. Soybeans are Mississippi's top row crop in terms of planted acreage and farm gate value. Over 50 percent of Mississippi soybeans are grown on non-irrigated sites. These soybean plants are more susceptible to yield loss from drought. The Intergovernmental Panel on Climate Change predicts that drought will increase in intensity and frequency in the United States, especially in Southern states. Therefore, there is a great need to develop production systems to maintain consistent yields of soybeans grown on nonirrigated sites across years. Acetic acid application has recently been reported to increase water use efficiency and improve drought tolerance in several crops. These resent reports of acetic acid-enhanced drought tolerance across a range of plant species encourage consideration of this low-cost organic acid as a biostimulant. Seed priming involves prior exposure to chemical agents which brings a cellular state that hinders the harmful effects of abiotic stress, and plants raised after priming are more tolerant of abiotic stress. In this study, we evaluated the effects of seed priming with acetic acid on vegetative growth and grain yield of two soybean varieties grown on nonirrigated sites. To evaluate the effects of seed priming with acetic acid on vegetative growth of soybeans grown on nonirrigated sites, growth parameters such as plant height and shoot fresh weight were measured. Plant height and shoot fresh weight were higher in plants grown from seeds primed with acetic acid solutions than those grown from unprimed seeds. Furthermore, priming soybean seeds with acetic acid significantly increased grain yield compared with non-primed seeds grown on nonirrigated sites.These results indicate that seed priming with acetic acid enhances vegetative growth and grain yield of soybeans grown on nonirrigated sites.

P1.16

Genetic Variability of Root and Shoot Traits in Cowpea Germplasm

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With the growing interest in plant-based protein sources, the demand for cowpea (*Vigna unguiculata* [L.] Walp.) is expected to rise. Consequently, enhancing cowpea yield potential is essential to meet future food and nutritional demands. Nevertheless, yields are frequently constrained by unfavorable environmental stressors during the growing season. Roots are the key interface with the soil, driving plant adaptation and resource acquisition. Genotypes possessing deep and proliferative roots are better equipped to extract water and nutrients for sustained productivity. Characterizing the variability in root traits of cowpea germplasm will help identify genotypes with suitable root traits for efficient resource utilization under different environmental stressors. In this study, a cowpea diversity panel (n = 200) was phenotyped for the variability of shoot and root traits using custom-designed root beds. This panel has four types of leaf shape, with 44% of them being sub-globose. Measurements were taken at the blooming stage (35 days after sowing), revealing significant variations in leaf gas exchange parameters and pigments. Above-ground biomass ranged from 1.2 g to 21 g with an average of 10.2 g, while root biomass varied from 0.12 g to 3.16 g, averaging 0.60 g. Compared to plant height, which explained 12% of the variation in biomass ($R^2 = 0.12$), root weight explained 48% of the variation ($R^2 = 0.48$), showing that root traits can be a key focus for improving biomass in cowpea. These findings highlight the potential of integrating root-related traits into breeding programs aimed at enhancing cowpea growth and yield under varying environmental conditions. Further investigation is underway to identify the markers and genetic loci associated with superior root traits.

P1.17

Enhancing Early Soybean Growth Under Salt Stress Using Biostimulants

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Soil salinity is an increasing global threat to crop production, impairing plant growth through osmotic imbalance and ion toxicity. Soybean (*Glycine max*), moderately sensitive to salt, shows considerable variation in tolerance among genotypes. Biological products have emerged as potential tools to enhance early-stage stress resilience, particularly when applied as a priming solution or seed coating. This study investigated whether

biostimulant based seed priming enhances soybean performance under salt stress (NaCl, 6 dS/m) during germination assays and seedling establishment. Salt stress significantly reduced radicle dry weight, but final germination percentage remained unaffected. However, primed seeds germinated faster under salinity, indicating that priming mainly enhances germination speed rather than overall early growth performance. Salt stress reduced the accumulation of photosynthetic pigments, but BioHold-primed seeds maintained chlorophyll levels, indicating improved pigment stability. In the early stages of growth, salinity caused significant reductions in stomatal conductance, leaf area, and shoot biomass. However, certain priming treatments maintained leaf area and shoot biomass at levels comparable to those of the control, indicating an enhancement of salt tolerance. Despite improvements in aboveground growth, salt stress severely reduced root length, root surface area, and root biomass in both primed and unprimed plants, suggesting a limited effect of biostimulants on salt-induced inhibition of root growth. Overall, biostimulants can accelerate germination and improve germination and shoot traits under salinity, but their capacity to alleviate salt-induced root growth suppression remains limited. However, increasing biostimulant concentration and optimizing formulation may enhance their overall effectiveness in improving salinity tolerance.

P1.18

Mapping Genomic Regions Associated with Heat Tolerance in Rice

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Understanding the impact of heat stress on rice is crucial, as rising global temperatures threaten rice yields and grain quality, posing a significant challenge to food security. While rice tolerates heat stress during the vegetative stage, it has a severe impact on yield and quality during the reproductive stage. In this study, 300 accessions from Rice Diversity Panel 1 were phenotyped for pigment and yield potential under daytime temperatures of 32 °C (control) and 38 °C (heat) during flowering. Pigment was collected at the milk stage (14 days after stress) and the dough stage (28 days after stress), with significant variation. Specifically, chlorophyll was reduced by 12% and 23% under heat stress compared to the control, respectively. Panicle weight decreased by 5% following heat exposure. A genome-wide association analysis was conducted using 700,000 SNPs to identify genomic regions contributing to heat tolerance. We identified three significant SNPs: SNP-1:38516210 and SNP-1:38537794 linked to plant height, and SNP-6:1552803 associated with shoot biomass. Furthermore, haplotype mining is being conducted to identify superior alleles associated with heat tolerance, which can be used for marker-assisted breeding.

P1.19

Optimization of Hydroponic Systems for Leaf Vegetable Production for Small-Scale Growers

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Hydroponics, a soilless plant cultivation method utilizing nutrient-rich water, offers a sustainable alternative to traditional farming by allowing precise nutrient and water management to enhance crop growth and quality. As demand for fresh vegetables rises and arable land decreases, vertical hydroponic systems are emerging as efficient solutions for urban agriculture. This study evaluated two systems for leafy vegetable production: the Nutrient Film Technique (NFT) and a Tower (Aeroponic) system. Both methods were tested under controlled environmental conditions without growth stimulants to compare yield, water-use efficiency, and seasonal adaptability. The investigation also examined the effects of different nutrient flow rates on plant growth. Preliminary results showed that the Aeroponic (Tower) system demonstrated significantly higher productivity, achieving yields three times greater per cultivation area than the NFT system. This advantage was attributed to enhanced spatial utilization and the precise delivery of nutrients through mist. Furthermore, the Aeroponic system produced greater fresh and dry mass in both shoots and roots across the different flow rates tested. In contrast, the NFT system resulted in more uniform plants and consistent root development. The results indicated that the interaction between flow rate and plant age was an important factor, as root lengths varied between systems at different flow rates.

P1.20

Genetic Basis of CO_2 Responsiveness in Rice for Climate-Smart Breeding

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Rice (*Oryza sativa* L.) is a staple food for over 3.5 billion people worldwide. As a C3 crop, its growth and yield are significantly influenced by a changing environment, including increased carbon dioxide (CO_2) levels. Screening and identifying genotypes that respond positively to rising CO_2 levels ensure better yields. This study evaluated 192 diversity panel of rice *japonica* under ambient CO_2 (aCO_2; 425 ppm) and elevated CO_2 (eCO_2; 725 ppm) conditions using sunlit plant growth chambers (SPAR) with optimal water and nutrient supply. Morpho-physiological traits

were measured 60 days after sowing. Significant reductions in stomatal conductivity (36%), electron transport rate (34%), chlorophyll content (44%), and nitrogen balance index (33%) were observed compared to the control. There was considerable variation in leaf area among genotypes at aCO_2, ranging from 61 to 713 cm^2; at eCO_2, this range was from 60 to 712 cm^2. Under eCO_2, INIA09 demonstrated the highest growth (5.04) and physiological vigor index (10.2), while RU1703132 had the lowest performance (2.9 and 5.8), respectively. INIA09 showed the strongest response to CO_2 (CO_2 response index of 1.29), whereas RU1703110 had the weakest response (CO_2 response index of 0.74). These data are being subjected to GWAS to identify putative genes and promising genotypes that can serve as valuable resources for breeding rice for future environments.

P1.21

Evaluating Protected Fertility Management for Mitigating Greenhouse Gas Emissions from Southern Corn Production

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Corn relies extensively on nitrogenous (N) fertilizers, which significantly contribute to the atmospheric nitrous oxide (N_2O) level. Management practices that enhance the nitrogen uptake and reduce its mineralization can reduce N_2O effluxes. Field experiments were initiated in May 2024 to evaluate two N application levels (Low: 246 kg N ha^{-1} and High: 297kg N ha^{-1} as Urea and Urea Ammonium Sulfate), N-stabilizer (No-stabilizer and 0.75 g ai N-(n-butyl)-thiophophoric triamide (NBPT) kg^{-1} Urea), fertilizer placement depths (0 and 10 cm), and post-fertilization management (closing trench with packer wheel and leaving open) on total seasonal carbon-dioxide equivalent (CO_2e) emission (including N_2O and CO_2), yield, and yield-scaled emission (YSE) in corn (*Zea mays*). Treatments were arranged in a randomized complete block design with four replications. Weekly to biweekly measurements of soil N_2O and CO_2 fluxes were taken using trace gas analyzers and static flux chambers. In 2024, results showed that the high N rate increased seasonal CO_2 production by 12.89% to the low rate. At the low N rate, CO_2e and YSE were reduced by 11.79% and 12.22%, respectively, compared to the high N rate. In the second year, the treatment's effect was comparable. Although the use of inhibitors showed increased seasonal N_2O emission in the second year, overall emissions were similar among treatments. Further, yield was comparable across all treatments. Results suggest that fertility management strategies suited to improve N use can reduce N_2O emissions and the overall GHG footprint of corn production, accounting for seasonal climatic variability.

P1.22

Optimizing Harvest Time of Microgreens Through Metabolomic Profiling: A Species-Specific Approach to Enhancing Nutritional Value

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Microgreens, young shoots of vegetables, grains, and herbs harvested early in growth, emerged in high-end cuisine in the 1980s and are increasingly recognized for their nutritional potential. Despite their popularity, the influence of harvest timing on final nutrient content remains barely understood. It represents a knowledge gap for producers and consumers seeking to maximize microgreens' nutritional health benefits. This study employs both untargeted and targeted liquid chromatography-mass spectrometry (LC-MSn)- based metabolomics to characterize species-specific variations in nutrient composition across different growth stages. Preliminary experiments were conducted on shiso (Perilla frutescens) and chives (Allium schoenoprasum) to establish reproducible growth, sampling, and extraction protocols. Metabolomic profiling identified 17,424 features, including 1,063 compounds with assigned molecular formulas, and 222 confidently annotated metabolites using the mzCloud database. Principal Component Analysis revealed a clear, statistically significant separation between the metabolomes of the two species. Differential abundance analysis detected 445 compounds that varied between species, highlighting pathways associated with flavonoid biosynthesis (e.g., flavanones), fatty acid metabolism (e.g., α-linolenic acid), phenylpropanoid biosynthesis (e.g., catechin), phyto-sterol synthesis (e.g., beta-sitosterol), and others that are linked to several health-promoting effects.

These results demonstrate the feasibility of LC-MS-based metabolomics for evaluating nutrient variability in microgreens, and they provide insight into species-specific biochemical differences. The data also establishes methodological foundations for larger studies comparing different species across multiple harvest time points. This research will potentially generate data-driven recommendations for producers to optimize harvest timing and enhance the nutritional quality of microgreens, contributing to broader efforts to improve population health via offering specialty crops as a functional, health-promoting food.

P1.23

Dietary L-arginine Supplementation Modulates the Biochemical Fingerprint of Porcine Seminal Plasma as Revealed by Near-Infrared Spectroscopy

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Dietary supplementation with L-arginine, a semi-essential amino acid, has been shown to enhance reproductive performance in pigs in terms of increasing semen quality, and libido. Moreover, L-arginine supplementation has been associated with proteomic changes in porcine seminal plasma (SP), a key modulator of sperm function and fertility. However, the overall impact of L-arginine on SP composition remains poorly characterized. Therefore, this study aimed to assess the effect of dietary L-arginine supplementation on porcine SP composition using near-infrared spectroscopy (NIRS) as a non-invasive, non-destructive, and integrative analytical approach. Ten sexually mature boars were randomly assigned to two experimental groups (n = 5 per group): a control group (Ctrl) fed a basal diet (0.77% L-arginine) and a treatment group (ARG) receiving an L-arginine-supplemented diet (1.77% L-arginine). The 13-week trial comprised three phases: a 2-week baseline phase (all animals on the basal diet), a 6-week treatment phase (ARG, supplemented diet; Ctrl, basal diet), and a 5-week clearance phase (both groups returned to the basal diet). Ejaculates were collected weekly and SP isolated by sequential centrifugation. NIRS transmittance spectra of SP samples were acquired using a portable FieldSpec 3+ IndicoPro spectrometer (ASD/Malvern Panalytical, Boulder, CO, USA) in the 350-2,500 nm range (1 nm interval, six replicates per sample) and the analyses focused on the 1,300-1,830 nm spectral region, which captures the first overtones of O-H and C-H stretching vibrations, associated with water, proteins, and lipids. PCA and ASCA were conducted to explore underlying trends in the spectra related to experimental groups and to quantify systematic effects associated with the studied factors, respectively. Spectral analysis revealed subtle but significant treatment-related differences (P = 0.008). Moreover, phase- and time-dependent effects suggested that L-arginine supplementation induced biochemical alterations in SP that evolved over time and persisted beyond the treatment phase. SCA modelling indicated that L-arginine supplementation affected both water-associated O-H and C-H vibrational overtones, suggesting modifications in SP hydration dynamics and organic composition, respectively. Taken together, these findings provide novel evidence that dietary L-arginine supplementation modulates the molecular composition of porcine SP. Future metabolomic analysis will help elucidate specific molecular changes and the underlying biochemical pathways involved.

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P1.24

Microbial Signatures in Boar Seminal Plasma Associated with Variations in Sperm Quality

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High-quality semen plays a crucial role in boar reproductive efficiency by enhancing conception and fertility rates, which in turn improves pig production. Semen contains a unique microbiota that can influence reproductive outcomes. However, the impact of bacteria on semen quality and the overall microbiome of boar seminal plasma remains poorly understood. The objective of this study was to investigate the microbial composition of boar seminal plasma (SP) and its association with sperm quality. A total of 45 semen ejaculates were collected from individual, sexually mature Duroc boars at a commercial boar stud (Prestage Farms, West Point, MS). Semen samples were analyzed using computer-assisted sperm analysis (CASA) and classified into two groups based on semen quality: Passed (n = 10) and Failed (n = 10). The samples were centrifuged to isolate seminal plasma (SP) then subjected to 16S rRNA gene sequencing and bioinformatic analyses. The most abundant phyla identified were Firmicutes (45.2% vs. 33.2%), Bacteroidetes (37.6% vs. 33.7%), Proteobacteria (17% vs. 12.1%), and Actinobacteria (8.9% vs. 5.1%) between Passed and Failed SP samples, respectively. Notably, Porphyromonas and Bacteroides were the most abundant genera. No significant differences were observed in alpha diversity indices (Chao1 and Simpson: $P > 0.05$), except for Shannon ($P = 0.038$). Similarly, beta diversity analysis based on Bray Curtis showed no significant differences ($P = 0.736$). Correlation analysis revealed a negative correlation between the bacterial phylum Euryarchaeota and sperm concentration ($r = -0.86$; $P < 0.042$). Furthermore, linear discriminant analysis (LDA) effect size (LEfSe) identified 20 biomarkers, including 7 associated with the Passed group and 13 with the Failed group. In the Passed group, the families Sphingomonadaceae and Nocardiaceae, and the genera Rhodococcus, Streptococcus, and Sphingomonas were significantly enriched ($P < 0.05$). In contrast, the Failed

group showed increased abundance of Tenericutes (phylum), Clostridia and Mollicutes (classes), Clostridiales and Bacteroidales (orders), and Streptococcus, Lactobacillus, and Empedobacter (genera). The higher abundance of these bacterial phyla and genera in the Failed semen samples suggests a dysbiosis, indicating a shift away from a healthy semen microbial community. In conclusion, boar seminal plasma harbors a distinct microbiome that is associated with impaired sperm quality. However, the microbiome in boar semen is complex, and further research is necessary to confirm and expand upon these findings to improve boar reproductive efficiency.

P1.25

Resilience of Finger Millet to Drought During the Reproductive Stage

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Drought during the reproductive stage significantly limits finger millet productivity, making both stress response and post-stress recovery crucial targets for improvement. In this study, twelve genotypes were evaluated under control (CNT) and drought stress (DS) conditions at the flowering stage across two environments, followed by a 14-day recovery period. A comprehensive set of physiological, gas-exchange, and spectral traits was measured, and percentage reductions were calculated. Analysis of variations revealed significant effects ($p \leq 0.05$) of genotype × treatment interactions for most traits, highlighting the genetic variability in drought adaptation. Drought stress caused declines in key gas exchange and pigment traits, including chlorophyll (12%), photosynthesis (6.4%), electron transport rate (5.9%), canopy temperature (5.2%), NDVI (4.6%), and nitrogen balance index (16%), confirming substantial physiological impairment. In contrast, stress-responsive antioxidants, such as flavonoids, increased by 9%, and TCARI increased by 12%, indicating the activation of photoprotective pathways. Upon rewatering, several traits showed strong recovery, including flavonoids (12.7%), stomatal conductance (19.1%), and TCARI (28.85%). In contrast, ETR, photosynthesis, and NDVI demonstrated only modest recovery. Correlation analysis indicated a stronger negative association ($r=-0.63$; $p < 0.05$) between pigments and canopy temperature under drought stress, while recovery conditions showed a positive correlation ($r=0.88$; $p < 0.05$) between NBI and chlorophyll. Additionally, a negative correlation was observed between stomatal conductance and canopy temperature, demonstrating the recovery potential of finger millet plants after 14 days of rewatering. Overall, the information generated from this study will support future breeding efforts for finger millet suited to water-limited environments.

P1.26

Warmer Nights and Water Limitation Impair Predawn Physiological Responses in Soybean

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Nighttime temperatures, in particular, have increased across the southern United States. Soybean reproductive stages are experiencing the most pronounced nighttime warming compared to other growth stages. Predawn stomatal regulation plays a critical role in photosynthesis by mitigating diffusional limitations to CO_2 uptake. This study aimed to investigate stomatal regulation and assimilate utilization in soybeans under warmer night conditions with and without drought conditions. Six soybean genotypes with contrasting responses to high night temperature (HNT) were subjected to four treatments: (i) control (CNT: 22 °C nighttime temperature + 100% irrigation), (ii) drought stress (DS: 22 °C + 50% irrigation), (iii) HNT (28 °C + 100% irrigation), and (iv) combined stress (HNT+DS: 28 °C + 50% irrigation). After 14 days of stress exposure, photosynthetic rate decreased by 22%, 71%, and 73% under HNT, DS, and HNT+DS treatments, respectively. Warmer nights significantly impaired predawn physiology, with >40% reductions in stomatal conductance (gs_{pre}) and transpiration rate (E_{pre}). The greatest reductions were observed under HNT+DS (79% in gs_{pre}; 73% in E_{pre}), leading to a 67% increase in intercellular CO_2 concentration (Ci_{pre}). While HNT alone increased predawn respiration (Rd_{pre}) by 41%, the addition of drought suppressed Rd_{pre} to one-third of the HNT level. Significant genotypic variation was observed in predawn physiological traits. These findings underscore the urgent need to develop genotypes resilient to warmer nights in rain-fed environments for sustaining soybean yields.

P1.27

Pima and Upland Cotton Physiological and Growth Responses to Salinity Stress

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Soil salinity poses significant threat to agriculture due to its adverse effects on plant growth, yield, and ecosystem stability. In this study, two cotton species, *Gossypium hirsutum* (Upland) and *G. barbadense* (Pima), were grown under sunlit controlled environmental conditions and exposed to salt concentration ranging from 0 to 12 dS m^{-1}, with increments of 3 dS m^{-1} from three-leaf stage to boll development stage. Physiological and growth measurements showed significant differences between species and salt concentrations. Stomatal conductance

decreased by 64% in Pima and 81% in Upland cotton, leading to 43% and 63% reduction in transpiration rates, respectively. The weekly growth and development traits of plants, measured by plant height and the number of nodes, showed varied response to salt concentration. The average daily growth rate of plant height under 0 dS was 2.27 cm in Pima and 3.03 cm in upland. While it gradually decreased with an increase in salt concentrations, reaching only 1.11 and 1.22 cm, respectively, under 12 dS. A similar response was observed for the node addition rate in Pima and Upland cotton, with 0.29 and 0.31 nodes day^{-1} under 0 dS, respectively, but this decreased to 0.177 and 0.21 nodes day^{-1} under 12 dS in Pima and Upland cotton, respectively. These differences in plant growth resulted in a significant reduction in total biomass accumulation, with about 59 to 60 % reductions under 12 dS compared to 0 dS in Pima and Upland cotton. The relationships between various plant traits and salt concentrations and algorithms may enhance the functionality of cotton simulation models for field applications. The proteomic analysis revealed downregulation of major biological processes related to photosynthesis and cell homeostasis. The proteins linked to protein folding and oxidative stress response were significantly downregulated in both species, indicating severe challenges with protein misfolding and oxidative damage.

P1.28

Cover Crop Species Composition Shapes Rhizosphere Microbial Communities and Soil Carbon Dynamics

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Row crops in Mississippi's agricultural systems require substantial nitrogen inputs to achieve optimal yields. To mitigate the economic and environmental costs associated with synthetic fertilization, many farmers implement cover cropping strategies prior to the main growing season. Cover crops are selected for their ability to form symbiotic relationships with nitrogen-fixing bacteria, prevent soil erosion, and sequester carbon in the soil. This study investigates how different monocultures and polycultures of brassica, grass, and legume cover crops influence soil nitrogen and carbon availability under controlled greenhouse conditions. The objectives are to (1) Evaluate the impact of cover crop diversity on soil microbial activity and nutrient cycling, and (2) Characterize rhizosphere bacterial communities associated with carbon mineralization via metabolic characterization. Monocultures of Winter Wheat (grass), Gulf annual rye (grass), Crimson clover (legume), and purple top turnip (brassica), along with two- and three-way polyculture mixtures, were planted alongside four fallow controls, with four replicates per treatment in approximately 10 lb of soil sourced from north Mississippi farming fields. Once a week, heights of the tallest plant of each species were recorded and the pots' positions rotated. After termination, rhizosphere soil samples will be collected from each pot and metabolic characterization will be done using BIOLOG ecoplates to quantify microbial functional diversity. We hypothesize that legume monocultures and polycultures will contribute the greatest levels of bioavailable carbon and nitrogen to the soil. Findings from this study will provide critical insights into optimizing cover crop selection for sustainable nutrient management and soil health enhancement in Mississippi agroecosystems.

P1.29

Influence of *Pseudomonas putida* inoculation on Lead (Pb) uptake in *Nerium oleander*

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Lead (Pb) contamination poses a major environmental challenge requiring sustainable remediation strategies. This study evaluates the ability of *Nerium oleander* to accumulate Pb and examines how inoculation with the rhizobacterium *Pseudomonas putida* influences Pb uptake under controlled conditions. Plants were grown in soils containing increasing Pb concentrations, and growth traits such as height and leaf number were recorded. Pb accumulation in leaves, stems, and roots was quantified using Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES), while X-ray fluorescence (XRF) imaging was used to visualize Pb distribution within root tissues.

Results showed that Pb uptake increased with soil concentration across all treatments, with roots consistently retaining the highest Pb levels. XRF imaging revealed Pb localization mainly in the rhizodermis. Inoculated plants displayed altered Pb availability in the soil, suggesting that *P. putida* may enhance Pb stabilization. Growth responses varied among treatments, reflecting different levels of tolerance to Pb stress.

Overall, *N. oleander*, particularly when supported by beneficial bacteria, demonstrates strong potential for phytostabilization of Pb-contaminated soils.

P1.30

Evaluation of Antifungal Activity of MS455 and Other Isolates Against the Fumonisin Toxin Producer *Fusarium verticillioides*

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Fusarium ear rot is one of the most common diseases of corn, and Fusarium verticillioides is the fungal species most frequently associated with this disease. A notable feature of F. verticillioides is its ability to produce the mycotoxins fumonisins (FB1, FB2, FB3, and FB4), which poses significant health risks to humans and animals. The endophytic bacterium MS455, isolated from a soybean plant, exhibits antifungal activity against a range of plant fungal and bacterial pathogens. Previous studies have shown that the ocf gene cluster, responsible for the production of the antifungal compound occidiofungin, is a key genetic determinant of this activity. The objectives of this research are to characterize the antifungal activity of MS455 against the ear rot pathogen and to identify additional bacterial isolates with antimicrobial properties. Preliminary bioassays revealed that MS455 and several other bacterial isolates inhibit F. verticillioides. Quantitative plate assays demonstrated that a mutant of an ocf homologous gene lost antifungal activity, whereas the wild-type MS455 strain retained strong inhibition of the pathogen. Additional MS455 mutants are currently being evaluated. The antifungal activities of the newly identified bacterial isolates are also being tested, and their taxonomic identities are being determined through the analyses of housekeeping genes. This research will contribute to the development of biological control agents aimed at reducing FB contamination in agricultural products.

P1.31

Using 3-Methylhistidine to Measure Protein Breakdown Rates in Chicken Muscle

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A major goal in poultry production is to promote optimal muscle growth while reducing reliance on chronic antibiotic use. However, when antibiotics are removed or reduced, subclinical bacterial infections may occur more frequently, potentially increasing muscle protein degradation and negatively affecting growth performance. To investigate this, we quantified 3-methylhistidine (3-MH), a reliable biomarker released during muscle protein breakdown, in fecal samples collected from chickens exposed to different bacterial challenges.

Amino acids were isolated using trichloroacetic acid precipitation to remove large proteins, followed by organic-aqueous phase separation. The extracted amino acids were fluorescently labeled with o-pthaldehyde (OPA) and analyzed with an HPLC reverse-phase C18 column and fluorimeter to quantify 3-MH concentrations. Preliminary analysis shows that one treatment group exhibited a significant change in 3-MH levels compared to the other conditions. Because treatment identities cannot currently be confirmed due to the government shutdown affecting USDA communications, results are reported in neutral terms until verification is possible.

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P1.32

Characterization of Soybean Roots and Nodulation Responses Under Drought

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Soybean (*Glycine max)* is a vital legume crop, valued for its high protein and oil content. Roots serve as the plant's primary sensory organs, detecting stress signals and translocating them to above-ground parts to facilitate physiological adjustments crucial for stress tolerance. Unlike monocots, soybean root systems continue to grow during reproductive stages. As a result, drought stress at these stages can significantly impair nutrient acquisition, water uptake, and biological nitrogen fixation, all of which are essential for maintaining plant health and achieving high yields. This study evaluated 14 different soybean genotypes under control (100% irrigation) and drought (40% irrigation) conditions. Below-ground traits were measured to assess how drought during the reproductive stage affects root system development and nitrogen-fixing capacity. Initial results showed that drought caused a 14% decrease in root length and a 33% decrease in root biomass; however, the root-to-shoot ratio remained stable under stress. In addition, nodules involved in biological nitrogen fixation declined by an average of 33%, indicating that drought stress reduces nodulation and overall nitrogen availability for plants. Variability among genotypes was evident, with some showing nodulation reductions as high as 61%, which may suggest different levels of drought sensitivity. The findings highlight the importance of root and nodule traits as key indicators for selecting soybean genotypes with varying drought tolerance. Our study advances understanding of the root and nodulation trade-off in response to drought stress during the reproductive period.

P1.33

Identification of *Aspergillus flavus* Infection in Mississippi Corn using Morphological and Molecular Techniques

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The fungus *Aspergillus flavus* poses a major threat to corn yield and quality due to aflatoxin contamination. Aflatoxins are potent hepatotoxins and carcinogens, associated with severe liver damage and other health risks. This highlights the critical need for rapid and reliable detection of *A. flavus* in infected samples. In this study, harvested corn samples were collected from six counties across Mississippi to confirm the presence of *A. flavus*. Samples were cultured on selective media to promote fungal growth, and multiple subcultures were performed to obtain pure isolates. Morphological identification was conducted by observing colony color, growth pattern, and microscopic features. To confirm infection, molecular identification was carried out using species-specific primers (FLA1/FLA2) on extracted DNA samples. Culture results revealed colonies ranging from light yellowish to greenish with characteristic spore-bearing structures such as conidiophores and conidial heads typical of *A. flavus*. All isolates were further confirmed by PCR amplification using FLA1 and FLA2 primers, producing a distinct 497-bp DNA fragment. This combination of morphological and molecular analyses provides strong evidence for the presence of *A. flavus* in Mississippi corn. These findings establish a critical baseline for understanding *A. flavus* prevalence in the region. The confirmed isolates will serve as the foundation for future studies focusing on aflatoxin biosynthetic gene cluster analysis and toxin quantification.

P1.34

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P1.35

TEST, DON'T GUESS: BOOSTING CROP PRODUCTIVITY WITH ACCESSIBLE SOIL KITS

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Soil health is a critical determinant of crop productivity, yet many minority and resource-limited farmers in Mississippi face significant challenges in accessing affordable and timely soil testing services. Traditional laboratory methods are often costly and time-intensive, limiting their practicality for small-scale farmers. To address this gap, this research evaluates a portable, cost-effective soil testing kit as an alternative. We used the Rapitest Soil Test Kit to conduct on-site analysis of key soil health parameters: pH, Nitrogen (N), Phosphorus (P), and Potassium (K). Soil samples were collected from multiple spots to create composite samples and analyzed following the kit's protocols. Results from the collected samples showed soil pH values ranging from 6.0-6.5, with average N, P, and K levels identified as adequate or sufficient. These findings demonstrate the kit's effectiveness in detecting soil pH and nutrient variations, empowering farmers to apply precise, site-specific amendments. This accessible and cost-effective method promotes sustainable agriculture and long-term soil health, offering a viable pathway to enhance productivity for resource-limited farmers.

P1.36

Survival and Growth of Shortleaf and Loblolly Pine Planted in Central Mississippi

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A pine species trial comparing loblolly and shortleaf was established on nearly a 3-acre area in central Mississippi south of Crystal Springs. The soil type is predominantly Providence silt loam, and its family is defined to be fine-silty, mixed, active, thermic Typic (Oxyaquic) Fragiudalfs. Over the past 20 years, the site was an annually harvested hay pasture of improved grasses, the site received no fertilization. A broadcast chemical site preparation treatment was conducted in October 2022. Due to the harvesting of hay, compaction occurred and thus the site was ripped/subsoiled in mid-December of 2022 on 16-foot planting centers with a single shank to a depth near 15 inches. Both species were planted at 454 seedlings per acre using 16 feet between rows and 6 feet between seedlings within a row. The treatment was species and there are three replications. Container open-pollinated (OP) improved shortleaf (early March) and bareroot OP Elite loblolly seedlings (mid to late March) were hand planted deep in March of 2024. Over-the-top of the seedlings first- and second-year chemical herbaceous weed control treatments were conducted in late April of 2024 and mid May of 2025, respectively. Surprisingly, during late-June of 2025, shortleaf (93.2%) had slightly higher percent survival than loblolly pine (91.3%), although it was not statistically different. As expected, loblolly pine heights and diameters were statistically greater relative to the slower-growing shortleaf pine. Average total seedling heights were 3.41 and 2.34 feet while GLD averaged 25.14 and 20.88 mm for loblolly and shortleaf pine, respectively.

P1.37

Identification of Antifungal Metabolites in Maize Cob Using Liquid Chromatography-Mass Spectrometry

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Maize is the most produced global food staple, with the United States leading the overall production of the crop. However, corn is susceptible to a pathogenic fungus, Aspergillus flavus L, which not only causes ear rot in the maize but also produces the most potent carcinogenic mycotoxin, Aflatoxin B1. The FDA limits the amount of aflatoxin that can be present in crops to 20 ppb due to the toxin leading to hepatocellular carcinoma and immunosuppression. Previously, it has been found that the cob is the conduit tissue for spreading the fungal pathogen across the kernels. This study aims to analyze corn cob metabolites in both fungi-susceptible and -resistant maize genotypes to determine their role in limiting the pathogen colonization. The discovery/untargeted metabolomics methodology based on liquid chromatography - mass spectrometry was employed. Due to limited spectral database of plant compounds available when the experiments were performed, only a small number of metabolites (28) was confidently identified using the mzCloud database. Due to recent exponential growth in the number of spectral entries in the database, it is beneficial to reanalyze existing experimental data to reveal more of known and novel antifungal corn cob metabolites. The obtained knowledge will serve as a building block for a future effort to develop new, fungi-resistant and commercially successful corn cultivars, either by targeted breeding or genetic manipulation.

P1.38

Real-Time Seed Size Phenotyping Using Open-Source Computer Vision and Marker-Based Calibration

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Accurate and high-throughput measurement of seed traits is essential for plant science, breeding, quality assurance, and agricultural research. Traditional manual methods are labor-intensive and slow, with limited measurement speed and reproducibility. To overcome these limitations, we aimed to develop an open-source computer vision system for real-time, automated seed measurement with sub-millimeter accuracy. The system is built in Python and uses OpenCV for image processing. Scale calibration is performed using ArUco markers, enabling precise metric measurements regardless of camera distance, alignment, or sensor setup. The processing pipeline includes adjustable Gaussian filtering, adaptive thresholding, and morphological refinement to ensure consistent segmentation under various lighting conditions. Contour-based analysis automatically measures seed count, bounding dimensions, and area. A node-based visual workflow editor, developed with DearPyGUI, enables users to build and test image processing pipelines without coding, while maintaining reproducibility through preset management. Validation on soybean and cotton datasets collected under different lighting and background conditions showed strong agreement between manual measurements and predicted results ($R^2 = 0.90$). The system's modular design and standardized data outputs facilitate integration with machine learning extensions, such as CNN models for seed-size characterization and large-scale breeding populations under different growing conditions.

P1.39

Impact of poultry litter on cover crops growth, development, and soil CO_2 dynamics

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Sustainable, integrated soil fertility management is crucial for resilient crop production, especially as variability increases during the cropping season. Incorporating cover crops with poultry litter offers a strategy to improve soil health, enhance cash-crop performance, and potentially boost soil carbon stocks. This study examined the combined effects of poultry litter application and moisture stress on cover crop growth and soil CO_2 flux. A 45-day pot experiment was conducted using two levels of poultry litter (0 and 2T/acre), two cover crops (cereal rye and vetch), and three moisture regimes (control, drought, and waterlogging). Poultry litter was applied 15 days before sowing to allow mineralization, and irrigation treatments were imposed 14 days after emergence. Cover crop biomass was significantly higher under the poultry litter-applied treatment than the no poultry litter treatment. Furthermore, poultry litter applications significantly influenced cover crop growth and root traits, with biomass being greatest under control conditions and lowest under drought stress. With poultry litter treatment, cereal rye produced the highest biomass, whereas without litter, vetch accumulated more biomass. Root traits, including total root length and root surface area, were greater in rye than in vetch with poultry litter consistently improving these parameters. Poultry litter significantly increased soil CO_2 flux, especially under saturated conditions for rye. The elevated CO_2 flux with poultry litter likely reflects added carbon inputs and stimulated rhizosphere metabolic

activity. However, improved root traits may offset the flux by increasing carbon sequestration under favorable conditions. Overall, poultry litter enhanced plant vigor under different soil moisture conditions.

P1.40

An Investigation of the Growth And Development of *Lolium multiflorum, Echinochloa crus-gall*i, and *Nicandra physalodes*

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During crop production, growth of crops is hindered by the invasive plant species or weeds. For the present study three invasive plant species were investigated, namely, Lolium multiflorum, Echinochloa crus-galli, and Nicandra physalodes. Lolium multiflorum is a weed that affects growth of maize, wheat, and soybean. Echinochloa crus-galli is a weed that affects the growth of rice, maize, sunflower, wheat, and barley. Nicandra physalodes can compete with cotton, maize, and legumes. The hypothesis of the study was that the growth and development of L. multiflorum, E. crus-galli, and N. physalodes would be significantly affected when they are grown together under laboratory conditions. Seeds of N. physalodes were purchased from the seed company and those of L. multiflorum and E. crus-galli were obtained from USDA Research Station in Stoneville. The seeds were grown, and the lengths of the germinating seedlings were measured. To further investigate the interaction of the plant species on each other, seeds of L. multiflorum and E. crus-galli were grown to study cell division. The results indicated that the growth of L. multiflorum was decreased in the presence of E. crus-galli and N. physalodes when the three plant species were grown together. E. crus-galli grew well in the presence of L. multiflorum and N. physalodes. There was a decrease in the growth of N. physalodes in the presence of L. multiflorum when the two plant species when grown together. The study indicates that the growth of the three plant species is significantly affected when grown together.

P1.41

Nano-purification of boar semen for improved maintenance of sperm quality during storage

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Prolonged storage of boar semen is essential for artificial insemination programs but is challenged by a rapid decline in sperm quality, which compromises fertility and reduces the shelf life of semen doses. This deterioration is partly driven by damaged spermatozoa that generate oxidative stress and accelerate cellular aging. Targeted removal of these defective cells using nanotechnology has emerged as a promising strategy to improve semen quality. Lectin-coated magnetic nanoparticles (LMNPs), which selectively bind to glycoconjugates on compromised sperm membranes, offer a potential purification approach. This study evaluated the potential of nanopurification with LMNP to enhance sperm quality during chilled storage. Extended semen doses (n = 5) from fertile Duroc boars were divided into four aliquots, supplemented with 0 (Control), 5 (NP1), 7.5 (NP2), and 10 µg per 107 spermatozoa (NP3) and incubated at 37ºC for 30 minutes. After incubation and magnetic separation, samples were stored at 17°C for seven days. Sperm motility, kinematics, and morphology were assessed on Days 0, 3, 5, and 7 using computer-assisted sperm analysis. Data were analyzed using linear mixed-effects models, with $P < 0.05$ considered significant. Contrary to expectations, LMNP treatments did not improve sperm motility or morphology compared to the Control ($P > 0.05$). All groups experienced a significant decline in sperm quality from Day 0 to Day 7, with total motility dropping by around 30%. Velocity parameters (VAP, VCL, and VSL) remained relatively consistent over time and were similar across groups. Morphological abnormalities increased notably over time, particularly with a higher prevalence of distal cytoplasmic droplets. These results suggest that LMNP supplementation, at the tested concentrations, does not prevent the decline in sperm quality during prolonged storage. Future studies should aim to optimize nanoparticle composition, surface chemistry, and dosage to the targeted removal of defective spermatozoa. Understanding the interactions between nanoparticles and sperm at the molecular level will be essential for developing safe and effective nanotechnology-based sperm preservation methods.

P1.42

Evaluating Cold Tolerance in non-GMO Winter Canola Varieties for Increased Resilience in Central Mississippi

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In recent years, the deep south has seen a rise in production of winter canola (*Brassica napus* L.) as both a cover and cash crop, generally following soybeans. While there is significant interest from the agricultural industry in production of winter canola in Mississippi, regionally specific management recommendations are generally lacking. Cold tolerance - or winterhardiness - is one of the primary factors to consider before choosing a canola variety, as is planting date relative to the first hard freeze (≤20°F). Generally, canola plants require six weeks of hardening off before they are expected to survive exposure

to a hard freeze. Much of this cold tolerance research has been conducted from the American Midwest through central Canada, and often in the spring. In Mississippi, canola fits well as a rotational crop following soybean, and as such, establishment is delayed until after soybean harvest (September-October). This timing often puts the six-week hardening process in jeopardy, risking winterkill and, potentially, complete stand loss. To evaluate elite germplasm for winterhardiness, 12 cultivars (9 conventional, open pollinated; 3 hybrid, open pollinated) were selected from the National Winter Canola Variety Trial (Kansas State University, Manhattan, KS USA) and established at the H.H. Leveck Animal Science Research Farm in Starkville, MS. The study design was a randomized complete block design with planting dates every two weeks from September 1 until the first hard freeze. Each cultivar was represented with three replications per planting date. Plots were established from seed using single, 15' long rows, with a target plant density of 1.5 plants per ft^2.

P1.43

Investigating Heat Stress Induced Alterations in Muscle Metabolism and Growth

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Heat stress is a major environmental challenge affecting livestock production worldwide. Prolonged exposure to elevated temperatures reduces feed intake, slows growth, alters skeletal muscle metabolism, and compromises overall animal health and productivity. Skeletal muscle is particularly sensitive to thermal stress due to its high metabolic demand. Heat stress has been shown to disrupt protein turnover, oxidative balance, and energy metabolism, with consequences for growth performance and meat quality. This study utilizes rabbits as a model for larger livestock species to explore how heat stress alters skeletal muscle metabolism in animals with contrasting growth rates. Post-weaning rabbits were assigned to a randomized experimental design with four treatment groups: high growth rate non-heat stress, high growth rate heat stress, low growth rate non-heat stress, and low growth rate heat stress. New Zealand rabbits served as the high growth rate model, while Mini Rex rabbits represented the low growth rate model. Animals were housed in temperature-controlled environments, with heat-stressed rabbits exposed to 75°F and non-heat-stressed rabbits maintained at 68°F. All rabbits were fed a standardized diet to minimize dietary variation. Rabbits were weighed and harvested at eight and sixteen weeks of age. Skeletal muscle samples from the *longissimus dorsi* (LD) and liver samples were collected immediately postmortem. The LD was collected again post-rigor at 24 hours. In progress initial assays include measurements of muscle pH, lactate, glycogen, glucose, and glucose-6-phosphate concentrations to evaluate glycolytic activity and energy metabolism. Understanding heat stress-induced metabolic adaptations, particularly in relation to growth rate, may provide insight into mechanisms underlying altered muscle development, animal productivity, and meat quality under thermal stress conditions.

P1.44

Impact of trace mineral source and ionophore inclusion on growth performance of beef steers during preconditioning

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Weaning is one of the most stressful events in the beef production cycle, after which feed intake is often inadequate. Nutritional strategies that improve the performance of stressed cattle are warranted. The objective of this research is to evaluate the independent and interactive effects of monensin supplementation and trace mineral source during the preconditioning phase on growth performance of beef steers. On the day of weaning (day -1), 64 steers were ranked by body weight (**BW**) and age and assigned to 1 of 4 groups, which were housed in drylot pens equipped with the Vytelle Sense individual feed intake monitoring software from day 0 to 56. Subsequently, pens were assigned to receive 1 of 2 mineral (**MIN**) supplements: organic (**OTM**) or inorganic (**INR**) trace mineral sources, and ionophores (**MON**; monensin at 200 mg/steer/day) or not (**CON**) in a 2 × 2 factorial arrangement of treatments. Individual feed intake was recorded daily, and steer BW was recorded on days 0, 3, 7, 10, 14, 21, 28, 35, 42, and 56. No MON × MIN treatment effects were detected ($P \geq 0.11$) for steer initial or final BW, or ADG throughout the experiment. However, a tendency for a MON effect was detected ($P = 0.08$) for ADG given that steers consuming MON had reduced ADG compared to CON steers. A tendency for a MON × MIN effect was detected ($P = 0.09$) for total dry matter intake, which was less ($P \leq 0.02$) for INR+MON steers compared to INR+CON and OTM+CON, and tended ($P = 0.09$) to be less compared to OTM+MON steers. A tendency for a MON effect was detected ($P = 0.08$) for total BW gain, which was greater for CON vs. MON steers. No MON × MIN interaction or main MON or MIN effects were detected ($P \geq 0.49$) for feed efficiency. These findings indicate that monensin supplementation during preconditioning may modestly depress intake and growth in newly weaned calves, with limited evidence of interaction with trace mineral source. Further research is needed to determine whether these early responses

influence downstream performance beyond the preconditioning phase.

P1.45

Visualization of leaf and bracteal nectaries of cotton using digital microscopy to improve scoring accuracy and data preservation

Lavanya Mendu[1], Jodi Scheffler[1]

[1]USDA-ARS

Nectaries are specialized nectar producing glands in plants that not only attract insects for cross pollination but also attract pests causing yield losses. Selection of nectariless traits in cotton plants gained attention by breeding programs as it naturally reduces the yield losses caused by pest damage. Visual identification of nectaried and nectariless traits using traditional scoring methods cannot distinguish subtle differences in nectary trait expression. Therefore, a proper and accurate scoring method of this trait is necessary. Phenotyping of nectary trait using digital imaging technology overcomes this limitation by providing high resolution images. To achieve this objective, F2 populations were generated from different crosses of nectaried and nectariless cotton parents and screened for nectariless traits by analyzing the leaf and bracteal nectaries. The current study describes the protocol step by step, and details of the application of high-resolution digital imaging technology to screen for nectariless traits. Further, this method helps in narrowing down large number of populations to a small number of plants with desired nectariless traits. These selected plants can be used as candidates to develop molecular markers for faster selection. Integrating this trait into high-yielding varieties will benefit stakeholders by reducing pest-induced yield losses, thereby increasing productivity and economic return.

END OF THURSDAY'S PROGRAM

Friday, March 20, 2026
MORNING
Hall D Room 1
8:00 Welcome and Opening

O1.26

8:10 - Cover Crop Species Composition Shapes Rhizosphere Microbial Communities and Soil Carbon Dynamics

Natalie Lovell, Shankar Ganapathi Shanmugam

Institute of Genomics, Biocomputing and Biotechnology, Mississippi State University, Starkville, MS

Row crops in Mississippi's agricultural systems require substantial nitrogen inputs to achieve optimal yields. To mitigate the economic and environmental costs associated with synthetic fertilization, many farmers implement cover cropping strategies prior to the main growing season. Cover crops are selected for their ability to form symbiotic relationships with nitrogen-fixing bacteria, prevent soil erosion, and sequester carbon in the soil. This study investigates how different monocultures and polycultures of brassica, grass, and legume cover crops influence soil nitrogen and carbon availability under controlled greenhouse conditions. The objectives are to (1) Evaluate the impact of cover crop diversity on soil microbial activity and nutrient cycling, and (2) Characterize rhizosphere bacterial communities associated with carbon mineralization via metabolic characterization. Monocultures of Winter Wheat (grass), Gulf annual rye (grass), Crimson clover (legume), and purple top turnip (brassica), along with two- and three-way polyculture mixtures, were planted alongside four fallow controls, with four replicates per treatment in approximately 10 lb of soil sourced from north Mississippi farming fields. Once a week, heights of the tallest plant of each species were recorded and the pots' positions rotated. After termination, rhizosphere soil samples will be collected from each pot and metabolic characterization will be done using BIOLOG ecoplates to quantify microbial functional diversity. We hypothesize that legume monocultures and polycultures will contribute the greatest levels of bioavailable carbon and nitrogen to the soil. Findings from this study will provide critical insights into optimizing cover crop selection for sustainable nutrient management and soil health enhancement in Mississippi agroecosystems.

O1.27

8:20 Real-Time Seed Size Phenotyping Using Open-Source Computer Vision and Marker-Based Calibration

Bibek Bhatta, Raju Bheemanahalli

Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS

Accurate and high-throughput measurement of seed traits is essential for plant science, breeding, quality assurance, and agricultural research. Traditional manual methods are labor-intensive and slow, with limited measurement speed and reproducibility. To overcome these limitations, we aimed to develop an open-source computer vision system for real-time, automated seed measurement with sub-millimeter accuracy. The system is built in Python and uses OpenCV for image processing. Scale calibration is performed using ArUco markers, enabling precise metric measurements regardless of camera distance, alignment, or

sensor setup. The processing pipeline includes adjustable Gaussian filtering, adaptive thresholding, and morphological refinement to ensure consistent segmentation under various lighting conditions. Contour-based analysis automatically measures seed count, bounding dimensions, and area. A node-based visual workflow editor, developed with DearPyGUI, enables users to build and test image processing pipelines without coding, while maintaining reproducibility through preset management. Validation on soybean and cotton datasets collected under different lighting and background conditions showed strong agreement between manual measurements and predicted results (R^2 = 0.90). The system's modular design and standardized data outputs facilitate integration with machine learning extensions, such as CNN models for seed-size characterization and large-scale breeding populations under different growing conditions.

O1.28

8:30 Identifying leaf signals associated with drought tolerance in soybeans during nodulation

Patton Simbeck[1, 2], Sujan Poudel[1], Lekshmy V. SankaraPillai[1], Raju Bheehmanahalli[1]

[1]Department of Plant and Soil Sciences, Mississippi State University, MS, [2]Department of Agricultural and Biological Engineering, Mississippi State University, Mississippi State, MS

Soybean (*Glycine max*) is a vital legume crop for global agriculture, serving as a major source of oil and protein. However, drought during the reproductive stage remains one of the most yield-limiting stresses in soybean, as it disrupts key physiological and photosynthetic processes that ultimately reduce yield. Therefore, understanding the mechanisms and integrating physiological, pigment-based, and spectral indicators can serve as a reliable approach to identify genotypes with greater stress tolerance. In this experiment, we evaluated 14 soybean genotypes for their physiological and morphological responses to different irrigation levels (100% irrigation, control) and water-limited conditions (40% irrigation of the control, representing drought). Drought stress led to a substantial decline in stomatal conductance (62%) and impaired quantum efficiency of PSII by 29%, which collectively resulted in a 45% decrease in photosynthesis rate. Drought-stressed plants were ~1°C warmer compared to control plants. However, a significant increase (36%) was observed in the chlorophyll index under drought stress. These changes in physiology and pigment signals resulted in a 13% reduction in node number, a 16% decrease in plant height, a 22% decrease in leaf area, and ultimately a 26% decrease in biomass. These findings provide insight into leaf biophysical signals that can be utilized in breeding and crop management to improve drought tolerance in soybeans.

O1.29

8:40 Identification and Characterization of Sclerotium rolfsii Causing Southern Blight on Herbs and Leafy Vegetables in Southern Mississippi

Meiosha Andrews, Abdul-lateef Popoola, Velma Oliver, Sumyya Waliullah, Emran Ali

Alcorn State University, Lorman, MS

Sclerotium rolfsii (teleomorph: *Athelia rolfsii*), the causal agent of southern blight, is a destructive soil-borne pathogen. Its persistence through long-lived sclerotia poses a serious threat to crop rotation in Mississippi, yet the risk it presents to the region's leafy green and spice crops remains poorly understood. This study was undertaken to characterize an active *S. rolfsii* infection on a leafy vegetable in southern Mississippi and to evaluate its cross-pathogenic potential. A virulent isolate, designated MS-SR01, was obtained from symptomatic collard greens exhibiting basal stem rot. The pathogen was identified based on morphological features (e.g., hyphae with clamp connections) and confirmed molecularly through sequencing of the Internal Transcribed Spacer (ITS) region. Pathogenicity was verified by fulfilling Koch's postulates using a soil inoculation assay. The isolate's virulence was then assessed against a host panel including mustard greens, kale, basil, and mint. ITS sequence analysis of MS-SR01 revealed 99-100% homology with *Athelia rolfsii*, confirming the morphological identification. The isolate exhibited strong virulence on mustard greens, kale, and basil, causing fatal southern blight, while mint displayed tolerance. The pathogen was re-isolated from all symptomatic hosts, again fulfilling Koch's postulates. This study provides the first molecular and pathogenic characterization of *S. rolfsii* on leafy vegetables in Mississippi, emphasizing its cross-infection risk for diversified vegetable systems.

O1.30

8:50 Simplifying Plant Disease Diagnosis Through the Application of Immunostrip Assays in Vegetable Crops

Jamiyla Watson, Emran Ali, Waliullah Sumyya

Alcorn State University, Lorman, MS

Rapid and accurate detection of plant pathogens is essential for effective disease management and minimizing yield losses in vegetable production. Traditional diagnostic methods such as symptom observation, microscopic examination, and molecular assays are often time-consuming, require laboratory facilities, and demand trained personnel. To overcome these limitations, ImmunoStrip assays offer a rapid, reliable, and user-friendly alternative for field-based pathogen detection. This study evaluated the performance of ImmunoStrip tests in identifying common viral pathogens affecting vegetable crops in Mississippi. Leaf samples were collected from

multiple vegetable species, including cucurbits, tomatoes, lettuce, and strawberries, at the Alcorn State University Model Farm (Claiborne County) and local farms in Adams County. The ImmunoStrip test procedure involved extracting leaf tissue in buffer solution, immersing the strip, and visually interpreting the results within 5-15 minutes. The assays successfully detected several viral pathogens such as Cucumber mosaic virus (CMV), Melon necrotic spot virus (MNSV), Squash mosaic virus (SqMV), and Lettuce mosaic virus (LMV). Some strawberry samples displayed symptoms likely linked to abiotic stress or foliar pathogens, warranting further investigation. Our findings demonstrate that ImmunoStrip assays are a practical and reliable diagnostic tool for on-site identification of plant diseases. Their portability, ease of use, and rapid turnaround make them ideal for growers, extension agents, and researchers seeking efficient solutions for plant health monitoring. Future work will expand the survey to other Mississippi counties and additional pathogens to enhance regional plant disease surveillance and management.

O1.31

9:00 H2Grow: A Climate-Smart Alternative Raised-Bed Design for Water-Efficient Vegetable Production

Timothy Ayankojo

Mississippi State University, Mississippi State, MS

Agriculture continues to account for over 70% of global freshwater withdrawals, despite extensive research into water conservation methods in food production. A significant portion of this water usage is attributed to irrigation. In vegetable crops, the traditional raised bed system with plastic mulch can reduce irrigation application by minimizing evaporative losses. However, this system does not prevent water and nutrient losses to deep percolation or lateral movement outside the bed area. Therefore, this study evaluates an alternative raised bed system (H2grow), and compares its impact on water use, yield, and fruit quality in bell pepper production against the conventional raised bed system. Six treatments were tested, which included three nitrogen (N) application rates in both raised bed systems (bed type). A split-plot design was used, with bed type as the primary factor and nitrogen rates as the secondary factor. All treatments were replicated four times. Soil moisture sensors were used to trigger irrigation when soil moisture levels fall below 90% field capacity. Soil moisture, nutrient levels, and tissue nutrient content were monitored throughout the growing season. Yield and fruit quality (fruit wall thickness), were assessed at harvest. Preliminary results show that cumulative water use under the H2grow was 33% lower than the conventional raised bed, regardless of nitrogen application rates. This corresponds to a water savings of 1460 m^3/ha. Although there were no significant differences in yield or wall thickness between bed types; the H2grow system showed promising potential over conventional beds with a p-value of 0.08 for yield and 0.06 for wall thickness. Nitrogen application rates had no significant effect on yield or fruit wall thickness, though fruit biomass was lowest under the low-N treatment. These findings demonstrate that the H2grow system significantly conserves water in bell pepper production and has the potential to reduce the water footprint in commercial vegetable production. As water conservation becomes an increasing concern in agriculture, this innovative technology offers a critical solution to address the growing challenge of freshwater use in food production.

O1.32

9:15 Seed Composition and Seed Weight as Affected by Plant Architecture Genes in Soybeans Grown in the Midsouth USA

Nacer Bellaloui, James Smith, Jeffery Ray, Neeraj Kumar, Chunda Feng, Abdu Abdelraheem

USDA-ARS, Stoneville, MS

Plant architecture is essential for maximizing seed yield and seed composition (nutrition). The objective of this research was to investigate the effect of plant architecture (stem termination genes) on seed composition (seed protein and oil) and seed size (100-seed weight). We used a set of four near-isogenic stem termination lines from maturity group (MG) V that were developed for adaptation to the Early Soybean Production System (ESPS) in the Midsouth, which is characterized by high heat, water deficient, and disease pressure. The four germplasm near-isogenic lines were USDA-ARS-GDS-880Dt1 (indeterminate), USDA-ARS-GDS-880dt1-t2 (tall determinate), and USDA-ARS-GDS-880Dt2 (semi-determinate), and determinate-dt1, with differing plant architectures derived from different stem termination genes. This set of near-isogenic lines was developed through a traditional backcrossing procedure, using DS-880 (PI 659348; dt1) as the recurrent parent. These isolines are F5-derived bulked lines, and each backcrossed line in the set has approximately 97% of the genotype of the recurrent parent (DS-880). A 3-year field experiment was conducted in 2022, 2023, and 2024 at Stoneville, MS. DS49-142 (check1) was used as the MG V high protein check, and 'Osage' (check2) was used to represent MG V cultivars, and both are determinate. The results showed that the semi-determinate (semi-det), DS49-142, and Osage had higher seed protein content than the determinate (det), indeterminate (indet), and tall-determinate (tall-det) isolines in 2022, 2023, and 2024. Oil content in the semi-det was also higher than in both checks, and competitive

with the other genotypes. The 100-seed weight was highest in the semi-det, tall-det, and DS49-142 in all three years. Across the three years, and among the all lines, semi-det had the highest protein (38.95%), oleic acid (21.90%), and 100-seed weight (15.17 g). To our knowledge, this is the first report comparing these four plant architecture types in a MG V background in the ESPS in the Midsouth. This research demonstrated that the semi-det stem termination type contained the highest seed protein, acceptable levels of oil, and larger seed size than the other types, all potentially desirable traits for soybean producers and the seed industry.

O1.33

9:30 Nitrification inhibitor effects on post-flooded soil N_2O and CO_2 emissions

Frank Johnson[1], Jason Taylor[2], Jason Hoeksema[2], Matthew Moore[1], Martin Locke[3]

[1]Water Quality and Ecology Research Unit, USDA-ARS National Sedimentation Laboratory, Oxford, MS, USA, [2]Department of Biology, University of Mississippi, Oxford, MS, USA, [3]USDA-ARS National Sedimentation Laboratory, Oxford, MS, USA

Controlled flooding events during the fall and winter months may have the potential to reduce N losses from agricultural systems in the Lower Mississippi River Basin. As soil dries and aerates in the spring, nitrification activity can increase, making NO3- more vulnerable to loss through leaching. This study investigated how the application of a nitrification inhibitor (NI), nitrapyrin, on post-flooded soils influenced soil N_2O and CO_2 emissions. A laboratory incubation experiment was conducted over a period of 49 days in which a NI was applied to 80 g of soil in Mason jars. Five treatments of the NI were applied: 0 (control), 0.25, 0.5, 1, 5, 10, and 20 mg ai kg^{-1} soil, each with three replicates. Soil CO_2 and N_2O emissions were measured weekly and used to calculate cumulative emissions for the duration of the experiment. There were no detected treatment effects on cumulative N_2O (cN_2O) emissions observed ($p > 0.05$). Estimates of cN_2O ranged from 15.8 µg N_2O-N kg^{-1} (20 mg ai kg^{-1}), to 46.0 µg N_2O-N (control). There was a significant NI concentration effect on cCO_2 emissions ($p = 0.0004$), with estimates of cCO_2 ranging from 10.2 mg CO_2 - C kg^{-1} (0.5 mg ai kg^{-1}) to 67.6 mg CO_2 - C kg^{-1} (5 mg ai kg^{-1}). Treatments of the NI applied at concentrations ≥ 5 mg ai kg^{-1} resulted in significantly higher cCO_2 compared to the applications of NI concentrations < 5 mg ai kg^{-1}. These results highlight how there may be a trade-off between reducing N losses and increasing CO_2 emissions with the application of a NI.

O1.34

9:45 Introgression of *Reniform nematode* Resistance from Diploid Gossypium species to Upland Cotton

Chunda Feng, Salliana Stetina

USDA-ARS, Stoneville, MS

Reniform nematode (RN) is an increasing threat to the US cotton production, which causes about 1% yield loss to the total production (equivalent to hundreds of millions of dollars). In some southeast states, such as Alabama, Louisiana, Mississippi, and Tennessee, reniform nematode is becoming the most important issue for cotton production, the yield losses caused by this parasite is about 5% to 11% in these states and could be up to 50% in some heavily infested fields. Toxic chemical nematicides could only provide protection in a short period. Rotation with no-host crops may temporally reduce the population of reniform nematode, but the effectiveness, feasibility, and economic returns are uncertain. Growing resistant (R) cultivars would the most effective and sustainable way to manage this parasite. However, resistance to RN was not found in the widely grown tetraploid upland cotton (*Gossypium hirsutum*), but in a few genotypes of tetraploid Sea Island cotton (*G. barbadense*) and some diploid Gossypium species. Crossing tetraploid and diploid usually result in embryo abortion due to post-zygotic barriers, and derived triploid seed would be sterile, making it impossible to directly introduce useful genes from diploid *Gossypium* species to tetraploid cultigens. Our research focuses on introgression of resistance from diploid to tetraploid upland cotton. Through chromosome doubling, three strategies have been applied to overcome the ploidy barriers between diploid and tetraploid species: 1. Double the chromosomes of resistant diploid *G. arboreum* genotypes to generate autopolyploid plants; 2. Cross a resistant *G. arboreum* and *G. trilobum*, then double the chromosomes of the hybrid to obtain an allotetraploid plant; 3. Cross tetraploid *G. hirsutum* and diploid species, triploid plants by embryo rescue or seeds are treated with colchicine to produce hexaploid plants, which then be crossed with diploid species to generate tetraploid plants. These lines are crossed with upland cotton cultivars, derived F1s and a F2 population were tested for resistance to reniform nematode. Some hybrids and F2 plants could reduce reniform nematode infection by 70% to 90%. Moreover, several other traits were introduced in upland cotton, which will be valuable for cotton genetic improvement.

10:00 BREAK

O1.35

10:15 Complete Genome Sequence of the Virulent *Aeromonas hydrophila* ALG-15-097 Isolated from Diseased Hybrid Catfish in West Alabama

Brian Burnes

Mississippi University for Women, Columbus, MS

Aeromonas hydrophila ALG-15-097 was isolated from a diseased hybrid catfish (*Ictalurus punctatus*, ♀ × blue catfish, *I. furcatus*, ♂) in west Alabama during a 2015 disease outbreak. The full genome of *A. hydrophila* ALG-15-097 is 5,057,091 bp. The availability of this genome will allow comparative genomics to identify genes involved in pathogenesis or antigenicity.

O1.36

10:30 Development, Optimization and Deployment of an Advanced On-Site Diagnostic Assays for *Phytophthora capsici* in Vegetable Production

Emran Ali, Sumyya Waliullah, Franklin Chukwuma

Alcorn State University, Lorman, MS

Accurate and rapid pathogen identification is the critical first step in controlling plant diseases that threaten global food production. However, field-based diagnosis is often complicated by misleading symptoms, allowing destructive pathogens such as Phytophthora capsici to spread rapidly and cause severe economic losses, particularly in warm, wet regions like Mississippi. Traditional laboratory methods, including plate culturing and conventional PCR, are reliable but slow, costly, and require specialized equipment. This inherent delay prevents the immediate, in-field decision-making necessary to manage explosive outbreaks. To address this challenge, advanced on-site diagnostic assays are emerging as indispensable tools for modern extension programming. New nucleic acid- and antibody-based technologies, such as ImmunoStrips, Loop-Mediated Isothermal Amplification (LAMP), Recombinase Polymerase Amplification (RPA), and portable Oxford Nanopore (ONT) sequencing, are transforming crop disease diagnostics. ImmunoStrips enable rapid, visual detection of specific plant pathogens in less than five minutes, requiring no specialized equipment. Similarly, LAMP and RPA provide visual, colorimetric detection of pathogen DNA in under 30 minutes using only a simple heat block. Concurrently, ONT sequencing offers real-time, actionable genomic data for precise pathogen identification from a portable device. These assays have been validated for high sensitivity and can detect pathogens directly from plant tissues and environmental sources such as irrigation water. The deployment of these rapid, sensitive, and cost-effective tools empowers extension agents and growers to identify infections immediately, enabling timely management decisions. This capacity for early, in-field identification is vital for mitigating epidemic risk, reducing crop losses, and promoting sustainable vegetable production.

O1.37

10:45 How to Increase the Production of Ethanol by *Saccharomyces cerevisiae*

Marta Piva[1], Ismael Mayo[1], Jamal Chambers[1], Jon I. Moreno[1]

[1]Alcorn State University, Lorman MS

Human-made greenhouse gas emissions from burning fossil fuels have caused a significant rise in global temperatures over recent decades, increasing the risk of heatwaves, droughts, and wildfires. Ethanol is a sustainable biofuel that can help mitigate the planet's rapid warming by producing fewer greenhouse gases than fossil fuels. It is also a renewable resource derived from plant-based fermentation substrates. However, opposition persists because diverting agricultural resources toward biofuel production could threaten food supplies. One potential solution to this complex issue is to increase ethanol production yield by removing the source of oxidative radicals in the fermentative microbe. We tested this idea by comparing the rate of carbon dioxide production between *CCM1* deletion mutants, which lack mitochondrial function, and their wild-type counterparts at the start of fermentation, before ethanol accumulates to toxic levels. These *Saccharomyces cerevisiae* mutants overexpress two key fermentation genes, *TDH3* and *ADH1*, and exhibit an $NADH/NAD^+$ imbalance that favors NADH, resulting in a more reduced cytoplasmic environment that favors ethanol production. As a result, these mutants nearly double their fermentation rate per cell compared to wild-type strains. Thus, altering a genetic trait that decreases oxidation enhances the production of a product enriched in reduction equivalents— a characteristic of all fuels. This work was supported by the Mississippi INBRE, funded by an Institutional Development Award from the National Institute of General Medical Sciences of the National Institutes of Health, grant number P20GM103476, and by the US Department of Education, Title III, grant number P382G230011.

O1.38

11:00 - Amount of Carbon Within a Log Truck Load of Pine Logs in the Southeastern United States

Curtis VanderSchaaf

Mississippi State University, Mississippi State, MS

Forestry and logging are big business in the southeastern United States. Thus, transportation of logs from a harvesting site to a processing facility, or mill, is very important to the wood supply chain. An interesting question is how much carbon is within a truckload of pine logs? Factors such as legal gross vehicle weight restrictions, overall truck length and log overhang restrictions, stacking efficiency of the logs, truck and trailer

configurations, log load configurations (e.g. tree length versus two bunks), time since harvesting and how long logs have been sitting, species, genotypes, forest management, season of year, even bark slippage, and potentially other factors can impact the amount of carbon contained within logs of a particular truckload. This assessment attempts to identify factors that can impact carbon amounts and to provide estimates of carbon contents for various log truck and log characteristics. Based on log recovery assumptions (e.g. efficiency of converting logs into usable products), how much carbon is stored in harvested wood products on each log truckload could be derived. The assessment will hopefully lead to the production of an extension article.

O1.39

11:15 Characterization of Boar Sperm Microbiota and Their Potential Role in Sperm Quality Assessment

Serge L. Kameni, Notsile H. Dlamini, Jalyn Hawkins, Fan Peixin, Jean M. Feugang

Department of Animal and Dairy Sciences, Mississippi State University, Mississippi State, MS

Sustainability and profitability in the boar stud industry depend not only on the number of artificial insemination (AI) doses produced but also on their quality, which directly influences fertility. However, up to 10% of collected ejaculates fail to meet processing criteria, reducing productivity. While factors such as animal health and environmental conditions contribute to ejaculate rejection, emerging evidence suggests that microbial composition may also play a role. This study compared the microbial profiles of boar ejaculates classified as Passed (n = 10, total motility = 87.50 ± 2.15%, normal morphology = 84.80 ± 1.61%, Concentration = 426.3 ± 13.01 × 10^6 spermatozoa/mL) or Failed (n = 10, total motility = 77.10 ± 3.98%, normal morphology = 58.20 ± 2.45%, Concentration = 343.60 ± 30.31 × 10^6 spermatozoa/mL) for AI processing using 16S rRNA gene sequencing. Ejaculates were centrifuged (800 g, 10 min, 4 °C) to obtain sperm pellets. DNA was extracted from sperm pellets, amplified (V3-V4 region), and sequenced on the Illumina NextSeq platform. Firmicutes (62%) and Proteobacteria (18%) dominated the microbiome, accounting for 80% of the total composition. Alpha diversity differed significantly between groups based on the Chao1 index (P = 0.01), while the Shannon index was not significant (P = 0.05). Beta diversity (Bray-Curtis) was comparable between groups. Differential abundance analysis revealed significant taxonomic differences at multiple levels (class, order, genus, species), although no correlations were observed between sperm parameters and genus abundance, and between sperm parameters and diversity metrics. These findings indicate that boar ejaculates exhibit distinct microbial profiles, which may influence semen quality and AI processing outcomes.

O1.40

11:30 Quantifying Tolerance of Finger Millet to Heat and Drought Stress During Seed-Set and Seed Filling Stages

Renganathan Vellaichamy Gandhimeyyan, Chami Rampati Dewage, Mohan K Bista, Raju Bheemanahalli

Department of Plant and Soil sciences, Mississippi State University, Mississippi State, MS

Finger millet (*Eleusine coracana* L. Gaertn.) is a climate-resilient C4 cereal crop with stress tolerance and health benefits. However, the mechanisms associated with individual drought, heat, and combined tolerance in finger millet have not been well understood. The present study aimed to assess the heat and drought tolerance, as well as the combined stress tolerance of twelve finger millet genotypes. At the reproductive stages, these genotypes were exposed to four different treatments: control (100% irrigation), heat (38°C daytime), drought (30% irrigation), and a combination of drought and heat (38°C+30% irrigation). A significant interaction between genotype and environment (G × E) was observed on gas exchange ($p < 0.05$) and pigment parameters ($p < 0.01$) during combined heat and drought stress. Under individual stress, a significant negative correlation ($r = -0.53$, $p < 0.05$) was observed between stomatal conductance and leaf temperature. Irrespective of the genotype, chlorophyll (29%) and nitrogen balance index (40%) decreased under combined stress, while leaf temperature (10%) increased. Under combined stress, some genotypes recorded a significant reduction in biomass and number of filled panicles per plant compared to the control. The sensitivity of finger millet to individual or combined stress during the reproductive stage is significantly associated with physiological changes. This strongly suggests the differential physiological regulation of finger millet to stressors.

O1.41

11:45 Does Soybean Stress Tolerance Change with Short- and Long-Term Heat and Drought Stress?

Lekshmy V. Sankarapillai[1], Sujan Poudel[1], Nuwan K. Wijewardane[2], Raju Bheemanahalli[1]

[1]Department of Plant and Soil Sciences, Mississippi State University, MS, [2]Department of Agricultural & Biological Engineering, Mississippi State University, Mississippi State, MS

Dry weather and high temperatures during soybean [*Glycine max* (L.) Merr.] flowering often impairs pod formation, seed development, and yield. Few studies have examined the short- and long-term effects of these stressors on physiological changes during day and night. Here, we examined the responses of three soybean genotypes to heat and drought stress during full bloom (R2). Plants were grown under nonstress conditions until R2, then exposed to

one of four treatments: (i) optimum temperature (32 °C) with full irrigation (control, CNT), (ii) daytime temperature (38 °C) with full irrigation (HS), (iii) optimum temperature with 50% irrigation of the CNT (DS), and (iv) 38 °C with 50% irrigation (HS+DS). Following 14 days of HS (6.9 °C above control), stomatal conductance (*gs*) increased by 15.9%, and transpiration rate (*E*) by 34%. While HS+DS reduced *gs* and *E* by more than 70%, leading to a 68% decline in photosynthetic rate (*A*). Prolonged stress into R5-R6 stages further reduced *A* by >80% under HS+DS compared with CNT. Although nighttime temperatures were maintained at 24 °C levels, DS and HS+DS reduced dark respiration (*Rd*) by more than 25% after 14 days, while HS maintained *Rd* at a level similar to CNT. As stress was long-term, reduced substrate availability lowered the *Rd* by 30% across all stress treatments. Moreover, the reproductive traits, including flower size and number, were maintained in DS25-1 under HS. However, combined stress caused >60% pod loss, even in this heat-tolerant genotype, highlighting the vulnerability of soybeans to dry and hot conditions. Thus, identifying tolerance mechanisms under HS+DS will be essential for sustaining production under future climatic conditions.

12:00 Industry Panel

Panel Title: Building Productive AgTech Ecosystems in the Mid-South: A Needs Assessment for Startup, Producer, and Research Partnerships

This one-hour discussion aims to:

- Assess the strengths and gaps of Mississippi's current agricultural innovation landscape
- Learn from Nebraska's producer-connected AgTech ecosystem model
- Identify actionable strategies to strengthen collaborations among **startups, researchers, producers, investors, and industry partners**
- Explore opportunities for MAS to support student engagement, industry partnerships, and sponsorship pathways

Panel Structure
0:00–0:03 | Welcome & Context Setting –
Dr. Prakash Kumar Jha**,**
MAS Ag Innovation & Technology Liaison

0:03–0:08 | Moderator Opening Remarks - Ankit Chandra
0:08–0:25 | Round 1 – Panelist Perspectives (3–4 min each): Guiding Prompt
"Where do you see the strongest opportunities—and greatest gaps—in building a productive AgTech ecosystem in the Mid-South?"

Dr. Nick Pashos

- Entrepreneurial culture at Mississippi State University–industry–startup bridge models
  Startup incubation and commercialization bottlenecks

Masha Trenhaile Industry–

- Academia collaboration models at scale
- University engagement and workforce development
- How global companies seed innovation ecosystems
-

Nikhilesh Kumar

Climate, digital agronomy, and real-time field intelligence
Scaling AI/IoT solutions in diverse geographies
Lessons from deploying precision tools with producers

María Paz Álvarez

Biological innovation and field validation
Challenges early-stage startups face in entering U.S. markets
Role of producer networks for rapid testing and adoption

0:25–0:45 | Round 2 – Interactive Dialogue Led by Moderator

- Building a Regional AgTech Innovation Stack
- Producer Engagement & Technology Adoption
- Startup Acceleration & Investment Readiness

1:00 Business Meeting and Awards Ceremony

Alcorn State University/MAS Junior Academy of Sciences High School Division

Chair: Babu Patlolla
Alcorn State University

Friday, March 20, 2026
10:00-11:30 Poster Area Hall C

P2.01

Silver-Doped Quantum Materials for Eradication of Gram-Positive and Gram-Negative Bacteria

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[1]Madison Central High School,Madison, MS, [2]Jackson State University, Jackson, MS

Antibiotic-resistant bacteria such as Methicillin-resistant *Staphylococcus aureus* (MRSA) and *Salmonella Typhi* can cause life-threatening illnesses in humans. The antimicrobial properties of quantum materials such as bismuth selenide give them the potential to kill antibiotic-resistant bacteria strains. We prepared bismuth selenide and silver-doped bismuth selenide quantum materials using the hydrothermal synthesis method. Specifically, we dissolved 1 mM bismuth nitrate pentahydrate with 1.5 mM selenium in 12 M hydrochloric acid and autoclaved the solution for 24 hours to create the bismuth selenide quantum material. To create the silver-doped bismuth selenide quantum material, we dissolved 1 mM bismuth nitrate pentahydrate with 1.5 mM sodium selenite and 15% silver nitrate in nitric acid and autoclaved the solution for 24 hours. Scanning Electron Microscopy and Transmission Electron Microscopy revealed that the bismuth selenide and silver-doped bismuth selenide had nano-structured morphology, with the silver-doped sample displaying a coating of silver. Energy Dispersive Spectroscopy confirmed that the quantum material samples contained only bismuth, selenium, and silver. Next, we tested the quantum materials against MRSA and *Salmonella* bacteria by incubating the bacterial solutions with the quantum materials for two hours before plating the samples and culturing them overnight. We found that the bismuth selenide was able to kill ~10% of the MRSA and >50% of the *Salmonella*, while the addition of silver to the bismuth selenide increased the material's killing efficiency for both bacteria to >99%. This method shows potential for the eventual eradication of antibiotic-resistant MRSA and *Salmonella Typhi* and could be used as a successful treatment for other gram-positive and gram-negative bacterial infections. In the future, we aim to explore the use of bismuth selenide to eradicate *E. coli* and other antibiotic-resistant bacteria.

P2.02

Influence of Doping and Functionalization on Quantum Confinement and Optoelectronic Properties of Graphene Quantum Dots: An AB-Initio Study

Anik Picarsic[1], Pabitra Narayan Samantra[2], Jerzy Leszczynski[2]

[1]High school Homeschooler, [2]Jackson State University, Jackson, MS

Within the framework of electronic structure theory calculations, this research explores the influence of doping and surface functionalization on the quantum confinement and resulting optoelectronic properties of graphene quantum dots (GQDs). GQDs, nanoscale fragments of graphene, exhibit unique size-dependent properties due to quantum confinement and edge effects, making them promising materials for diverse applications including optoelectronics, catalysis, sensing, and sustainable energy devices. However, the intrinsic characteristics of pristine GQDs, including their bandgap and luminescence, can be further modified and enhanced through doping and functionalization of the GQD surface. The quantum mechanical calculations are performed to elucidate the synergistic effects of doping and functionalization on the density of states, band gaps, spectral behavior including IR and UV-visible spectra, as well as optical properties (e.g., polarizability, hyperpolarizability, etc.) of GQDs. Heteroatom doping (e.g., nitrogen, boron, etc.) introduces defect states and affects charge carrier mobility, influencing both electronic and optical properties. Such modifications lead to a shift in the energy gap, enabling the tuning of absorption and emission wavelengths, often causing a red shift towards the visible and even near-infrared spectrum. Functional groups, such as hydroxyl, epoxy, and carboxyl groups, also modify the electronic and optical properties by altering the electron wave function distribution and inducing conformational changes in the GQD structure. This allows for fine-tuning of the energy gap and tailoring the absorption spectrum. The atomic-scale understanding provides the structural basis for achieving precise control of the photoluminescence properties of the GQDs.

P2.03

Administration of PRX Targeting KCNT1 Affects Cocaine-Seeking Behavior in Female Rats Only

Tanise Brown[1], Ariel Cox[2], Amy Kohtz[2]

[1]Base Pair Program, Murrah High School, Jackson, MS, [2]Department of Psychiatry and Human Behavior, Division of Neurobiology and Behavior Research, University of Mississippi Medical Center, Jackson, MS

The inability to maintain abstinence is a hallmark of substance use disorders (SUDs). In women, this may be particularly complex, as their psychological and biological responses to drugs differ from those in men. Several measures of cocaine use are greater in women, a pattern reflected in female rodents, yet the biological mechanisms remain unclear. Furthermore, cravings during initial abstinence predict long-term relapse outcomes in both humans and rodents. We previously used whole-transcriptome sequencing analysis during the initiation of abstinence (Extinction Day 1, ED1) in rats and identified 5 targets predicting the magnitude of cocaine-seeking behavior in females only. One of those targets was KCNT1, which has been previously linked to behavioral flexibility. We hypothesized that it may also drive perseverative cocaine-seeking behavior. To evaluate the role of KCNT1 on cocaine-seeking behavior, rats underwent daily 2h self-administration sessions, pressing the active lever for a cocaine reward on a fixed ratio one schedule for at least 10 days. Once they met the criteria of ≥10 infusions/day, on Day 11, 24h after the last session, male and female rats received a subcutaneous injection or intracranial infusion to the dorsal hippocampus of KCNT1 antagonist, PRX-2904 or the corresponding vehicle. The systemic group consisting of male and female rats received an injection of 30mg/kg at 7.5mg/mL 30 min before their first 90min ED1 test. The intracranial group consisting of only female rats received a 1uL-1mM bilateral infusion of PRX or its aCSF vehicle 10 min before their first 90 min ED1 test. Inhibition of KCNT1 by PRX2904 decreased cocaine-seeking behavior during ED1 and persisted through ED2/WD15 in female rats only when administered systemically or intracranially. These findings suggest that KCNT1 may play a crucial role in driving cocaine-seeking persistence during early abstinence, particularly in females. Using therapeutics that target molecular pathways engaged during cocaine-seeking behavior may improve abstinence maintenance, providing strong implications for sex-specific treatment strategies for SUDs. This work was supported by R00-045758/ P20GM144041 to ASK.

P2.04

Bone Loss Associated with SSRi Antidepressant Use

Nicholas D. Pride[1], Michelle A. Tucci, PhD[2]
[1] Northwest Rankin High School, [2] University of Mississippi Medical Center

This research-based review aims to expand understanding of the association between selective serotonin reuptake inhibitor (SSRI) antidepressant use and adverse effects on bone health, with a specific focus on bone mineral density (BMD), osteoporosis, and fracture risk. SSRIs are widely prescribed for the treatment of depression, anxiety disorders, and other psychiatric conditions, often for long-term use. As the prevalence of SSRI use continues to rise across adolescent, adult, and geriatric populations, increasing attention has been directed toward their potential systemic side effects beyond the central nervous system. Emerging clinical and epidemiological evidence suggests that SSRI use may contribute to measurable bone loss and increased skeletal fragility, representing an important and underrecognized public health concern. Numerous observational studies and large-scale meta-analyses have demonstrated a consistent association between SSRI exposure and reduced BMD at critical skeletal sites, including the lumbar spine, hip, and femoral neck. These reductions in BMD are clinically significant, as they correlate with a higher incidence of osteoporotic fractures, particularly hip and vertebral fractures, which are associated with increased morbidity, mortality, and reduced quality of life. The risk appears to be dose-dependent and more pronounced with prolonged SSRI use. Populations at greatest risk include postmenopausal women, older adults, and individuals with preexisting risk factors for osteoporosis, such as vitamin D deficiency, sedentary lifestyle, or chronic medical conditions. The biological mechanisms underlying SSRI-associated bone loss are believed to involve serotonin's regulatory role in bone metabolism. Serotonin functions not only as a neurotransmitter but also as a signaling molecule in bone tissue, influencing the balance between osteoblast-mediated bone formation and osteoclast-mediated bone resorption. SSRIs inhibit serotonin reuptake, which may disrupt this balance by suppressing osteoblast activity while promoting osteoclast function, resulting in net bone loss over time. Additionally, SSRI use has been associated with an increased risk of falls due to side effects such as dizziness, sedation, and impaired coordination, further compounding fracture risk. It is important to recognize that depression itself is an independent risk factor for decreased BMD and fractures, likely due to hormonal changes, increased inflammation, reduced physical activity, and poor nutritional status. This overlap complicates the interpretation of causality; however, evidence suggests that SSRI use independently contributes to skeletal risk beyond the effects of depression alone. Given these findings, increased clinical awareness is essential when prescribing SSRIs, particularly for long-term treatment. Preventive strategies may include baseline and follow-up bone density screening, lifestyle interventions such as weight-bearing exercise, smoking cessation, and adequate calcium and vitamin D intake, as well as careful consideration of alternative or adjunctive therapies when appropriate. Improved recognition of SSRI-associated bone effects may lead to earlier intervention, reduced fracture risk, and better long-term musculoskeletal outcomes for patients receiving antidepressant therapy.

P2.05

The BPH/5 mouse model of Superimposed Preeclampsia displays cerebral hypoperfusion but no change in microglia density at 2 months Postpartum

Danielle McClellan[1, 2], Qingmei Shao[2], Shanise Rouser[2], Junie Warrington[2]

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Background: Women who were diagnosed with hypertensive disorders of pregnancy (HDP) have a higher risk of developing Alzheimer's disease and vascular dementia later in life. Superimposed preeclampsia is an HDP that affects women with pre-pregnancy hypertension who develop preeclampsia symptoms. The blood pressure high (BPH/5) mouse is a well-characterized model of superimposed preeclampsia. While pregnancy-related changes have been described in the BPH/5 mouse, whether there are pregnancy-related and postpartum cerebral complications is not known. Additionally, whether postpartum mice have evidence of neuroinflammation is unknown.

Objective: To determine whether superimposed preeclampsia is associated with reduced cerebral perfusion and neuroinflammation postpartum.

Methods: Timed-pregnant C57BL/6 mice (n=5) underwent sham abdominal surgery on GD 13.5 and were allowed to deliver normally. BPH/5 mice went through normal pregnancy/delivery. At 2 months postpartum, dams were weighed, and baseline cerebral perfusion was measured using a laser Speckle Imager for 5 minutes under 1.5% isoflurane. Regions of interest (ROI) were drawn in the regions overlying the left and right parietal cortices and the whole brain. Mean perfusion measurements were normalized to the area of each ROI. Brains were removed and prepared for immunofluorescence staining. Brain slices were stained using Iba-1 antibody and imaged using confocal microscopy. Microglia were counted using Fiji software, and based on morphology, microglia were rated as Type 1-4. Type 1 are the resting, and Type 4 are the activated (ameboid-shaped). The percentage of each type was calculated per region.

Results: Postpartum BPH/5 mice had lower perfusion of the left (11±1 vs 13±1 p.u/mm^2, $p<0.01$) and right (20±2 vs 24±1 p.u/mm^2, $p<0.01$) parietal cortex and whole brain (3.4±0.3 vs 4.2±0.5 p.u/mm^2; $p=0.02$) compared to postpartum control mice. There was no difference in the density of microglia in the hippocampus or cortex between groups ($p>0.05$). In both regions, there were fewer Type 1 microglia compared to other microglial types, although no significant difference was observed between groups.

Conclusion: Our results indicate that a history of superimposed preeclampsia-like conditions is associated with reduced cerebral perfusion, but no change in microglial density or activation state, at 2 months postpartum, compared to mice with normal pregnancy. Future studies will measure changes in astrocyte density, another glial cell, in similar brain regions. Additionally, we will assess changes in these parameters at later postpartum time-points.

P2.06

Photopolymerized Bio-based Polymer Composites from Acrylated Epoxidized Soybean Oil and Hexagonal Boron Nitride

JeMele Moore[1], Olivia McNair[2], Megan O'Neil[2], Grant Odom[2]

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The environmental impact of petroleum-based plastics has created a demand for renewable and sustainable polymer alternatives. This study investigates the development of a bio-feasible polymer system for food packaging applications synthesized from Acrylated Epoxidized Soybean Oil (AESO) and hexagonal boron nitride (h-BN) to evaluate its thermal, structural and permeation properties. AESO was selected as the main resource for its renewable origin, low toxicity, and reactive acrylate groups that facilitate crosslinking. AESO, Pentaerythritol tetracrylate (PETTA), a tetrafunctional petroleum- based acrylate crosslinker) and 2, 2-dimethoxy-2-phenylacetophenone (DMPA) photoinitiator were photopolymerized to create films for analysis. PETTA was loaded into AESO formulations at 5, 20, 30, and 40 wt%. Thermogravimetric Analysis (TGA) of the base films did not imply a significant difference in thermal stability as PETTA loading increased. Tensile modulus of the neat polymer films was 85, 56, 97 and 121 MPa respectively while the strain at break for those same systems was 26, 27, 23 and 21%. From initial experiments the best balance of mechanical performance was demonstrated with 5% PETTA loading. HBN nanosheets were introduced to a down selected formulation to enhance mechanical and gas permeation properties. HBN is loaded into the optimal base formulation at 5, 10, 15, and 20%. Thermal, mechanical and gas transport properties of the acrylate-hBN composites will be determined in future studies.

P2.07

Highly Thermally Conductive Hexagonal Boron Nitride (HBN)/Thiol-ene Composites via Resin Infusion of Consolidated HBN Pellets

Olivia McNair[1], Logan Hughes[2], Megan O'Neil[1], Sonia Patil[3], Sergei Nazarenko[1]

[1]The University of Southern Mississippi, Hattiesburg, MS, [2]Hattiesburg,HighSchool, Hattiesburg, MS. [3]California Polytechnic State University,San Luis Obispo, CA

Polymers offer a versatile materials platform with tunable properties through monomer design; however, this versatility rarely extends to thermal conductivity. Incorporating thermally conductive fillers into polymers can significantly enhance heat transport, but achieving sufficient filler loadings is often limited by high viscosity. Hexagonal boron nitride (h-BN) is an especially advantageous filler due to its low density, high intrinsic thermal conductivity, and electrical insulation. Here, we present a strategy to enhance the thermal performance of polymers by compacting two-dimensional h-BN nanosheets into a preform, infiltrating the preform with low-viscosity photo- and thermally reactive thiol-ene monomers, and curing to form highly filled composites. Thiol-ene systems with distinct glass transition temperatures (Tg) were employed to produce rubbery and glassy h-BN/thiol-ene composites. Pentaerythritol tetrakis(3-mercaptopropionate) (4T) combined in a 1:1 ratio with either tri(ethylene glycol) divinyl ether (TEGDVE) or 1,2,5-triallyl-1,3,5-triazine-2,4,6-trione (TTT) generated the respective rubbery and glassy materials. Thermogravimetric analysis (TGA) revealed a positive correlation between h-BN volume fraction and compaction pressure, although pressures exceeding 12,000 psi hindered resin infiltration. Scanning electron microscopy (SEM) showed h-BN alignment perpendicular to the compaction direction, resulting in high in-plane thermal diffusivity (3.69 mm^2/s) and lower through-plane diffusivity (0.70 mm^2/s) in the 4T/TEGDVE system, as measured by laser flash analysis (LFA). The corresponding in-plane (6.79 W/m·K) and through-plane (1.34 W/m·K) thermal conductivities represent substantial improvements over neat polymers (0.1-0.5 W/m·K). This approach establishes a versatile platform for fabricating tunable polymer composites for advanced thermal management applications, particularly where high filler loadings are otherwise impractical.

P2.08

Executive Decision Making is Impaired following Preeclampsia/Eclampsia-like Conditions at Two Months Postpartum in C57BL/6 Mice

Theresa Frazier[1], Chauncey J. Darden[2], Simranjit Kaur[2], Qingmei Shao[2], Maria Jones-Muhammad[2], Tyranny Pryor[2], Junie P. Warrington[2]

[1]Murrah High School, Jackso, MS, [2]University of Mississippi Medical Center, Jackson, MS

Introduction: Preeclampsia (PE) is a systemic, pregnancy-related condition that affects women worldwide, characterized by new-onset hypertension and end-organ damage. Progression of PE can further lead to the development of eclampsia, when new-onset seizures develop, increasing the risk for maternal mortality. Studies also show that both conditions increase risks for late-life neurological diseases such as Alzheimer's and other dementias, particularly vascular dementia. Vascular dementia is caused by cerebrovascular damage, resulting in symptoms such as impaired memory and decreased decision-making abilities. The causes of late-life cognitive impairment following PE/E exposure are not very clear. Our lab has demonstrated that mice exposed to reduced uterine perfusion pressure (RUPP) and experiencing seizures exhibit cerebral hypoperfusion and mitochondrial dysfunction in the prefrontal cortex (PFC) postpartum.

Hypothesis: Since the PFC plays a major role in decision-making, we hypothesized that RUPP and seizure exposure lead to impaired decision-making, evidenced by the use of random search strategies on a spatial learning task at two months postpartum.

Methods: Pregnant C57BL/6J mice underwent sham or RUPP surgeries (ligation of uterine arteries) at gestational day (GD) 13.5. A subset of these mice was injected with pentylenetetrazol (PTZ, 40mg/kg), a seizure-inducing GABA receptor antagonist, at GD 18.5 to mimic eclampsia. Mice were allowed to deliver naturally, and at 2 months postpartum, we assessed spatial learning and executive decision-making using the Barnes maze over 4 days of training. Track visualizations (indicative of search strategy) were scored as follows: Direct = 11; Serial = 2-8, with lower scores indicating a higher number of holes visited in succession; Random = 1. The highest score indicates an optimal search strategy.

Results: On Day 1 of learning, there was a significant effect of seizure exposure ($F(1,18)=4.78$; $p=0.042$) and a near-significant effect of RUPP ($F(1,18)=3.48$; $p=0.078$) on search strategy scores, with those exposed having the highest scores. The average search strategy score for sham-exposed mice was 9±1 vs 6±3 for RUPP only-exposed mice ($p=0.033$) and 6±2 for seizure only ($p=0.026$) treated mice on Day 1. Mice exposed to RUPP+PTZ scored 5±4 on Day 1. Small strategy improvements were observed in mice exposed to RUPP on Days 2 and 3, with a score of 7±5. Mice exposed to seizures only or both treatments did not show any improvements on Day 2; however, RUPP+PTZ mice scored higher on Day 3 compared to RUPP-only mice (10±3; $P=0.073$). There was no difference between groups on Day 4, with average scores of 10±1 indicating a corrected direct strategy.

Conclusion: Our results demonstrate that PE and eclampsia-like conditions result in impaired spatial navigation on the Barnes maze at 2 months postpartum. Because these impairments in spatial navigation occur in conjunction with hypoperfusion of the PFC and impaired mitochondrial function, we will investigate whether restoring cerebral perfusion and mitochondrial function can prevent postpartum impairments in executive function.

P2.09

Using Geographic Information Systems (GIS) to Uncover Underlying Reasons for Domestic Violence Incidents in Metropolitan Areas

Wynter Fairley

Hattiesburg High School, Hattiesburg, MS

This research examines how geographic information systems (GIS) can uncover the underlying reasons and spatial patterns of domestic violence incidents in metropolitan areas. Using GIS data from Chicago, Birmingham, and Los Angeles, this study maps domestic violence hotspots and connects them with key social and environmental factors. Spatial clustering shows that neighborhoods experiencing high unemployment, economic distress, and limited community resources consistently report higher levels of domestic violence. Across all three cities, sleep deprivation emerged as a common underlying factor, with areas reporting fewer than seven hours of average sleep per night also showing elevated domestic violence rates. By integrating law enforcement records, and census data the study demonstrates how environmental and social conditions intersect to influence domestic violence patterns. Overall, the findings show that GIS is not only a valuable tool for visualizing domestic violence distribution but also for identifying shared systemic issues across cities. This provides a foundation for data-driven interventions that promote safety, awareness, and equity within metropolitan regions.

P2.10

Assessing Bacterial Contamination in Community Water Sources Affected by an Overflowing Sewer System

Kendall Ellis, Myah Eaton, Garrett Osowski, Joshua Allen, Ramesh Rijal

University of Southern Mississippi, Hattiesburg, MS

Sewer overflows can introduce fecal bacteria into adjacent waterways and pose significant environmental and public-health risks. Residents near Magnolia Lane in Petal, Mississippi reported frequent foul odors from an overflowing sewer grate, yet no formal microbial assessment had been conducted. This study aimed to identify bacteria present in affected water and sediment samples, quantify contamination levels, and provide data to guide community-based monitoring and remediation.

We collected samples at the overflow site and downstream locations and were cultured on LB and EMB agar. We identified isolates using the EnteroPluri biochemical assay. Our colony counts ranged from 30,764 to 37,776 CFU on selective media, which is more than 150 times the accepted recreational limit of ≤200 CFU/100 mL. We identified *Escherichia coli*, *Proteus vulgaris*, *Proteus mirabilis*, and *Morganella morganii* in samples, all of which are indicative of fecal contamination and can contribute to malodour and human health risk.

These results indicate ongoing fecal-bacterial release from the municipal sewer overflow into community water sources. We recommend that community stakeholders institute regular microbial monitoring, at least monthly, and weekly during high-use or rainy seasons, in alignment with citizen-monitoring best practices in Mississippi. Preventive actions should include prompt sewer repair, the installation of upstream buffer zones or diversion measures, and outreach to residents about potential exposure risks. By coupling student-driven microbial surveillance with municipal remediation efforts, this study highlights an effective model for local environmental health assessment and community engagement.

P2.11

Cheap, Fast, Reliable: Optimizing PCR Genotyping for cost and time savings

Destynee Younger[1, 2], Bradley Walters[1, 2]

[1]The University of Mississippi Medical Center, Jackson, MS, [2]Base Pair Program, Murrah High School, Jackson, MS

PCR (polymerase chain reaction) has become a standard technique for biologists worldwide. It is frequently utilized across many disciplines including genetics, diagnostics, agriculture, forensics, and epidemiology. During the first year of the COVID-19 pandemic over 360 million PCR tests were conducted in the U.S. alone. Reagents for PCR cost between $10-$30 per reaction, and PCR tests from commercial labs cost $15-$90 each. In a single mouse genetics laboratory at the University of Mississippi Medical Center (UMMC), thousands of PCR reactions are run each year, and PCR protocols even within one lab like this often rely on different reagents and different temperature cycling conditions that vary in duration. We tested an engineered KlenTaq polymerase to replace the existing, more costly reagents, and sought to identify the lowest number of cycling conditions that would work for the genotyping reactions in the UMMC laboratory identified above. Using lab records and current costs from commercial suppliers, we estimated the number of reactions run per year and the cost per reaction. Of the 30 different protocols routinely performed in this lab at UMMC, 10 of 11 tested so far produce reliable results with KlenTaq. Only two different sets of cycling conditions are required. Analysis of current costs for these reactions with Klentaq replacement, suggests annual savings to this individual lab of tens of thousands of dollars. The consolidation of many cycling protocols into just two allows multiple reactions to be run in the same cycler leading to less time/wage costs and increased productivity. Optimization of PCR protocols can lead to substantial

savings within an individual research lab. Extrapolation of this suggests PCR-based research and diagnosis costs in the United States could be reduced by tens of millions of dollars each year.

P2.12

Towards New Therapeutics for Prevention and Treatment of Influenza

Alana Harp[1, 2], Stephen Stray[3]

[1]Base Pair Program, Murrah High School, Jackson, MS, [2]University of Mississippi Medical Center, Jackson, MS, [3]Center for Immunology and Microbial Research, Department of Cell and Molecular Biology, University of Mississippi Medical Center, Jackson, MS

Influenza A, B, C, and D all infect humans, with influenza A and B showing Neuraminidase (NA) and Hemagglutinin (HA) activity. Since 1900, influenza A has been responsible for five viral pandemics, including the "Spanish 'flu" of 1918, which is thought to have caused up to 100 million deaths worldwide. Due to the segmented nature of the influenza genome. Influenza A can undergo antigenic shifts, which exchange the major surface antigens with homologs not previously seen in human viruses. Such antigenic changes would render existing immunity next to useless. While effective antiviral drugs targeting influenza exist, the virus can develop resistance, limiting their efficacy. We wish to develop a new class of influenza antiviral, based on the fusion apparatus of influenza HA. HA must undergo conformational change between the fusion-inactive high pH form and the fusion-active low-pH form. We have designed peptides based on HA sequences, which we believe may inhibit this transition or the process of membrane fusion. We will test the effectiveness of the peptide *in vitro* infection. Hoping to prevent viral infection by targeting the virus, we aim to investigate the use of a peptide designed on H3 HA sequences on a virus of the same type, H3. We will also test the same peptide on a different type of virus, H1. New antiviral treatments that may be used prophylactically in the context of a novel influenza may help reduce the spread and severity of an influenza pandemic.

P2.13

Evaluation of the Longevity of Implant/Abutment Sets with Different Diameters

Georgia Mason[1, 2], Jason Griggs[1], Riya Titus[1], Renan Brandenburg dos Santos[1], Jasmine Caliedo[1]

[1]The University of Mississippi Medical Center, Jackson, MS, [2]Base Pair Program, Murrah High School, Jackson, MS

Objectives: Narrow-diameter (ND) implants may show distinct long-term mechanical behavior compared to standard-diameter (SD) implants when subjected to fatigue conditions. This study aimed to evaluate the longevity of implant systems with different diameters by assessing structural damage and loosening after fatigue challenge.

Methods: Morse taper implants (Plenum®, Jundiaí, SP, Brazil) and their corresponding abutments with identical dimensions were divided into 5 models. Their inner screw thread diameters were all changed from the original screw thread (3.0mm) to (2.4, 2.7, 3.3, 3.6, and 3.9 mm) using SolidWorks software. The models were then converted into STEP files so they could be uploaded to ABAQUS (a program that predicts the life and structural integrity of the models). The products and materials were applied to all five models. The load was applied at a 30-degree angle, ensuring that all models received the same stress at the specified pressure points. The pressure is applied this way to replicate a human bite force, which, most times, doesn't come from a 90-degree angle. The stress is decoded into a color chart, where the parts with the most stress/damage are red, and the parts that are the least damaged/distressed are blue. The results of this color chart will show which model has the best design.

Results: The project is not yet completed, but the products have been inputted. The last thing left to do is to input the interaction of the pieces so that the weight restraint can be applied. The outcome of the project are still underway.

Significance: Some people pay thousands of dollars every single year to get their teeth fixed. Either because something was defective, hurt, fragile, etc. Our goal is to try to help our dental lab begin to find solutions to making implants stronger, so that people won't have as many complications in the future.

P2.14

Antimicrobial Resistance in Mississippi: Implications for Stewardship and Public Health

Kavya Maheshwari[1], Poonam Sharma[2]

[1]St. Andrew Episcopal School, Jackson, MS, [2]University of Mississippi Medical Center, Jackson, MS

Background: Antimicrobial resistance poses a major public-health challenge in the United States and globally. States can have different resistance patterns compared to the national average, depending upon local pathogen distribution, antibiotic use, and infection control strategies. Understanding the microbial resistance patterns in Mississippi is essential for guiding stewardship, infection control priorities, and public health interventions.

Methods: A retrospective review of five years of CDC antimicrobial resistance surveillance data (2019-2023) was conducted for methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant *Enterococcus faecium* (VREfm) and *E. faecalis* (VREf), carbapenem-resistant *Acinetobacter* spp. and *Escherichia coli*, and multidrug-resistant (MDR) *Enterobacter* spp., *Klebsiella pneumoniae*, and *Pseudomonas aeruginosa*. National and

Mississippi-specific resistance percentages were extracted and systematically compared across organisms and years. Trends were compared across various bug-drug combinations to identify which micro-organisms exhibited a high resistance burden.

Results: Mississippi showed significantly higher resistance levels than the national average for MRSA and VREfm, with MRSA remaining 15-22% above U.S. levels across all years. VREfm in Mississippi exceeded national rates by up to 20%. MDR *Klebsiella* and MDR *P. aeruginosa* demonstrated multi-year spikes in Mississippi that surpassed national trends. MDR *E. coli* and MDR *Enterobacter* showed lower overall burden but greater year-to-year variability at the state level. Carbapenem-resistant *Acinetobacter* increased nationally but lacked state-level reporting.

Conclusion: Mississippi's antimicrobial resistance burden is substantially higher than national averages, particularly for MRSA and VRE, highlighting ongoing challenges in infection control. Strengthening the antimicrobial stewardship and expanding diagnostic capacity will be essential to slow further resistance growth.

P2.15

Evaluation of the Longevity of Implant/Abutment Sets with Different Connector Screw Thread Depth

Jasmine Caliedo[1],2, Georgia Mason[1, 2], Jason Griggs[1], Riya Titus[1]

1Base Pair Murrah High School, Jackson, MS, [2]University of Mississippi Medical Center, Jackson, MS

Objectives: Narrow-diameter (ND) implants may show distinct long-term mechanical behavior compared to standard-diameter (SD) implants when subjected to fatigue conditions. This study aimed to evaluate the longevity of implant systems with different diameters by assessing structural damage and loosening after fatigue challenge.

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P2.16

Developing and Evaluating Computational Methods for Modeling Protein Corona Formation on PLGA Nanoparticles

Victoria L. Petrosyan[1, 2], Karina Kapusta[2]

[1]Tougaloo College, Jackson, MS, [2]St. Andrew's Episcopal School, Jackson, MS

When nanoparticles enter biological environments, they rapidly acquire a protein corona, a layer of adsorbed proteins that redefines their physicochemical identity. The corona critically influences nanoparticle circulation time, cellular uptake, immune recognition, and overall therapeutic efficacy. Understanding its formation is therefore essential for the rational design of safer, more effective nanomedicines. Despite its importance, computational modeling of protein corona formation remains highly challenging, requiring representation of dynamic polymer-protein-solvent interactions across large, heterogeneous systems and long simulation timescales. In this project, we focused on poly(D,L-lactide-co-glycolide) (PLGA) nanoparticles. Although PLGA is typically synthesized with a fixed lactic-to-glycolic acid ratio, differences in monomer reactivity often yield complex, non-random copolymer sequences. To model these architectures realistically, we developed a Python-based tool that generates SMILES strings for multicomponent polymers with fully customizable monomer types, chain lengths, and sequence distributions. These polymer models were then used in GROMACS Molecular Dynamics simulations to evaluate PLGA self-assembly and behavior in aqueous environments. A 1,000-ns MD simulation was performed to investigate the self-assembly of this polymer into a nanoparticle. Overall, this work advances computational strategies for modeling protein corona formation and supports the rational design of next-generation polymer-based nanocarriers.

This work was supported by the National Science Foundation (NSF), award number OIA-2414445.

P2.17

Uncovering the Mechanisms of Cobalt(II) Complexes as Candidate Drugs Against African Sleeping Sickness

Anna L. Petrosyan[1, 2], Karina Kapusta[2]

[1]Tougaloo College, Jackson, MS, [2]St. Andrew's Episcopal School, Jackson, MS

Human African trypanosomiasis (HAT), commonly known as African sleeping sickness, is a neglected tropical disease caused by the protozoan parasite Trypanosoma brucei. Current therapeutic options, including fexinidazole, acoziborole, nifurtimox, and benznidazole, remain limited by toxicity, inefficacy, and emerging drug resistance. Recently, novel cobalt (II) coordination organometallic complexes have been synthesized and demonstrated significant antiparasitic activity, with IC_{50} values of 10-30 μM, highlighting their potential as promising candidates for HAT treatment. However, their molecular mechanisms of action remain poorly understood. In this study, two cobalt (II) complexes: $[CoII(BBH)_3]^{2+}$ (experimentally resolved by X-ray crystallography) and $[CoII(INH)_3]^{2+}$ (computationally modeled), were investigated. Toxicity predictions using ProTox 3.0 indicated that these complexes exhibit a less aggressive toxicity profile compared to current therapeutics. Four key T. brucei enzymes were selected as potential molecular targets: type II tryparedoxin-dependent peroxidase (PDB ID: 2VUP), trypanothione reductase (2WPE), triose-phosphate isomerase (2Y6Z), and tryptophanyl-tRNA synthetase (3I05). Protein structures were retrieved from the Protein Data Bank, and potential binding sites were identified using Schrödinger Sitemap. Molecular docking was performed with both complexes and known ligands, followed by MM-GBSA calculations to refine binding poses and assess interaction patterns. While MM-GBSA scoring did not yield strong binding energies, analyses revealed consistent protein-ligand interactions, suggesting specific binding modes. Subsequent molecular dynamics simulations further elucidated the stability of these complexes within binding pockets, providing insight into their mechanism of action. Overall, this combined experimental-computational approach supports the potential of cobalt (II) complexes as novel metalloorganic drug candidates for the treatment of African sleeping sickness.

P2.18

A Home-Cage Automated Infusion Method for Producing Fentanyl Dependence and Withdrawal in Rats

Makenzie Armstead, Ethan Blair, Connor Callahan, Kevin B. Freeman

University of Mississippi Medical Center

The relatively short duration of action of fentanyl presents a methodological challenge for modeling opioid dependence in rodents, as the high injection frequencies required to maintain physiologically relevant exposure exceed those typically used for longer-acting opioids such as morphine or oxycodone. To address this issue, we developed a home-cage automated infusion system capable of delivering around-the-clock fentanyl dosing at intervals sufficient to induce dependence. A single male Sprague–Dawley rat was surgically implanted with a femoral-vein catheter connected to a subcutaneous infusion port (Instech). The infusion system was integrated into the home cage using a spring-suspension and swivel assembly, enabling continuous pump access in the subject's standard housing environment without restricting movement. The infusion protocol spanned 9 consecutive days. Fentanyl was delivered every 20 minutes throughout the 24-hr cycle. Dose escalation followed a staged schedule: 0.01 mg/kg per infusion on Day 1, 0.018 mg/kg per infusion on Day 2, and 0.032 mg/kg per infusion for the remaining 7 days. Body weight was measured daily during dosing and for 15 days following drug discontinuation. The subject entered the study at 462 g and concluded fentanyl administration at 425 g. After cessation, the subject exhibited further weight reduction, reaching a minimum of 370 g by Day 12 (relative to study start), before recovering steadily to 440 g by Day 24. This automated home-cage infusion approach achieves sustained fentanyl exposure sufficient to generate a clear withdrawal syndrome, with weight loss serving as a robust and quantifiable indicator of dependence. The method provides a practical, high-frequency dosing solution for modeling fentanyl dependence and withdrawal in preclinical research that is optimized for developing treatments for withdrawal episodes in patients being treated for opioid use disorder.

Cellular, Molecular, and Developmental Biology

Co-Chair: James a. Stewart, Jr.
University of Mississippi
Co-Chair: Davida Crossley
Mississippi University for Women
Co-Vice-Chair: Felicite Noubissi-Kamdem
Jackson State University
Co-Vice-Chair: Nikki Reinemann
University of Mississippi
Co-Vice-Chair: Galen Collins
Mississippi State University
Co-Vice-Chair: Benjamin Onyeagucha
Mississippi University for Women

Thursday, March19, 2026

MORNING

Hall D Room 3

Moderators: Drs. James A. Stewart, Jr., Davida Crossley, Felicite Noubissi-Kamdem, Nikki Reinemann, Galen Collins, Benjamin Onyeagucha

8:50 WELCOME

O3.01

9:00 Identification of Novel Inhibitors of *Mycobacterium smegmatis* Growth through Genome-Wide Overexpression of P3 Cluster Mycobacteriophage Xavia Genes

Anushka Tennakoon, Ramesh Rijal

The University of Southern Mississippi, Hattiesburg, MS

Rising antibiotic resistance has created an urgent need for alternative strategies to treat bacterial infections. Phage therapy, which uses bacteriophages to target and kill bacterial pathogens, offers a promising solution. However, understanding phage genetics and their interactions with bacterial hosts is crucial for safe and effective therapies. Despite extensive sequencing efforts, the majority of bacteriophage genes remain uncharacterized. To identify genes from mycobacteriophage Xavia that can impair bacterial growth or viability, 69 genes of unknown function were cloned into a pExTra01 plasmid vector. Each gene was placed under the control of an anhydrotetracycline (aTc)- inducible *pTet* promoter, with an *mCherry* transcriptional reporter located downstream of the gene insertion site to monitor expression. Successfully cloned plasmids were verified by sequencing and subsequently used to transform *Mycobacterium smegmatis* mc^2155. Transformants were selected using kanamycin, and 100 ng/ml aTc. Cytotoxic Xavia genes were identified using a bacterial viability assay. Overexpression of 16 out of the 69 tested genes resulted in mild to severe cytotoxic effects on *M. smegmatis*. Bioinformatic analysis predicted that the identified cytotoxic genes encode proteins associated with phage structural components, Rha-like transcriptional regulators, DNA modification enzymes, immunity repressors, endolysins, gene regulatory factors, and RusA-like resolvases. Together, this study provides new insights into the genetic determinants of cytotoxicity in the *M. smegmatis* phage Xavia and advances our understanding of phage-host interactions with potential applications in combating bacterial infections and addressing antibiotic resistance.

O3.02

9:20 - Growth Defect Caused by NIPP1-Mediated PP1 Inhibition may Result from Altered Translation and/or Ribosome Biogenesis in *Saccharomyces cerevisiae*

Neta Nnabuenyi[1], Mark Hall[2], Janice Evans[2], Lavanya Challagundla[3], Michael Garrett[3], Nikki Camlin[1]

[1]University of Southern Mississippi, Hattiesburg, MS, [2]Purdue University, Lafayette, IN, [3]University of Mississippi Medical Center Molecular and Genomics Facility, Jackson, MS

Protein phosphatase 1 (PP1) is a serine/threonine phosphatase which plays an important role in almost all cellular functions including cell survival, cell cycle progression, and protein translation. PP1 is also tightly regulated by up to 200 regulatory proteins responsible for controlling PP1 activity and substrates. One such regulatory protein is Nuclear Inhibitor of PP1 (NIPP1) which inhibits PP1 activity. Overexpression of NIPP1 can be used as a tool to inhibit PP1, hereafter termed NIPP1-mediated PP1 inhibition. Previous results from our lab found that NIPP1-mediated PP1 inhibition grossly impairs *Saccharomyces cerevisiae* growth. Importantly, PP1 is an essential gene in yeast, with loss of PP1 causing cell cycle abnormalities and lethality. Therefore, we hypothesized that altered cell survival and/or cell cycle progression was the cause of this NIPP1-induced growth reduction. To test this hypothesis, live/dead staining and DAPI cell cycle staging of our three yeast lines - empty vector, NIPP1, and mutant NIPP1 (no PP1 binding, control to show phenotype is PP1 dependent) was performed. Surprisingly, we found no difference in cell viability or cell cycle stage between control cells and NIPP1 overexpressing cells. Therefore, to determine the potential pathways that are altered with NIPP1-mediated PP1 inhibition which could cause the reduced cell growth phenotype we performed RNA-seq. Differential gene expression (DEG) was observed for 518 genes, with 256

downregulated and 262 upregulated. Enrichment analysis of DEGs found significant enrichment of cytoplasmic translation (GO enrichment), translation (GO enrichment), and the ribosome (KEGG enrichment). A total of 90 genes (17% of the total DEG population) were found in these enrichment categories with 85 downregulated and 5 upregulated. Notably, 70% of these translation / ribosome associated DEGs were ribosomal protein genes. Current follow-up studies are confirming DEG via qRT-PCR and determining the impact of NIPP1-mediated PP1 inhibition on translation and ribosome biogenesis.

Acknowledgements: This project was supported by NIH grant R00HD103909 to NJC and a DCUR Spur Award to NN. The work performed through the UMMC Molecular and Genomics Facility is supported, in part, by funds from the NIGMS, including the Molecular Center of Health and Disease (P20GM144041) and Mississippi INBRE (P20GM103476).

O3.03

9:40 - Investigation of Antibacterial Innate Immunity Shaped by the Unique Properties of Mouse Embryonic Stem Cells

Marwah Walid Ali Alzara, Damilola Oyebode, Yanlin Guo

University of Southern Mississippi, Hattiesburg, MS

Our previous studies have shown that mouse embryonic stem cells (ESCs) exhibit distinct immunological characteristics compared to differentiated somatic cells. ESCs do not express interferons in response to viral stimuli and lack responsiveness to inflammatory cytokines. However, a critical question is whether this attenuated immune response in ESCs could compromise their innate immunity against microbial pathogens. To address this, we infected ESCs with Listeria monocytogenes (Lm), an intracellular bacterium known to cause pregnancy complications. Surprisingly, ESCs exhibited remarkable resistance to infection compared to mouse embryonic fibroblasts (MEFs). RT-PCR analysis revealed that ESCs did not express pro-inflammatory cytokines (TNFα and IL-6) in response to Lm infection. Additionally, NFκB, a key transcription factor in mediating immune responses, was not activated by Lm infection as shown by immunocytochemistry. These findings suggest that ESCs have developed effective anti-Lm mechanisms that are independent of a classical inflammatory response. It is known that Lm can hijack the host's actin cytoskeleton to spread from cell to cell and evade the host's innate immune system. Using GFP-expressing Lm (GFP- Lm) and fluorescence microscopy, we observed close interactions between GFP-Lm and actin filaments in MEFs. In contrast, such interactions were absent in ESCs, which have distinct actin filaments. The soft cytoskeletal architecture of ESCs, characterized by low-level expression of actin monomers and lacking assembled filaments, is a defining mechanical feature critical for maintaining stem cell properties. Our study suggests that the unique actin cytoskeleton architecture in ESCs functions as an intrinsic barrier to Lm intracellular replication, survival, and cell-to-cell spread.

10:00 - 10:20 BREAK

ORAL PRESENTATION SESSION II

Moderators: Drs. James A. Stewart, Jr., Davida Crossley, Felicite Noubissi-Kamdem, Nikki Reinemann, Galen Collins, Benjamin Onyeagucha

O3.04

10:20 Lipid Peroxidation Triggers IL-1β release from CES1-Deficient Macrophages.

Oluwabori Adekanye, Abdolsamad Borazjani, Matthew Ross

Mississippi State University, Mississippi State, MS

Macrophages are immune cells derived from hematopoietic precursors. They are essential cells of innate immunity that maintain host defense and tissue homeostasis. They patrol tissues to identify damage-associated molecular patterns (DAMPs) and pathogen-associated molecular patterns (PAMPs) from microorganisms. When macrophage pattern recognition receptors detect these signals, the cells respond by secreting lipid mediators, cytokines, and chemokines, thereby initiating inflammation. Lipid peroxidation is a chemical reaction that occurs when oxygen molecules (free radicals) damage lipids (fats) in the body, generating DAMPs that trigger cytokine release. Polyunsaturated fatty acids (PUFA) are highly susceptible to lipid peroxidation. Carboxylesterases belong to the α/β- hydrolase fold family of proteins and catalyze the hydrolysis of ester-containing substrates into alcohols and carboxylic acids. We previously reported that human CES1 hydrolyzes triacylglycerols (TAGs), including PUFA- TAGs and oxidized TAGs in macrophages. Also, we reported that CES1-deficient (CES1KD) macrophages express and secrete more IL-1β than control macrophages. Here, we demonstrate a significant accumulation of select oxidized TAG species in CES1KD macrophages treated with exogenous PUFA (linoleic acid). In contrast, there was an upward trend in IL-1β released from THP-1 cells treated with arachidonic acid and menadione, a redox cycling agent. Furthermore, CES1KD cells treated with ascorbic acid and alpha-tocopherol secreted lower amounts of IL-1β than CES1KD cells that were not treated with these antioxidants. Our results suggest that lipid peroxidation within CES1- deficient macrophages can induce IL-1β secretion and indicate that CES1 could be a potential target in managing and regulating hyperinflammation.

O3.05

10:40 Loss of DDI2 Gene Function Promotes Transcriptional Adaptation of Other Shuttling Factors and Retroviral Proteases

Daniel Joyce, Galen Collins

Mississippi State University Department of Biochemistry, Nutrition and Health Promotion, Mississippi State, MS

Cancer is a leading cause of morbidity and mortality worldwide. For cancer cells to survive and proliferate, they must evade immune detection and apoptosis, which can be achieved by restricting antigen presentation and downregulating pro-apoptotic signaling. Promoting immune recognition and pro-apoptotic signaling is the basis of many therapeutic strategies, including small-molecule inhibitors and immunotherapies; therefore, identifying genes that restrict antigen presentation and pro-apoptotic signaling provides targets for inhibition. DDI2 (DNA-damage inducible 1 homolog 2) shuttles ubiquitylated proteins to proteasomes, promoting protein degradation. DDI2 also has a retroviral protease domain that can be inhibited by HIV protease inhibitor Nelfinavir. In an unpublished study, loss of DDI2 function increased antigen presentation and pro-apoptotic signaling by inducing the unfolded protein response (UPR). However, these effects dissipated over time, suggesting an adaptive response to DDI2 deletion. We hypothesize that this adaptive response results from increased transcription of another gene that compensates for the loss of DDI2. Therefore, we are investigating the compensatory expression of the other 12 shuttling factors and 7 retroviral proteases after ablation of DDI2 function using a combination of DDI2KO/Null cell lines, DDI2 inhibition assays, and DDI2 siRNA knockdown. Data from the DDI2KO/Null gene expression screen revealed 4 shuttling factors (RAD23A, UBQLN1, ZFAND3, and ZFAND5) and 2 retroviral proteases (NRIP3 and PEG10) increased with the knockout of DDI2. DDI2 inhibition with Nelfinavir also demonstrated early-stage upregulation of pro-apoptotic signaling, medium-term upregulation of UPR signaling genes, and late-stage upregulation of 1 shuttling factor and 2 retroviral proteases along with late-stage downregulation of pro-apoptotic and UPR signaling. These findings confirm that DDI2 inhibition triggers the onset of the unfolded protein response and suggest that the upregulation of genes similar to DDI2 occurs with the recovery from ER stress signaling.

O3.06

11:00 α-Galactosyl Epitope-Decorated Virus-Like Particles Induce Protective Immunity Against *Leishmania braziliensis* Infection In Mice

Godspower Okeke, Alexandre Marques

University of Southern Mississippi, Hattiesburg, **MS**

Leishmania braziliensis is an important etiological agent of cutaneous leishmaniasis in the Americas, and it is associated with chronic lesions, tissue destruction, and severe morbidity. The toxicity, incomplete efficacy, and development of resistance associated with current chemotherapeutics emphasize the critical need for new immunoprophylactic approaches. In this investigation, we tested the protective effect of a virus-like particle (VLP) platform that was recombinantly engineered to present the α-galactosyl (α-Gal) epitope, a carbohydrate recognized by natural anti-carbohydrate immune responses against L. braziliensis infection in mice. Mice were primed with empty Qβ VLPs (Qβ-WT), Qβ-αGal VLPs, or controls (PBS and naïve). Lesions were followed for 18 weeks post-L. braziliensis infection by footpad swelling. Qβ-αGal-vaccinated animals showed significantly smaller lesion size than Qβ-WT and PBS controls, which all presented progressive swelling and severe pathology. Histological evaluation demonstrated a considerable reduction in tissue damage in Qβ-αGal-immunized animals, as shown by imaging analysis. Consistent with these clinical findings, unvaccinated mice presented a higher parasite load, whereas Qβ- αGal-vaccinated animals showed less parasite persistence. We conducted immunological analysis on the spleen supernatant, whose protection was correlated with the induction of Th/TH2 balanced cytokines by increased Anti- αGal IgG antibodies and IFN-γ and TNF-α in Qβ-αGal-immunized mice. These cytokines are essential for macrophage activation and parasite killing, implying that α-Gal-decorated VLPs induce a protective cellular immune response. On the contrary, Qβ-WT and PBS showed little effect on cytokine induction, while lesion growth was uncontrolled. Collectively, our results provide proof of concept for the ability of α-Gal-conjugated VLP to induce a protective immune response against L. braziliensis infection, characterized by decreased lesion severity and parasite burden, in the context of enhanced Th1/Th2 balanced responses. These results warrant further development of carbohydrate- based VLP vaccine as a potential approach against cutaneous leishmaniasis. Ongoing studies will investigate antigen presentation optimization, the longevity of immunity, and the induction of cross-protection to other Leishmania species.

O3.07

11:20 HTLV-1 P13 Protein Impairs Mitochondrial Respiration and Function in Myeloid Cells

Christian Owusu[1], Ramona Moles[1], George Booz[2]

[1]University of Mississippi Medical Center, Department of Cell and Molecular Biology, Jackson, MS, [2]University of Mississippi Medical Center, Department of Pharmacology, Jackson, MS

Human T-cell leukemia virus type 1 (HTLV-1) is a retrovirus responsible for adult T-cell leukemia/

lymphoma, a malignancy with a poor prognosis and no available curative therapies. Although CD4+ T cells have been considered the principal reservoir, recent studies indicate that myeloid cells also harbor proviral DNA, and importantly, these cells are required *in vivo* for viral persistence. The viral accessory protein p13, encoded by *open reading frame II*, localizes to mitochondrial membranes in T cells. Here we show that in monocytes and macrophages, p13 likewise accumulates in mitochondria and reshapes organelle homeostasis. P13 expression reduces the expression of key regulators of mitochondrial fission and fusion, including MFN1, MFN2, MFF, TOMM20, MIRO2, and SLC25, consistent with impaired mitochondrial integrity. Using Seahorse extracellular flux analysis, p13 expression impairs basal respiration, ATP production, and maximal respiration capacity in myeloid cells. Functionally, p13 affects macrophage polarization, M0, M1, and M2-associated markers, and it modulates cytokine and chemokine release, favoring CD4+ T-cell recruitment. Together, the data support a monocyte-intrinsic mitochondrial mechanism that can sustain viral persistence by disabling myeloid support for antiviral clearance and tissue homeostasis, and by promoting a proinflammatory microenvironment favorable to HTLV-1 spread. Defining how p13 changes mitochondrial dynamics and metabolism in myeloid cells provides a mechanistic framework for targeting this reservoir. The work will support the development of therapeutic strategies that restore mitochondrial quality control or correct polarization states to restrict viral persistence and improve outcomes, not only for HTLV-1 but also for other pathogens that exploit mitochondrial biology

12:00 - 1:30 GENERAL SESSIONS

Thursday, March19, 2026
AFTERNOON
D Hal1 Room 3

ORAL PRESENTATION SESSION III

Moderators: Drs. James A. Stewart, Jr., Davida Crossley, Felicite Noubissi-Kamdem, Nikki Reinemann, Galen Collins, Benjamin Onyeagucha

O3.08

1:40 - Alpha-Gal Knockout Mouse Immune Responses to Nymphal Bites of *Amblyomma americanum* and *Amblyomma maculatum*

Olaoluwa Oyediran[1], Shahid Karim[1], Scott Commins[2], Shailesh Choudhary[2]

[1]The University of Southern Mississippi, Hattiesburg, MS, [2]University of North Carolina, Chapel Hill, NC

Alpha-gal syndrome (AGS) arises when tick bites trigger IgE sensitization to the oligosaccharide galactose-α-1,3 galactose(α-gal) found in tick saliva. This condition has gained increasing global attention, with over 450,000 cases estimated in the United States alone. Previous studies suggest that B cells undergo class switching to produce alpha- gal-specific IgE (Sharma et al., 2024-DOI: 10.3389/fimmu.2023.1336883); however, the mechanisms underlying tick-driven IgE switch remain poorly understood. Key questions remain about which salivary components are necessary or sufficient to induce IgE, and how the local tick-bite environment shapes T follicular helper (Tfh) cell responses and germinal center (GC) B cell differentiation toward IgE production. To address these gaps, we experimentally compared host immune responses to nymphal feeding by *Amblyomma americanum* and *Amblyomma maculatum* using α-gal knockout (AGKO) mice, a model that recapitulates the human inability to synthesize α-gal. AGKO mice were infested with nymphal *A. americanum* or *A. maculatum*. Serum was collected after feeding and analyzed for total IgG, total IgE, and α-gal-specific IgE. Both alpha-gal-sensitized and control mice were orally challenged with 400 mg of cooked pork kidney homogenate (PKH). Lymph nodes and spleens were harvested for RNA expression profiling of Th2-associated pathways, germinal-center activation, and innate inflammatory mediators. Nymphal bites from both species induced measurable humoral activation. *Amblyomma americanum* elicited a stronger early antibody response, whereas *Amblyomma maculatum* showed a slower, more variable response. Rapid IgG induction in *A. americanum* suggests a pronounced Th2-skewed response, while the gradual increase of IgG in *A. maculatum* indicates a robust but

delayed antibody response. Following the red meat challenge, the body temperature was monitored, and mice sensitized by *A. americanum* exhibited a significant drop in core body temperature, which is consistent with physiologic anaphylaxis. This study reveals species-specific differences between key immune determinants linked to host response and the induction of AGS. Repeated infestations with *A. americanum* elicited an earlier and more consistent IgE and IgG induction, consistent with its strong epidemiological link to α-gal syndrome. In contrast, *A. maculatum* produced a delayed but higher magnitude IgG response, suggesting potent antibody production. Understanding these differences strengthens mechanistic models of tick-induced α-gal sensitization and may help refine AGS risk prediction across tick species.

O3.09

Honeybee Hemocyte Biology: Defining microRNA Profiles in Immune Cell Populations

Nazifa Tasnia, Michael Oeth, Deepak Kumar, Shahid Karim

School of BEES, University of Southern Mississippi, Hattiesburg, MS

Small non-coding RNAs regulate gene expression at the post-transcriptional level in insects, including honeybees (*Apis mellifera*). In arthropods, microRNA-mediated gene regulation influences essential processes, including development, immunity, and pathogen resistance. In this study, we conducted a 25-day consecutive study to determine the miRNA profiles of bees maintained in hive and cage conditions. Bee hemolymph was sampled daily from day 1 to day 25 to compare hemocyte populations and their cellular characteristics. In parallel, 18 small RNA libraries of bee hemolymph collected om Day 1, Day 10, and Day 20 were generated to characterize the small RNA landscape in both hive and cage conditions. Bees maintained in hive settings consistently showed robust cellular immunity by exhibiting significantly elevated numbers of differentiated hemocyte populations including granulocytes, plasmatocytes, prohemocytes, and oenocytoids along with more organized cytoskeletal structure and elevated lysosomal activity. In contrast, cage-maintained bees showed reduced survival, significantly higher hemolymph volume, and accelerated declines in both total hemocyte counts and differentiated hemocyte population observed from day 1 to day 25. Sequencing 18 small RNA libraries generated over 600 million reads and identified 175 unique miRNAs, comprising 170 known and 5 novel miRNAs. Differential expression analysis identified significant changes in miRNA expression across Day 1, Day 10, and Day 20, as well as between hive- and cage-reared bees, highlighting age- and environment-dependent miRNA regulation. These expression patterns indicate dynamic miRNA involvement in immune and developmental processes across different age groups. For example, several immune-associated miRNAs including miR-34, miR-277, miR-279, miR-315, and miR-6001 showed significant differential expressions. These miRNAs may interact with key immune pathways, including the IMD, JAK/STAT, and Wnt signaling systems. Notably, miR-315, which activates Wnt signaling in Drosophila by repressing Axin and Notum, and miR-6001, predicted to regulate GSK3β and Sos, point toward conserved miRNA-Wnt immune regulatory interactions in honeybees. Honeybee cellular immunity declined with age and was strongly affected by rearing environment, with hive-maintained bees showing robust hemocyte characteristics than cage-reared bees. We established a miRNA profile of bee hemolymph, and these results provide a basis for future functional studies if miRNA roles in innate immunity.

O3.10

2:20 GATA and RUNT Transcription Factors Shape the Hemocyte Biology in the Gulf-Coast Tick, *Amblyomma maculatum*

Musa Rabiu, Shahid Karim

University of Southern Mississippi, Hattiesburg, MS

Ticks are major vectors of bacterial, viral, and protozoan pathogens, and their prolonged blood feeding relies on precise physiological control. Understanding the molecular pathways that drive core processes such as immunity and reproduction can help identify new strategies for tick control. In this study, we examined the roles of two conserved transcription factor families, GATA and RUNT, in the Gulf Coast tick, *Amblyomma maculatum*, with a focus on the immature as well as mature developmental stages. Using RNA interference (RNAi) to silence GATA and RUNT genes, we tested how these factors influence hemocyte proliferation, lineage commitment, and differentiation, function, blood-feeding, and oviposition. Silencing the GATA factor led to clear defects in hemocyte growth and differentiation, whereas knocking down RUNT impacted hematophagy, which resulted in reduced weight and longer feeding periods. We also found that GATA plays a broader role in development. The nymphal GATA knockdown carried over into the transition to adult ticks and caused striking disruption in oviposition. Together, these results show that GATA and RUNT are central transcriptional regulators in *A. maculatum*. GATA links immune function with reproductive fitness. This work helps clarify the regulatory networks that guide hemocyte biology and highlight potential molecular targets for future interventions.

O3.11

2:40 Understanding the Dose-Dependent Effect of *Nosema ceranae* Infection on Honeybee Innate Immune System

Michael Oeth[1], Deepak Kumar[1], Mohamed Alburaki[2], Michael Goblirsch[3], Shahid Karim[1]

[1]University of Southern Mississippi, [2]USDA ARS, Beltway, MD, [3]USDA ARS, Poplarville, MS

Nosema ceranae is a pathogenic microsporidian that infects honeybees (*Apis mellifera*), weakening immunity, and contributing to colony decline. This study examined how varying doses of *Nosema* infection impact the bee innate immune system and survivability. Bees were divided into four groups: three treatment groups inoculated with varying *Nosema* spore suspensions (10^3, 10^5, & 10^7), and a control group fed only sugar syrup (1:1). Three-day old bees were inoculated with Nosema spores or with syrup and libitum. Nosema infection was quantified using a qRT-PCR assay 15 days post Nosema inoculation to quantify the infection in the infected bees. Bee survivability, syrup consumption,hemolymph volume, and hemocyte population counts were assessed on day 1, 2, 4, 7, 11, and 15 post-infections. Mortality increased with spore dose, with the highest dose (10^7) reducing survival to 64%. Hemolymph volume was reduced by ~2µL in 10^5 and 10^7 groups compared to the controls. Granulocyte, plasmatocyte, and prohemocyte populations were most affected, with significant reductions in the 10^5 and 10^7 groups. These results demonstrate a dose-dependent link between *Nosema* infection and physiological decline, highlighting the value of monitoring spore loads to inform colony management and reduce losses.

THURSDAY, March19, 2026

EVENING

Hall B

3:30 DODGEN LECTURE /AWARDS CEREMONY

THURSDAY, March19, 2026

EVENING

Hall C

5:00-7:30 Reception and General Poster Session

(Immediately following Dodgen Event)

All posters should be placed in the poster all by 12:00 pm on Thursday, March 19, 2026

Odd poster numbers will be presented from 5 -6

*Even poster numbers will be presented from 6-***7**

P3.01

Transcriptional and Functional Characterization of Macrophage Responses to *Mycobacterium tuberculosis* and Polyphosphate

Ella King, Ramesh Rijal

The University of Southern Mississippi, Hattiesburg, MS

In the lungs, macrophages are key defenders that ingest and kill bacteria. Some pathogens, such as *Mycobacterium tuberculosis* (Mtb), evade this defense by preventing phagosome-lysosome fusion and surviving inside host cells. We found that Mtb secretes polyphosphate (polyP), a phosphate polymer that acts as a "don't kill me" signal to macrophages by blocking phagosomal acidification and lysosomal killing, allowing the bacteria to persist. Inhibiting polyP signaling in macrophages greatly enhances Mtb clearance. This study examined how Mtb-secreted polyP affects macrophage functions and whether these responses differ between males and females. We used transcriptomics to analyze transcriptional changes, qPCR to validate gene expression, Western blot to confirm protein-level alterations, and microscopy to visualize functional effects such as phagosome-lysosome fusion and cytoskeletal dynamics. Significant differences were observed between male and female macrophages in response to Mtb and polyP. Both conditions caused overlapping but distinct transcriptional changes in pathways related to lipid signaling, cytoskeletal remodeling, and inflammation, which are essential for macrophage activation and pathogen clearance. In conclusion, this research highlights the key role of bacterial polyP in disrupting macrophage functions and its potential as a therapeutic target. The observed sex-specific differences, together with the higher global tuberculosis incidence in males, suggest that developing host- and sex-

directed therapies could strengthen macrophage immunity and improve tuberculosis control.

P3.02

Validating CMA Colonization Plus Sensitization Induces Tuft Cell Hyperplasia in a SPF Mouse Model

John Clay Hong[1], Shuang Wu[2], Cathryn Nagler[2]

[1]Delta State University, Cleveland, MS, [2]University of Chicago, Chicago, IL

Food allergies, one of the most rapidly increasing non-communicable diseases for both children and adults in various parts of the world (Warren et. al., 2023), are associated with the gut microbiome, and its dysbiosis is a focus of research for the Nagler lab. Recent interest is in the notably higher succinate and lower protective butyrate levels in cow milk allergic individuals' stool relative to those who are healthy. Literature demonstrates that succinate drives tuft cell hyperplasia and type II immune responses through a tuft cell-ILC2 circuit (Schneider et. al., 2018), and recently it was found that cow milk allergy (CMA), but not healthy, colonized germ-free (GF) mice induce tuft cell hyperplasia only when sensitized (Nagler lab, unpublished). Because succinate likely plays a key role in this process, the lab aims to develop a more maintainable specific pathogen free (SPF) *Sucnr1*$^{-/-}$ mouse model for further studies. Before doing so, the main goal of this project is to validate that SPF mice will have the same tuft cell hyperplasia as the germ-free colonized mice. Additionally, T cell population data provides references for future immune cell studies on how they promote or protect from food allergies. We find that, surprisingly, our SPF experiments do not yield significant differences, and this raises further questions for both this experimental design and the lab's future into *Sucnr1*$^{-/-}$ studies.

P3.03

Loss of DDI2 Gene Function Promotes Transcriptional Adaptation of other Shuttling Factors and Retroviral Proteases.

Daniel Joyce, Galen Collins

Mississippi State University, Mississippi State, MS

Cancer is a leading cause of morbidity and mortality worldwide. For cancer cells to survive and proliferate, they must evade immune detection and apoptosis, which can be achieved by restricting antigen presentation and downregulating pro-apoptotic signaling. Promoting immune recognition and pro-apoptotic signaling is the basis of many therapeutic strategies, including small-molecule inhibitors and immunotherapies; therefore, identifying genes that restrict antigen presentation and pro-apoptotic signaling provides targets for inhibition. DDI2 (DNA-damage inducible 1 homolog 2) shuttles ubiquitylated proteins to proteasomes, promoting protein degradation. DDI2 also has a retroviral protease domain that can be inhibited by HIV protease inhibitor Nelfinavir. In an unpublished study, loss of DDI2 function increased antigen presentation and pro-apoptotic signaling by inducing the unfolded protein response (UPR). However, these effects dissipated over time, suggesting an adaptive response to DDI2 deletion. We hypothesize that this adaptive response results from increased transcription of another gene that compensates for the loss of DDI2. Therefore, we are investigating the compensatory expression of the other 12 shuttling factors and 7 retroviral proteases after ablation of DDI2 function using a combination of DDI2KO/Null cell lines, DDI2 inhibition assays, and DDI2 siRNA knockdown. Data from the DDI2KO/Null gene expression screen revealed 4 shuttling factors (RAD23A, UBQLN1, ZFAND3, and ZFAND5) and 2 retroviral proteases (NRIP3 and PEG10) increased with the knockout of DDI2. DDI2 inhibition with Nelfinavir also demonstrated early-stage upregulation of pro-apoptotic signaling, medium-term upregulation of UPR signaling genes, and late-stage upregulation of 1 shuttling factor and 2 retroviral proteases along with late-stage downregulation of pro-apoptotic and UPR signaling. These findings confirm that DDI2 inhibition triggers the onset of the unfolded protein response and suggest that the upregulation of genes similar to DDI2 occurs with the recovery from ER stress signaling.

P3.04

Secreted Phosphate Polymer Regulates Cellular Pathways and Bacteriolysis in an Amoeba Model for Immunity

Jaelyn Davis, Ramesh Rijal[1]

The University of Southern Mississippi, Hattiesburg, MS

Polyphosphate (polyP) is a phosphate polymer that regulates bacterial growth, host-pathogen interactions, stress responses, and other metabolic functions. My research aims to study the effects of polyP on lysosomal pathways in *Dictyostelium discoideum*, a model for phagocytosis and immunity. PolyP inhibits the phagocytic clearance of bacterial cells; however, the mechanism by which this occurs is unknown. In this study, we characterized polyP- induced changes in the phosphorylation of *D. discoideum* proteins that promote the survival of ingested bacteria following 24 hours of infection. Mass spectrometry-based proteomics and phosphoproteomics analyses identified 4,057 total proteins and 359 phosphoproteins. Among these, levels of 36 proteins and 37 phosphoproteins increased,

while 3 proteins showed decreased abundance in response to polyP. Further analysis using AlphaFold, FoldSeek, UniProt, and ShinyGO showed that polyP alters the levels of key proteins that affect transcription, cytoskeletal function, and membrane trafficking. Using MEME/FIMO

bioinformatics tools, we confirmed the presence of conserved binding motifs for Casein Kinase 1 (CK1), Protein Phosphatase 2A (PP2A-B56), Protein Kinase B (PKB/AKT), and Protein Kinase G (PKG), indicating that polyP modulates key cellular signaling pathways. We used flow cytometry as a secondary screening approach to isolate *D. discoideum* CRISPR mutants deficient in proteins whose phosphorylation is modulated by polyP. The selected mutants are evaluated for changes in phagosome acidification and bacterial survival to determine the mechanistic insight into how polyP regulates the broader cellular signaling network. Together, these findings show that changes in protein phosphorylation caused by polyP can point to host pathways that can be targeted to control infection and improve immune defense.

P3.05

Characterization of the Humoral Response Induced by Intranasal α-Gal Virus-Like Particle Immunization: Implications for Anti-Leishmania Vaccine Design

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Protozoan parasites of the genus *Leishmania* cause leishmaniasis, a neglected tropical disease responsible for up to one million new cutaneous and mucocutaneous infections annually. Current chemotherapeutic treatments, such as meglumine antimoniate and miltefosine, are limited by toxicity and emerging resistance, underscoring the need for safe and effective vaccines. The α-galactose (α-Gal) epitope, present on the parasite surface, has emerged as a promising target, as elevated anti-α-Gal antibody titers correlate with resistance to infection in humans and animal models. Intranasal immunization represents an attractive route for inducing both systemic and mucosal immunity. In this study, α1,3-galactosyltransferase-knockout (α1,3GalT-KO) mice were immunized intranasally with 10 µg of α- Gal-conjugated Qβ virus-like particles (VLPs) per nostril and boosted after three weeks. Sera and lung lavage samples were analyzed by ELISA to quantify α-Gal-specific antibody responses. Immunized mice exhibited robust systemic and mucosal humoral responses characterized by elevated IgG, IgA, and IgM antibody titers against the α-Gal epitope, while IgE was undetectable. Antibody responses in lung lavage mirrored those observed in serum, confirming mucosal immunogenicity. Cytokine profiling of splenocyte cultures is ongoing to further characterize the Th1/Th2 balance elicited by vaccination. Together, these findings demonstrate that intranasal delivery of α-Gal-VLPs induces strong humoral immunity without IgE-mediated sensitization, supporting α-Gal as a safe and immunogenic candidate for the development of vaccines against *Leishmania* and potentially other α-Gal-expressing pathogens.

P3.06

Biophysical and biochemical characterization of cysteine mutants of TDP-43 C-terminal domain

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Amyotrophic lateral sclerosis (ALS) and frontotemporal dementia (FTD) are characterized by the mislocalization of TDP-43 from the nucleus to the cytoplasm and the concomitant amyloid aggregation of its aberrantly cleaved prion- like C-terminal domain (TDP-43PrLD) in the cytosol. Under stress, wild-type TDP-43, which lacks cysteines in TDP- 43PrLD, undergoes phase separation with RNA to form biomolecular condensates called stress granules (SGs). Cysteine mutations in TDP-43PrLD have been observed in both familial and sporadic ALS. Our lab has previously established that cysteines can affect phase separation and aggregation in a redox-sensitive manner. Therefore, it is hypothesized that cysteine mutations influence the propensity of TDP-43PrLD to phase separate and aggregate and thereby influence pathology. Compared to the wild type, S332C and S395C mutants show distinct phase separation behavior, redox-sensitivity, aggregation kinetics, and cytotoxicity. These findings provide insights into the role of TDP-43 cysteine mutants in neurodegenerative pathologies.

P3.07

Immunogenic Evaluation of Trans-Sialidase-Derived Peptides as Vaccine Candidates Against *Trypanosoma cruzi*.

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Chagas disease, caused by the protozoan parasite *Trypanosoma cruzi*, affects more than 7 million people globally, with over 50 million at risk of infection. Despite its significant impact and rising incidence in non-endemic regions such as Europe and the United States, there is currently no approved vaccine. Transmission occurs through vector exposure, oral ingestion of contaminated food, blood transfusion, organ transplantation, and congenital routes. Approximately 30% of infected individuals progress to chronic disease, developing severe cardiac, digestive, or neurological complications. Current treatments rely on benznidazole and nifurtimox, which are associated with high toxicity and limited efficacy, particularly during the chronic stage.

This study focuses on *T. cruzi* trans-sialidase (TS), a critical enzyme involved in host cell invasion by mediating the

transfer of sialic acid from host glycoconjugates to the parasite surface. Using immunoinformatic analyses, we identified three TS-derived epitopes, TSP-4, TSP-5, and TSP-6, which were chemically conjugated to Qβ bacteriophage virus-like particles (VLPs) to enhance antigen presentation. C57BL/6 mice (n=5 per group) were immunized with 20 μg of each VLP construct, followed by two booster doses at two-week intervals. Sera and splenocytes were collected three weeks after the final boost to assess immune responses. Preliminary ELISA results showed elevated total IgG titers against TS peptides. Cytokine profiling (IFN-γ, TNF-α, IL-10, and IL-4) was performed to characterize the induced immune response. These findings provide proof of concept for developing a Qβ-VLP-based trans-sialidase vaccine against Chagas disease.

P3.08

Does PSMC5 P320R Mutation Induce Inflammatory Gene Expression?

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A rare neurodevelopmental disorder with autism-like behavior and learning delays is associated with a mutation of proline to arginine at the 320th amino acid of *PSMC5* gene, which is a mutation of the 19 regulatory particles of the proteasome. It is hypothesized that a lack of proteasome causes inflammation, more specifically neural inflammation, thereby causing neurodevelopmental disorders. The objective of this research is to determine if this mutation causes a cell autonomous interferon response. We are using neuronal-like cell line, BE(2)M17 with the P320R mutation genomically integrated by CRISPR-CAS9 engineering as either a single copy mutation (Heterozygous) or two copies of the mutation (Homozygous) in addition to the unedited control line (WT). These three lines were cultured for RNA extraction. This RNA was subsequently converted to cDNA for qPCR analysis of proteasome and interferon- stimulated genes. A rare neurodevelopmental disorder with autism-like behavior and learning delays is associated with a mutation of proline to arginine at the 320th amino acid of PSMC5 gene, which is a mutation of the 19 regulatory particles of the proteasome. It is hypothesized that a lack of proteasome causes inflammation, more specifically neural inflammation, thereby causing neurodevelopmental disorders. The objective of this research is to determine if this mutation causes a cell autonomous interferon response. We are using neuronal-like cell line, BE(2)M17 with the P320R mutation genomically integrated by CRISPR-CAS9 engineering as either a single copy mutation (Heterozygous) or two copies of the mutation (Homozygous) in addition to the unedited control line (WT). These three lines were cultured for RNA extraction. This RNA was subsequently converted to cDNA for qPCR analysis of proteasome and interferon-stimulated genes. Preliminary data revealed that proteasome gene expression is modestly decreased in both heterozygous and homozygous P320R cells, consistent with impaired proteasome function. However, in contrast to the expected suppression of all proteasome-related genes, we observed a notable upregulation of immunoproteasome subunits and ubiquitin-like modifiers in the mutant lines. This expression pattern is distinct from the acute transcriptional response triggered by chemical proteasome inhibitors and suggests a longer-term adaptive remodeling of the proteostasis network. The increased expression of immunoproteasome and ubiquitin-like genes is consistent with activation of inflammatory signaling pathways, raising the possibility that the PSMC5 P320R mutation induces a chronic, cell-autonomous interferon-like state. Together, these findings support the hypothesis that proteasome impairment caused by this neurodevelopmental mutation may drive neural inflammation and contribute to the pathology observed in affected individuals.

P3.09

Development of Antibody Electroporation in Mammalian Oocytes for Novel Reserves Genetic Approaches in Mouse Oocytes

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Reverse genetic approaches are a standard cell and molecular biology tactic to determine a protein function. However, numerous unique features of mammalian oocytes make standard reverse genetic approaches difficult and/or impossible. For example, transfection, which is routinely done for cell lines, is impossible in mammalian oocytes. Notably, mammalian oocytes lack a simple non-invasive methodology for acute reverse genetic approaches. The standard practice for mammalian oocyte reverses genetic approaches is microinjection. This methodology uses specialized equipment to insert a small glass needle into oocytes before compressed air pushes a small amount of liquid containing RNA and/or proteins into the oocyte. Microinjection of mammalian oocytes requires specialized training and equipment, is labor intensive, and is cost prohibitive. For years there has been a push to develop a cheap, non-specialized, and non-invasive method for nucleic acid and protein introduction into oocytes. Recently, two different labs have adapted electroporation for introducing siRNA and mRNA less than 1,500 nucleotides into mouse oocytes. This approach offers numerous advantages over microinjection: no specialized training or equipment is required, and multiple oocytes can be manipulated at once. However, one notable

disadvantage of this new electroporation methodology is the inability to introduce large macromolecules such as proteins and/or mRNA greater than 1,500 nucleotides. Initial experiments in our lab have optimized electroporation of large mRNA (>1,500bp) finding that removal of the zona pellucida, a glycoprotein layer surrounding the oocyte, is key to successfully electroporating large macromolecules into oocytes. Therefore, the aim of this project is to optimize electroporation of antibodies into oocytes to perform Trim-Away mediated protein knockdown. Trim-Away is a recently developed reverse genetics approach that uses antibodies and Trim21 overexpression to target proteins-of-interest for proteasomal degradation. Mouse oocytes were collected from 8-to-12-week-old females and the zona pellucida was removed. Oocytes were electroporated with no antibody, 400 ng/µl non-immune rabbit IgG, or 600 ng/µl non-immune rabbit IgG prior to fixation. Oocytes were permeabilized, blocked, and incubated with goat-anti-rabbit IgG conjugated to Alexa488 prior to imaging on a Leica MICA microscope. Fiji Image J was used to quantify fluorescence intensity between the three groups. Electroporation of 600 ng/µl antibody caused a 15.5% increase in fluorescence intensity compared to no antibody control cells ($p=0.0022$). On the other hand, 400 ng/µl had no impact on fluorescence intensity. Taken together, these results point to the utility of antibody electroporation in mouse oocytes. Current studies in the lab aim to use electroporation to perform Trim-Away mediated knockdown of proteins-of-interest.

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P3.10

Increased Renal T lymphocytes in a Rat Model of Polycystic Ovary Syndrome

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Polycystic ovary syndrome (PCOS) is one of the most common hormonal disorders in women of reproductive age and it is associated with symptoms such as elevated levels of circulating androgens, inflammation, modest increases in blood pressure, and higher risk for cardiovascular disease. However, the mechanisms responsible for higher blood pressure have not been well defined. This study aims to test the hypothesis that T lymphocytes' infiltration is increased in the kidneys of hyperandrogenemic female (HAF) rats compared to placebo, which could potentially play a role in hypertension. To produce a rat model with a hyperandrogenic state similar to that of women with PCOS, female Sprague Dawley rats were implanted with dihydrotestosterone (DHT) pellets subcutaneously (7.5 mg/ 90 days). Blood and kidney samples were collected from HAF and placebo rats. Peripheral and renal immune cells were isolated, and the number of renal infiltrated T lymphocytes was measured by flow cytometry. It was found that HAF rats had a significantly higher percentage of pro-inflammatory T lymphocytes in the kidneys than placebo control rats. These results suggest that hyperandrogenemia may trigger renal infiltration of T lymphocytes in women with PCOS, which may facilitate increase in blood pressure. Overall, this research helps highlight the connection between elevated androgens and lymphocytes infiltration in PCOS, and it points to potential pathways that could be targeted in future treatments of hypertension. Understanding how the immune system behaves in this condition could eventually lead to better ways to manage the risks associated with PCOS, especially regarding long-term cardiovascular health.

P3.11

The Impact of Abatacept on Elevated T lymphocytes in a Rat Model of Polycystic Ovary Syndrome

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Polycystic ovary syndrome (PCOS) is the most common hormonal disorder in women who are of reproductive age, and it is associated with symptoms such as elevated levels of circulating androgen hormone and inflammation. However, the mechanisms responsible for chronic inflammation are not well defined. This study aims to test whether suppression of $CD4^+$ T cells with Abatacept (ABT) decreases chronic inflammation in a rat model of PCOS. Abatacept treats autoimmune diseases by blocking T cell activation. To produce a rat model with a hyperandrogenic state similar to that of women with PCOS, female Sprague Dawley rats were implanted with dihydrotestosterone (DHT) pellets subcutaneously (7.5 mg/ 90 days). These rats were referred to as hyperandrogenemic female (HAF) rats. After eight weeks of DHT treatments, all rats received Intravenous infusions of Abatacept (100mg/kg). Following seven days of infusion, blood samples were collected. Peripheral blood lymphocytes were then isolated. The percentages of $CD4^+$ and $CD8^+$ T lymphocytes were measured by flow cytometry. In HAF rats, $CD4^+$ T lymphocyte percentage was significantly elevated, but it was normalized after Abatacept infusions. In the placebo rats, there was no significant elevation of $CD4^+$ T lymphocytes, and the Abatacept infusions had no effect. The study suggests the possibility of $CD4^+$ T lymphocytes as a significant source of inflammation in PCOS. In addition, the attenuation of $CD4^+$ T lymphocytes levels in the HAF rats after treatment with Abatacept suggests that anti-inflammatory drug such as Abatacept is a potential treatment for the chronic inflammation in PCOS.

P3.12

Methyl Palmitate: Inhibitor of Proliferation, Clonogenesis and Efflux Pumps in MCF7 Cells

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Breast cancer is the most common cancer among women in the United States. An estimated 310,700 new cases will be diagnosed this year. Studies have also shown that chemo-resistance in cancers may be attributed to over-expression of efflux pumps and could be linked to reduced bioavailability of chemotherapeutic drugs in cancer patients. Previously, we showed that *Vernonia amygdalina* (VA) fractions inhibit DNA synthesis and growth of cancer cells, *in vitro*. In this study, firstly, effects of Methyl palmitate on Human ER+ breast cancer cells (MCF7) cell growth were examined. Secondly, the ability of treated cells to retain their proliferative capacity and propagation was assessed. Thirdly, gene expression of drug efflux pumps (Multidrug resistant proteins (MRPs) in treated cells were analyzed. MTT and Clonogenic assays were used to test cell viability and colony formation, respectively. RT-PCR was employed to detect expression of Multidrug Resistance Protein 3 (MRP-3, ABCC-3) and P-glycoprotein (P-gp) in cell lysates. Our results show that Methyl palmitate inhibits cell viability (IC_{50}= 9.817e-003 M) and clonogenesis ($p<0.0001$) in a dose-dependent manner. Density and distribution of Colony formation differ significantly among doses, indicating correlation with treatment efficacy (R= -0.9431; R^2 =0.8894, or 89% certainty). Low expression of efflux pumps was observed in treated cells compared to untreated controls. Overall, these results suggest that Methyl palmitate has cytotoxic activities, reduces clonogenic potential of cells, and has the capacity to increase sensitivities to chemotherapeutic agents due to reduced efflux pump activity.

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P3.13

Evaluation of Tick-Derived Peptides as Transmission-Blocking Vaccine Candidates

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The lack of effective preventive measures for tick-borne diseases represents a major public health challenge. Transmission-blocking vaccines targeting tick molecules essential for feeding or reproduction could provide a sustainable and broad-spectrum solution. In this study, we evaluated two tick-derived proteins, subolesin, a key regulator of blood-feeding and cellular processes, and vitellogenin, a protein involved in egg development, as potential vaccine antigens. Using bioinformatic tools, we identified immunogenic peptide sequences from each protein and chemically conjugated them to virus-like particles (VLPs) to enhance antigen presentation. C57BL/6 mice were immunized intradermally with 20 μg of VLP-peptide conjugates, followed by a booster dose after two weeks. Blood and spleen samples were collected three weeks after the final immunization to evaluate humoral and cellular immune responses. Serum IgG antibody titers were measured by ELISA, and spleen cell supernatants were analyzed for cytokine production, including interferon-γ (IFN-γ) and tumor necrosis factor-α (TNF-α). Both peptide constructs elicited robust IgG antibody responses and significant IFN-γ production, while TNF-α levels were not significantly elevated. These findings suggest that the selected subolesin- and vitellogenin-derived peptides induce strong humoral immunity and IFN-γ-associated cellular activation. The results provide encouraging preliminary evidence supporting these antigens as promising candidates for the development of transmission-blocking vaccines aimed at controlling tick-borne diseases. Future work will include further immunological characterization and efficacy testing in challenge models.

P3.14

Does Ubiquitin activate Ddi2's Retroviral Protease Domain in Trans?

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The Ubiquitin Proteasome Pathway (UPP) critically regulates cellular homeostasis by degrading excess or damaged proteins. It does so by first attaching the protein ubiquitin to target substrates, then degrading them via the 26S proteasome. A crucial but understudied player in this pathway is DNA damage-inducible protein 2 (Ddi2). Ddi2 has two currently known functions: it can deliver ubiquitylated proteins to proteasomes for degradation, and it can itself cleave proteins using its retroviral protease domain. Ddi2 also mediates cancer cells' ability to escape immune detection. Previous studies showed that retroviral protease inhibitors designed for HIV increase MHC-I levels on the cell surface, thereby restoring immune recognition of cancer cells. Our model is that Ddi2 somehow facilitates the degradation of MHC-I molecules. We are exploring how Ddi2 is regulated by binding to ubiquitylated conjugates using computational modeling. We are testing if Ddi2 is allosterically activated by ubiquitylation using AlphaFold2 (DeepMind) and ChimeraX (UCSF). We are also exploring the interactions of Ddi2 with other retroviral proteases from the human genome, suggesting that they need not only function as homodimers, but may also work as heterodimers.

P3.15

Immunofluorescent Analysis of IGF2BP1 Inhibition and Gene Expression in Basal Cell Carcinoma

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Basal cell carcinoma (BCC) is the most common form of skin cancer, and its progression is driven by the aberrant activation of the Hedgehog (Hh) and Wnt/β-catenin signaling pathways. Previous studies have identified insulin-like growth factor 2 mRNA-binding protein 1 (IGF2BP1) as a direct target of the Wnt pathway that stabilizes GLI1 mRNA, thereby sustaining Hh-mediated tumorigenesis. This study investigates the effect of IGF2BP1 inhibition on the expression of key skin-related and IGF2BP1-regulated genes in the BCC mouse model *Ptch1^{tm1Mps}/J*. Following targeted inhibition of IGF2BP1 in the skin, sections of skin lesions were subjected to immunofluorescence staining to examine the expression of β-TrCP1, c-Myc, Ptch2, Ki67, Keratin-5 (K5), and Keratin-14 (K14). While K5 and K14 serve as structural housekeeping markers of the epidermis, Ptch2 is a target of the Hh signaling pathway. β-TrCP1 and c-Myc are known downstream targets of IGF2BP1, and Ki67 indicates cell proliferation activity. Fluorescent imaging, including GFP, DAPI, and bright field, was performed to assess the localization and intensity of these markers, particularly within the epidermal regions of the lesions. Preliminary observations suggest that IGF2BP1 inhibition alters the expression profiles of its downstream targets, potentially reducing the proliferative activity associated with BCC development. These findings contribute to the understanding of IGF2BP1's regulatory role in BCC pathogenesis and may provide insight into new therapeutic targets for IGF2BP1-driven skin cancers.

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P3.16

Data Analysis of IGF2BP1 Overexpression and Lifestyle Risk Factors in Early-Onset Colorectal Cancer: Insights from GDC and cBioPortal

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Colorectal cancer (CRC) is driven by clinical, demographic, behavioral, and molecular factors. IGF2BP1, an mRNA- binding protein regulated by the Wnt pathway, may affect tumor behavior and patient outcomes. The aim of this study is to investigate factors associated with early-onset CRC, including demographic and lifestyle risk factors, and explore the role of IGF2BP1 in tumor biology and survival. In this study, data from the genomic data commons portal (GDC) and cBioPortal were analyzed. Clinical factors such as gender, age, and behavioral risk factors, specifically smoking, obesity, and alcohol use, were examined. IGF2BP1 expression, copy number alterations, and associated Wnt pathway dysregulation were assessed. Survival analyses compared high vs. low IGF2BP1 expression. From the GDC dataset, 684 patients were identified with CRC. Among these patients, 84 were below age 50 of which 51 (60.71%) were females and 33 (39.29%) males. Among the 600 patients above or equal age 50, 337 (56.17%) were males and 263 (43.83%) females. Lifestyle risk factors such as obesity were recorded for 9 cases (1.41%) in patients above or equal age 50 and 2 cases (2.25%) in patients below age 50. Alcohol consumption was noted for 3 cases (0.47%) in patients above age 50, but no reported cases of alcohol consumption were reported in patients below age 50. Smoking was recorded for 2 cases (0.31%) in patients above age 50; however, no reported cases of smoking were noted in patients below age 50. Analysis of bigger datasets would be critical in assessing the impact of obesity, alcohol, and smoking on the early onset of colorectal cancer. Analysis of the datasets from the cBiPortal showed that IGF2BP1 was frequently overexpressed in tumor samples, with higher expression linked to copy number gains or amplifications. Among the 594 colorectal adenocarcinoma cases analyzed, 11 patients under age 50 and 47 patients aged 50 or above exhibited IGF2BP1 overexpression (mRNA expression z-score > 2). Disease-specific survival was significantly worse in patients with high IGF2BP1 expression ($p = 0.0099$). Tumors with IGF2BP1 alterations demonstrated co-alterations in Wnt pathway components, indicating a Wnt-hyperactivated environment. Overall, our study shows that females are more prone to develop CRC at a younger age than males. IGF2BP1 overexpression correlates with Wnt pathway dysregulation and seems to be associated with the aggressive tumor behavior. These findings highlight IGF2BP1 as a potential prognosis marker for CRC outcomes.

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P3.17

Annotating genes 1-67 on Arthrobacter phage Phrampa

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Arthrobacter phage Phrampa is a bacteriophage that attacks the bacteria Arthrobacter globiformis B-2979. It was discovered in 2023 in Poughkeepsie NY at Marist University from a soil sample. The purpose of this study was to annotate all the genes in Phrampa. This phage has 292 genes, and this poster covers genes 1-67. After the annotations were completed, the genes were reviewed by

an expert and submitted to GenBank. During this process, at least one protein was identified on gene 44. This protein is called Peptidase M23; it is a membrane protein that assists in maintaining the structure of a bacteria cell during division.

P3.18

Annotations of the Actinobacteriophage: Phrampa 68-124

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Bacteriophage gene annotation has played a key role in our study of the FC cluster Phrampa. The focus of this study was to accurately annotate my genes 68-124, by figuring out if it was a gene, calling the start of the gene, and naming the function of our genes. We used PECAAN (Phage Evidence Collection and Annotation Network), during my time working with this site, I discovered numerous functions of genes including RNA ligase, Membrane proteins, SSB proteins, DNA helicase, Minor tail protein, and Portal Proteins to name a few. PECAAN uses tools such as GeneMark, Glimmer, HHPRED, PhageDB, NCBI, CDD, and TMHMM to help us call the functions of our genes. The Portal Protein is the function I will focus on, a portal protein responsible for the assembly of newly packaged DNA, viral replication, and the delivery of the DNA into the capsid. The annotation of the Phrampa phage will advance current understanding of bacteriophage diversity, and further bioinformatics analysis is being performed to explore the structure and function of the predicted proteins.

P3.19

Genomic Annotations of Bacteriophage Phrampa Genes 125-181 Using Integrated Bioinformatics Approaches

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Annotating bacteriophage genomes is crucial for understanding phage diversity, gene function, and evolutionary relationships. This project aims to produce accurate annotations for genes 125 through 181 of the newly sequenced bacteriophage *Phrampa* using the Phage Evidence Collection and Annotation Network (PECAAN). PECAAN integrates and compares results from various bioinformatics tools, including Glimmer, GeneMark, Pham Maps, PhagesDB BLAST, and HHPRED, to evaluate coding potential, determine start sites, and analyze gene synteny. Analysis of genes 131 and 161 revealed HNH endonuclease functions. Gene 131 showed strong PhagesDB BLAST hits with bacteriophages Mimi, Racecar, Talia, WaddleDee, Atuin, and SJReid, while gene 161 had strong matches with Mimi, Racecar, Talia, and WaddleDee. Gene 131 had an NCBI BLAST hit with 96.5% identity, 97.6% alignment, and 100% coverage with HNH nuclease. Similarly, gene 161 showed an NCBI BLAST hit with 91.7% identity, 94.8% alignment, and 100% coverage with HNH endonuclease. These findings improve understanding of gene organization within this genomic region, broaden the catalog of characterized phages, and provide valuable data for comparative genomics and studies of phage evolution.

P3.20

Structural Studies of the Biosynthetic Enzyme Tetraberberine Oxidase

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Tetraberberine oxidase (TBO) is a key enzyme in the berberine biosynthetic pathway, yet its catalytic mechanism and active site architecture remain incompletely understood. This project combines advanced computational and experimental approaches to elucidate the functional dynamics of TBO. Homology models of TBO, generated using AlphaFold 3, serve as the foundation for structure-based ligand design and molecular docking studies. Novel ligands targeting the TBO active site have been designed, and molecular dynamics simulations performed to evaluate their binding interactions and stability, providing insight into key catalytic residues and conformational changes during catalysis. To complement these computational investigations, structural studies were conducted using cryo-electron microscopy (cryo-EM) at the Environmental Molecular Sciences Laboratory (EMSL) at Pacific Northwest National Laboratory. These experiments directly visualize the active site and ligand interactions, enabling validation and refinement of computational predictions. Together, these integrated methodologies will advance our understanding of TBO's catalytic mechanism and inform future efforts in enzyme engineering and natural product biosynthesis.

P3.21

Genome Annotation of Bacteriophage Phrampa Genes 239-292 Using Integrated Bioinformatics Tools

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Bacteriophage genome annotation is critical for understanding phage diversity, gene function, and evolution. The goal of this project is to produce annotations for genes 239 through 292 of the newly sequenced bacteriophage *Phrampa* using PECAAN (Phage Evidence Collection and Annotation Network). This platform aggregates and compares results from tools such as Glimmer, GeneMark, Pham Maps, PhagesDB BLAST, and HHPRED to evaluate coding potential, start sites, and gene synteny. Although many of the genes in this region were annotated as hypothetical proteins, Gene 253 showed a

strong TMHMM hit indicating transmembrane helices, supporting its identification as a membrane protein. These findings enhance our understanding of *Phrampa*'s genomic organization and contribute to ongoing efforts in comparative phage genomics.

P3.22

Sodium Butyrate Enhances 5-Fluorouracil Cytotoxicity by Reversing Senescence and Promoting Apoptosis in Colorectal Cancer Cells

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Colorectal cancer (CRC) remains a significant public health concern in the United States and is the third most diagnosed cancer among both men and women. The overall 5-year relative survival rate is approximately 65%, though outcomes vary substantially by stage at diagnosis. In recent years, CRC incidence has risen, particularly among younger adults. This increase has been linked to lifestyle-related factors, including dietary patterns associated with obesity and reduced physical activity. Despite advances in screening strategies and improvements in chemotherapeutic options, treatment failure and disease recurrence continue to pose major challenges. These issues are often attributed to therapy-resistant cancer cell populations and senescence-associated changes within the tumor microenvironment. Short-chain fatty acids (SCFAs)—especially butyrate—are metabolites produced by gut microbiota through the fermentation of dietary fiber and exhibit well-documented anti-tumorigenic properties. Sodium butyrate (NaB), a functional analog of microbial-derived butyrate, acts as an epigenetic regulator and signaling molecule with the potential to influence cancer cell behavior and therapeutic response. In this study, we examined the effects of NaB and 5- fluorouracil (5-FU) treatment on human colorectal cancer HCT116 cells. We found that NaB inhibits cancer cell growth, and triggers apoptosis in HCT116 cells. Interestingly, NaB also reverses 5-FU-induced senescence, as evidenced by a marked reduction in canonical senescence markers when both agents are used in combination. Given that senescent cancer cells can contribute to chemoresistance, tumor relapse, and a pro-tumorigenic microenvironment via the senescence-associated secretory phenotype (SASP), this reversal could have significant therapeutic implications. Furthermore, co-treatment with NaB and 5-FU produced enhanced cytotoxicity compared to 5-FU alone, indicating that NaB sensitizes HCT116 cells to 5-FU. We conclude that NaB can enhance the chemosensitivity of 5- FU in colon cancer cells while reducing the 5-FU mediated senescence. Senescence is critical to tumor survival and recurrence. NaB may prolong the benefit of 5-FU in colorectal cancer treatments by decreasing the pool of surviving senescent cells after chemotherapy. Overall, our preliminary data support further investigation of NaB as a chemopreventive adjuvant, since it enhances the effectiveness of standard chemotherapeutic agents—both by killing cancer cells and by preventing the re-sensitization of chemotherapy-resistant cells.

P3.23

Investigating α-Gal Expression in Mosquito: A Potential Target for Transmission-Blocking Vaccines

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Mosquito-borne diseases remain a major global health challenge, and there is an urgent need for new prevention strategies beyond traditional vaccines and vector control. Transmission-blocking vaccines (TBVs) aim to interrupt pathogen development inside the mosquito, preventing disease spread to humans. This project investigates whether the α-Gal epitope, a carbohydrate structure absent in humans but common in many organisms, is present in mosquito tissues important for pathogen transmission. The hypothesis is that mosquitoes express α-Gal in their salivary glands and midguts, which could make α-Gal a potential universal TBV target by triggering host anti-α-Gal antibodies during a mosquito bite. To test this hypothesis, *Aedes aegypti* midguts and salivary glands, along with *Anopheles* salivary glands, were dissected and processed to extract proteins. ELISA was used to detect the presence of α-Gal in these tissue extracts, followed by Western blot to verify the findings and determine molecular specificity. By combining targeted tissue collection with immunological detection methods, this study aims to identify whether α-Gal expression in mosquitoes could be exploited as part of a future transmission-blocking intervention.

P3.24

DCLK 1 Isoform 1 Role in Proliferation and Migration Capabilities in Colorectal Cancer

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Colorectal cancer (CRC) is a leading cause of cancer-related mortality, ranking as the second most common cause of death in men and the third in women. Recurrence and poor prognosis are often linked to the presence of chemotherapy- resistant cancer stem cells (CSCs). Doublecortin-like kinase 1 (DCLK1), a protein normally involved in neurogenesis, has been identified as a marker for CSCs in CRC. It has five isoforms, and our research is focused on isoform 1. The goal of this study was to investigate the role of DCLK1 isoform 1 in regulating the proliferation and migration potential of HCT116 CRC cells. Two isogenic DCLK1, isoform 1 over-expressing cell lines, clone 3 (CL3) and clone 10 (CL10), were

established from parental HCT116 cells. Over-expression of DCLK1 was confirmed using real-time PCR. Cell proliferation was assessed using an MTT assay, and cell migration capability was evaluated using a wound healing assay. The MTT assay demonstrated that CL3 and CL10 cells exhibited reduced proliferation compared to parental HCT116 cells. Similarly, wound healing assays revealed that DCLK1 isoform 1 overexpressing cells migrated significantly slower than parental cells, suggesting a repression of migratory potential. Over-expression of DCLK1 isoform 1 decreases CRC cell proliferation and migration, highlighting its potential role as a regulator of tumor progression. These findings suggest that DCLK1 isoform 1 may act as a tumor suppressor and serve as a useful biomarker for targeted therapy.

We acknowledge funding support from the Mississippi INBRE (P20GM103476) and the National Science Foundation RIA (2100805).

P3.25

Studying the Role of Syntaxin 11 in Mast Cell Exocytosis/Degranulation of Tumor Necrosis Factor (TNF)

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The objective of this study was to determine the role of Syntaxin 11 in Tumor Necrosis Factor (TNF-alpha) exocytosis in mast cells. Syntaxin 11 is a SNARE protein known for its role in exocytosis and degranulation in several immune cell types, functioning through the formation of a SNARE complex that facilitates membrane fusion and mediator secretion. Previous studies identified Syntaxin 11 as the only syntaxin isoform essential for mediator exocytosis in platelet cells, and loss of this protein significantly inhibited platelet exocytosis. Additional work demonstrated that Syntaxin 11, together with its binding partner Munc18-2, is required for granule exocytosis in cytotoxic T lymphocytes, natural killer cells, and neutrophils. However, its function in mast cells, particularly in regulating TNF secretion, has not been clearly defined. To investigate this, our laboratory used RBL-2H3 cells, a model for mast cells, to examine the effects of Syntaxin 11 knockdown on TNF production and secretion. Preliminary experiments utilized cell lines with reduced Syntaxin 11 expression and measured TNF levels following stimulation. Unexpectedly, the knockdown of Syntaxin 11 resulted in a significant increase in both the secretion and production of TNF. These results led to the hypothesis that Syntaxin 11 may act as an inhibitory factor in TNF exocytosis by limiting formation of the trans-SNARE complex necessary for membrane fusion. To validate these findings, the next step in this study involves rescuing Syntaxin 11 expression in knockdown RBL-2H3 cells and comparing TNF secretion between knockdown and rescue cell lines. This approach will determine whether restoring Syntaxin 11 can reverse the enhanced TNF secretion phenotype and will clarify the functional role of Syntaxin 11 in mast-cell exocytosis. Understanding the relationship between Syntaxin 11 and TNF is important because both are implicated in human disease. Mutations in Syntaxin 11 are associated with severe immune dysregulation, and elevated TNF secretion is linked to numerous inflammatory and autoimmune conditions. These studies will contribute to defining the mechanisms underlying these diseases and may support the development of targeted therapeutic strategies.

P3.26

476 - Poxviruses Subvert Wnt/β-Catenin Signaling Through GSK-3β to Promote Infection

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Poxviruses such as mpox are re-emerging pathogens that pose a significant disease threat. The glycogen synthase kinase-3β (GSK-3β)-β-catenin axis regulates cell growth, Wnt signaling, and immune modulation. When GSK-3β activity is reduced, β-catenin escapes degradation and enters the nucleus to drive transcription of TCF/LEF target genes. Many viruses exploit this pathway by disrupting the destruction complex, stabilizing β-catenin to enhance replication. Our data reveals the opposite strategy by poxviruses. Vaccinia virus (VacV), a prototypic poxvirus, increases phosphorylated β-catenin and accelerates its degradation. Because β-catenin is critical to Wnt signaling and Wnt signaling contributes to the antiviral response, we reasoned that poxviruses target β-catenin to suppress immunity. We hypothesize that poxviruses utilize host GSK-3β kinase to tag β-catenin for degradation, inhibit Wnt signaling, and dampen the antiviral response to enhance replication. To test this, we infected normal human dermal fibroblasts with VacV at varying multiplicities of infection and time points, then measured viral titers and protein levels. Parallel cultures received selective GSK-3β kinase inhibitors. We quantified total and phosphorylated β-catenin by western blot and assessed viral proteins D8 and A14 by immunoblotting. Plaque assays determined the effect of GSK-3β inhibition on replication. Inhibition of GSK-3β reversed infection-induced changes: total β-catenin increased, phosphorylated β-catenin decreased, IRF3 is phosphorylated, and viral proteins and plaque formation are decreased. These results show that poxviruses rely on GSK-3β kinase activity to tag β-catenin for degradation, suppress Wnt/β- catenin signaling, and evade host antiviral defenses, identifying GSK-3β as a potential therapeutic target.

P3.27

453 - MYB Dysregulation in Prostate Cancer: Mechanisms and Consequences

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We have earlier shown a significant role of MYB in prostate cancer progression, aggressiveness, and resistance to therapy. Importantly, we also observed racially disparate MYB expression with Black patients exhibiting higher levels that correlate with a more advanced tumor grade and shorter time to biochemical recurrence. This study focused on identifying the molecular mechanisms driving MYB oncogene dysregulation in prostate cancer, potentially linked to its higher levels in Black patients. We observed significantly elevated serum IL-6 levels in Black patients with prostate cancer. In vitro treatment with IL-6, a dose- and time-dependent upregulation of MYB expression in prostate cancer cell lines. This induction was blocked by pre-treatment with an IL-6 neutralizing antibody (Tocilizumab) or a STAT3 inhibitor (Stattic), implicating IL-6/STAT3 signaling as an upstream driver of MYB expression. Moreover, androgen receptor-negative cell lines showed high basal MYB expression that was modestly reduced by IL-6 blockade but profoundly diminished by STAT3 inhibition, supporting STAT3 as a major regulator of MYB overexpression in prostate cancer. Chromatin immunoprecipitation analysis demonstrated increased STAT3 binding within the first intronic region of MYB after IL-6 exposure, which decreased with Tocilizumab or Stattic pretreatment. Additionally, in this region, we observed enhanced recruitment of CDK9, a key component of the P-TEFb complex, which is shown to facilitate the release of the MYB transcriptional pause through Ser2 phosphorylation in the c-terminal domain of RNA polymerase II. Importantly, CDK9 inhibition also attenuated IL-6-induced MYB upregulation. Functionally, blocking MYB via silencing or CDK9 inhibition significantly reduced IL-6-driven proliferation, migration, and invasion of prostate cancer cells. Collectively, these findings identify IL-6/STAT3 signaling as a key regulator of MYB expression in prostate cancer and suggest a mechanistic link to disease pathogenesis and observed racial disparities.

P3.28

375 - AI/ML to Determine High Lipid Content in Dairy Products Poses Negative Health Effects Compared to Non-Dairy Products

Jameka Grigsby

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People consume dairy daily without realizing it, as it is a common ingredient in many foods, from milk and cheese to yogurt and butter. Dairy products are rich in nutrients like calcium, protein, and vitamins such as B12 and riboflavin. Dairy has benefits like improved bone health, better blood pressure, and a lower risk of hypertension, but it also has drawbacks, leading many to seek non-dairy alternatives. These drawbacks have led to the growing popularity of plant- based alternatives like almond and soy milk, which cater to individuals seeking to avoid dairy for various reasons, including health, ethical, and environmental concerns. This study uses Artificial Intelligence and Machine Learning to investigate the potential health benefits and drawbacks of dairy versus non-dairy food items. Understanding the balance of dairy's benefits and risks is crucial for making informed dietary choices. This study illustrates a potential link to high lipid content in dairy products to negative health effects compared to non-dairy products, though this remains inconclusive. Results provide insights that will help individuals make informed decisions about incorporating dairy or non-dairy substitutes into their diets based on their health, lifestyle, and values.

P3.29

Comparative transcriptomic analyses reveal RTX-dependent virulence and iron transport mechanisms in virulent *Aeromonas hydrophila* under iron limitation

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Virulent *Aeromonas hydrophila* (vAh) causes motile Aeromonas septicemia in channel catfish, which causes significant disease losses in commercial catfish aquaculture. Prior research showed that pre-culturing vAh with the xenosiderophore deferoxamine mesylate (DFO) increases virulence, whereas an RTX-deficient derivative remains attenuated under the same condition. Our aim is to determine how DFO preconditioning enhances virulence in vAh and why this effect is lost in the RTX-deficient strain. To accomplish this, we compared the transcriptomes of vAh ML09-119 and its isogenic RTX-deficient mutant (Δ*rtxA-C*) grown in BHI with or without 0.4 mM DFO using RNA-seq, and evaluated virulence by immersion challenge of specific-pathogen-free channel catfish. Our result indicated that DFO preconditioning increased mortality in fish challenged with vAh but not with Δ*rtxA-C*, and DFO did not alter in vitro growth, indicating a transcriptional rather than growth effect. In both wild-type and Δ*rtxA-C*, DFO consistently upregulated high-affinity iron uptake, including TonB-dependent siderophore

receptors and heme import, and reduced iron storage and broad porin permeability (e.g., Dps and OmpC-like). In the direct Δ*rtxA-C*+DFO versus vAh+DFO comparison, the RTX operon (*rtxA*, and *rtxC*) was not expressed, the Type VI secretion effector (*hcp1*) was reduced, and decreases in envelope/secretory components were detected (including Tat pathway elements). Thus, iron-acquisition mechanisms are upregulated in both wild-type and Δ*rtxA-C* strains under iron restriction, but upregulation of toxin production/activation and T6SS output is decreased in Δ*rtxA-C*. Therefore, DFO primes a robust iron-acquisition response in vAh irrespective of RTX toxin, but increased virulence under iron restriction requires an intact *rtxA-C* operon. In addition, *rtxA-C* expression is linked with expression of T6SS-associated effectors. The attenuation of Δ*rtxA-C* under iron restriction most likely reflects a direct effect from loss of RTX cytotoxin with possible contribution from reduced T6SS activity, and upregulation of other vAh iron restriction-induced virulence factors was not able to restore virulence.

P3.30

Using AmE-711 Cells for Understanding the Cellular and Metabolomic Responses To Pesticides

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The mechanisms of action of pesticides on non-target organisms, such as honey bee, are poorly understood. Cell culture, a highly controllable, cost-effective platform for toxicity characterization, is underutilized in honey bee research. We address this deficiency by characterizing the potential of AmE-711 cells to detect cellular and metabolic effects of a commonly used fungicide frequently detected in the field. AmE-711 cells were exposed to 0.5 and 5 µM chlorothalonil for 24 hrs. Cells and media were then lyophilized prior to extraction and metabolites derivatized for analysis by gas chromatography coupled with time-of-flight mass spectrometry. Following spectral pre-processing and alignment, statistical analysis was performed with MetaboAnalyst 6.0. Preliminary findings indicate that twice as many metabolites were up- or down-regulated as exposure increased. Dose responsiveness was confirmed by changes in cellular morphology, viability and mitochondrial function. Significant fluxes in metabolites involved in glycolysis, glucogenesis and general oxidative stress were observed at the highest dose tested. Media analysis confirmed concentration fluxes in various mono- and disaccharides, citric acid cycle intermediates and amino acids following exposure. Current efforts are focused on linking the perturbed metabolites with biochemical pathways to best understand the biological consequences of fungicide exposure in these and other non-target species.

P3.31 Windows of developmental susceptibility to cannabidiol reveal stage-dependent morphological and behavioral effects

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Cannabidiol (CBD) is becoming increasingly available and is at times suggested to pregnant women to mitigate pregnancy symptoms commonly present during the first trimester including nausea, insomnia, and pain. The goal of this study is to consider different windows of developmental susceptibility using the zebrafish (Danio rerio) model.Wildtype (5D) embryos were exposed to control (0.05% DMSO) from 6-102 hours post fertilization (hpf) or 2 µM CBD from 6-102 hpf, 6-30 hpf, 30-54 hpf, 54-78 hpf, or 78-102 hpf, with mortality and hatching monitored daily. After each exposure period, embryos were collected for gas chromatography-mass spectrometry (GC-MS) to assess CBD bioaccumulation or transferred to clean egg water until 120 hpf. At 120 hpf, behavior (larval photomotor response assay) and morphology, including eye diameter and body length, were evaluated. GC-MS quantitation showed that later exposure windows (54-78 and 78-102 hpf) exhibited higher CBD concentrations than early stages, but were not significantly different from the full exposure window (6-102 hpf). Larvae exposed to CBD from 6-102 hpf showed reduced body length, smaller eyes, and decreased locomotor activity, indicating developmental impairment from continuous exposure. Shorter exposure windows caused less pronounced effects, yet incidence of yolk sac edema was increased regardless of exposure window. The embryos in the 30-54 and 54-78 hpf groups had significant growth deficits, while the 78-102 hpf group exhibited dark phase hypoactivity. Identifying critical periods of susceptibility will provide insight into how the timing of exposure influences adverse developmental outcomes and can contribute to a better understanding of potential risks associated with CBD use during pregnancy.

P3.32

Modulatory Effects of Triazole Compounds on Cystic Fibrosis Causing Mutation DF508-CFTR

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Cystic fibrosis is a common genetic disease primarily affecting individuals of Caucasian descent. It is caused by mutations in the plasma membrane protein CFTR, impairing its folding, trafficking, and chloride ion (Cl^-) channel function. Previous studies, including our own [Heda and Marino, *BBRC*, 271:659-664, 2000], have demonstrated that the functional defects of the prevalent CFTR mutation, ΔF508-CFTR, can be partially reversed using small molecules. In this study, we investigated how several triazole compounds known to influence Cl^- ion transport in cultured cells affect the expression and function of ΔF508-CFTR protein. CFBE41o$^-$ human airway epithelial cells stably expressing ΔF508-CFTR were treated with triazole compounds at 27°C for 60 h. Plasma membrane expression of CFTR was analyzed by immunoblotting using the R3195 anti-CFTR antibody, and the CFTR-specific signal was detected by chemiluminescence. Compared with vehicle-treated controls (DMSO), triazole compounds increased the CFTR expression in a concentration-dependent manner (2.5-10 μM), with a pronounced increase in the immature form (band B) and a modest increase in the mature form (band C) of CFTR. To further determine the optimal effective concentration, cells were also treated with nanomolar concentrations of PJ-08, with parallel studies ongoing with other triazole analogs. Additionally, PJ-08 enhanced the stability of ΔF508-CFTR-mediated transepithelial Cl^- currents relative to the vehicle controls, as measured by Ussing chamber analysis in Fischer rat thyroid (FRT) cells stably expressing ΔF508-CFTR. Collectively, these results indicate that triazole compounds function as multifunctional CFTR modulators, enhancing Cl- transport while simultaneously increasing the expression and functional stability of the ΔF508-CFTR.

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P3.33

Optimizing Detection of Sarcospan in 3T3-L1 Adipocytes: Preliminary Evaluation of Antibody Performance and Membrane Protein Solubilization

Peyton Bevan, John Hong, Groh, Xavier Stanford

Delta State University, Cleveland, MS

Sarcospan (SSPN) is a small four-pass transmembrane protein structurally related to the tetraspanin family. Although best known as a component of adhesion complexes in muscle, SSPN is also present in white adipocytes, where it interacts with extracellular-matrix (ECM) receptors and contributes to membrane organization. Altered SSPN expression in mouse models has been linked to disruptions in adipose tissue expansion and glucose regulation. Human epigenetic studies additionally report that *SSPN* promoter methylation increases with adiposity, suggesting regulatory relevance in metabolic states. Despite this growing interest, SSPN detection remains technically challenging because of its hydrophobic domains and low abundance. This work aims to determine conditions that reliably detect SSPN during early and late stages of 3T3-L1 adipocyte differentiation and to compare the performance of two antibody classes: the commercial E2 antibody and a recently developed monoclonal antibody, 10B8, produced by the Mokhonova & Crosbie laboratory. 3T3-L1 cells were induced to differentiate, and lysates were collected from proliferating and post-induction cultures. Preliminary western blot attempts employed routine RIPA-based solubilization. SSPN detection was evaluated side-by-side using E2 (Santa Cruz Biotechnology) and the rabbit monoclonal 10B8. During these trials, technical limitations emerged, including incomplete membrane protein solubilization, inconsistencies in total protein quantification, and unequal sample loading. These observations prompted ongoing optimization of lysis detergents, protein recovery, and normalization strategies. Both antibodies produced detectable bands in some trials, but signal strength varied considerably. E2 generated weak signal with occasional background, whereas 10B8 produced clearer bands but remained sensitive to solubilization efficiency. The variability across blots appears driven primarily by extraction and loading issues rather than antibody failure. Optimization efforts now focus on stronger detergents suitable for multi-pass membrane proteins, alternative quantification methods, and identifying stable adipocyte loading controls. Although full expression profiles are not yet available, this project establishes the methodological framework required for future studies of SSPN dynamics during adipocyte differentiation. Developing reliable detection conditions is a necessary first step toward examining how SSPN contributes to ECM interactions, lipid accumulation, and adipocyte metabolic function.

P3.34

Does Activation of Proteasomes Restore Viability in a Proteasome Mutation Associated with a Rare Neurodevelopmental Disorder?

Reagan Elmore, Galen Collins

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The Ubiquitin Proteasome Pathway is a major cellular process responsible for the efficient degradation of most intracellular proteins. The pathway catalyzes the selective degradation of misfolded or mutant proteins using a large 2.5MDa multiprotein complex called the 26S proteasome. Several mutations within the ubiquitin-proteasome pathway are associated with neurodevelopmental disorders but are poorly studied. Recently, a recurrent missense mutation in the proteasomal ATPase PSMC5 (P320R) was identified in multiple unrelated children with developmental delays and autistic spectrum behaviors. This dysfunction is likely due to reduced proteasome activity resulting from weakening the connection between the 19S regulatory particle and the 20S core particle. On the other hand, small molecule activators of the proteasome are of interest in neurodegenerative research. In this study, we sought to test whether these proteasome-activating pathways, such as Protein Kinase A (PKA) and Protein Kinase G (PKG) signaling, can improve viability in neuroblastoma cells with the PSMC5 P320R mutation. The mutant cell lines were treated with different concentrations of rolipram (an inhibitor of PDE4, the cAMP phosphodiesterase, and thus an activator of PKA) and sildenafil (an inhibitor of PDE5, the cGMP phosphodiesterase, and thus a PKG activator). We then assessed viability by resazurin assays. Although sildenafil doesn't produce a detectable improvement in viability in mutant proteasome cells, rolipram does. This suggests that proteasome activation may be possible even in this mutation and may lead to therapeutic benefits that could also extend to other neurodevelopmental disorders.

P3.35

Synergistic TNF-α and IFN-γ Signaling Drives Distinct Transcriptional Programs in Mouse Embryonic Fibroblasts but Not in Trophoblasts

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Trophoblast stem cells (TSCs) and their differentiated trophoblast derivatives (TSC-TBs) possess a uniquely immune-evasive phenotype, enabling them to resist cytotoxic cues present at the maternal-fetal interface. We recently reported that these cells are unresponsive to TNF-α and only minimally responsive to IFN-γ, suggesting an intrinsic mechanism that protects the developing placenta from inflammatory damage. Here, we directly compared the cytokine responses of TSCs, TSC-TBs, and mouse embryonic fibroblasts (MEFs) to TNF-α, IFN-γ, and their combination. Genome-wide transcriptomic profiling (RNA-seq), followed by differential expression analysis in RStudio, revealed striking cell-type-specific differences. MEFs mounted robust responses to both cytokines, and combined TNF-α/IFN-γ treatment produced a strong synergistic transcriptional program. Synergistically induced genes included Mmp3, Nos2, and Icam1, which mediate inflammation and cell viability. Conversely, genes essential for cytoskeletal organization and extracellular matrix stability, including Col1a1, Actb, and Lox, were strongly downregulated, consistent with cytokine-driven tissue remodeling and loss of structural integrity. While IFN-γ induced moderate responses in TSCs and TSC-TBs with patterns similar to those in MEFs, these cells displayed minimal transcriptional changes in response to TNF-α. Importantly, the synergistic action of TNF-α/IFN-γ observed in MEFs was not detected in TSCs or TSC-TBs, providing a molecular basis for the resistance of these cells to TNF-α/IFN-γ cytotoxicity, as we previously reported. These findings illuminate the synergistic crosstalk between TNF-α and IFN-γ in MEFs, identify downstream effector genes that mediate inflammatory and structural disruption, and highlight fundamental differences in cytokine responsiveness between embryonic fibroblasts and trophoblast lineages.

P3.35a

NIPP1-mediated PP1 inhibition has uncovered a novel, yet still undefined role, for PP1 in Saccharomyces cerevisiae

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PP1 is an evolutionarily conserved phosphatase across all eukaryotes. In *Saccharomyces cerevisiae,* PP1 is an essential gene involved in numerous cellular processes including cell viability, cell cycle progression, and glycogen metabolism. PP1 research is hindered by a lack of tools. In *S. cerevisiae* complete loss of PP1 is lethal, and therefore, research has primarily utilized yeast strains harboring different loss-of-function and/or temperature sensitive alleles. Each of these strains has proved valuable, however, a method for PP1-specific inhibition in *S. cerevisiae* that does not require genomic editing is missing. Previously our lab pioneered the use of NIPP1-overexpression from a galactose-inducible promotor as a tool to specifically and temporally inhibit PP1, hereafter called NIPP1-mediated PP1 inhibition. NIPP1 is a negative regulator of PP1 and NIPP1's overexpression has been successfully used in HeLa cells, *Drosophila*, and mouse forebrain neurons to specifically inhibit PP1. Previous research from our lab has found that NIPP1-mediated PP1

inhibition severely impairs yeast growth compared to empty vector and mutNIPP1 (NIPP1 that lacks PP1 binding) cells. Further investigation surprisingly found no change in cell viability, cell cycle progression, or glycogen metabolism. Therefore, the aim of this study was to determine what PP1 cellular pathway NIPP1-mediated PP1 inhibition was impacting. A literature search pointed to PP1 having essential roles in osmotic stress response, DNA damage (double strand breaks) and replication stress, which was each investigated. Growth spotting assays were performed comparing the growth of cells (empty vector, NIPP1, and mutNIPP1) on dextrose (no NIPP1 expression) or galactose (NIPP1 expression) with chemicals that induced each of these cellular stresses. Specifically, sorbitol (osmotic stress), phleomycin (DNA double strand breaks), and hydroxyurea (replication stress). As expected, exposure to each of these cellular stressors decreased cell growth of controls; all cells on dextrose plates and empty vector and mutNIPP1 on galactose plates. Remarkably, however, NIPP1-overexpression did not have an additive effect. Excitingly, this points to NIPP1-mediated PP1 inhibition uncovering a novel role for PP1 in yeast. Current studies in our lab are looking to uncover what this novel PP1 function is.

Acknowledgements: This project was supported by NIH grant R00HD103909 to NJC.

P3.36

Use of humanized yeast to elucidate the cellular impact of cancer-associated and disease causative Protein Phosphatase 1 beta (PP1β)

Elizabeth Lawrence[1], *Avrea Booth*[1, 2], *Nikki Camlin*[1]

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Protein Phosphatase 1 beta (PP1β) is an essential phosphatase for proliferation, cell cycle progression, and cell viability. Modifications in PP1β and abundance of PP1β regulatory proteins have been observed in various cancers with prognostic implications, suggesting a link between PP1β and cancer. However, exactly how PP1β dysregulation impacts cell cycle in cancer is unknown. Additionally, pathogenic PP1β polymorphisms cause Noonan syndrome-like with loosen anagen hair 2 (NSLH2), which is a rare neurodevelopmental disease. The cellular and molecular impact of these causative mutations on PP1β function, however, is unknown. Humanization of *Saccharomyces cerevisiae* is a simple and cost-effective way to investigate the cellular consequences of pathogenic and potentially pathogenic PP1β mutations. *GLC7* is the gene that encodes PP1β in *S. cerevisiae*. Complete loss of Glc7 activity in yeast is lethal. However, Glc7 loss can be rescued by expression of human PP1β, a process known as "yeast humanization". This project utilizes a temperature sensitive (ts) mutant Glc7 strain. At permissive temperature, 25°C, Glc7 is active and yeast are viable. However, at nonpermissive temperature, 37°C, Glc7 activity ceases, and yeast become nonviable. We have transformed ts-Glc7 yeast with plasmids that express wild-type (wt) human PP1β and disease-associated mutant versions of PP1β. Therefore, at 25°C Glc7 and human PP1β are active, but at 37°C only human PP1β is active, allowing the study of the *in vivo* effects of disease-associated mutations in PP1β. The aim of this project is to elucidate the impact of cancer-associated and NLSH2 causative polymorphisms on cell proliferation, cell cycle progression, and cell survival. To date, we have explored the impact of four cancer-associated PP1β variants (P57S, G90E, I129M, and R260Q) and two NSLH2 variants (P49R and M182K). Using agar growth spotting assays, we observed a severe decrease in yeast growth at 25°C (Glc7 and PP1β on) for G90E and I129M and a modest increase in growth for P57S expressing yeast compared to wtPP1β. At 37°C (Glc7 off and PP1β on) severe growth defects were observed for G90E, I129M, and R260Q with P49R displaying a moderate growth defect. Conversely, M182K and P57S showed a mild to moderate growth increase, respectively. Taken together these results show that different PP1β polymorphisms have different cellular impacts and highlight the utility of humanized yeast to screen for the cellular consequences of cancer-associated and disease causative mutations. Current studies are defining the cause of the growth phenotypes by investigating cell cycle progression and cell viability.

Acknowledgements: This project was supported by NIH grant R03HD117085 to NJC.

END OF THURSDAY'S PROGRAM

Friday, March 20, 2026

MORNING

Hall D Room 3

8:50 Welcome

8:50 Welcome

9:00 Cellular, Molecular, and Developmental Biology Division Awards

Divisional Awards are provided by the University of Mississippi School of Pharmacy Department of BioMolecular Sciences

9:15 Cellular, Molecular, and Developmental Biology Division Meeting

ORAL PRESENTATION SESSION IV

Moderators: Drs. James A. Stewart, Jr., Davida Crossley, Felicite Noubissi-Kamdem, Nikki Reinemann, Galen Collins, Benjamin Onyeagucha

O3.12

9:30 Effect of IGF2BP1 Inhibition on the Growth and Proliferation of Drug-Resistant CRC Cells

Oluwatoyin Odubanjo, Ja'Kira Luckett, Felicite Noubissi

Jackson State University, Jackson, MS

Colorectal cancer (CRC) continues to be a predominant cause of cancer-related mortality globally due to the resistance of cancer cells to chemotherapeutics. Constitutive activation of the Wnt/β-catenin signaling pathway has been known to be a major driver of CRC. Induction of the Insulin-like growth factor 2 mRNA-binding protein 1 (IGF2BP1), a direct target of the Wnt/β-catenin signaling pathway, might promote resistance of CRC cells to treatment via activation of anti-apoptotic pathways and induction of the multidrug resistance (MDR1) membrane transporter that pumps drugs out of the cells. Studies have shown that targeting mechanisms driving the resistance of CRC cells to treatment would significantly reduce cases of metastasis and death. Thus, we aim to study the effect of IGF2BP1 inhibition on the growth and proliferation of drug-resistant colorectal cancer cells. We hypothesized that inhibition of IGF2BP1 could sensitize CRC to chemotherapy. To test our hypothesis, we generated SW620 and HCT116 oxaliplatin/5FU resistant clones. Western blot analyses were used to characterize the clones. Cell viability, colony formation, and proliferation assays were performed to evaluate the effect of IGF2BP1 inhibition on growth dynamics. The RNAi approach was used to inhibit IGF2BP1 expression in these established drug-resistant CRC cells. We found that drug resistant CRC cells overexpressed CD133 while their expression of E-cadherin was significantly reduced. Their proliferation ability was also significantly enhanced. However, inhibition of IGF2BP1 in the drug-resistant cells significantly reduced the expression levels of CD133 and induced an increase in E-cadherin expression. In addition, cell proliferation, colony-forming capacity, and cell migration capability of the drug-resistant cells were reduced when IGF2BP1 was inhibited, while apoptosis was increased. These findings indicate that IGF2BP1 plays a critical role in sustaining drug-resistant CRC cell survival and proliferation. Targeting IGF2BP1 may therefore constitute a promising therapeutic strategy to overcome resistance and improve treatment efficacy in colorectal cancer. Additional *in vivo* validation and mechanistic investigations are necessary to confirm IGF2BP1 as a prospective molecular target for colorectal cancer therapy.

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O3.13

10:00 MYB-Regulated Extracellular Vesicle Release and Selective miRNA Enrichment in Pancreatic Cancer Cells

Shashi Anand[1], Kunwar Somesh Vikramdeo[1], Mohammad Aslam Khan[2], Seema Singh[1], Moh'd Khushman[3], Ajay Pratap Singh[1]

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The oncogenic transcription factor MYB is aberrantly expressed in pancreatic cancer and promotes tumor progression and metastasis. Earlier studies have shown that MYB facilitates hypoxic survival through metabolic reprogramming and modulates the secretome in pancreatic cancer cells, suggesting a role for MYB in shaping the tumor microenvironment. Extracellular vesicles (EVs) have emerged as critical mediators of intercellular communication within the tumor microenvironment. microRNAs (miRNAs) are among the most abundant EV cargo components, regulating a variety of gene targets through post-transcriptional mechanisms. In this study, we investigated the impact of MYB on EV shedding and on both EV-encapsulated and cellular miRNA profiles. EV

were isolated from the conditioned media (CM) of endogenous MYB-overexpressing non-targeting sgRNA-transfected control cells (MYB^{Ctrl}) and MYB knockout (MYB^{KO}) cells by differential-speed centrifugation and subjected to nanoparticle tracking analysis (NTA), RNA isolation, and next-generation small RNA sequencing (sRNA-seq). Nanoparticle tracking analysis revealed an increase in the large EV (LEV), decrease in small EV (SEV), while no significant difference was detected in medium-sized EV (MEV). Next-generation small RNA sequencing analysis identified 215 differentially expressed miRNAs in SEV from MKO cells compared to wild-type cells: 99 miRNAs were downregulated, and 116 were upregulated. Gene ontology and KEGG pathway enrichment analysis of target genes associated with these differentially expressed miRNAs revealed their involvement in various biological process and pathways, including small-GTPase-mediated signal transduction, cellular growth, apoptosis, histone modification, axon guidance, immune suppression, and extracellular matrix degradation. To determine whether MYB affects miRNA synthesis or their enrichment into SEV, we profiled cellular miRNAs in control and MYB^{KO} cells. MYB^{KO} cells showed distinct miRNA changes whose predicted targets were linked to metabolic, RNA-transport, ER- processing, phagosome, chemokine, and other cancer-related pathways. Comparison of cellular and SEV miRNA profiles showed selective enrichment of miRNAs into SEV in MYB-expressing cells. Notably, 61 of the 86 SEV-enriched miRNAs (70.9%) were significantly reduced in MYB^{KO}-derived SEV, indicating that MYB promotes selective miRNA loading into SEV. Collectively, these findings uncover a previously unrecognized role for MYB in regulating EV biogenesis and miRNA enrichment in pancreatic cancer. Ongoing studies aim to elucidate the mechanisms underlying MYB-mediated control of SEV production and cargo selection and their impact on TME remodeling.

O3.14

10:30 Microtubule-Destabilizing Effects of Vernonia amygdalina Fractions in Cancer Cells

Daniel Oyugi

Department of Natural Sciences, Mississippi Valley State University, Itta Bena, MS 38941

Vernonia amaygdalina (VA), one of the medicinally important plants of Africa, is considered the most used plant in the genus Vernonia. Previously, we reported the in-vitro growth inhibition and anti-proliferative activities of VA extracts on cancer cells. In the present study, we examine whether VA elicits the aforementioned effects by targeting and disrupting cellular microtubules. Using immunocytochemical and fluorescence analyses, we probed the effects of VA fractions on microtubule assembly, disassembly and apoptosis in prostate (DU-145) and breast (MCF-7) cancer cell lines. Cell viability was tested using Calcein-AM Red Orange. Apoptosis was measured using Double Stain Apoptosis Detection Kit (Hoechst 33342 and Propidium Iodide (PI)). Further, gene expression of drug efflux pumps (Multidrug Resistance Proteins (MRPs) in treated cells was analyzed using RT-PCR. Our results indicate that organic and aqueous fractions of VA extracts abrogated the steady state-microtubule pattern into a disassembled form in DU-145. In MCF-7 cells, the fractions caused retraction, condensation, and clustering of tubulin protofilaments into aggregates within the cytoplasm. Examination of cell structure and morphology revealed marked cell shrinkage, nuclear fragmentation, chromatin condensation, DNA fragmentation, and formation of membrane blebs and apoptotic bodies. Further analysis of cell death by fluorescence staining indicated manifestation of condensed chromatin and nuclear fragmentation, confirming an apoptotic death, with greater quantities of apoptotic phenotypes observed in MCF-7 than in DU-145. Viability assay showed a dose-dependent reduction in viable cells, with petroleum ether and aqueous fractions exhibiting a higher reduction effect (IC50 61.02 µg/mL; 65.82 µg/mL) than methanol fraction (IC50
80.77 µg/mL) in MCF-7 cells. In DU-145 cells, methanol fraction exerted highest viability reduction (IC50 44.21µg/mL) than aqueous (IC50 131.7 µg/mL) and petroleum ether fractions (IC50 130.5 µg/mL). Low expression of Breast Cancer Resistance Protein (BCRP) and Multi-Drug Resistance 1 (MDR1, ABCB1) was observed in treated MCF7cells compared to untreated controls. Taken together, these observations demonstrate that VA contains active components capable of inhibiting growth of cancer cells, exerting their properties by disrupting microtubule organization, effectively causing apoptotic death. Additionally, the extracts can increase sensitivities to chemotherapeutic agents due to reduced efflux pump activity.

This work was supported by the MS-INBRE, funded by an Institutional Development Award (IDeA) from the National Institute of General Medical Sciences of the National Institutes of Health under grant number P20GM103476.

O3.15

11:00 Aryl Hydrocarbon Receptor-STAT3 Axis Drives Cisplatin-Resistance in Small-Cell Lung Cancer

Gunjan Sharma[1, 2], KM Abdullah[1, 2], Jawed Siddiqui[1, 2]

[1]Department of Cell and Molecular Biology, University of Mississippi Medical Center, Jackson, MS, [2]Cancer Center and Research Institute, University of Mississippi Medical Center, Jackson, MS

Small-cell lung cancer (SCLC) is an aggressive, highly metastatic form of lung cancer with frequent early relapses and a high rate of acquired resistance to platinum-based chemotherapy. Cigarette smoke and environmental pollutants, including dioxins, as well as endogenous tryptophan (Trp) metabolites such as kynurenine (Kyn), activate the aryl hydrocarbon receptor (AhR), which drives the oncogenic programs in SCLC. Emerging evidence suggests a functional interplay between AhR and the JAK/STAT3 signaling pathway that may underlie aggressive behavior and treatment failure. In this study, we evaluated the role of the AhR-STAT3 axis in cisplatin-resistant SCLC cell lines. We tested whether pharmacologic inhibition with a selective STAT3 inhibitor and the repurposed AhR antagonist clofazimine (CLF) can restore chemosensitivity. In cisplatin-resistant SCLC cells, we observed persistently elevated AhR expression and increased STAT3 phosphorylation compared with their parental counterparts. Pharmacologic blockade of STAT3 decreased AhR-driven/Kyn-mediated transcriptional outputs and reduced proliferation, migration, and clonogenic potential of cisplatin-resistant SCLC cells. Treatment with CLF suppressed downstream AhR signaling and synergized with STAT3 inhibition to reduce cell viability, reverse epithelial-to-mesenchymal and stem-like signatures, and significantly lower cisplatin IC_{50} values. These findings identify the AhR-STAT3 signaling axis as a key driver of cisplatin resistance in SCLC and demonstrate that combined inhibition with a STAT3 inhibitor and clofazimine effectively reverses resistance and restores platinum sensitivity in vitro. These results provide a strong rationale for further preclinical development of AhR-STAT3 co-targeting strategies, including repurposing CLF, to overcome chemotherapy resistance in advanced SCLC.

O3.16

11:30 - cGAMP Innate Immune Signaling Pathway Increases Proteasome Activity

Maryam Javanpour, Galen Collins

Mississippi State University, Mississippi State, MS

Protein degradation is a fundamental determinant of cellular physiology, shaping signaling networks, stress responses, and the maintenance of proteome quality. The 26S proteasome sits at the center of this system, selectively removing regulatory proteins and clearing damaged or misfolded substrates to support homeostasis across diverse cell types.

While proteasome inhibitors have transformed the treatment of several hematologic cancers, emerging evidence shows that *insufficient* proteasome activity contributes to multiple neurodegenerative diseases. In Alzheimer's, Parkinson's, Huntington's disease, ALS, and spinocerebellar ataxias, impaired clearance of aggregation-prone or oxidatively damaged proteins is a central driver of pathology. In these contexts, increasing proteasomal protein hydrolysis represents a promising strategy to restore proteostasis and limit toxic protein buildup. Understanding how cells naturally elevate proteasome activity is therefore of broad biomedical interest.

One striking example comes from innate immunity: the second messenger **cGAMP**, generated by cGAS upon detection of cytosolic DNA, is best known for activating STING-dependent antiviral responses. Yet our recent work shows that cGAMP also **rapidly stimulates 26S proteasome activity** through a signaling pathway that is only beginning to be defined. This finding reveals that proteasome activation can be an intentional cellular response to immune sensing. In this talk, I will discuss emerging mechanisms that increase proteasomal hydrolysis rates and describe how my lab is beginning to characterize the cGAMP-dependent pathway linking innate immune activation to enhanced protein degradation.

Chemistry and Chemical Engineering

Chair: Clifton Wagner

Louisiana State University

Vice-Chair: MD Firoz Khan

Alcorn State University

Thursday, March19, 2026
MORNING
Hall D Room 4
8:30 Welcome and Opening

O4.01

8:30 Redox Active Ligand Mediated Transition Metal-Like Reactivity in Low-Valent Main-Group Complexes

Ekanayaka Arachchige, Uthpala Nayomi

Louisiana State University, Baton Rouge, LA

Redox-active diazine ligands offer powerful ways to expand the reactivity of low-valent main-group elements. In this work, we describe the first Sn(II) complex supported by a reduced quinoxaline radical anion. Chemical reduction of quinoxaline with KC_8 generates a ligand-centered radical that reacts with $Sn(HMDS)_2$ to form a dimeric Sn(II)-quinoxaline adduct. The reaction outcome is highly time-dependent: extended stirring causes ligand coupling to give a bis(quinoxaline)-bridged Sn(II) species, whereas rapid workup cleanly yields the desired radical-containing dimer. Switching to 2.2.2-cryptand instead produces a tris(HMDS)stannate anion, regardless of ligand reduction state. These results highlight how quinoxaline-based radicals can control structure and reactivity at tin, offering new avenues for non-innocent main-group chemistry.

O4.02

8:45 Optimization of BSMV Coat Protein Structural Stability for Palladium Nanorod Biotemplating via Terminal Positioning of His-Tags

MD Sohorab Uddin, Shohreh Hemmati

The University of Southern Mississippi, Hattiesburg, MS

This study investigates how the terminal positioning of a His-tag influences the structural stability of Barley Stripe Mosaic Virus (BSMV) coat proteins for palladium nanorod (PdNR) biotemplating, using molecular dynamics (MD) simulations. Traditional polyol-based PdNR syntheses often rely on toxic solvents and energy-intensive conditions, whereas biotemplating with His-tagged BSMV (BSMV-His) provides a promising green alternative. However, the optimal placement of the His-tag (N- vs. C-terminal) remains unclear.

N- and C-terminal His-tagged BSMV coat protein structures were constructed from the 5A79 PDB template using AlphaFold v2 and subjected to 1000-ps MD simulations via WebGRO. Structural properties, including root-mean-square deviation (RMSD), radius of gyration (Rg), solvent-accessible surface area (SASA), hydrogen-bonding patterns, residue depth, and normal-mode flexibility, were evaluated.

Results indicate that C-terminal His-tagging confers greater structural stability, reflected in higher intramolecular hydrogen bonding (mean 121.3 vs. 117.4), smaller Rg (1.84 nm vs. 2.05 nm), and enhanced surface accessibility. Depth analysis showed the C-terminal residue (A:192) had the lowest depth (3.32 Å), and normal-mode analysis revealed improved flexibility (eigenvalue = 3.084453×10^{-5}).

Overall, C-terminal His-tag positioning consistently provides more favorable structural characteristics for Pd^{2+} coordination and PdNR biotemplating. These findings establish a computational framework for designing stable BSMV-His constructs and advance the development of sustainable virus-enabled nanomaterial synthesis.

O4.03

9:00 Ionic Liquid Assisted Synthesis of Heteroatomic Clusters Containing Bismuth and Platinum Group Metals (Ru/Os)

Gayomi Samarakoon Mudiyanselage, Sviatoslav Baranets, Spencer Watts, George Tisdale

Louisiana State University, Baton Rouge, LA

A series of novel heteroatomic metal clusters containing Bi and a platinum group metal, *M* (*M*=Ru/Os) were synthesized in Lewis acidic ionic liquid (LAIL) reaction media ([BMIm]Cl - 1-butyl-3-methylimmidazolium) at 180 °C. Single crystal X-ray diffraction (SCXRD) revealed that these compounds are crystallizes in two distinct space groups where α-$[Ru_2Bi_{14}Cl_4][AlCl_4]_4$, α-$[Os_2Bi_{14}Cl_4][AlCl_4]_4$, and α-$[Os_2Bi_{14}Cl_4][GaCl_4]_4$ crystallizes in monoclinic space group $P2_1/c$ and $[Ru_2Bi_{14}Cl_2][AlCl_4]_6$, and $[Os_2Bi_{14}Cl_2][AlCl_4]_6$ crystallizes in triclinic space group *P* and both sharing common $[M_2Bi_{14}]$ cluster core. The major structural difference between monoclinic and triclinic arises from the median plane of the cluster where the monoclinic clusters incorporate four chlorine atoms, while the triclinic analogues contain only two. The monoclinic phases exhibit approximate unit cell parameters of $a \approx 9.4183$ (2) Å, $b \approx 17.5802$ (5) Å, $c \approx 14.9998$ (4) Å, and $\beta \approx 108.96$ (01)˚, and while the triclinic phases show $a \approx 10.0884$ (4) Å, $b \approx 11.2497$ (5) Å, $c \approx 14.5327$ (6) Å, $\alpha \approx 67.95(2)$˚, $\beta \approx 73.67(1)$˚, $\gamma \approx 69.51(2)$˚. Electronic structure calculations

revealed that wide band gap openings for all the compound ranging from 1.29 eV to 1.65 eV.

O4.04

9:15 Enhanced Magnetic Hyperthermia Efficiency of Iron Oxide Nanoflowers Synthesized via a Simple Co-precipitation Method

Bosede Kolawole, Yongfeng Zhao

Jackson State University, Jackson, MS

Cancer remains one of the leading causes of death worldwide, and conventional treatments such as chemotherapy and radiation often present significant side effects and limitations. As a result, there is growing interest in alternative and complementary therapies such as magnetic hyperthermia, which uses heat generated by magnetic nanoparticles to selectively kill cancer cells. In this study, iron oxide nanoflowers of varying sizes were synthesized using a simple and novel co-precipitation method. The nanoflowers were thoroughly characterized and compared with dispersed cubical iron oxide nanoparticles of similar crystal sizes. Heating efficiency studies revealed that the nanoflowers demonstrated significantly higher specific absorption rates (SAR) than the cubical counterparts. This enhanced performance is attributed to the unique flower-like morphology of the nanoparticles, which promotes stronger magnetic interactions and more efficient heat generation. These results highlight the potential of nanoflower-shaped magnetic nanoparticles as promising agents for magnetic hyperthermia-based cancer therapy.

O4.05

9:30 Heteroanionic Rare Earth Chalcohalides RE3Ch4Cl (RE = La-Nd; Ch = Se, Te): Synthesis, Crystal and Electronic Structures, and Optical, Magnetic, and Thermoelectric Properties

Thimira Kandabadage[1], Ella C. Madura[1], Spencer Watts[1], Bhushan Thipe[2], Xiaojian Bai[2], David P. Young[2], Sviatoslav Baranets[1]

[1]Department of Chemistry, Louisiana State University, Baton Rouge, LA, [2]Department of Physics & Astronomy, Louisiana State University, Baton Rouge, LA

The heteroanionic rare earth chalcohalide compounds RE_3Ch_4Cl (*RE* = La-Nd; *Ch* = Se, Te) were synthesized via high-temperature solid-state reactions using rare-earth metals, corresponding metal chlorides, and chalcogen powders in stoichiometric ratios. The mixtures were sealed in carbon-coated fused-silica ampoules and heated to 900 °C for the RE_3Se_4Cl phases and 950 °C for the RE_3Te_4Cl analogs. Single-crystal X-ray diffraction (SCXRD) was used to determine the crystal structures, while powder X-ray diffraction (PXRD) confirmed crystallinity, phase purity, and air stability. All compounds crystallize in the orthorhombic space group *Pnma*. The black plate-shaped RE_3Se_4Cl phases adopt the U_3S_5 structure type (a ≈ 12.59 Å, b ≈ 8.45 Å, c ≈ 7.87 Å), whereas the black needle-shaped RE_3Te_4Cl analogs crystallize in the U_3Te_5 structure type (a ≈ 15.98 Å, b ≈ 4.27 Å, c ≈ 13.92 Å). Elemental compositions obtained by scanning electron microscopy with energy-dispersive X-ray spectroscopy (SEM-EDS) confirmed the expected stoichiometry, and elemental mapping revealed homogeneous spatial distributions of all constituent elements. Electronic-structure calculations indicate direct band gaps of 1.20-1.30 eV for the RE_3Se_4Cl phases, while diffuse reflectance spectroscopy (DRS) gives slightly higher optical band gaps of ~1.60 eV, consistent with semiconducting behavior. In contrast, the RE_3Te_4Cl analogs exhibit narrow band gaps of ~0.2-0.3 eV. Magnetic susceptibility measurements show that both Se- and Te-based compounds are paramagnetic with no magnetic transitions down to low temperature. Thermoelectric measurements reveal that the Te containing phases exhibit large, negative Seebeck coefficients of approximately -300 $\mu V\ K^{-1}$ at room temperature, confirming their n-type semiconducting behavior. However, their relatively high electrical resistivities (1-10 Ω·cm) significantly suppress the overall zT, rendering the undoped materials ineffective as practical thermoelectric. Nevertheless, future aliovalent doping with tetravalent cations is expected to enhance carrier concentrations and reduce resistivity, potentially making these compounds more promising candidates for thermoelectric applications.

O4.06

9:45 Root of the Problem: Cassava in Gluten-Free Foods

Annaleigh Bain, Scoty Hearst, Trent Selby

Mississippi College, Clinton, MS

Cassava root, also known as yuca or manioc, is a starchy root tuber that is a staple food in tropical regions. It must be cooked properly before eating to remove naturally occurring cyanogenic glycosides, which can release toxic cyanide. Once cooked, cassava can be prepared in various ways, including boiling, frying, and mashing, and is a good source of carbohydrates, fiber, and vitamins. Cassava root products imported into the USA are sold for their gluten-free properties. However, recent reports indicate that cassava products be contaminated with lead, particularly if grown in polluted soil or irrigated with contaminated water, leading to high levels in the final products. This study investigates cassava products for toxic metal contamination and a health safety assessment.

O4.07

10:00 Optimizing DOTA Based Chelation of Actinium-225 for Gold Nanoparticle- Mediated Targeted Alpha Therapy

Shaquria Funchess[1], Bria Robinson[1], Thomas Ondera[1], Cathy S. Cutler[2], Vanessa Sanders[2]; Pavithra Hetti Achchi Kankanamalage[3]

[1]Department of Chemistry and Physics, Alcorn State University, Lorman, MS [2]MIRP-Brookhaven National Laboratory, New York, NY [3]Radioisotope Research and Development Group, Oak Ridge National Laboratory, Tennessee, TN

Actinium 225 (^{225}Ac) is a potent alpha-emitting radionuclide with high linear energy transfer and short-range cytotoxicity, making it ideal for targeted alpha therapy (TAT). Despite its promise, clinical application is limited by challenges in stable chelation, systemic toxicity, and effective delivery to metastatic tumors. Gold nanoparticles (AuNPs) offer unique advantages as carriers for ^{225}Ac due to their enhanced permeation and retention (EPR) effect, tunable size and shape, large surface area, and ease of modification. AuNPs can reduce release of radioactive daughters, overcome ligand limitations, minimize off-target distribution, and enable high payload delivery through attachment of multiple targeting ligands.

We investigated radiolabeling of ^{225}Ac with the chelating agent DOTA and derivatives under varying concentrations, incubation times, temperatures, and pH conditions. Radiolabeling yields were monitored using radio instant thin-layer chromatography (Radio-iTLC). Radiochemical purity and activity were analyzed with a high-purity germanium detector, and spectral data were processed with Gamma Vision software. Preliminary findings show that molar ratio, pH, incubation time, and temperature significantly influence complexation efficiency. These parameters provide critical insights for optimizing AuNP-based delivery systems. Nanoparticle-mediated ^{225}Ac delivery represents a promising strategy to advance TAT, supporting clinical translation for aggressive and disseminated cancers.

O4.08

10:15 Iron-Centered Electrocatalysts for the Sustainable Electrochemical Reduction of Toxic Hexavalent Chromium in Water

Malithi Mekhala Abeythunga[1], Noémie Elgrishi[1], Callie M. Stern[1]

[1]Louisiana State University, Baton Rouge, LA

Hexavalent chromium contamination in drinking water poses significant health risks, including the development of lung cancer and chronic kidney disease. Chemical precipitation and physical adsorption methods are used to remove hexavalent chromium from water at this time. However, they produce secondary pollutants such as Fe-Cr sludges which can lead to further contamination of soil and water. Electrochemical methods offer promising strategies for the reduction of hexavalent chromium to its less toxic trivalent form without the generation of secondary waste products. However, this direct reduction process involves a high activation barrier, requiring substantial energy input. The products also tend to deposit on the surface of electrode which further reduces the efficacy of this process. One approach to diminishing the high energy demand is to decrease the activation energy by using an electrocatalyst capable of delivering multiple electrons and protons through the electrocatalysis process. Recent work in this group demonstrated that a simple iron-based electron mediator, is effective in reducing hexavalent chromium to trivalent chromium electrocatalytically in water, with low overpotentials, and without electrode fouling or any competing hydrogen evolution reaction (*ACS Organic & Inorganic Au* **2024** *4* (1), 113-119). The current study focuses on expanding this concept by incorporating proton shuttles in the electrocatalysts to further facilitate the multi-proton, multi-electron electrocatalytic reduction of hexavalent chromium in water.

O4.09

10:30 Plasmon-Enhanced Fluorescence Nanoplatform for Determining of Antibiotic Susceptibility against Superbugs using Doxycycline-Decorated Silver Nanoparticle

Avijit Pramanik, Olorunsola Kolawole, Sanchita Kundu, Shivangee Rai

Jackson State University, Jackson, MS

The rapid rise of antibiotic-resistant superbugs is an urgent global health concern, projected to surpass all other causes of mortality in the near future. Conventional methods for determining antibiotic susceptibility often require more than 24 hours, delaying effective treatment. To address this, we introduce a plasmonic metal-enhanced fluorescence (PMEF) nanoplatform based on silver nanoparticles (AgNPs) decorated with doxycycline (DX) for rapid and sensitive prediction of bacterial susceptibility. Three-dimensional finite-difference time-domain (3D-FDTD) simulations and time-resolved fluorescence studies confirm that plasmonic "hotspots" generated by AgNP coupling amplify weak DX fluorescence by nearly 75-fold through increased excitation and radiative decay rates. When exposed to different bacterial strains, release of DX from the AgNP surface alters PMEF intensity, providing a direct measure of antibiotic effectiveness. Strong signal variation was observed in methicillin-resistant Staphylococcus aureus (MRSA), indicating high susceptibility,whereas Salmonella DT104 and carbapenem-resistant Escherichia coli showed negligible changes, reflecting poor responsiveness to DX. These

results were further validated using colony counts and LIVE/DEAD viabilityassays. The platform enables susceptibility determination within 30 minutes and detects MRSA at concentrations as low as 50 CFU/mL.

O4.10

10:45 263 - Phase separation and Adsorption behavior of surfactant micelle-Polymer complex coacervates

Sulochana Ekanayaka Mudiyanselage

Louisiana State University, Baton Rouge, LA

Complex coacervation provides a flexible framework for creating materials that respond to environmental stimuli. In this work, we examine surfactant micelle-polymer coacervates, which are particularly advantageous because the micellar domains can encapsulate hydrophobic compounds while maintaining dynamic behavior. We investigate a model system consisting of mixed surfactant micelles combined with a cationic polymer. Our results show that the micelle composition—especially the proportion of ionic surfactant—directly influences micelle charge and interfacial structure. These factors determine the progression of phase behavior, shifting the system from soluble polymer-micelle complexes to coacervates and eventually to precipitates. Under iso-ionic dilution conditions, we observe dilution-induced complex coacervation (DICC), and the boundaries of this coacervation window can be tuned by adjusting micelle charge and polymer-to-surfactant stoichiometry. In this front, Turbidimetric type 1 titrations, Dynamic Light Scattering, QCM-D and Small-Angle Neutron Scattering and Contact angle measurements experiments were performed. Contact angle measurements indicate that the formed coacervates spread effectively on both hydrophilic and hydrophobic substrates. Notably, coacervates show enhanced spreading on hydrophobic surfaces with nano-micro hierarchical roughness compared to micelle solutions. This improved wetting likely arises from the interconnected network structure within the coacervates, which promotes cooperative surfactant adsorption. Overall, these findings highlight that micelle-polymer complex coacervates offer tunable phase behaviour and advantageous interfacial properties, making them promising candidates for responsive coating technologies.

O4.11

11:00 Multifunctional Nanoadsorbents for Cooperative Capture of Short-Chain PFAS

Olorunsola Kolawole, Avijit Pramanik, Sanchita Kundu, Kaelin Gates, Shivangee Rai, Paresh Ray

Jackson State University, Jackson, MS

Short- and ultrashort-chain PFAS (C2-C7) are increasingly detected in drinking and environmental waters and are difficult to remove using existing technologies. In this work, we developed multifunctional magnetic nanoadsorbents by conjugating nonafluorobutanesulfonyl (NFBS) groups and polyethyleneimine (PEI) onto Fe_3O_4 nanoparticles. These NFBS-PEI nanoadsorbents achieved highly efficient removal of six short- and ultrashort-chain PFAS, capturing nearly 100% of perfluorobutanesulfonic acid within 30 minutes and exhibiting a high maximum adsorption capacity ($q_m \approx 234$ mg g^{-1}). Their performance stems from the cooperative action of hydrophobic, fluorophilic, and electrostatic interactions, highlighting the power of cooperative molecular interactions in advancing practical PFAS remediation solutions.

O4.12

11:15 Thermally Driven Self-Healing of Microcracks via Thermo-responsive Polymer-Grafted Silica Nanoparticles

Nadish Tharindu Galwadu Acharige, Donghui Zhang

[1]Department of Chemistry and Macromolecular Study Group, Louisiana State University, Baton Rouge, LA

We are working on developing thermally responsive, polymer-grafted silica nanoparticles that are stable and dispersible. Therefore, these polymer-grafted silica nanoparticles can be injected into microcracks caused by impact and then cured in situ to form a synthetic “clot.” This synthetic clot prevents microcrack propagation and material failure that build up over time. After injection, an external field, either electric or magnetic, directs the particles to the damaged site to initiate the self-healing process. Here, two types of polymers are grafted onto the same silica surface: the first polymer promotes physical crosslinking interactions among particles via a well-controlled lower critical solution temperature (LCST) phase transition upon heating. The second polymer bears Diels-Alder end groups that, upon heating, induce covalent crosslinks to permanently immobilize the physically merged aggregate. To avoid early covalent crosslinking at room temperature and at low particle concentrations, the LCST polymer is prepared with a longer chain length than the polymer chains with Diels-Alder reactive ends, providing steric protection for these reactive ends. These modified nanoparticles are developed by both grafting-from and grafting-to methods to assess control over polymer structure, grafting density, and surface coverage. In this presentation, the synthesis of these polymer-functionalized particles using both grafting-from and grafting-to approaches will be presented, and their characterization by nuclear magnetic resonance (NMR), thermogravimetric analysis (TGA), Fourier transform infrared (FTIR) spectroscopy, and dynamic light scattering (DLS) will be described to confirm successful grafting, quantify polymer loading, and evaluate colloidal stability and assembly behavior under activation conditions.

O4.13

11:30 448 - Blending Ester-Bridged Bis-Benzoxazines for Toughness and Tunability

Amy Coronado, Derek Patton[1], Zhe Qiang

University of Southern Mississippi, Hattiesburg, MS

Traditional thermoset resins, widely used in high-performance applications, are typically derived from petrochemical-based monomers and are not recyclable or reprocessable, resulting in large volumes of persistent waste at end-of-life. Polybenzoxazine thermoset networks, while offering excellent thermal stability and mechanical strength, still face significant challenges such as difficult processing and the lack of reprocessability, limiting their contribution to advancing a circular economy. Additionally, attempts to boost toughness in these traditionally brittle materials by blending polybenzoxazines with other networks often creates macrophase separation due to incompatibility, resulting in weak interfacial adhesion and stress concentration during deformation.

This presentation introduces a modular blending approach designed to enhance both the recyclability and tunability of polybenzoxazine networks, utilizing some bio-derivable chemical building blocks. By incorporating ester-containing bisphenols and free hydroxyl groups into benzoxazine monomers, we impart reprocessability through transesterification-based dynamic covalent bond exchange, yielding associative covalent adaptable networks. These ester-containing benzoxazines, with bisphenol and tertiary amine structural motifs, can self-catalyze both ring-opening polymerization and transesterification. Furthermore, blending miscible bis-benzoxazine monomers with different intra-bisphenol alkyl bridge lengths enables systematic tuning of glass transition temperature, elastic modulus, and other thermomechanical properties.

The talk will cover the synthesis, purification, and blending of two model monomers, along with curing behavior and thermomechanical performance of the resulting pure and blended polybenzoxazine networks.

O4.14

11:45 Unravelling Molecular Mechanism Behind the Segregative Phase Separation of Glycogen

Dilki warshamana Dewayalage

Louisiana State University, Baton Rouge, LA

Segregative liquid-liquid phase separation (SPS) refers to the process in which two macromolecules separate into distinct phases due to their mutual incompatibility, resulting in each macromolecule being enriched in a different phase. This study explores such phase behavior of two glycogen molecules with different sizes, namely bovine glycogen (BGly) and oyster glycogen (OGly) in the presence of two neutral macromolecules polyethylene glycol (PEG) and Ficoll. Upon mixing glycogens with either PEG or Ficoll, liquid-liquid phase separation (LLPS) were observed. For both systems, glycogen molecules were found to be preferentially partitioned into the dense liquid phase, while PEG and Ficoll are largely excluded into the top liquid phase. In general, a more expanded LLPS region was found for BGly. Furthermore, to investigate the driving force for the phase separation, phase diagrams were constructed in the presence of NaSCN, NaCl, and D_2O. These additives selectively modulate hydrophobic (NaSCN), electrostatic (NaCl), and hydrogen bonding (D_2O) interactions. The resulting changes in phase behavior suggest that solvent and salt conditions influence the packing and arrangement of glycogen within the separated phase. Small-angle X-ray Scattering (SAXS) analysis of the dense phase revealed that the molecular packing and structural organization of glycogen differ significantly depending on the size of the glycogen and the presence of PEG or Ficoll. Overall, our study demonstrates that how size difference in glycogen molecules could impact their segregative phase behaviour.

12:00 Lunch Break

Thursday, March 19, 2026
AFTERNOON
Room Hall D Room 3

O4.15

1:00 Photochemical O-Glycosylation Promoted by Umemoto's Reagents

Olusegun Adebayo, Justin Ragains

Louisiana State University, Baton Rouge, LA

Chemical *O*-glycosylation is critical for the synthesis of glycans. Development of novel methods for the activation of thioglycosides using easily handled reagents is in demand.Besides designing novel and pure glycans, our works over the years have continued to dedicate significant efforts to overcoming challenges that remain at each stage of the *O*-glycosylation process, such as activation of donors, controlling temperatures and anomerization, and accessing glycans with stereoselectivity. Specifically, this work explores development of a photochemical method for the activation of thio- and selenoglycosides for *O*-glycosylation using Umemoto's reagents (e.g. *S*-trifluoromethyldibenzothiophenium triflate) and visible-light irradiation. Our mechanistic hypothesis is based on the formation of chalcogen-bonded complexes between

thio/selenoglycoside S/Se and Umemoto's reagent, resulting in *O*-glycoside products.

O4.16

1:15 Synthesis of Achiral Squaramide Catalysts for Use in Organocatalyzed Reactions

Francis K. Kekessie, Julie A. Pigza

The University of Southern Mississippi, Hattiesburg, MS

Squaramide (SQ) organocatalysts are bifunctional catalysts composed most often of an acidifying group and a basic tertiary amine component. They can catalyze a wide range of reactions by taking advantage of noncovalent interactions (NCIs) between substrates. Noncovalent interactions (NCIs) are the collection of both favorable and unfavorable interactions between molecules that ultimately determine the fate of reactions. Chiral SQ organocatalysts employed in organic synthesis convert achiral or prochiral substrates to chiral products yet are difficult to make and are expensive to purchase. On the other hand, achiral squaramides yield racemic products or can be used to probe diastereoselectivity, but they are readily accessible in the lab. Our group has found them key for screening new organocatalyzed reactions towards the synthesis of small molecules of relevance in the pharmaceutical and chemical space to find 'hits'. This work describes a two-step synthesis of achiral squaramide organocatalysts from commercially available materials with varying acidifying and basic groups. We successfully synthesized 40 achiral squaramide catalysts using this procedure. We also demonstrated their utility by screening them in various known reactions to show proof of concept.

O4.17

1:30 Investigation of the Electrophile-Initiated Cyclizations for the Synthesis of 1,2-Difunctionalized Heterocycles

Parth Patel, Matthew G. Donahue

The University of Southern Mississippi, Hattiesburg, MS

Heterocyclic rings are found to be prominent scaffolds of various molecules in biology and medicinal chemistry. The importance of densely functionalized heterocyclic rings provides motivation towards their synthesis using various acyclic precursors. Alkene precursors that bear internal nucleophiles have been used to deliver heteroatoms such as nitrogen, oxygen and sulfur when treated with electrophiles such as halogens and chalcogens to initiate cyclization. In this talk, screening of reaction variables such as solvent and electrophile to induce cyclization according to Baldwin's rules will be discussed. The use of acyclic precursors is directed with the ring size of the heterocycles being formed which can be an allyl amine or homoallylic amines. A sulfonamide moiety that can act as a control element and increasing the acidity of the N-H bond that allows the installation of internal nucleophiles such as carbamate, guanidine, urea, and thiourea. The current work includes use of a precursor based on allyl amine with p-toluenesulfonyl group as control element and Boc group as internal nucleophile. To date, the conditions have been investigated regarding the solvent polarity and nature of electrophile towards the cyclization forming a 5 vs 6 membered ring. Products resulting from this work are characterized by using spectroscopic methods (IR, NMR, HRMS) to validate the hypothesis. Based on the results, cyclization appears to proceed through a 5-exo trig pathway while disfavoring the 6-endo trig pathway, noting both being favorable according to Baldwin's rules. The long-term goal includes the use of chiral aryliodine catalyst to induce asymmetry in transition state leading to formation of stereogenic carbon in the heterocyclic ring. The initial stage synthesis of catalysts and their role in catalysis with non-covalent interactions will also be discussed.

O4.18

1:45 Pyridine-based HIV Integrase Inhibitors: Pyridine-Core Development

Tyler Twedt[1], Christopher Bruni[1], Wolfgang Kramer[1], Sharon Suffern[1], Jacques Kessl[2], Matthew Donahue[2]

[1]Millsaps College, Jackson, MS, [2]The University of Southern Mississippi, Hattiesburg, MS

Retroviruses employ three unique enzymes, reverse transcriptase, integrase and protease, that are essential for their life cycle. Antiviral therapy targets those enzymes preferably, as less side effects are expected. Human immunodeficiency virus (HIV), which causes acquired immunodeficiency syndrome (AIDS), is generally combated with triple therapy, consisting of usually two reverse transcriptase inhibitors and one integrase or protease inhibitor. As the high mutation rate of the virus causes resistance, HIV drugs are constantly optimized. HIV integrase incorporates the viral DNA into the host cell genome. HIV Integrase inhibitors are mostly based on aromatic heterocycles such as pyridine and quinoline. This project aims to synthesize new inhibitors based on the pyridine core. The heterocycle is generated by reaction of substituted malonic esters with an aminocrotonate ester. The development of the side chain in the 3-position which consists of a methine carbon carrying a tert-butoxy group and a carboxylic acid, is essential. Several methods have been attempted and are discussed. Further incorporation of substituents on the pyridine core will determine the efficiency of the inhibitors.

Acknowledgement: This work was supported by the Mississippi INBRE, funded by an Institutional Development Award (IDeA) from the National Institute of General Medical Sciences of the National Institutes of Health under grant number P20GM103476.

O4.19

2:00 Synthesis of a highly branched 4,5 Kdo Trisaccharide from the LOS core of Acinetobacter baumannii

Brenda Okoko[1], Victor Filogonio[1], Justin Ragains[1]

Louisiana State University, Baton Rouge, LA

Acinetobacter baumannii, a Gram-negative, multidrug-resistant (MDR) bacterium of the *Moraxellaceae* family, has been designated a critical priority pathogen by the World Health Organization due to its central role in severe nosocomial infections, particularly in intensive care units (ICUs). As a member of the ESK**A**PE group of pathogens, *A. baumannii* exhibits a remarkable capacity to evade host immune responses, survive under extreme environmental stress, and acquire resistance to a broad range of antimicrobial agents. Clinically, it is associated with ventilator-associated and hospital-acquired pneumonia, blood infections, urinary tract infections, meningitis, and increased mortality rates. A major virulence factor, lipooligosaccharide (LOS), forms part of the outer membrane and represents a promising target for vaccine development. Unlike conventional lipopolysaccharides, LOS lacks the O-antigen but retains a highly conserved outer core locus (OCL), identified in over 73.6 % of sequenced strains, including *A. baumannii* ATCC 19606. Within this conserved region, the 4,5-branched Kdo trisaccharide motif constitutes a potential antigenic epitope with significant relevance to chemical immunology. Considering the biosafety challenges associated with obtaining LOS through fermentation, chemical synthesis offers a more reliable and scalable means for accessing this glycan. This work focuses on the stereoselective synthesis of a highly 4,5-branched Kdo trisaccharide fragment of LOS from *A. baumannii*, for investigation in chemical immunological studies.

O4.20

2:15 Synthesis and Testing of Halofuginone Derivatives for the Treatment of Tickborne Diseases

Abigail Taylor, Julie Pigza, Aiden Leise, Brooke Warren

University Of Southern Mississippi, Hattiesburg, MS

According to the US Centers for Disease Control and Prevention, ticks are responsible for the transmission of over 15 different diseases including those that are chronic such as Lyme disease. The Mississippi Gulf Coast tick (*Amblyomma maculatum*) is responsible for the transmission of *R. parkeri* to humans through direct bites resulting in fever, headaches, rash, and muscle aches. Recently, febrifugine, a bioactive constituent of a plant used in Chinese medicine, and halofuginone, a feed-additive to prevent diseases in poultry farms, have been tested in the treatment of tickborne diseases. However, it is prohibitively expensive to purchase either febrifugine ($35,000/gram) or halofuginone ($51,000/gram) from commercial suppliers. Chemical synthesis will enable us to make these compounds more cost efficiently, allow the production of structural analogs to find even more potent compounds, and provide material for testing in cellular assays and in ticks. This presentation will describe our progress on the synthesis of derivatives of halofuginone.

Acknowledgements: This work was supported by an NSF award from the Chemical Catalysis Division (#1848257).

O4.21

2:30 Diastereoselective Addition of Masked Acyl Cyanides to Nitroalkenes Using Achiral Squaramide Organocatalysts

Darrien Carter, Francis K. Kekessie Julie A. Pigza

The University of Southern Mississippi, Hattiesburg, MS

Amino acids are important building blocks in the pharmaceutical and chemical industry for their role in synthesizing bioactive molecules and other natural products. This study uses achiral squaramide organocatalyzed addition reactions of masked acyl cyanides to nitroalkenes to study the diastereoselectivity of the reaction. The products can be converted to useful amino acids in only two steps and this method represents a formal synthesis of these valuable building blocks. Squaramide (SQ) organocatalysts take advantage of dual activation of substrates via non-covalent interactions (NCIs) to catalyze a wide range of reactions. SQs act as a hydrogen bond donor to activate a substrate as an electrophile (the nitroalkene) and as a hydrogen bond acceptor to activate another substrate (the masked acyl cyanide) as a nucleophile. This quality of SQ catalysts make them excellent for polar addition reactions. The products were obtained in high yields and diastereoselectivity. This research also provides an opening to future work using chiral SQ catalysts for the purposes of furnishing enantiopure intermediates.

THURSDAY, March19, 2026

EVENING

Hall C

5:00-7:30 Reception and General Poster Session (Immediately following Dodgen Event)

All posters should be placed in the poster all by 12:00 pm on Thursday, March 19, 2026

Odd poster numbers will be presented from 5 -6

Even poster numbers will be presented from 6-7

P4.01

Organocatalyzed Addition of Masked Acyl Cyanides to Nitroalkenes

Francis Kekessie, Lee Garman, Darrien Carter, Julie Pigza

University of Southern Mississippi, Hattiesburg, MS

Bifunctional squaramide organocatalysts activate substrates through various modes of noncovalent interactions that ultimately promote stereoselection. Masked acyl cyanides (MAC) are umpolung reagents capable of delivering a masked amide, ester, or carboxyl equivalent to a molecule. MAC reagents are uniquely suited to the dual activation mechanisms enabled by these squaramide organocatalysts. This provides exciting opportunities for new amidation and carboxylation methods, ubiquitous functional groups found throughout biologically active compounds. In prior work, we described the organocatalyzed conjugate addition of MAC reagents to beta-nitrostyrenes (BNS) in high enantioselectivity and yield, providing a formal synthesis of beta-amino acids. To expand the scope of organocatalyzed MAC reactions, we want to explore alpha-substituted BNS. This generates two adjacent stereocenters to increase complexity and provides an opportunity to study the diastereoselectivity using achiral squaramide organocatalysts. An interdisciplinary approach of organic synthesis and computational calculations is utilized to provide a more thorough investigation of the subtle intermolecular interactions between the catalyst and substrates.

P4.02

Tailoring Magnetic and Imaging Performance of Water-Soluble $CoFe_2O_4$@$ZnFe_2O_4$ Core-Shell Nanoparticles for MPS and MRI Applications

Qinku Zhang[1], Pohlee Cheal[2], Usha Grewal[1], Yong Zhao[1]

[1]Jackson State University, Jackson, MS, [2]Alabama State University, Montgomery, AL

Bi-magnetic core-shell nanoparticles hold great potential for many applications such as imaging and sensor. However, the controlled synthesis of this type of nanostructure was still challenging. Core-shell ($CoFe_2O_4$@$ZnFe_2O_4$) magnetic nanoparticles were synthesized via a seed-mediated growth approach using triethylene glycol (TREG) as the solvent, yielding materials with excellent water dispersibility and long-term colloidal stability. Structural and morphological characterizations by XRD, TEM, and FT-IR confirmed the formation of well-defined core-shell architectures. The magnetic properties were further evaluated using SQUID magnetometry, and the MRI and MPS performances were systematically investigated. The results show that the core-shell nanoparticles exhibited significantly enhanced MRI relaxivity, with an r_2 value of 524 $mM^{-1}\cdot s^{-1}$ and an r_2/r_1 ratio of 5.7, compared with 353 $mM^{-1}\cdot s^{-1}$ and 3.1 for the core-only nanoparticles of identical size. Moreover, the MPS signal intensity of the core-shell structures was approximately 1.5 times higher than that of the core counterparts. These improvements arise from the engineered hard-soft magnetic coupling between the core and shell, which substantially alters the magnetic relaxation behavior of the nanoparticles. This study lays a foundation for the development of structurally engineered ferrite nanomaterials for advanced magnetic imaging and diagnostic applications.

P4.03

Development of a Computational Chemistry Laboratory to Teach the Diels-Alder Reaction Using WebMO

Autumn Westmoreland, Kirsten Stewart, Julie Pigza

University of Southern Mississippi, Hattiesburg, MS

The Diels-Alder reaction is a standard bond forming process taught within the second semester of organic chemistry involving the [4+2] cycloaddition of a diene and a dienophile. It has many difficult concepts for students, including the formation of regioisomers and stereoisomers depending on the substitution of the diene and dienophile, as well as variants involving inverse electron demand. To rationalize product formation, one needs to understand the orbital overlap that occurs during the reaction, which is a highly visual concept. However, most traditional laboratory experiments involving the Diels-Alder reaction utilize a wet lab, where the main value would be in analyzing the NMR spectrum to assign the main isomer formed. Even this would be difficult at the sophomore organic level requiring analysis of advanced spin-spin coupling. We are developing a more visual computational laboratory to teach the Diels-Alder reaction, in which students can readily 'see' and reinforce which orbitals are involved in bonding between the diene and dienophile. Computational chemistry utilizes theoretical calculations to simulate properties of molecules and predict chemical phenomena, such as the best match of reactivity between a diene and dienophile, which we hope to utilize in this

laboratory. The development of a computational laboratory using the program WebMO will be discussed in this presentation.

P4.04

Utilizing Bioconjugaed Ti3C2 Mxene Quantum Dots with Good Two Photon Absorption Coefficients for Targeted Near Infrared Imaging of Triple Negative Breast Cancer Cells

Shivangee Rai

Jackson State University, Jackson, MS

The Near Infrared region offers inside tissue penetration, improved resolution, making two photon excitation very important for next-generation bioimaging. Here we are proposing that Mxene-based quantum dots with very large two photon absorption can be used for targeted two photon fluorescence imaging of live cancer cells. This technique can be used for early diagnosis of triple negative breast cancer

P4.05

Mechanistic Insights into Anion Transport and Antibacterial Activity of Ammonium-Based Receptors

Zuliah Abdulsalam[1], Udyogi Conthagamage[1], Nasim Akhthar[2], Victor Garcia-Lopez[1]

[1]Louisiana State University, Baton Rouge, LA, [2]Virgina Tech University, Blacksburg, VA

Antimicrobial resistance poses a significant global health threat, with projections indicating over 10 million deaths annually by 2050, underscoring the urgent need for innovative treatment strategies. One promising approach involves disrupting bacterial membranes through the modulation of ion homeostasis. In this study, we developed a series of ammonium-based compounds designed to facilitate anion transport across synthetic lipid bilayers and bacterial membranes of varying compositions, thereby inducing ion imbalance and causing membrane depolarization to kill bacteria. These compounds provide valuable insights into their underlying transport mechanisms, enabling us to determine whether they operate as mobile carriers or form channel-like pathways. Such understanding can lead to improved mechanisms for targeting ion homeostasis dysregulation. We specifically examine the structure-activity relationship to assess how different molecular components influence interactions with synthetic and bacterial membranes and, consequently, their antibacterial activity. Variations in linker length affect binding constants and transport efficiency in synthetic liposomes, highlighting the importance of hydrophobic linker size for optimal membrane interactions. Preliminary mechanistic studies with liposomes of varying fluidities suggest that these receptors function mainly as carriers rather than transmembrane channels. Finally, antibacterial studies indicate that altering the charge of compounds significantly impacts their inhibitory activity against Gram-negative bacteria.

P4.06

[2]Rotaxane Labeled with Nitrobenzoxadiazolyl (NBD) Fluorophore for Shuttling Studies in Solution and Synthetic Lipid Bilayers

Jullyane Emi Matsushima, Víctor García-López

Louisiana State University, Baton Rouge, LA

Rotaxanes are mechanically interlocked molecules composed of an axle threaded onto a macrocycle. Moreover, these molecules can be composed of one or more components. For instance, a [1]rotaxane has only one component, a long axle containing a covalently bonded macrocycle on its end that is further threaded onto the macrocycle. [2]Rotaxanes are composed of one axle and one macrocycle that are mechanically interlocked. Furthermore, rotaxanes are known for their shuttling motions in which the threaded macrocycle freely moves along the axle due to the presence of binding stations. Recently, our group reported a [2]rotaxane containing an azobenzene functionalized dibenzo-24-crown-8 (DB24C8) macrocycle and an axle containing two alkyl ammonium stations and one triazolium station. Interestingly, the [2]rotaxane has been shown to modulate synthetic lipid bilayers through photoisomerization of the azobenzene macrocycle. Additionally, recent unpublished studies highlight the molecule potential to be used as an antimicrobial agent. It is of the utmost importance to understand these molecules' placement in the lipid bilayer and determine whether they are shuttling or not. Therefore, this work aims to synthesize a [2]rotaxane containing a DB24C8 macrocycle labeled with a nitrobenzoxadiazolyl (NBD) unit to investigate its shuttling motion along the axle in solution and in synthetic lipid bilayers. The NBD fluorophore is known to have weak fluorescence in polar solvents and environments. In contrast, in nonpolar solvents and environments the NBD fluorophore presents higher fluorescence. Moreover, when in the presence of a receptor, such as the alkyl ammonium and triazolium stations, the NBD fluorescence is quenched. Hence, when the macrocycle is stationed in one binding station and no shuttling is occurring no fluorescence is observed, and when the macrocycle is shuttling, the fluorescence is observed due to the constant movement of the macrocycle from one station to another. This project aims to provide insights on the shuttling motion of these rotaxanes in solution and the role in lipid bilayer modulation and antibacterial activity.

P4.07

High enzymatic activity of Fe3O4@PAA nanoenzymes prepared via polyol method and Cr (VI) sensing

Usha Grewal, Qinku Zhang, Dalephine Davis, Yongfeng Zhao

Jackson State University, Jackson, MS

Over the last two decades, considerable efforts have been focused towards simplifying the synthetic process and enhancing the catalytic activity of nanozymes. However, these efforts have remained complicated. In this research, we synthesized water soluble Fe_3O_4@PAA nanoenzymes via using polyol method, which produced nanoparticles with high peroxidase like activity. A comparison study on peroxidase like activity has been conducted with nanoenzymes synthesized with organic route but same precursor. Although both methods yielded comparable sized nanoenzymes, the peroxidase-like activity of polyol nanozymes was markedly higher. Their water solubility and stability were comparatively better than those synthesized by organic route. Michaelis-Menten kinetic studies revealed 2.5-fold higher Vmax for TMB and 2-fold for H_2O_2 in the polyol samples relative to the organic route nanoenzymes. For colorimetric detection of Cr (VI), the nanoenzymes exhibited a low LOD(0.0857μM) within the range 0-100μM.

P4.08

Gold Nanoparticles as Nanocarriers for Actinium-225: Exploiting the EPR Effect in Targeted Alpha Therapy

Bria Robinson[1], Shaquria Funchess[1], Thomas Ondera[1], Cathy S. Cutler[2], Vanessa Sanders[2]; Pavithra Hetti Achchi Kankanamalage[3]

[1]Department of Chemistry and Physics, Alcorn State University, Lorman, MS, [2]MIRP-Brookhaven National Laboratory, New York, NY, [3]Radioisotope Research and Development Group, Oak Ridge National Laboratory, Tennessee, TN

Targeted alpha therapy (TAT) delivers highly cytotoxic radiation to cancer cells, but a key challenge is ensuring stable binding of therapeutic radionuclides to disease-targeting vectors. This requires effective chelation strategies that prevent radionuclide release and off-target distribution. Gold nanoparticles (AuNPs) offer unique advantages as carriers for Actinium-225 (^{225}Ac) due to their enhanced permeation and retention (EPR) effect, tunable size and shape, large surface area, and ease of surface modification. AuNPs can reduce the escape of radioactive daughters, overcome limitations in ligand availability, and enable high payload delivery through attachment of multiple targeting ligands, thereby improving therapeutic efficacy. We investigated radiolabeling of ^{225}Ac with the chelating agent 1,4,7,10-tetraazacyclododecane1,4,7,10-tetraacetic acid (DOTA) and its derivatives under varying concentrations, incubation times, temperatures, and pH conditions. Radiolabeling yields were monitored using radio instant thin-layer chromatography (Radio-iTLC), while radiochemical purity and activity were analyzed with a high-purity germanium detector. Preliminary results indicate that molar ratio, pH, incubation time, and temperature significantly affect complexation efficiency. These findings provide critical parameters for optimizing radiolabeled AuNP-based theranostics, supporting ongoing research in cancer treatment and diagnosis.

P4.09

Investigating Pharmaceutical Contaminants in Water Supplies

Anjana Danivas, Jasmine Brewer, Emily Bonura, Timothy Ward

Millsaps College, Jackson, MS

While most state and federal agencies routinely monitor drinking water for common contaminants such as *E. coli,* the presence of chemical compounds such as pharmaceuticals, drug metabolites, and pesticides remains largely unexamined. Self-reported surveys indicate regular use of recreational drugs and prescription medications among college students and other urban populations, suggesting a possible route of these substances into municipal wastewater systems. Painkillers and anti-inflammatories are among some of the most common contaminants due to their prevalent use as over the counter drugs. Additional contaminants arise from illicit drugs and their metabolites, as well as pesticides that may be contaminating the municipal water system. Municipal water is not typically tested for these compounds, and their presence may potentially pose health risks to residents. After analyzing mock samples, wastewater samples will be collected and analyzed by LC-MS to ascertain levels of potential contaminating compounds. The research project will better inform the public about contaminants that may persist in the drinking water of Jackson, MS. The contaminants that will be tested include cannabinoids and several pharmaceuticals and their metabolites.

P4.10

Method Development to Identify Biomarkers for the Analysis of Pulque and Comparison to Different Agave Plants

Estrella Castillo, Hannah Meyer, Emily Bonura, Timothy Ward

Millsaps College, Jackson, MS

Evidence from earlier research indicated that the ancient amphora, called Blanco Levantado, was believed to have been used for the storage and distribution of pulque, a drink consisting of fermented sap from the maguey plant in Central Mexico. In this project, pulque samples from the central region of Mexico were obtained for analysis to determine suitable biomarkers for identification. Pulque's

complex mixture of alcohols, lipids and fatty acids, was derivatized before injection into a GC-MS. The derivatization reagent used was N,O-Bis(trimethylsilyl)-trifluoroacetamide (or BSTFA) because of its flexibility and thermal stability of its products. Due to pulque's complexity and possible different plant sources for the pulque samples analyzed, reproducibility of consistent chromatograms proved to be a challenge. According to Martínez-Aguilar's article concerning the characterization of five typical agave plants used to produce mezcal, pulque can be produced from several different species of maguey plants, each with their own chemical profiles. The various pulque samples used in this research often produced different biosignatures. The signatures we obtained from our analysis of pulque samples were compared to the five different agave species identified in the journal. In this presentation, we report on the comparison of biosignature obtained from our work with those of other Agave mixtures for the development of an accurate method for the determination of pulque residue in amphora from the Mesoamerican region in Mexico.

P4.11

No Ifs, Ands, or Bucks About It: Sniffing Out Volatile Semiochemicals in Deer Glands

Ella Goolsby, Scoty Hearst, Trent Selby

Mississippi College, Clinton, MS

Odocoileus virginianus (White-tailed Deer) are social animals that communicate using semiochemicals. Scraping behavior is an olfactory reproductive communication used by white-tailed deer to establish social networks during the breeding season. Male scraping behavior is a complex scent-marking behavior which advertises sociosexual status and location to potential females as well as to competing males. Female scraping behavior is also a complex scent-marking behavior which signals mate interests, location, and sexual receptiveness. These semiochemical scent markers are produced in body fluids such as urine, saliva, and glandular secretions released on to tree branches or the ground at scrape sites. However, the composition of these chemicals remains unknown. We used a GCMS to analyze tarsal glands and urine samples from male and female white-tailed deer. Our results suggest that volatile aromatic compounds may play a role in social semiochemical communication in white-tailed deer during mating season.

P4.12

Photochemical Cyclization Reactions involving the Saccharin Chromophores

Alex Bremond, Braeden Brewer, Wolfgang Kramer

Millsaps College, Jackson, MS

In this project we investigate the use of saccharin as a chromophore in photochemical cyclization reactions. Saccharin has an absorption maximum that is comparable to phthalimide, but due to its asymmetry it provides regiospecificity for any type of photoreaction. Cyclization of substituted chromophores with the goal of targeted synthesis requires control of the regiochemistry of the photochemical reaction.

P4.13

Synthesis of Isoindolone Piperidines as Kinase Inhibitors: Preparation of Photochemical Starting Materials and Photoreactions

Caleb Solangi[1], Davin Karst[1], Christian Hart[1], Zoe Elder[1], Matthew Donahue[2], Wolfgang Kramer[1]

[1]Millsaps College, Jackson, MS, [2]The University of Southern Mississippi, Hattiesburg, MS

In this project we report a novel synthesis of isoindolone piperidines. Our synthesis involves a photochemical key step that forms the piperidine moiety. Further transformation depends on the target molecule, and which substituents are tolerated during the photocyclization. The target structures, valmerins, are inhibitors of two key phosphorylating enzymes, glycogen synthase kinase-3 (GSK3) and cyclin-dependent kinases (CDKs). Inhibition of these enzymes leads to disruption of cancer cell metabolism and thus valmerins are used as cancer drugs. Valmerins contain an amino nitrogen on the isoindolone moiety which has to be introduced after the photoreaction because it is not tolerated during the cyclization. The use of nitro phthalimide has so far been not successful in the photodecarboxylative cyclization as reported in the literature. Reduction of the nitro group would yield the desired amine which can be transformed into the various substituents. An alternative is the formation of amide protected amino groups on the chromophore. Other syntheses of the photochemical starting materials are presented. Variations in the substitution pattern of the chromophore lead to the formation of regioisomers, the control of which is important. Electron-donating and electron-withdrawing effects of the substituents might direct the cyclization to one side of the imide.

P4.14

Pyridine Modifications HIV Integrase Inhibitors

Vivian Jordan[1], Tyler Twedt[1], Christopher Bruni[1], Jacques Kessl[2], Matthew Donahue[2], Wolfgang Kramer[1]

[1]Millsaps College, Jackson, MS, [2]The University of Southern Mississippi, Hattiesburg, MS

Human immunodeficiency virus (HIV), which causes acquired immunodeficiency syndrome (AIDS), is generally treated with a triple approach. Two reverse transcriptase inhibitors and one integrase or protease inhibitor are used. As the high mutation rate of the virus causes resistance, HIV drugs are constantly optimized. HIV integrase incorporates the viral DNA into the host cell

genome. HIV Integrase inhibitors are mostly based on aromatic heterocycles such as pyridine and quinoline. This project presents the synthesis of inhibitors based on the pyridine core. The challenging but essential side-chain in the 3-position, a methine carbon carrying a tert-butoxy group attached to a carboxylic acid, requires either the insertion of a carbon in the correct oxidation state if starting from traditional pyridine syntheses, or the incorporation of said carbon in the pyridine starting materials. To avoid some of the challenging steps, novel pyridine syntheses are employed which include the correct number of carbons in the 3-position. Preparation and modification of those compounds is discussed in this presentation

.P**4.15**

Design and Characterization of Redox-Sensitive Biomolecular Condensates as a Function of Spacer Length and Cysteine Composition

Conner Allen, Malay Mondal, Vijay Rangachari

University of Southern Mississippi, Hattiesburg, MS

Biomolecular condensates (BCs), dynamic assemblies formed through liquid-liquid phase separation (LLPS), organize biochemical reactions without membranes and are increasingly recognized as central to cell biology and materials design. While weak noncovalent interactions between "stickers" and "spacers" are known to drive LLPS, the role of covalent disulfide cross-links mediated by cysteine residues remains less understood. In our recent study, we demonstrated that incorporating cysteines into synthetic peptides dramatically lowers the saturation concentration (C_{sat}) required for phase separation and enables reversible redox control of condensates through disulfide bond formation. These findings established cysteine as an effective modulator of condensate fluidity and stability. Building on this discovery, we aim to systematically elucidate the positional and compositional preferences of cysteines and spacers in regulating condensates. A library of designer peptides has been created by varying spacer lengths and introducing cysteines at defined positions in place of serine or glycine residues. These variants will allow us to test how spacer chemistry and cysteine number govern C_{sat}, droplet nucleation and coalescence, and the percolation threshold for condensate formation. Together, we unravel the role of spacer length and the number of disulfide cross-links in condensate formation and stability.

P4.16

The Utilization of Polymers with Guanidinium Functional Groups as an Environmentally Friendly Pest Control Method

Sarah Crowsey[1], Burcu Balaban[1], Jillian Porter[1], Evan Stacy[1], Kevin Quito[2, 3], Penelope Jankoski[1], Alex Flynt[4], Tristan Clemons[1, 2]

[1]School of Polymer Science & Engineering, University of Southern Mississippi, Hattiesburg, MS, [2]Center for Molecular and Cellular Biosciences, University of Southern Mississippi, Hattiesburg, MS, [3]School of Biological, Environmental, and Earth Sciences, University of Southern Mississippi, Hattiesburg, MS, [4]Biomedical Engineering, University of Mississippi, University, MS

The use of RNA interference as a targeted pest control strategy offers a species-specific approach for combating agricultural pests through silencing key insect genes. The success of this method relies on the efficient protection and delivery of interfering RNA molecules into pest cells. Cationic polymers are particularly suited for this purpose as they are able to electrostatically associate with nucleic acids through their positive charge, forming polyplexes that protect RNA and enhance cellular uptake. The aim of this research is to develop a small library of homopolymers and copolymers of 3-guanidinopropyl methacrylamide (GPMA), a monomer of interest due to its arginine-mimetic guanidinium group that is able to maintain its cationic character in alkaline environments. By systematically varying polymer size, charge, and hydrophilicity, we will examine how these factors affect nucleic acid complexation and delivery efficiency. The fall armyworm (*Spodoptera frugiperda*) will serve as a model organism for assessing the gene knockdown efficacy of the resulting RNA-polymer complexes, providing insight into the structure-property relationships that influence effective nucleic acid delivery for agricultural pest control.

P4.17

Elemental Analysis of Tomatoes Grown Traditionally Versus Hydroponically

Mary Grace Foster, Ward Adams, Scoty Hearst, Trent Selby

Mississippi College, Clinton, MS

High potassium levels in the blood causes hyperkalemia, a serious medical condition associated with heart disease and kidney disease. Hypernatremia is caused by high levels of sodium in the blood and is associated with heart disease, kidney failure, and diabetes insipidus. Patients with hyperkalemic and hypernatremic follow restrictive diets that reduce potassium and sodium levels in their blood. This food restriction often limits consumption of other important nutrients. Restrictive diets cause a poorer quality of life as certain foods especially vegetables are restricted or cannot be consumed. One such vegetable is the tomato; tomatoes are edible fruits of the *Solanum lycopersicum* plant and native to South America, and Central America. Tomatoes are consumed in diverse ways: raw or cooked, and in many dishes, sauces, salads, and drinks. In this study, we compare the potassium and sodium content of many varieties of heirloom and hybrid tomatoes using an ICP-OES. The goal of this study was to identify tomato varieties that are low in potassium and sodium to

improve quality of life for hyperkalemic and hypernatremic patients. Additionally, selected varieties of tomatoes were hydroponically cultivated to further reduce potassium and sodium levels without reducing other essential elements.

P4.18

Forensic Toxicology of Human Tissue Samples Predicts Medical Treatment and COD

Ella Brown, Trent Selby, Scoty Hearst

Mississippi College, Clinton, MS

Forensic Toxicology of Human Tissue Samples Predicts Medical Treatment and COD

Ella Brown, Forrest Aby, Wilson Hooker, Angel Bell, Ward Adams, Sofia Elenkov, Kaitlyn Hamblin, Hannah Hinckley, Emily Huff, Jasmine Kaur, Jonathan Lott, Catalina McCoy, Duha Musa, Christina Raley, Anna Redhead, Kaniquia Fulton, Joshua Khanna, Trent Selby, Beth Barlow, Stan Baldwin, and Scoty Hearst

The Department of Biology, The Department of Chemistry and Biochemistry, Mississippi College, Clinton, MS

Forensic toxicology is the application of toxicology to legal and criminal investigations to identify the presence and effects of drugs, poisons, and other chemicals in biological samples. This field involves analyzing samples like blood, urine, and tissue to provide scientific evidence for cases involving death investigations. The purpose of the experiment was to use forensic toxicology of human tissues to predict medical treatment and cause of death from cadaver samples. We paired gas chromatography-mass spectrometry data with AI computational analysis to create medical profiles of tissues from cadavers. We sound medications such as antibiotics and opioids as well as bioactive metabolites. This data was then compared blindly to the known cause of death. Overall, forensic toxicology using GCMS analysis paired with AI can be used to predict medical treatment and cause of death.

P4.19

Gas Station Cannabinoid Products: The Risk They Pose On Motor Function and Human Health

*Catalina McCoy, Angel Bell, Ward Adams, Ella Brown, Sofia Elenkov, Kaitlyn Hamblin, Hannah Hinckley, Emily Huff, Jasmine Kaur, Jonathan Lott, Duha Musa, Christina Raley, Anna Redhead, Kaniquia Fulton, Joshua Khanna, and Scoty Hearst **

The Department of Chemistry and Biochemistry, Mississippi College, Clinton, MS

A cannabinoid is a type of chemical in cannabis and other plants that causes drug-like effects all through the body, including the central nervous system and the immune system. There have been several cannabinoids, both natural and unnatural, that can pose health risks to humans. A provision in a federal funding bill signed into law on November 12, 2025, effectively creates a federal ban on most hemp-derived THC products, including gummies, drinks, vapes, and creams currently sold nationwide. To better understand the risks this THC products, pose for humans, a variety of cannabinoid containing vapes and gummies were purchased at a local gas station and tested for cannabinoids using a GCMS. We found a wide variety of cannabinoids and other chemicals of human health concern in these products. Mice were treated with THC extracts containing Delta-8 THC and CBD and subjected behavioral testing. Overall cannabinoids had a sedative-like effect that lowered breathing rates and significantly impaired balance and motor coordination suggesting that consumption of these compounds could impair human abilities to drive a car or operate machinery.

P4.20

GCMS Analysis of Milkweed Plants Reveals Toxic Cardiac Glycoside Synthesis Pathway

Jadyn Davis, Forrest Aby, Trent Selby, and Scoty Hearst

Mississippi College, Clinton, MS

Milkweed (Asclepidacae) is a genus of flowering plants, primarily found in North and South America, that is crucial for the survival of the monarch butterfly, which lays eggs only on milkweed. Named for the milky sap it contains, which can be toxic to many animals due to its cardiac glycosides, milkweed also serves as a nectar source for many other pollinators. The goal of this study was to develop a GCMS method to detect the toxic compounds found in milkweed. We collected milkweed flowers, leaves, and seeds and used various solvents to extracts components. Next, we derivatize the extracts with TMS. However, we did not detect the toxic cardiac glycosides as expected. We did detect key compounds in the toxic glycoside synthesis pathway indicating the cardiac glycosides are most likely present, but not detectable by our current GCMS methods. Future research will focus on improving our GCMS method to detect these toxic glycosides.

P4.21

The Chemistry of Magic: Analysis of Witches' Flying Ointments and Entheogenic Plants

Isabella Shidler, Vivian Mcree, Annaleigh Bain, Katherine Browning, Gabriella Mulligan, Ellie Slay, Trent Selby, and Scoty Hearst

Mississippi College, Clinton, MS

Flying ointment is a substance described in folklore and in modern occult practices used to fly, often on broomsticks. These ointments were believed to contain hallucinogenic plants and were linked to the superstition of witches flying at night. These ointments contain hallucinogenic plants such as belladonna, henbane, jimson weed, mandrake, hemlock, and wolfsbane. These plants contain compounds

such as atropine, hyoscyamine, and scopolamine that can cause psychotropic effects when absorbed transdermally. We acquired multiple flying ointments and analyzed their composition using GCMS analysis. We also tested Angel Trumpets; a hallucinogenic plant used in shamanic practices. Our results indicated that these ointments and plants contain dangerous entheogenic compounds and should be used with caution.

P4.22

Chemical Composition of Digestif: Jägermeister

*Jacob Allen, Trent Selby, and Scoty Hearst **

The Department of Chemistry and Biochemistry, Mississippi College, Clinton, MS

Jägermeister is a German herbal liqueur traditionally considered a digestif, meaning it is meant to be consumed after a meal to aid digestion. Originally developed in the 1930s as a medicinal tonic, its recipe contains 56 herbs, roots, and spices that give it a unique, bitter, and herbal flavor profile. Ingredients include herbs, fruits, roots, and spices, including citrus peel, licorice, anise, poppy seeds, saffron, ginger, juniper berries, and ginseng. Digestifs are believed to stimulate the secretion of digestive enzymes, which can help break down food after a heavy meal and reduce feelings of discomfort. The goal of this study was to determine to determine the chemical composition of digestif Jägermeister using GCMS analysis. Many furanic compounds were found. Furan compounds have antioxidant, anti-inflammatory, and antimicrobial properties which could explain the digestif properties of Jägermeister. The finding of toxic compound furfural is concerning warranting further study using TMS derivatizations.

P4.23

Analysis of Sun Hemp and Passion Flower Plants Using GCMS

Forrest Aby, Jadyn Davis, Trent Selby, and Scoty Hearst

Mississippi College, Clinton, MS

Sunn Hemp (*Crotalaria juncea*) is widely grown in the Indian subcontinent and Brazil for its fiber, which makes it especially useful in the manufacturing of twine, rug yarn and fish nets. It is also used as a cover crop to improve nutrient patterns in agricultural plants. Passion Flower (Passiflora) species are widely cultivated for their striking flowers, flavorful fruits, traditional medicinal uses, and roles in dietary supplements. Many species of Passion Flower have been found to contain beta-carboline harmala alkaloids some of which are MAO inhibitors. In this study, we examined the chemical content of Sun Hemp and Passion Flower Plants using GCMS. We found some interesting organic compounds including a plant compound used in defense against insects and another compound useful for treating swine flu. In our future studies, we will focus on derivation using TMS to further analysis extracts from these two plants.

P4.24

Medical Profiling of Human Tissues using Forensic Pharmacology and AI Modeling

Joshua Khanna, Ella *Brown, Forrest Aby, Wilson Hooker, Angel Bell, Ward Adams, Sofia Elenkov, Kaitlyn Hamblin, Hannah Hinckley, Emily Huff, Jasmine Kaur, Jonathan Lott, Catalina McCoy, Duha Musa, Christina Raley, Anna Redhead, Kaniquia Fulton, Trent Selby, Beth Barlow, Stan Baldwin, and Scoty Hearst*

The Department of Biology, The Department of Chemistry and Biochemistry, Mississippi College, Clinton, MS

Forensic pharmacology is the application of pharmacology to legal and criminal investigations to identify the presence and effects of drugs, poisons, and other chemicals in biological samples. This field involves analyzing samples like blood, urine, and tissue to provide scientific evidence for cases involving death investigations. The purpose of the experiment was to use AI modeling and forensic analysis of human tissues to predict medical treatment and cause of death from cadaver samples. We paired gas chromatography-mass spectrometry data coupled with AI computational analysis to create medical profiles of tissues from cadavers. We found medications such as antibiotics and opioids as well as bioactive metabolites. This data was then compared blindly to the known cause of death. Overall, forensic pharmacology using GCMS analysis paired with AI can be used to predict medical treatment and cause of death.

P4.25

Leveraging Lewis-Acid Mediated Photoiniferter for Highly Living Polymerization of Alternating Styrenic/Methacrylic Copolymers

Erik Spain, Kaden Stevens

The University of Southern Mississippi, Hattiesburg, MS

Lewis acids can promote alternating radical polymerizations between electron-rich and electron-poor monomers by amplifying the electrophilic character of electron-poor monomers. Previously, alternating polymers of styrene and methyl methacrylate have been synthesized via reversible addition-fragmentation chain transfer (RAFT) polymerization in the presence of a Lewis acid, but the high temperatures required for RAFT polymerization leads to side-reactions with the Lewis acid, which compromised chain-end fidelity and reduced molecular weight control. Here, we introduce Lewis acid mediated photoiniferter (LAMPI) polymerization as a more living approach to Lewis-acid mediated alternating copolymers of a variety of methacrylate and styrenic monomers. LAMPI has been shown to be more living than alternative polymerization methods due to the absence of exogenous

initiator and the ability to perform polymerizations at ambient temperatures. By applying LAMPI towards alternating copolymerization, we can direct monomer sequence while retaining improved chain-end fidelity and polymerization control.

P4.26

Critical role of solvent in immersion annealing compatibilization of brittle polypropylene

Carmen Dun, Sallie Ann Schmidt, Zhe Qiang

University of Southern Mississippi, Hattiesburg, MS

Since their inception, plastic production has continuously increased, and low recycling rates contribute to the buildup of plastic waste in landfills. To promote plastics circularity, packaging manufacturers are being required to employ recycled plastics into their products to lower plastic waste. As one of the most ubiquitous plastics in everyday life, polypropylene (PP), enabling its effective use after recycling is a key challenge to overcome. Current strategies to recycle PP result in chain scission, leading to detrimental impacts on mechanical performance. The shortened chains form less stable crystalline structures with few tie chains, which act as defects, preventing extensibility. While current strategies to employ recycled PP use additives to improve toughness, they ultimately compromise the feedstock, preventing a truly circular economy. In this presentation, we address the pitfalls of brittle, post-consumer PP through a solvent immersion annealing approach, which is applied to blends of high and low molecular weight PP. We explore the isolated impacts of heat, solvent removal, and annealing time on PP blend compatibilization through swelling. Our results indicate an increase in toughness which is attributed to selectively restructuring the crystalline domains of the blends, mitigating unstable crystal defect sites. Solvent immersion annealing may enable in a circular plastics economy and effective use of post-consumer PP with comparable performance to virgin material.

P4.27

Analysis of Microplastics in Teeth

Erick Manriquez, Chuck Smithhart

Delta State University, Cleveland, MS

Microplastics (MPs), plastic fragments smaller than 5 mm, have emerged as a global contaminant of concern, yet their interactions with calcified tissues remain largely unexplored. While previous studies have documented MPs in soft tissues and the gastrointestinal tract, little is known about their potential binding to tooth enamel or biofilms on tooth surfaces. This project addresses this gap by investigating whether MPs can adhere to enamel, dentin through chemical interactions with hydroxyapatite and organic components. Hydroxyapatite, the primary mineral of teeth, is of particular interest because its surface exposes polar phosphate and hydroxyl groups that may serve as binding sites for MPs.

Our approach integrates multiple analytical methods. Including the scanning electron microscopy (SEM), coupled with energy-dispersive X-ray spectroscopy (EDX), will provide surface imaging and elemental mapping of polymer-tooth interfaces. Fluorescent microscopy, supported by Nile Red staining, will enable visualization of MP localization in cross-sections and biofilms. To replicate oral conditions, in vitro biofilm models and saliva-mimicking solutions will be used to assess particle adhesion under biologically relevant environments.

This chemistry-driven framework will provide a systematic study of MPs in the dental environment. By combining spectroscopy, microscopy, and biological modeling, our work will establish baseline evidence for polymer and mineral interactions in teeth, bridging environmental chemistry with oral health science and contributing to the broader understanding of microplastic pollution.

P4.28

Developing and Evaluating Computational Methods for Modeling Protein Corona Formation on PLGA Nanoparticles

Victoria L. Petrosyan[1, 2], Karina Kapusta[2]

[1]Tougaloo College, Jackson, MS, [2]St. Andrew's Episcopal School, Jackson, MS

When nanoparticles enter biological environments, they rapidly acquire a protein corona, a layer of adsorbed proteins that redefines their physicochemical identity. The corona critically influences nanoparticle circulation time, cellular uptake, immune recognition, and overall therapeutic efficacy. Understanding its formation is therefore essential for the rational design of safer, more effective nanomedicines. Despite its importance, computational modeling of protein corona formation remains highly challenging, requiring representation of dynamic polymer-protein-solvent interactions across large, heterogeneous systems and long simulation timescales. In this project, we focused on poly(D,L-lactide-co-glycolide) (PLGA) nanoparticles. Although PLGA is typically synthesized with a fixed lactic-to-glycolic acid ratio, differences in monomer reactivity often yield complex, non-random copolymer sequences. To model these architectures realistically, we developed a Python-based tool that generates SMILES strings for multicomponent polymers with fully customizable monomer types, chain lengths, and sequence distributions. These polymer models were then used in GROMACS Molecular Dynamics simulations to evaluate PLGA self-assembly and behavior in aqueous environments. A 1,000-ns MD simulation was performed to investigate the self-assembly of this polymer into a nanoparticle. Overall, this work advances

computational strategies for modeling protein corona formation and supports the rational design of next-generation polymer-based nanocarriers.

This work was supported by the National Science Foundation (NSF), award number OIA-2414445.

P4.29

Uncovering the Mechanisms of Cobalt(II) Complexes as Candidate Drugs Against African Sleeping Sickness

Anna L. Petrosyan[1, 2], Karina Kapusta[2]

[1]Tougaloo College, Jackson, MS, [2]St. Andrew's Episcopal School, Jackson, MS

Human African trypanosomiasis (HAT), commonly known as African sleeping sickness, is a neglected tropical disease caused by the protozoan parasite Trypanosoma brucei. Current therapeutic options, including fexinidazole, acoziborole, nifurtimox, and benznidazole, remain limited by toxicity, inefficacy, and emerging drug resistance. Recently, novel cobalt (II) coordination organometallic complexes have been synthesized and demonstrated significant antiparasitic activity, with IC_{50} values of 10-30 μM, highlighting their potential as promising candidates for HAT treatment. However, their molecular mechanisms of action remain poorly understood. In this study, two cobalt (II) complexes: $[CoII(BBH)_3]^{2+}$ (experimentally resolved by X-ray crystallography) and $[CoII(INH)_3]^{2+}$ (computationally modeled), were investigated. Toxicity predictions using ProTox 3.0 indicated that these complexes exhibit a less aggressive toxicity profile compared to current therapeutics. Four key T. brucei enzymes were selected as potential molecular targets: type II tryparedoxin-dependent peroxidase (PDB ID: 2VUP), trypanothione reductase (2WPE), triose-phosphate isomerase (2Y6Z), and tryptophanyl-tRNA synthetase (3I05). Protein structures were retrieved from the Protein Data Bank, and potential binding sites were identified using Schrödinger Sitemap. Molecular docking was performed with both complexes and known ligands, followed by MM-GBSA calculations to refine binding poses and assess interaction patterns. While MM-GBSA scoring did not yield strong binding energies, analyses revealed consistent protein-ligand interactions, suggesting specific binding modes. Subsequent molecular dynamics simulations further elucidated the stability of these complexes within binding pockets, providing insight into their mechanism of action. Overall, this combined experimental-computational approach supports the potential of cobalt (II) complexes as novel metalloorganic drug candidates for the treatment of African sleeping sickness.

P4.30

Understanding the Influence of Charge Placement on Properties of Conjugated Polyelectrolytes

Vanessa Phan, Graham Collier

University of Southern Mississippi, Hattiesburg, MS

Conjugated polyelectrolytes (CPEs) have received increased attention in recent years for their diverse applications ranging from electronics to biomedical applications. CPEs are categorized into two main groups: conjugated backbones with ionic groups installed on the side chain, and conjugated polymers with ionic groups installed directly onto the polymer backbone. While numerous CPEs have been synthesized and studied, there has not been a systematic study to determine how the placement of charged group (side chain versus main chain) influences the polymer properties. To address these knowledge gaps, CPEs must be synthesized using building blocks that enable precise control over charge placement. In this work, 1,4-dihydropyrrolo[3,2-b]pyrroles (DHPPs) are used as the monomeric motifs due to their synthetic simplicity and scalability. Cationic pyridinium groups are introduced either on the side chains or directly onto the conjugated backbone to elucidate structure-property relationships of main chain and side chain CPEs. Initial characterization of thermal properties via differential scanning calorimetry reveals molecular DHPPs to maintain their polymorphic phase behavior indicated by multiple melting transitions when ionic groups are placed on the side chain positions; whereas no melting transitions are observed when ionic groups are placed on the main chain positions. Ongoing work involve polymerizing these cationic DHPP monomers to determine whether the characteristics observed at the molecular level carry over to the macromolecular scale. By establishing fundamental knowledge and rational designs for CPEs with tunable thermal and optoelectronic properties through controlled charge placement, this study provides the framework for developing next-generation materials for electronics, sensing, and bio-integrated technologies.

P4.31

Ionic Dependence on the Electrochemical Stability of Molecular and Polymeric Materials in Organic Solvents

Perry Skiouris

University of Southern Mississippi, Hattiesburg, MS

The use of electroactive conjugated polymers have been implemented as active materials in numerous applications ranging from organic light-emitting diodes (OLEDs), organic field-effect transistors (OFETs), electrochromics, and batteries. The redox process of these organic semiconductors has a direct impact on the optoelectronic properties of these materials. In this work, a propylenedioxythiophene (ProDOT) - based polymer was

used to study the doping/de-doping process using cyclic voltammetry and spectroelectrochemistry to monitor the evolution of charged species (polarons) and to understand the electrochemical stability based on choice of electrolyte and solvent. By the simple alteration of these two parameters, we show drastic effects on electrochemical reversibility, onsets of oxidation, and charge-injection kinetics. Here, it is shown how the size-dependence and polarity of supporting electrolytes such as lithium hexafluorophosphate (LiPF6), potassium hexafluorophosphate (KPF6), and tetrabutylammonium hexafluorophosphate (TBAPF6), can change the electrochemical behavior of the polymer. The extent of dissociation and solvation of these electrolytes by organic solvents such as acetonitrile (ACN) or propylene carbonate (PC) has also shown to turn a kinetically driven doping process into a diffusion-limited process, from scan rate dependence experiments. Overall, data from these experiments emphasize the importance in considerations used in electrochemical experiments and further expands the fundamental understanding of electronic properties of conjugated polymers in organic solvents.

P4.32

Natural Therapeutics Targeting Alpha-Synuclein Aggregation in Parkinson's Disease

Ca'Lajasia Robinson, Karina Kapusta

Tougaloo College, Jackson, MS

Parkinson's disease (PD) is a progressive neurodegenerative disorder primarily characterized by the loss of dopaminergic neurons in the substantia nigra. A central feature of PD pathology is the misfolding and aggregation of the intrinsically disordered protein α-synuclein (α-Syn). Under normal conditions, α-Syn regulates dopamine synthesis, vesicle trafficking, and transporter localization. However, genetic mutations, duplications, or environmental stressors can drive α-Syn to adopt misfolded conformations, leading to toxic oligomers and fibrils that disrupt cellular homeostasis and promote neuronal death. Current therapies alleviate motor and non-motor symptoms but do not target the protein aggregation that drives disease progression. Gedunin, a tetranortriterpenoid derived from the Meliaceae family, has demonstrated potential in modulating protein aggregation and providing neuroprotection through its interaction with molecular chaperones such as Hsp90. In this study, we used molecular dynamics (MD) simulations and induced docking to examine Gedunin's interaction with α-Syn. Our computational results indicate that Gedunin preferentially binds to aggregation-prone regions, stabilizing conformations less likely to form fibrils. These findings suggest Gedunin may act as a molecular chaperone, interfering with α-Syn misfolding pathways. Overall, this study provides computational evidence supporting Gedunin as a promising candidate for further exploration in disease-modifying strategies for PD.

P4.33

Dihydropyrrolo[3,2-b]pyrroles Luminogens as Novel and Tailorable Emissive Materials

Waleed Ahmad, Graham Collier

University of Southern Mississippi, Hattiesburg, MS

Conventional organic fluorophores are bright in dilute solution but undergo aggregation-caused quenching in the condensed phase, limiting their use in solid-state applications or as fluorescence imaging agents in high concentration. Aggregation-induced emission luminogens (AIEgens) invert this behavior, motivating the design and synthesis of new chromophores that combine AIE with tunable visible-NIR absorption/emission and electrochemical activity. The Collier Research Group is developing a new class of emissive chromophores based on (dihydropyrrolo[3,2-b] pyrrole (DHPP). The DHPP platform is a redox-active scaffold with intense fluorescence and, when coupled with tetraphenylethene (TPE) AIE units, displays strong emissions in the solid state. Three TPE-functionalized DHPPs were synthesized via Suzuki cross-coupling reactions with the key design features being phenyl, thienyl, and benzothiadiazole units. The variation of chemical and electronic structure facilitates investigating structure-property relationships and determines utility in emissive applications. UV-vis absorbance spectroscopy reveals systematic bathochromic shifts bandgap by changing the aromatic unit from phenyl to thienyl to benzothiadiazole. Investigation of emissive properties reveals these chromophores to display intense emission in the aggregated/solid state with green, orange, and red colors. Ultimately, these results establish DHPPs as tunable AIE-active chromophores and provide a foundation for ongoing studies into design-structure-property relationships of emissive DHPP chromophores and polymers in emerging emissive technologies.

P4.34

Saponins as Potential Modulators of Pancreatic Lipase: A Computational Perspective Supporting Experimental Findings

Ta'Miyia Tobias, Karina Kapusta

Tougaloo College, Jackson, MS

Saponins are plant-derived compounds that have been found to modulate the activity of pancreatic lipase. While some studies suggest they act as inhibitors, our experimental findings revealed that certain saponin-rich extracts function as activators of lipase. However, the mechanism underlying their action remains unclear. Our previous work proposed a computational approach to elucidate how saponins may influence lipase activity. In this project, we investigated seven saponins and nine bile

salts to determine whether they act as activators or inhibitors. The saponins analyzed include Ginsenoside Rg1, Ginsenoside Re, Ginsenoside Rb1, Ginsenoside Rd, Herniariasaponin 2, Herniariasaponin 4, and Osladin. The crystal structure of human pancreatic lipase (PDB ID: 1LPA) was obtained from the Protein Data Bank. Simulations were performed at pH 8.0 to mimic the physiological conditions of the human pancreas. Our In Silico study employed SiteMap analysis, molecular docking, MM-GBSA calculations, and molecular dynamics (MD) simulations. Analysis of the MM-GBSA and MD results provided evidence supporting the modulatory effects of saponins and bile salts. This study offers mechanistic insight into the modulation of pancreatic lipase by various saponins, effects that have been observed experimentally but not previously explained. Our computational framework presents a robust approach for identifying natural activators and inhibitors of lipase, enhancing our understanding of digestive enzyme regulation and paving the way for the development of new dietary supplements to support digestive health.

P4.35

Synthesis of Iron Oxide Nanoparticles Using PEG as Solvent for MRI Applications

Cecil Taylor, Jing Qu, Mia Robinson, Yongfeng Zhao

Jackson State University, Jackson, MS

Magnetic resonance imaging (MRI) offers non-invasive, high-resolution imaging without radiation, yet conventional Gd-based contrast agents present toxicity and rapid clearance issues. Iron oxide nanoparticles (Fe_3O_4) provide a biocompatible alternative with superparamagnetic properties, tunable size, and potential theranostic functions. Nevertheless, established synthetic routes often suffer from limited water solubility or insufficient control over particle nucleation and growth. Here, we introduce a PEG-based synthesis approach that extends our group's continuous-growth methodology while leveraging PEG's biocompatibility, clinical validation, and capacity for surface functionalization. Importantly, this strategy enables the controlled production of ultrasmall, water-dispersible iron oxide nanoparticles with physicochemical characteristics optimized for improved T1-weighted MRI performance and enhanced biological compatibility.

END OF THURSDAY'S PROGRAM

Friday, March 20, 2026
MORNING
Hall D Room 4

8:30 Welcome and Business Meeting

O4.22

9:00 Bimetallic Complexes of 1,4-Diazine Ligands

Clifton Wagner, Uthpala Ekanayaka, Fahmida Islam

Louisiana State University, Baton Rouge, LA

The ditopic 1,4-diazines hold great potential as multimetallic ligand scaffolds with modular communication between metal centers. In lithium chemistry, their dual-coordination gives rise to rich aggregation chemistry dependent upon the degree of π delocalization within the diazine. This binding mode also allows for the isolation of the radical anion complexes of 1,4-diazines, which had previously only been detected spectroscopically. Upon double reduction the 1,4-diazines adopt bimetallic quinoidal structures, observed here with magnesium, zinc, and tin β-diketiminates. These systems can serve as synthons for the monovalent metalloradical derivatives. In transition metal chemistry, the 1,4-diazine coordination remains dynamic until the bimetallic complexes are singly reduced, at which point the magnetic coupling of the phenazine derivatives switches from antiferromagnetic to ferromagnetic. Together these complexes highlight the versatility of the 1,4-diazines as redox-active bridging ligands that support aggregation, stabilize open-shell configurations, and mediate spin coupling across various elements.

O4.23

9:15 Volatile Organic Compounds Over an Industrial Houston Site: Emission, Near-Ground Ozone Smog and Human Health Effect

Md Khan[1], Md Ahmed[2], Md Uddin[3], Giana Coach[1]

[1]Department of Chemistry & Physics, Alcorn State University, Lorman, MS, [2]Green Climate Fund, Yeonsu-Gu, Incheon 22004, South Korea, [3]Chemistry Department, University of Bridgeport, Bridgeport, CT

Volatile Organic Compounds (VOCs) are of deep concern due to their short- and long-term impacts on human health as well as their effect on vegetation's growth. This project aims to investigate the seasonal variations of VOCs, identify their emission sources, assess their carcinogenic risk to local populations, and examine their influence on near-surface ozone build-up. To address the objectives, we obtained hourly VOCs data (13 gas molecules) for 2024 from the Texas Commission for Environmental Quality (TCEQ), specifically from an industrial site in Clinton, Houston. VOC profiles exhibit significant month-to-month variation, which can be attributed to several anthropogenic factors, as well as local-scale meteorology. An accurate

source apportionment was conducted using Absolute Principal Component score (APCS) analysis and Positive Matrix Factorization (PMF). Considering the local meteorological changes, the potential source contribution function (PSCF) and concentration-weighted trajectories (CWT) are applied to determine the source region of VOCs and the impact of clean and polluted air mass trajectories. USEPA's human health risk model applied to several VOCs already in the spotlight due to their long-term carcinogenic health effect. The VOCs originating from biogenic sources show a potential for photochemistry and impact on near-ground ozone build-up in the form of photochemical smog at the study site. Overall, this study addresses several key points regarding ambient VOC profiles, including seasonal changes, emission sources, interactions with meteorology, and the dispersion of air masses, ultimately examining their effects on human health and the interruption of vegetation growth in the presence of ozone smog. Also, the potential of VOCs to enhance the level of secondary organic aerosol (SOA) over the study areas.

O4.24

10:00 Spectroscopy of 1,8-Naphthalimide and N-Substituted Pyridines

Wolfgang Kramer[1], Courtney Mullins[1], Woods Curry[1], Ian Gould[2], Irene Corrao[1], Anna Allred[1]

[1]Millsaps College, Jackson, MS, [2]Arizona State University, Tempe, AZ

N-alkoxy substituted heteroaromatic compounds based on pyridine, quinoline, isoquinoline and phenanthridine allow the photochemical generation of transient species that can be used to damage biomolecules and induce controlled cell death. The transient species, heteroaromatic radical cations and a methoxy radical are produced with a quantum yield of about 0.55 as determined by trapping experiments.

Laser flash photolysis was used to analyze the photophysical properties of the bifunctional compounds. Interestingly, the 1,8-naphthalimide radical cation was formed and confirmed.

The N-methoxy substituted heterocycles produce a radical cation and a methoxy radical, each of which can initiate DNA cleavage. By comparison with restriction endonuclease, cleaving assays indicates that both transient species might be involved in the cleaving process.

DNA double strand cleavage is desired for efficient cleavage. The bifunctional compounds presented in this project have the ability to induce DNA damage by two different mechanisms, thus showing potential for double strand cleavage.

This work was supported by the Mississippi INBRE, funded by an Institutional Development Award (IDeA) from the National Institute of General Medical Sciences of the National Institutes of Health under grant number P20GM103476.

O4.25

10:30 Computationally Engineered siRNA Delivery Polymers for Precision Targeting of TP53

Karina Kapusta[1], Victoria L. Petrosyan[1, 2]

[1]Tougaloo College, Jackson, MS, [2]St. Andrew's Episcopal School, Jackson, MS

Developing polymer nanocarriers for delivering small interfering RNA (siRNA) as gene-silencing therapeutics requires precise structural modeling and optimization to enhance stability and target affinity between the siRNA and its carrier. In this study, we established a computational methodology for optimizing nanocarriers using a molecularly imprinted polymer (MIP) approach. Various siRNA construction techniques were evaluated, highlighting structural discrepancies along with the advantages and limitations of each method. Each structure was optimized using the Schrödinger software package and subjected to 500 ns molecular dynamics (MD) simulations to refine and validate siRNA conformations in a physiological environment. Five backbone-modified TP53-targeting siRNA variants were then used as targets to screen a library of 1,065 RNA-binding fragments from ASINEX via molecular docking, aiming to identify potent siRNA binders. An in-house Python pipeline was developed to analyze the docking data and select the top-scoring fragments across all models. These fragment-siRNA complexes were subsequently evaluated using MM-GBSA calculations. Our findings identified 10 highly promising fragments suitable for synthesizing molecularly imprinted polymers, offering novel strategies for siRNA stabilization and targeted therapeutic delivery. One of the top-scoring fragments was selected as a lead candidate due to its structural simplicity and multiple functionalization sites. Molecular stacking analyses revealed stable binding conformations for over 40 fragments within the minor groove of siRNA. Furthermore, we applied free energy perturbation (FEP) to assess changes in binding affinities following polymerization of the selected fragment. These results provide a foundation for the rational design of siRNA-targeting molecules, advancing the therapeutic potential of gene-silencing technologies.

This work was supported by the National Science Foundation (NSF), award number OIA-2414445. It was partially supported by the Mississippi INBRE, funded by an Institutional Development Award (IDeA) from the National Institute of General Medical Sciences of the National Institutes of Health under grant number P20GM103476.

Ecology, Entomology, Evolutionary Biology, and Zoology

Chair: Nina Baghai-Riding

Delta State University

Co- Vice-Chair: Seung-Joon Ahn

Mississippi State University

Co-Vice-Chair: Alex Acholonu

Alcorn State University

Thursday, March19, 2026
MORNING
Hall C Room 4

8:00 Welcome and Opening

O5.01

8:10 Palynology of the Late Cretaceous Booneville Dinosaur Site in Mississippi, U.S.A.

Nina Baghai-Riding[1], Carol Hotton[2], James Starnes[3], Alyson Brink[4], George Phillips[5], Olivia Pharr[1]

[1]Delta State University, Cleveland, MS, [2]National Museum of Natural History, Washington DC, [3]Mississippi Department of Environmental Quality, Jackson, MS, [4]University of Southern Mississippi, Hattiesburg, MS, [5]Mississippi Museum of Natural Science, Jackson, MS

The most complete dinosaur remains in Mississippi have recently been reported from a site in the northeastern corner of the state near Booneville, and includes a partial skeleton of an adult hadrosaur, along with a dentary of a very young hadrosaur. Other faunal remains include crocodilians, marine and freshwater turtles, marine fish, saltwater clams, and ammonites. This locality, known as the Booneville Dinosaur Site (BDS), also contains a rich assemblage of palynomorphs, which we describe here. The BDS, in the lower Coffee Formation, consists of interlaminated carbonaceous clays, silts, and fine-grained sands along with teredinid-bored lignified logs, and is interpreted as a tidally influenced estuary. Twenty samples were collected from five units along an approximately 220 m transect extending northwest from the dinosaur site; of these, sixteen samples were productive. Approximately ninety assorted palynomorphs have been identified to date. Based on 200-grain counts, angiosperms comprise about one third to one half of the assemblage, spores about one third, and gymnosperms about 10% of the assemblage. Algal cysts are also significant, comprising 10-20% of the assemblage. Dinoflagellates are present but rare. Species of the important Late Cretaceous group Normapolles (= Fagales) comprise between 10% and 30% of all angiosperms. Other typical Late Cretaceous angiosperms include eudicots of uncertain affinity as well as monocots. Gymnosperms include Pinaceae, Araucariaceae Cheirolepidiaceae and Cupressaceae. Diverse spores include sphagnum mosses, liverworts, club-mosses, as well as members of the fern families Anemiaceae, Gleicheniaceae, Osmundaceae, and Schizaeaceae. Abundant algal cysts and rarity of dinoflagellate cysts indicate a strong fresh-water influence. A refined biostratigraphic age for the BDS can be proposed based on correlations with comparable palynofloral assemblages in South Carolina. The co-occurrence of the angiosperm species *Holkopollenites propinquus* with a Last Appearance Datum in the earliest mid Campanian and *Osculapollis aequalis* with a First Appearance Datum in the late early Campanian places it in the upper half of the Hp palynozone of Christopher & Prowell (2010), close to the early/middle Campanian boundary. The abundance of Normapolles forms suggests a warm and perhaps moderately dry climate, but the abundant and diverse ferns, lycophytes and bryophytes indicate that much of the local vegetation near the site of deposition was adapted to moist or wet environments.

O5.02

8:40 Connecting Wildlife and the Environment to Human Health in Mississippi

Scoty Hearst and Trent Selby

The Department of Chemistry and Biochemistry, Mississippi College, Clinton, MS

Human health is directly linked to the well-being of wildlife and the environment. Disruptions to ecosystems, via pollution or anthropogenic habitat disruption, can lead to the emergence of toxic environmental pollutants or the spread of zoonotic diseases, drastically impacting human health. For these reasons, we have begun surveillance of zoonotic pathogens and emerging pollutants in wildlife and the environment throughout central Mississippi. Our studies range from surveillance of SARS-CoV-2 in white-tailed, zoonotic parasitic infections in raccoons and fish species, and emerging environmental pollutants such as mercury in the Mississippi River. In this talk, we will discuss ongoing zoonotic surveillance and environmental contaminate projects throughout central Mississippi and their impact on public health.

O5.03

9:10 A Multigenerational Study of Insect Larvae that Consume Expanded Polystyrene

Trent Selby, Scoty Hearst

Mississippi College, Clinton, MS

The world is producing twice as much plastic waste as two decades ago. In the United States, the *plastic waste* generated *annually* per person is 221 kg. Slow degradation

allows plastics to accumulate in the environment. Insects and larvae certainly come into contact with the accumulated plastic waste. How this waste affects the insect's life cycle is of concern. Recently, we have discovered that several insect larvae native to Mississippi will consume large quantities of expanded polystyrene. The focus of this work is a multigenerational study of the Carolina Sphinx Caterpillar *(Manduca sexta)* and their ability to eat and possibly digest polystyrene. Wild-caught and lab-raised insect larvae at the 4th or 5th instar stage were fed a diet of expanded polystyrene. These larvae were able to pupate, emerge, mate, and lay eggs. From the polystyrene-fed larvae, samples of the larval frass, pupae, and emerging adults were extracted with tetrahydrofuran (THF) to isolate any polystyrene. After removal of the THF solvent, samples were studied by FT-IR and NMR spectroscopy. The results will be presented here.

O5.04

9:40 Exploring Egg Size Plasticity and its Proximate Causes in Honey Bee Castes

Esmaeil Amiri[1], Bin Han[2], Olav Rueppell[3]

[1]Delta Research and Extension Center, Mississippi State University, Stoneville, MS, [2]State Key Laboratory of Resource Insects, Chinese Academy of Agricultural Sciences, Beijing, China, [3]Department of Biological Sciences, University of Alberta, Edmonton, Alberta, Canada

Variations in parental investments per offspring are readily observable among and within species, which is influenced by both genetic and environmental circumstances. In honey bee colonies, the queen invests resources in their eggs, as reflected in the egg size, while worker bees engage in brood care and feed the offspring for survival and growth. Due to the complex contributions at both individual and colony levels, the resource allocation to each offspring and the proximate causes of egg size have not sufficiently been explored in honey bees. Therefore, in a series of experiments, we demonstrate that in addition to the genetic background of honey bee queens, egg size is a reversable trait that can be actively adjusted by queens in response to environmental factors, including colony size, food availability, viral infection and insecticide exposure. Proteomics analysis showed that egg size plasticity is associated with quantitative differences of 290 ovariole proteins between queens producing small versus large eggs. These differences result in different proteomes and growth-promoting metabolomes in large eggs compared to small eggs. Further experiments revealed a compensatory effect of the colony environment on larval growth, with large and small eggs developing into workers with similar body sizes under natural conditions. The advantage of large eggs only persists to adulthood under cross-fostering conditions. However, we show that this compensatory growth is not present during the development of queen larvae because they are consistently overfed with royal jelly. As a result, the advantage of large eggs confers a body size advantage in grafted larvae that persists into adulthood. Our findings demonstrate the long-term effects of both individual and colony level resource allocation on the size and development of honey bee castes. In conclusion, maternal provisioning strategies are understudied but may be more important than anticipated in social insects in general.

O5.05

10:10 Testing of Atrazine and Glyphosate on Flowers of Mississippi Delta Plants

Nina Baghai-Riding, William Katembe, Severine Groh, Chuck Smithhart, Olivia Pharr, Donald Coleman

Delta State University, Cleveland, MS

Pollen, produced by plants, is commonly associated with hay fever allergies and asthma. It is light and is transported by wind, insects, other animals, and water. Pollen is an important food source for diverse insects (e.g., bees, butterflies, moths, ants, beetles), birds, and spiders. Humans also can consume pollen as a food source because it contains essential vitamins, amino acids, proteins, iron, antibiotics, and antioxidants that may reduce heart disease. Humans consume grass crops that are wind pollinated: corn, rice, wheat, sugarcane, and more. Throughout the Mississippi Delta, crop dusters apply atrazine and glyphosate (Roundup) herbicides to fields to improve crop yields. Atrazine, an endocrine disrupting compound in humans, may contribute to birth defects, breast cancer, non-Hodgkin lymphoma, and more. In this study, Delta State University undergraduate students and faculty collected fresh flowers of weedy plants that border sprayed agricultural fields and unsprayed areas that are within a 10-mile radius of Delta State University (DSU) to determine atrazine and glyphosate concentrations. Flowers of tall golden rod (*Solidago canadensis* L.), late boneset (*Eupatorium serotinum* Michx.), and Johnson grass (*Sorghum halepense* (L.) Pers.) were collected in late Fall 2024 and summer 2025; spiderwort (*Tradescantia virginiana* L.), white clover (*Trifolium repens* L.), common dandelion (*Taraxacum officinale* (L.) Weber ex F. H. Wigg.), and blue violet (*Viola sororia* Willd.), were collected in early Spring 2025. Undergraduate students prepared extracts of the flowers; students used ELISA tests to detect and diagnose the quantity of both herbicides. Students also made microtome sections of golden rod, Johnsongrass, and boneset flowers to determine sizes and shapes of cells from sprayed and unsprayed areas. Results indicate that there are differences in accumulated atrazine and glyphosate in the species surveyed, suggesting that weedy species do not accumulate pesticides equivalently. Johnson grass possessed lower concentrations of both

pesticides whereas white clover and late boneset had higher concentrations. White clover growing in a lawn near a farm field had high atrazine levels in April and early May even before spraying began. Late boneset flowers had elevated levels of both pesticides in a sprayed area that bordered Bear Pen Park as well as at the DSU Golf Course, which has not been in operation for eight years. Cell variation was also notable. Style cells of late boneset flowers from sprayed areas were rectangular and linear while style cells from uncontaminated regions had more size variation and shape. In heavily sprayed areas, Johnson grass pollen was distorted and not circular. Elevated concentrations of pesticides in non-sprayed areas may be from heavy rainfall and wind drift throughout the year. Future studies will examine in more detail the contamination by atrazine and glyphosate in residential and recreational areas bordering farm fields to determine whether atrazine and glyphosate infiltrate soil and water.

O5.06

10:40 Berry Delicious, Chemically Suspicious: Pesticide Residues Raise Human Health Concerns

Selah Roberts, Scoty Hearst, Trent Selby

Mississippi College, Clinton, MS

Pesticides are widely used in fruit and vegetable production to protect crops and improve yield. However, the presence of pesticides on produce can pose health risks to humans. While some pesticides degrade naturally, others persist and can be found in various foods, with potential for contamination of soil and water. Monitoring pesticide residues in fruits and vegetables is crucial to ensure food safety and minimize potential health hazards. In this study, we purchased fruits and vegetables from 3 local supermarkets and analyzed the samples for the presence of organic pesticides using a GC/MS with a 400,000-organic compound NIST library. Human health hazard assessments were performed to estimate consumption hazards of pesticides present on produce. Overall, our data indicated that local produces may contain pesticides of human health concerns warranting larger scale studies assess this threat to human health.

O5.07

11:00 Mitey Metabolism: Investigating Metabolic Mechanisms of Amitraz Resistance in Varroa destructor

Eadie Keenan, Jeff Harris, Natraj Krishnan, Seung-Joon Ahn

Mississippi State University, Mississippi State, MS

Since its host migration to the Western honey bee, the Varroa mite (*Varroa destructor*, Anderson and Trueman) has become one of the greatest threats to apiculture worldwide. Mite control is now a near-ubiquitous aspect of beekeeping and commercial pollination, with synthetic miticides typically considered the easiest and most cost-effective option. Overuse of these formulations has selected for mites resistant to the formerly popular tau-fluvalinate and coumaphos, driving many beekeepers to rely on the formamidine amitraz. Unfortunately, amitraz resistance was first confirmed in the United States in 2020 (Rinkevich) and has spread rapidly, with resistant mites potentially contributing to the >60% colony losses reported in 2024/2025. Our project aims to address amitraz resistance by investigating the underlying metabolic resistance mechanisms. Dose-response assays will be used to characterize the resistance phenotypes of local mite populations, and discriminatory assays will be used to obtain susceptible and resistant mites for differential gene expression analysis. Combining dose-response assays with transcriptomic data should reveal both the prevalence and potential metabolic drivers of amitraz resistance in Mississippi mite populations. These insights could inform the development of improved amitraz formulations and alternative miticides, thus supporting sustainable Varroa management and safeguarding honey bee health.

O5.08

11:20 Environmental and Biological Drivers of Bull Shark Distribution in the Northern Gulf of America

Noah Harris[1], Robert Leaf[1], Jeremy Higgs[1, 2]

[1]The University of Southern Mississippi, Hattiesburg, MS, [2]GCRL Center for Fisheries Rese, Ocean Springs, MS

Bull sharks (*Carcharhinus leucas*) are highly adaptable coastal predators whose use of estuarine and nearshore habitats is shaped by both biological traits and environmental conditions. Despite their ecological importance, the drivers of vertical habitat use in the northern Gulf of America remain poorly quantified. Using SEAMAP fishery-independent data from 920 bull shark captures across the northern Gulf of America, we examined how depth occupancy, catch per unit effort (CPUE), and spatial distribution varied with body size, sex, maturity stage, season, and key abiotic factors. Depth-at-capture was analyzed relative to total length, sex, and maturity, while seasonal and monthly depth patterns were compared using grouped data. CPUE was evaluated against bottom temperature, salinity, and dissolved oxygen to assess environmental influences on catch likelihood. Bull shark depth use increased significantly with body size, indicating clear ontogenetic shifts, and mature individuals were captured at greater depths than juveniles. However, males and females showed nearly identical depth distributions, and seasonal and monthly depth ranges remained broadly consistent, with most sharks occurring between two and a half and seven and a half meters year-round. CPUE exhibited no strong linear relationships with any measured abiotic variable, suggesting that bull sharks tolerate a wide range of environmental conditions or that fine scale drivers

were not captured by survey resolution. Spatial CPUE patterns were stable across seasons, with only minor shifts in localized hotspots.

O5.09

11:40 Geology Governing the Habitat of the Big Black Rock Snail *(Lithasia hubrichti*)

James Starnes[1], Calvin Rezac[2], Robbert Ellewanger[2], Marinee Humphries[2], Matthew Wagner[3], Ashley Ruppel[3], David Ruppel[4]

[1]MDEQ, Mississippi Office of Geology, [2]MDWFP, Mississippi Museum of Natural Science, [3]U.S. Fish and Wildlife Service, [4]USACE ERDC

The Big Black Rock Snail (*Lithasia hubrichti*; BBRS) is a small Pleurocerid gastropod which exclusively inhabits a coarse gravelly channel substrate of just under 5 kilometers of the Big Black River (BBR) along the Hinds and Warren County line in the loess bluffs region of west-central Mississippi. The BBR is a proposed State Endangered and a Species of Greatest Conservation Need in Mississippi. Juveniles are smoothly turbinate in form. As adults their shells become nodularly ornamented, typically exhibiting a distinctive purple nacre in the aperture and operculum, and a completely eroded protoconch. The habitat is associated with two particular stratigraphic units of the Vicksburg Group, the Marianna and Glendon Limestones, which form continuous subcrop along the river channel. Its densities are highest at the upstream boundary with densities declining by the time they reach the lower bounds. The snail's habitat is bound upstream by the less stable subcrop of the sands of the Forest Hill and Mint Springs members and downstream by the Byram Marl and Bucatunna Clay members of the Vicksburg Group. Stable, cobble-sized chert gravel bedload in this stretch of river is held by limestone ledges exposed by erosion along the riverbed and is swept clean from siltation by strong river currents. The lower BBR evolved through the loess bluffs region from major head cuts in response to the cyclic glaciation of the Pleistocene epoch on the lower Mississippi River Valley and its continued confluence with the Mississippi River. The BBR channel became permanently entrenched through the marine section of the Vicksburg Group at the height of the Last Glacial Maxima. This occurred just after the river meandered unbound at a higher base level across the Bucatunna Clay member, eroding into the eastern valley wall (near Edwards, MS) and then immediately across to the western valley wall (at the mouth of Clear Creek), exacerbating the width of the BBR's floodplain and the stream's low terrace complex before it's head-cut entrenchment. A coarse gravel bedload is provided to the BBR by erosion of the mid-Pleistocene-aged Rawhide Terrace, an ancestral Mississippi River pre-loess terrace in the adjacent uplands. Higher gradient tributaries that are spring fed from the Rawhide Terrace transport these coarse gravels to the BBR. The BBRS can be considered a Pleistocene relic species whose ancestors had a wider distribution along the Mississippi Valley and its tributaries. As the regional environment changed and the range of its ancestors shifted, this population became isolated and evolved on the stable gravel substrate created by these unique geologic conditions.

12:00 Divisional Business Meeting

12:00 Lunch

THURSDAY, March19, 2026

EVENING

Hall B

3:30 DODGEN LECTURE /AWARDS CEREMONY

THURSDAY, March19, 2026

EVENING

Hall C

5:00-7:30 Reception and General Poster Session

(Immediately following Dodgen Event)

All posters should be placed in the poster all by 12:00 pm on Thursday, March 19, 2026

Odd poster numbers will be presented from 5 -6

*Even poster numbers will be presented from 6-***7**

P5.01

Transcriptome Analysis of the Hibiscus Sawfly: Unraveling Molecular Mechanisms of Detoxification

Seth Lee, Seung-Joon Ahn

Mississippi State University, Mississippi State, MS

The hibiscus sawfly, *Atomacera decepta* (Hymenoptera: Argidae), is a foliar-feeding insect that damages ornamental plants such as hibiscus, rose mallows, and hollyhocks, leaving characteristic "skeletonized" leaves. Although considered a minor pest, its biology and physiology remain poorly understood. This study aimed to characterize the molecular mechanisms of digestion and detoxification in *A. decepta*. Morphological features of larvae and adults were examined using light microscopy and scanning electron microscopy (SEM). Behavioral observations were conducted both in natural habitats and under laboratory conditions to document developmental stages and activity patterns. Larval dissections revealed internal features potentially associated with defensive mechanisms. Furthermore, transcriptomic analyses using Illumina HiSeq2000 were performed on larval and adult stages to explore gene expression related to digestion,

detoxification, and development. Differential expression analysis identified larval-specific genes involved in detoxification and digestive metabolism, providing insights into how this species adapts to chemically defended host plants. Together, these findings establish a foundational understanding of the physiology of *A. decepta*, offering valuable information for future studies on its digestive and defensive systems and for developing management strategies to mitigate its impact on ornamental plants.

P5.02

Mississippi State University Coastal ONE Health Research

Amanda Free, Holley Muraco, Madison Parks

Mississippi State University, Mississippi State, MS

Mississippi State University's Coastal ONE Health Research Program fosters interdisciplinary research that enhances the health of coastal ecosystems, wildlife, and human communities by investigating and understanding their interconnectedness. The current focus areas of this program are microbiomes and water quality, wildlife sentinel species (including aquatic mammals, finfish, and insects) as indicators of ecosystem health, and disease ecology at the human-animal-environment interface. Coastal ONE Health Research encourages collaborative partnerships to produce actionable management, technology and innovation to monitor and assess coastal health, and translation of complex scientific data into accessible outreach for communities, policymakers, and educators to strengthen environmental stewardship.

P5.03

Development of a Method for Predicting the Flowering of Honey Plants Based on the Sum of Effective Temperatures

Elena Kostyleva

Alcorn State University, Lorman, MS

Since the timing of plant flowering depends largely on weather conditions - particularly temperature - it is important to develop a method for predicting the flowering time of honey plants based on the sum of effective temperatures. Flowering begins only after a certain sum of effective temperatures has accumulated. This value represents the total of average daily air temperatures over the period in question, exceeding the conventional lower temperature threshold for plant vegetation. For most plants in the subtropical zone, this lower limit is approximately 50°F. Therefore, determining the sum of effective temperatures can serve as a valuable tool for predicting the flowering of honey plants, which is crucial for beekeepers to fully utilize the nectar flow period. The objective of the present research was to develop a method predicting the flowering of major honey plants in the state of Mississippi based on the accumulation of effective temperatures. Daily air temperatures were recorded, and the average sums of effective temperatures were calculated (above 50°F) required for the flowering of the main honey plant species in the study region. The results demonstrate a direct correlation between the onset of plant flowering and the sum of effective temperatures. Although some deviations occur depending on the age of the plants and their growing conditions, the accumulation of effective temperatures sums can reliably predict the timing of flowering. For example, when the sum of effective temperatures reaches 85°F on February 9 and increases by 5-8°F per day, the first productive spring honey plant - the buckwheat tree (*Cliftonia monophylla* (Lam.) Britt.) - can be expected to bloom within 3-5 days, around February 12-14, when the sum of effective temperatures reaches 109°F. Similarly, if on April 6 the sum of effective temperatures equals 437°F and increases by 14-17°F daily, flowering of the most productive honey plant - the tulip tree (*Liriodendron tulipifera* L.) should begin around April 10-11, when the sum of effective temperatures reaches 505°F. Thus, as effective temperatures accumulate, it becomes possible to make accurate short-term (3-5 days) forecasts of the onset of honey plant flowering. This approach provides a practical and scientifically grounded method for predicting nectar flow periods, which can significantly enhance beekeeping efficiency and honey production management

P5.04

214- Evaluating the Effectiveness of *Nerium oleander* in Removing PFAS from Soil

Utsab Basnet

Jackson State University, Jackson, MS

Per- and polyfluoroalkyl substances (PFAS) have emerged as ubiquitous environmental contaminants, persisting indefinitely in soil and groundwater systems due to their exceptional chemical stability and bioaccumulative potential. Conventional remediation technologies face significant limitations in terms of scalability, economic viability, and environmental sustainability, necessitating the exploration of innovative plant-based remediation strategies. This investigation evaluates the phytoremediation capacity of *Nerium oleander*, a robust woody shrub with demonstrated environmental stress tolerance and potential hyperaccumulation characteristics, as a functional agent for PFAS remediation in contaminated soil systems. This study addresses critical knowledge gaps in ornamental species phytoremediation by evaluating *Nerium oleander's* capacity to remove five PFAS compounds. The research uses a Randomized Complete Block Design with four replications and 11 treatments. Five PFAS were tested: perfluoro butanoic acid (PFBA), perfluorooctanoic acid (PFOA), perfluoro butane sulfonic acid (PFBS), perfluoro octane sulfonic acid

(PFOS), and hexafluoropropylene oxide dimer acid (GenX) at 50 and 100 µg/kg concentrations, plus control. After 90-day plant establishment, three-month PFAS exposure occurred under controlled greenhouse conditions with systematic monitoring. Research objectives include quantifying differential uptake between short-chain and long-chain PFAS, comparing perfluoroalkyl carboxylic acids versus perfluoroalkane sulfonic acids accumulation, and determining translocation factors across roots, stems, and leaves. We hypothesize that short-chain PFAS will demonstrate higher bioaccumulation and superior translocation to aerial tissues compared to long-chain compounds, with perfluoroalkyl carboxylic acids showing greater mobility than sulfonic acids. This research provides essential baseline data for GenX, an emerging PFAS replacement with limited phytoremediation research. Results will establish practical guidelines for implementing plant-based remediation at contaminated sites, contributing to sustainable environmental management strategies.

P5.05

Elemental and Textural Differences of Four Regional Noncommerical Jams

Nina Riding, Olivia Pharr, Chuck Smithhart, Curissa Bacon, Daniel Aboumonzer, Briggs Nassar

Delta State University, Cleveland, MS

Fruits are a major component of the human diet and are important to the global agricultural economy. Nutritional value of food may be a measure of soil fertility and available nutrients. From 2017-2025, students in BIO 415- Materials and Methods in Environmental Science and CHE 434- Environmental Chemistry at Delta State University have studied ashes from forty-five different fruit spreads (jam/jellies/preserves) using an energy-dispersive x-ray ESD analyzer attached to a JEOL scanning electron microscope (SEM) to determine elemental compositions. Each fruit spread represents locally cultivated or naturally grown fruit that local vendors would grow on their land and use to create fruit spreads. To date, DSU students enrolled in BIO 415 and CHE 434 have studied thirty-nine fruit spreads from nineteen USA states and four from Great Britain. During the Spring 2025 semester, DSU students analyzed four of the 43 fruit spreads: fig jam from Richmond, Missouri, apricot jam from Austin, Texas, beet jam from Garfield, Texas, and chuckleberry jam from Bewdley, Wales, UK. A total of eleven elements occurred throughout the four ash samples. The fig jam possessed eight elements and contained massive amounts of calcium, the apricot spread had ten elements and had high amounts of calcium and phosphorous, the chuckleberry jam contained nine elements and had elevated levels of phosphorus and calcium, and the beet jam contained nine elements and had high levels of phosphorus. The apricot jam was the only sample that contained traces of iron and the chuckleberry jam lacked silica. The soil chemistry associated with the Natural Resources Conservation Service (NRCS), Texas A&M AgriLife Extension Service, and the U.K. Soil Observatory soil databases support these findings. Each ash sample, also, possessed a unique texture and visual pattern when viewed using the JEOL SEM. For example, the fig jam ash possesses a rough, spongy surface with tiny pores, the apricot jam is coarse and layered with overlapping flaky fragments, the beet jam resembles fractured smooth sheets with gentle indentations, and the chuckleberry jam has uniform rounded grains with a fine-pebble-like arrangement. Munsell Color Charts were utilized to determine a color code of each ash: beet jam 10YR 7/4, chuckleberry jam ash 10 YR 7/3, apricot jam 5 YR 8/4, and fig jam 5 Y 7/1. Overall, results from this study imply that plants are selective about what nutrients they need for growth and reproduction. Root uptake tends to be complex and even small traces of soil elements may occur in edible fruits.

P5.06

3Comparison of Different Collection Methods for Wild Bee Sampling

Tahir Rashid

Alcorn State University, Lorman, MS

The pollinator diversity has been consistently associated with higher yields and improved crop quality. Various studies have shown a downward trend in the population size of pollinator bee species globally, including in the United States. This study investigates the wild bee community on different crops by using three collection methods, the bee bowl traps, blue vane traps, and sweep nets during the bloom of several crops including purple hull peas, butter beans, corn, and sweetpotatoes. The goals were to establish a baseline dataset for comparisons to other small farms growing similar crops as well as to identify potential pollinators of different bee species. We also assessed the performance of each collection method for bee species specificity. During the 2023-2024 sampling period, a total of 62 bee species (in 23 genera) were collected. The most dominant genera included *Melissodes*, *Megachile*, *Lasioglossum*, *Epimelissodes*, *Ceratina*, *Bombus*,*Agapostemon*, and *Halictus*. Students participated in hands-on learning by collecting bees in the field and analyzing data, while simultaneous on-farm sampling and workshops engaged farmers. These activities enhanced understanding of the program participants about the pollination process and the advantages of diverse pollinator community.

P5.07

Pesticide Residue Research and Chemical/Bacterial Analysis

Hannah Jones

Delta State University, Cleveland, MS

The Alabama Department of Agriculture and Industries (ADAI) in Montgomery, Alabama, offered me a summer internship from July 2025 to August 2025. Through this internship, I was to apply classroom knowledge in a real-world setting, gain hands-on laboratory experience, learn, and perform analytical methods, and understand the regulatory and quality control processes in an ISO accredited laboratory. The research activities focused on the analysis of pesticide residues, the detection of *Salmonella* spp. in pet food, and the evaluation of nutrient and contaminant levels in animal feed and fertilizers. Materials included weekly arrivals of ten fruits, ten vegetables, one fish, and a variety of animal feed samples, which were prepared using grinders, centrifuges, and TurboVap evaporators prior to analysis. Two different pesticide residue tests were conducted: organophosphate pesticides (OPP) and organonitrophenol pesticides (ONP). Both tests tested approximately 50 different pesticides. Samples went through an extraction method and were quantified using a Gas Chromatography-Mass Spectrometry (GC-MS) machine. Microbiological testing employed polymerase chain reaction (PCR) for pathogen screening, selective agar culturing for bacterial isolation, and latex gelatinization assays for confirmatory identification. Feed analysis involved hydrolysis-based fat extraction, nitrate testing, and inductively coupled plasma (ICP) spectroscopy to determine mineral concentrations. Relevant data collected during the internship demonstrated the presence of Salmonella contamination in one name-brand dog food sample, which was subsequently confirmed through culture and biochemical testing. No detectable nitrate levels were found in the feed samples tested. These results contributed to ADAI's ongoing surveillance efforts and reinforced the importance of laboratory precision and safety protocols. Future research could focus on developing faster and more sensitive detection methods for Salmonella and other pathogens, expanding the database of pesticide residue levels in Alabama crops, and evaluating long-term nutritional label accuracy in commercial feed products. This internship experience provided valuable technical and analytical skills while highlighting the critical role of laboratory science in safeguarding agriculture and public health.

P5.08

The Fate of Homing Pigeons (*Columba livia domestica*)

Molly Mellen, Canaan Mercer, Nina Baghai-Riding

Delta State University, Cleveland, MS

Humans have domesticated birds, including chickens, ducks, geese, turkeys, and guinea fowl for food, and canaries, and parakeets for pets. Although people today often consider the Rock Pigeon (*Columba livia*) a pest, the subspecies *Columba livia domestica* commonly known as the homing /carrier/messenger pigeon became modified over centuries through selective breeding. During the Spring 2025 semester, students in Ornithology (BIO 462) at Delta State University investigated how ancient and modern human civilizations relied on homing pigeons. The ancient Greeks, for example, used homing pigeons to carry news about the Olympic Games; Julius Caesar used homing pigeons to transmit news between cities and to send love messages; and homing pigeons were significant military technology messengers in WWI, WWII, and the Korean War for the U.S.A. and other countries. The United States Army Signal Corps operated a Pigeon Service that trained homing pigeons from 1917-1957 and maintained 15,000 out of 500,000 birds during conflict. Messenger pigeons served with the US Army, Navy, Coast Guard and Marines. During the 2025 semester, ornithology students realized why homing pigeons were useful in military warfare compared to other birds: trainable, docile, intelligent, strong, keen-scented, sharp-eyed, magnetically oriented, enduring, and fast. Homing pigeons can fly more than 500 miles per day, with most flying 50 to 100 miles per day. These birds receive flight training lessons when they are four to six weeks old; after two to three months they can work as a reliable secret messenger, carrying messages on the legs, chests, or backs despite the local environmental terrain (deserts, mountains, jungles and more). Trained military personnel would transport homing pigeons to designated areas. The bird would fly back to their home loft and deliver the message/item to the recipient. According to President Wilson, homing pigeons had a 95% success rate of delivering messages, despite the fact that thousands of pigeons became wounded and did not return home. Homing pigeons named Cher Ami, GI Joe, Paddy, Mocker, and White Vision are notable American war heroes for saving human lives; these birds are portrayed in military parades and museum displays. Expenses to support trainers and the birds as well as technology communication improvements are the main reasons why The United States Army stopped training pigeons after May 1957. Other western countries, except France, also dismantled their governmental support for homing pigeons, which have contributed to this bird's decline. Although this bird is not near extinction, conservation biologists and ornithologists believe this

valuable bird may become endangered. Eastern countries like India continue to utilize homing pigeons for emergency communication following natural disasters. China's Ministry of National Defense are utilizing 50,000 homing pigeons for military missions along its borders. Pigeon racing, a common sport in Belgium, Taiwan, Japan, and the Philippines, help to maintain this species survivability. Ornithology DSU students suggested homing pigeons could still be used as a communication means when technology fails or to deliver drugs to medical patents in rural areas or assist with aerial topography.

P5.09

Reforesting a Remediation Site in Southwest Mississippi with Loblolly Pine (*Pinus taeda* L) to Enhance Ecological Condition

Curtis VanderSchaaf[1], Umarfarooq Abdulwahab[2]

[1]Mississippi State University, Mississippi State, MS, [2]ExxonMobil

Loblolly pine (*Pinus taeda* L.) occupies a large proportion of forested acreage within the southeastern United States, close to 68.0 million acres. Slightly more than half of this is planted, with an area of 37.2 million acres. These forests contribute significantly to the timber supply of this region, and thus local and state economies. It can grow under a wide variety of physical and chemical properties of soils, physiographic areas, and under a wide range of climate and length of growing season, past agricultural uses, and is highly productive. This species can reach biological maturity certainly by age 80, and given recent genetic and silvicultural enhancements, likely sooner. Historically, loblolly pine occurred naturally across southwestern Mississippi. In this study, we aim to assess the feasibility of re-establishing the species on a remediation site in this region that has been maintained for many years in herbaceous cover through regular vegetation management. The long-term ecological goal is to transition the vegetation to a more natural state while increasing biodiversity through the planting of loblolly pine. Beyond that, the overstory trees along with understory vegetation is an important approach to optimize long-term carbon sequestration and storage and carbon management on this site and other such remediation sites. Transitioning the site to a more natural state occupied by pine trees should also reduce site maintenance such as the need for frequent, intensive vegetation management. The dominant soil type on the site is likely a Providence silt loam, and its family is defined to be fine-silty, mixed, active, thermic Oxyaquic Fragiudalf. Due to legacy management practices, there were concerns that intensive mechanical preparation may not be ideal for circumventing the problem of soil compaction. Thus, alternatively, a hand-held soil auger was used to drill holes to a depth of at least 16 inches at each planting spot. Bareroot Coastal-Source Mass Control Pollinated (MCP) Elite seedlings (21652-AGM-562) obtained from the ArborGen Selma, AL nursery were hand planted deep on February 28, 2025. Deep refers to placing the root collar around four inches into the soil; deep planting has been found to increase loblolly pine survival. A total of 454 seedlings were planted using 16 feet between rows and 6 feet between seedlings within a row. A first-year chemical herbaceous weed control treatment was conducted at the end of May (May 24). The treatment consisted of 4-oz Arsenal AC® (2.0 oz a.i. imazapyr) plus 2-oz Oust XP® (1.5 oz a.i. sulfometuron-methyl) per sprayed acre applied over the planted trees in a 4-foot band. On August, 1, 2025 survival was found to be 89%. Height and survival are to be measured during January 2026 which will provide inference as to whether loblolly pine can be restored on this site. This project demonstrates how silvicultural principles can be integrated into ecological restoration frameworks to improve habitat structure, reduce long term site management needs, and support the transition of previously managed lands towards more natural ecological conditions.

P5.10

A Cursory Overview of Key Species at a Holcomb Spring, Holcomb, Mississippi

Aubrie Pitts, Molly Mellen, Alliston Nester, Canaan Mercer

Delta State University, Cleveland, MS

The bottomland hardwood forest historically took up millions of acres across the southeastern United States. It supports a diverse range of biota, including birds, invertebrates, and other ecologically significant wildlife. Over time, much of this landscape has been converted for agricultural or developmental purposes, taking the wildlife with it. A spring in Holcomb, Mississippi (Holcomb Spring) is a remnant of the former bottomland hardwood forest ecosystem that prevailed in the Mississippi Delta before agricultural conversion. In the past, this site was used by Dr. Eric Blackwell to educate Delta State University (DSU) students about wetlands. He chose it because of the unique plants and herpetological organisms that could be found there, but since he retired from DSU, the site has become unused. Several students in Dr. Baghai-Riding's Fall 2025 Conservation Biology class chose to do a cursory overview of the site as well as compile a list of significant flora and fauna for a class project. We visited the site twice in October and November 2025, and our methods included taking water measurements and simple observation by eye. We took digital photos using iPhones and used iNaturalist to help us identify the organisms. The site is mainly a cypress swamp with bald cypress (*Taxodium distichum*) trees surrounding the spring. Water flows from multiple sources, which bubble up through the sandy bed; the water is very shallow and not turbid. The

ground surrounding the spring is muddy, wet, covered in fallen leaves, and has many pebbles close to the spring's source. Fallen trees litter the site, and some are rotting. Fungi, including *Trichaptum* sp., *Xylariaceae* sp., and *Fomitospidaceae* sp., were observed growing on some of the fallen trees. These natural processes of decay contribute to the spring's health. The bald cypress trees appear to range from 20 to 100 years old; cypress knees (pneumatophore roots) are abundant. Other common trees around the spring include the American sycamore (*Platanus occidentalis*), sweetgum (*Liquidambar styraciflua*), and assorted oaks. Whorled pennywort (*Hydrocotyle verticillata*) grows in the spring's water along its sandy bed, and Christmas ferns (*Polystichum acrostichoides*) grow around the water. No animals were observed in the water. Evidence of animals that we documented included southern cricket frogs (*Acris gryllus*), crawfish burrows, white-tailed deer skeletons (*Odocoileus virginianus*), red-bellied woodpeckers (*Melanerpes carolinus*), and other unidentified songbirds, hawks, and vultures. About 10 pieces of anthropogenic litter were found throughout the site. Aside from the litter, the observed flora and fauna show that the spring is a healthy, bioactive area. Future studies, such as coring trees, soil samples, and additional water measurements, could reveal more details about the historical and current environmental conditions of the area. The site could serve as an example to conservationists of what the beginnings of a healthy wetland ecosystem look like, and as an educational site for DSU staff and students, and local students. To our knowledge, this study is the first time key species have been documented at the Holcomb spring.

P5.11

Palynology of the Late Cretaceous Booneville Dinosaur Site in Mississippi, U.S.A.

Nina Baghai-Riding[1], Carol Hotton[2], James Starnes[3], Alyson Brink[4], George Phillips[5], Olivia Pharr[1]

[1]Delta State University, Cleveland, MS, [2]National Museum of Natural History, Washington DC, [3]Mississippi Department of Environmental Quality, Jackson, MS, [4]University of Southern Mississippi, Hattiesburg, MS, [5]Mississippi Museum of Natural Science, Jackson, MS

The most complete dinosaur remains in Mississippi have recently been reported from a site in the northeastern corner of the state near Booneville, and includes a partial skeleton of an adult hadrosaur, along with a dentary of a very young hadrosaur. Other faunal remains include crocodilians, marine and freshwater turtles, marine fish, saltwater clams, and ammonites. This locality, known as the Booneville Dinosaur Site (BDS), also contains a rich assemblage of palynomorphs, which we describe here. The BDS, in the lower Coffee Formation, consists of interlaminated carbonaceous clays, silts, and fine-grained sands along with teredinid-bored lignified logs, and is interpreted as a tidally influenced estuary. Twenty samples were collected from five units along an approximately 220 m transect extending northwest from the dinosaur site; of these, sixteen samples were productive. Approximately ninety assorted palynomorphs have been identified to date. Based on 200-grain counts, angiosperms comprise about one third to one half of the assemblage, spores about one third, and gymnosperms about 10% of the assemblage. Algal cysts are also significant, comprising 10-20% of the assemblage. Dinoflagellates are present but rare. Species of the important Late Cretaceous group Normapolles (= Fagales) comprise between 10% and 30% of all angiosperms. Other typical Late Cretaceous angiosperms include eudicots of uncertain affinity as well as monocots. Gymnosperms include Pinaceae, Araucariaceae Cheirolepidiaceae and Cupressaceae. Diverse spores include sphagnum mosses, liverworts, club-mosses, as well as members of the fern families Anemiaceae, Gleicheniaceae, Osmundaceae, and Schizaeaceae. Abundant algal cysts and rarity of dinoflagellate cysts indicate a strong fresh-water influence. A refined biostratigraphic age for the BDS can be proposed based on correlations with comparable palynofloral assemblages in South Carolina. The co-occurrence of the angiosperm species *Holkopollenites propinquus* with a Last Appearance Datum in the earliest mid Campanian and *Osculapollis aequalis* with a First Appearance Datum in the late early Campanian places it in the upper half of the Hp palynozone of Christopher & Prowell (2010), close to the early/middle Campanian boundary. The abundance of Normapolles forms suggests a warm and perhaps moderately dry climate, but the abundant and diverse ferns, lycophytes and bryophytes indicate that much of the local vegetation near the site of deposition was adapted to moist or wet environments.

P5.12

An Assessment of Vernal Pools at Dahomey National Wildlife Refuge, Bolivar Co., Mississippi

Canaan Mercer, Molly Mellen, Donald Coleman, Nina Riding, Kaley Harden

Delta State University, Cleveland, MS

In the Mississippi Delta, vernal pools form in shallow depressions of forested floodplains underlain by impermeable clay. Winter and spring rain fill the vernal pools before they dry out in the summer. Vernal pools are temporary wetlands and serve as important stopover sites for migrating birds along the Mississippi flyway as well as for the breeding and survival of forest salamanders, frogs, and macroinvertebrates. Dr. Baghai-Riding's Materials and Methods in Environmental Science (BIO 415) class has been evaluating the water quality of vernal pools located near the Dahomey National Wildlife Refuge headquarters building for the past 19 years (2006-2025)

from February to March. Students would fill five to six passive mesh leaf traps with 50-100 g of dry deciduous leaves. Students would then place the leaf traps into deep parts of the vernal pools for three to six weeks. Each leaf trap occurs in a different location along a south to north transect. Students would record the date, GPS coordinates, pool depth, pH, turbidity, nitrate, and phosphate values associated with each passive leaf trap. Following collection of the traps, students would determine the number of aquatic invertebrates and species diversity. The number of species recovered each year varies from three to seventeen and the quantity of organisms ranged from 54 - 306 individuals. Students have documented thirty-eight species over the past 19 years. Common taxa include fingernail clams, planorbid snails, scuds aquatic sowbugs, and aquatic red worms. In last year's study, five leaf traps and a Hester Dendy were submerged in the vernal pools from February 28 -March 28, 2025. Students recorded 306 specimens representing nine species: scuds (59%, highest percentage ever noted), followed by aquatic red worms (25.5%) and fingernail clams (10%). Other taxa included sowbugs, midge larvae, water beetles, leaches, and crawfish. The shallowest regions upon collection yielded the highest quantity and diversity of macroinvertebrates. Students noted that the water chemistry and depth changed throughout the four weeks. For example, at site 5 the water depth changed from 26 cm to 7 cm, the pH changed from 5 to 6, and the water temperature changed from 10°C to 23°C. Ms. Debra Veeder from Mississippi Department of Energy Quality allowed students to use her dip nets upon collection of the leaf traps; students caught crawfish, tadpoles, spiders, mosquitoes, dragonflies, and salamanders. Overall, the water quality of the vernal pools was determined to be good to fair based on the presence of fingernail clams, sowbugs, tadpoles, crawfish, and salamanders.

P5.13

Function of Thoracic Setae in Mosquito Larvae

Dylan Vo

University of Southern Mississippi, Hattiesburg, MS

Many insects have setae (body hairs) on their body that exhibit various functions. Setae often play a crucial role in identification and sensory functions, including taste, touch, and smell. Although this may be true for most insects, other insects, such as mosquito larvae, do not have known setae functions. Mosquito larvae setae can be used to identify the genus and species of a mosquito based on physical characteristics such as length and placement. Even so, their ultimate function remains unknown.

In previous research, it has been discovered that when larvae of the mosquito *Orthopodomyia signifera* had their setae mechanically shortened, they tended to die within a short time. It was hypothesized that the setae were important to larvae in maintaining equilibrium to access the surface for breathing. It is unclear if other species exhibit a similar negative effect when their setae are shortened. This research project looked to expand upon prior results of trimming setae of *Orthopodomyia signifera* and analyzed how behavior and mortality rates are affected for several species when their setae are mechanically shortened. The process consisted of amputating either the left, right, or both left and right sides of the setae and checking in on the larvae at exponentially increasing intervals to analyze the mortality rate. The larvae were also recorded in thirty-minute time periods to analyze whether larval behavior differed from that of non-shortened larvae. This research project is the first to investigate how setae on mosquito larvae influences and contributes to their ecological and behavioral activity.

P5.14

Palynology of the Late Cretaceous Booneville Dinosaur Site in Mississippi, U.S.A.

END OF THURSDAY'S PROGRAM

Friday, March 20, 2026

MORNING

10:00-12:00 Field Trip (See Flyer in the Symposia and Workshop Section) Maritime and Seafood Industry Museum*

***Note:** Dr. Nina Baghai-Riding will meet conference attendees at the entrance of the Aquarium on Friday, March 20, 2026

Geology and Geography

Chair: Alyson Brink

University of Southern Mississippi

Vice-Chair: Claire Babineaux

Mississippi State University

Thursday, March19, 2026
MORNING
Hall D Room 5

8:45 Welcome and Opening

O6.01

9:00 A Model of the Volume of Mississippi's Pre-Loess Terrace Deposits

Jonathan Leard

Mississippi Office of Geology, Jackson, MS

Terrace material underlying loess deposits along the uplands east of the Mississippi River's modern floodplain represents a distinct geologic depositional system tied to ancestral fluvial regimes active during the Pleistocene. These deposits are found at varying elevations descending westward toward the modern river. A complex history of sediment transport and terrace formation as glacial meltwater influenced the river's dynamics is recorded in these terraces. The term Pre-loess Terrace Deposits was introduced by the Mississippi Geological Survey to describe gravels that could not feasibly be correlated to the Citronelle Formation in Hinds County. This report maps 1,230 mi^2 of Pre-loess Terrace Deposits with 9 base levels ranging from 40 to 370 feet above modern sea level in Desoto, Tate, Marshall, Panola, Tallahatchie, Grenada, Carroll, Holmes, Yazoo, Madison, Hinds, Warren, Jefferson, Claiborne, Adams, Franklin and Wilkison Counties. The base of the Pre-loess Terrace Deposits is primarily evidenced by boreholes. Mapping efforts were additionally supported by mining records, outcrop study, and GIS analysis to produce county level maps of the Pre-loess Terrace Deposits. The modern characterization of these terrace levels at the state scale contributes to a deeper understanding of Quaternary processes and the evolution of fluvial landscapes across Mississippi. Terrace derived aggregates of predominately chert gravel and quartz sand represent valuable industrial mineral resources in Mississippi. These aggregate resources are uneven across the state, and the geologic interpretation behind the distribution of terrace material has resulted in a gap of understanding leading to a possible underutilization of the materials. This study identifies a longitudinal trend of high-quality aggregate deposits stretching from Wilkinson County to Desoto County focused on modeling the volume and accessibility of specific terrace material underlying a thick loess overburden in the western part of the state. This report integrates borehole data, sand and gravel operations, geologic field mapping, and GIS analysis to estimate the in-place and exploitable volume of the Pre-loess Terrace Deposits. The model accounts for loess overburden and applies sterilization factors to reflect regulatory and operational constraints. Results show a total in-place volume of 33.16 billion cubic yards of terrace material with 28.54 billion cubic yards deemed exploitable. The results of this study have direct implications for Mississippi's infrastructure. By quantifying the volume and distribution of Mississippi's Pre-loess Terrace Deposits, more informed resource management and economic planning can be employed. This project highlights the importance of proactive geologic mapping for identifying viable geologic resources for Mississippi.

O6.02

9:20 Vein growth related to extension and hydration of the oceanic lithosphere, Atlantis Massif, Mid-Atlantic Ridge, Expedition 399

Jeremy Deans, Lyndsey Tutor, Payton Townsend

University of Southern Mississippi, Hattiesburg, MS

This study analyzed thin sections of serpentinized harzburgite from the Atlantis Massif oceanic core complex using petrography and Raman spectroscopy to study vein formation and mineral assemblage related to depth, extension, and hydration of the oceanic lithosphere. These samples were collected on IODP Expedition 399, Site U1601, which drilled a 1.2 km deep section of oceanic lithosphere exhumed ~1.5 Ma along the Mid-Atlantic Ridge by a detachment shear zone/fault, very close to the Lost City Hydrothermal Field. Vein abundance is variable with the most veins occurring around 400-450 mbsf. The majority of slickenfiber veins occur ~800 mbsf with both normal and reverse sense of shear. Vein minerals include brucite, iowaite, aragonite, chlorite, serpentine, dolomite, calcite, sulfides, talc, and diopside. Serpentine minerals include chrysotile, lizardite, and antigorite. Aragonite was found only in shallow samples and is usually aligned with carbon dating indicating older ages. Chrysotile is typically fibrous and formed with aragonite, chlorite, and calcite. Calcite was found throughout the core and contained a variety of textures. When calcite is present in chrysotile veins it is usually cross cutting and has sulfide phases. Dolomite is found in two intervals (~107 and ~315 mbsf), separated by an interval of calcite. Antigorite has a granular texture and notably formed with diopside. This core section contains sheared and unsheared veins, and some as rosettes like talc, indicating changes in deformation, likely due to formation during rotation. The presence of phases like talc and diopside indicate changes in fluid composition with depth, namely increases silica activity and calcium activity, respectively, which may derive from magmatic fluids

and/or fluids that have interacted with gabbro. Intervals of high vein density ~450, ~675, and ~1050 mbsf match increases in hydrogen concentration in fluids, which may indicate that veins may be hydrogen reservoirs.

O6.03

9:40 The Timing of Evaporite Deposition/Brine Formation In The Northern Gulf of Mexico Basin Based on Strontium Isotope Stratigraphy

Tim Palmer and Paul Parrish

Mississippi Office of Geology, Jackson, MS

By volume the post-Triassic Lower Jurassic evaporite section in the subsurface of the northern Gulf of Mexico basin is the largest evaporite and brine deposit on Earth. It is extremely difficult to date. However, the age of the salt is one of the most important, unresolved, and controversial geological problems in the Gulf of Mexico basin. For example, metals (e.g., Li, K, and Mg) are carried by residual brines made from the deposition of the salt. To date, the timing of evaporite/brine formation is controlled by stratigraphic position and to a lesser degree strontium isotopic work carried out on drill core from the subsurface of Mexico. Currently, window of evaporite deposition ranges from 161-169.5 Ma. However, the work presented here pushes the timing of evaporite/brine formation back 31 million years to the earliest Jurassic based on strontium isotopes measured on three salt tests scattered across the northern periphery of the basin. The result of this effort challenges the previous stratigraphic framework and provides insight into the timing of evaporite events across a regional versus localized scale.

O6.04

10:00 Characterizing surface-subsurface water fluxes within the headwater Goodwin Creek Experimental Watershed, Panola County, Mississippi

Andrew O'Reilly[1], Samiul Alim[2], Abdullateef Lawal[3], Leti Wodajo[3], Robert Holt[2], William Rossell[1]

[1]National Sedimentation Laboratory, USDA Agricultural Research Service, Oxford, MS, [2]Department of Geology and Geological Engineering, University of Mississippi, Oxford, MS, [3]National Center for Physical Acoustics, University of Mississippi, Oxford, MS

Agricultural land management practices can cause beneficial or deleterious impacts on soil and water resources by changing the partitioning of precipitation into runoff, evapotranspiration (ET), and infiltration. A multidisciplinary investigation integrating hydrological, geological, and geophysical techniques is being applied in the Goodwin Creek Experimental Watershed (GCEW) to define the spatiotemporal variability of surface-subsurface water fluxes along a transect covering a hillside pasture adjoining a flat riparian row-crop field. Goodwin Creek is a headwater tributary of the Yocona, Yazoo, and Mississippi Rivers. GCEW is a 2,100-ha mixed land-use catchment (pasture, row crop, pine and hardwood forest) in the Bluff Hills region of Panola County, Mississippi, where the USDA Agricultural Research Service, National Sedimentation Laboratory has been conducting research since 1981. Surface and internal soil erosion are common in GCEW due to fine-grained soils, high ground surface slopes (>10%), and focused subsurface flow. In 2022, an electrical resistivity tomography survey was conducted along the 501-m transect, revealing a continuous aquifer extending from the creek and underlying the row-crop field and pasture. The aquifer outcrops or is thinly confined (~1 m) over a short distance (<30 m) in the pasture but is confined on both sides of the outcrop. A follow up electromagnetic induction survey further revealed that the outcrop is limited (<3,000 m^2). A transect of five wells was subsequently installed in 2024 to monitor the perennial water table. Standard penetration tests (14-46 m deep, 0.5-m cores, 1.5-m intervals) were conducted at each well location to validate the aquifer geometry. A vertical electrical sounding profile was conducted at each well, showing resistivity characteristics generally correlating with core samples indicating layers of silt (loess), silty clay, sandy clay, sand, and gravelly sand. The aquifer comprises 8-21 m of sand and gravel but averages only 6 m in saturated thickness. One year of weekly water-level monitoring shows that the water table is perennially below the creek bed and slopes aways from the creek, suggesting the creek is the primary source of recharge. Slug testing of the wells indicated hydraulic conductivity of 0.5-3 m/d, suggesting moderate to high permeability, but values may be bias low due to limited displacement volume of testing. Future work includes installation of sensors in or adjacent to each well to measure groundwater (level and temperature) and soil properties (moisture content, temperature, electrical conductivity, and matric potential). Data collected will support research on assessment of conservation practices that can change the partitioning of precipitation into runoff, ET, and infiltration, such as contour grading of berms/swales, check dams, and on-farm reservoirs. High runoff in GCEW limits the water available for aquifer recharge. Implementation of conservation practices that can reduce the volume and velocity of runoff would also reduce erosion and increase infiltration, ultimately increasing aquifer recharge. Increasing recharge in the pasture may affect conditions at the row-crop field downslope and eventually groundwater-surface water interactions at the creek. Quantifying these physical processes will also provide opportunities for expanding future research into topics such as transport of sediments, nutrients, and pesticides.

10:20 Break

O6.05

10:40 The Ripley-Prairie Bluff Formational Contact (Cretaceous, Maastrichtian) near Macon, Noxubee County, Mississippi

George Phillips

Mississippi Museum of Natural Science, Jackson, MS

The Prairie Bluff Chalk (PB) is a marine carbonate confined to the eastern Mississippi Embayment where it lies at the top of the Cretaceous section and forms the outer margin of that system in an arcuate outcrop belt within the Eastern Gulf Coastal Plain. The PB comprises middle (to outer) shelf marls and chalks with quartz sand facies and phosphatic pebble beds in places, particularly at the base and middle. Its alkaline nature precludes the preservation of most mollusks; however, where well-preserved, as in the phosphatic beds, the moldic assemblages are diverse and form substrate for a speciose sclerobiotic fauna, together recording substantial benthic activity. The basal PB (bPB) is a chalk/marl-embedded conglomerate of fossiliferous phosphatic pebbles and moldic and calcitic macrofossils enriched in coarse granular quartz and glauconite.

Although Stephenson (1937, AAPG Bull) defined the base by its phosphate content, Bergquist (1943, MGS Bull 53), working in Clay County, proposed ledge-forming sandy beds to represent the bPB. Similar sandy facies have elsewhere been equated with the Chiwapa Sandstone in the top of the Ripley Formation (RF) further north; this coarse facies also contains phosphatic steinkerns in the uppermost bed(s). In Pontotoc County, Priddy (1943, MGS Bull 54) identified two discrete phosphatic grounds within the bPB: a lower moldic bed with small, non-cephalopod mollusks and an upper bed with common cephalopods, each about 1.5 m thick. Priddy did not include sandy beds in describing the base.

An excavation near Macon, Mississippi, contains 5+ m of the lower PB resting on about a meter of the subjacent RF. The section exhibits two conspicuous macrofossil conglomerates rich in phosphatic clasts—an upper steinkern-shell bed (USB) and a lower steinkern-shell bed (LSB). The two fossil beds are separated by ~1.3 m of less-clastic chalk with occasional calcitic macrofossils and no phosphatic steinkerns.

The lower part of the LSB contains a concentration of calcitic bivalves and small, pale, low-density, partially phosphatized mollusk molds. The calcitic fauna includes anomiids, pectinids (e.g. *Syncyclonema*), small limids, small and large oysters, polychaetes, and echinoderms. The upper part of the LSB (uLSB) and the entirety of the USB consist of coarse conglomerates of skeletal macroinvertebrates (including terebratulid brachiopods) and dense mollusk steinkerns. The ambient matrix in each layer is rich in glauconite with small quantities of quartz sand. The mollusk steinkerns of the uLSB are small, range from green to light brown, and lack clionaid sponge traces (*Entobia*). Characteristic moldic bivalves include *Nuculana*, small cardiids, a large pterotrigoniid largest moldic bivalve taxon), and encrusting *Diploschiza*. In contrast, the USB steinkerns average notably larger, are darker colored, and exhibit *Entobia*. Characteristic taxa include several med-large gastropods, rudists, common solitary ahermatypic corals, diverse cephalopods, and encrusting spondylids. Burrows are conspicuous in the intervals immediately subjacent to the uLSB and USB, and *Cylindrichnus* is particularly prominent.

Analysis is ongoing, but a sequence stratigraphic solution is to place the LSB as Chiwapa-equivalent (uppermost RF), and the USB would thus represent the basal PB.

O6.06

11:00 Geologic Mapping of the Bluff Lake Quadrangle, Oktibbeha, Noxubee, and Winston Counties, Mississippi

Jonathan Leard, Timothy Palmer, James Starnes

Mississippi Office of Geology, Jackson, MS

The Bluff Lake 7.5-Minute Quadrangle is located at the intersection of Oktibbeha, Noxubee, and Winston Counties. The Mississippi Office of Geology mapped this quadrangle under STATEMAP award number GS24AS00043. The quadrangle largely encompasses the Sam D. Hamilton Noxubee Wildlife Refuge. Bluff Lake is an 800-acre lake that is a popular recreational attraction. It is an engineered lake formed by the damming of Oktoc Creek, a tributary of the Noxubee River. It occupies the large floodplain upstream of the confluence of the Noxubee River, Oktoc Creek, and Loakfoma Creek. Extensive fluvial deposits of Holocene to Pleistocene alluvium and stream terraces, composed of quartzose sands, silts, and clays were mapped along the major drainages. The Maastrichtian Prairie Bluff Formation, approximately 55 feet thick in this quadrangle, is a fossiliferous chalky marl, which unconformably overlies the Maastrichtian Ripley Formation composed of interbedded clay, sand, chalk, and limestone. The Cretaceous-Paleogene boundary occurs at the spillway of Bluff Lake. The Danian Clayton Formation, about 15-30 feet thick, is marked by a basal glauconitic sandstone with *Pycnodonte pulaskensis* oyster. The Danian-Selandian Porters Creek Formation is dominantly clay but includes an anomalous ridge-forming sand body above 280 feet msl between the Chinchahoma and Cypress Creek/Noxubee River confluences. Due to the thickness of the chalk section in this quadrangle, ground water must be sourced from measured depths greater than 600 feet for the Eutaw Formation or depths greater than 1000 feet for the Tuscaloosa Formation. These aquifers consist of thick, cross-bedded sands and gravels, with the Eutaw Formation reaching ~260 feet in thickness and the Tuscaloosa Formation unconformably overlying Paleozoic basement rock. A well from each aquifer is shown in cross section to assist with planning and development for the area.

Paleontological resources are abundant in the quadrangle. A notable *Mosasaurus hoffmannii* lumbar vertebrae was recovered from the Prairie Bluff Formation and was featured in several national news stories. Additional fossil resources include silicified wood and Pleistocene vertebrate remains in surficial alluvium and terraces, as well as abundant invertebrates in the Ripley and Prairie Bluff formations. The anomalous, ridge-forming, sand body located in the Porters Creek Formation could be an economic target. Deeper cross-section units not exposed at the surface include the Demopolis Chalk (~420 feet thick), Arcola Limestone (~15 feet thick), and Mooreville Formation (~180 feet thick).

O6.07

11:20 Geology Governing the Habitat of the Big Black River Rock Snail (*Lithasia hubrichti*)

James Starnes[1], Calvin Rezac[2], Robbert Ellewanger[2], Marinee Humphries[2], Matthew Wagner[3], Ashley Ruppel[3], David Ruppel[4]

[1]MDEQ, Mississippi Office of Geology, [2]MDWFP, Mississippi Museum of Natural Science, [3]U.S. Fish and Wildlife Servie, [4]USACE ERDC

The Big Black River Rock Snail (*Lithasia hubrichti*) (BBRRS) is a small Pleurocerid gastropod which exclusively inhabits a coarse gravelly channel substrate of just under 5 kilometers of the Big Black River (BBR) along the Hinds and Warren County line in the loess bluffs region of west-central Mississippi. The BBR is a proposed State Endangered and a Species of Greatest Conservation Need in Mississippi. Juveniles are smoothly turbinate in form. As adults their shells become nodularly ornamented, typically exhibiting a distinctive purple nacre in the aperture and operculum, and a completely eroded protoconch. The habitat is associated with two particular stratigraphic units of the Vicksburg Group, the Marianna and Glendon Limestones, which form continuous subcrop along the river channel. Its densities are highest at the upstream boundary with densities declining by the time they reach the lower bounds. The snail's habitat is bound upstream by the less stable subcrop of the sands of the Forest Hill and Mint Springs members and downstream by the Byram Marl and Bucatunna Clay members of the Vicksburg Group. Stable, cobble-sized chert gravel bedload in this stretch of river is held by limestone ledges exposed by erosion along the riverbed and is swept clean from siltation by strong river currents. The lower BBR evolved through the loess bluffs region from major head cuts in response to the cyclic glaciation of the Pleistocene epoch on the lower Mississippi River Valley and its continued confluence with the Mississippi River. The BBR channel became permanently entrenched through the marine section of the Vicksburg Group at the height of the Last Glacial Maxima. This occurred just after the river meandered unbound at a higher base level across the Bucatunna Clay member, eroding into the eastern valley wall (near Edwards, MS) and then immediately across to the western valley wall (at the mouth of Clear Creek), exacerbating the width of the BBR's floodplain and the stream's low terrace complex before it's head-cut entrenchment. A coarse gravel bedload is provided to the BBR by erosion of the mid-Pleistocene-aged Rawhide Terrace, an ancestral Mississippi River pre-loess terrace in the adjacent uplands. Higher gradient tributaries that are spring fed from the Rawhide Terrace transport these coarse gravels to the BBR. The BBRRS can be considered a Pleistocene relic species whose ancestors had a wider distribution along the Mississippi Valley and its tributaries. As the regional environment changed and the range of its ancestors shifted, this population became isolated and evolved on the stable gravel substrate created by these unique geologic conditions.

O6.08

11:40 The Neogastropoda Family Pyramimitridae Cossmann, 1901, Lost and Found

David T. Dockery III

Mississippi Department of Environmental Quality, Jackson, MS

Some neogastropod families have a continuous record from the Cretaceous or Paleogene to the Recent, but a number of obscure nominal families with unusual shell characters are hard to place in extant families. Many fossil families that were once accepted have been "lost" in synonymy. One such family is the Pyramimitridae, named by Cossmann (1901) for the genotype *Pyramimitra* Conrad, 1865, a genus known at the time by a single species from the Gosport Sand of Alabama *Pyramimitra terebraeformis* (Conrad, 1848). Dockery, 1977, named a second species from the Moodys Branch Formation of Mississippi *Pyramimitra quadralirata*. Pyramimitridae have shell characters that resemble both the Mitridae and Buccinidae; the genus was placed in the synonymy of Buccinidae. The family would still be buried in synonymy were it not for several small, vaguely turriform species reported by Kantor, Lozouet, Puillandre, and Bouchet, 2014, from deep water off New Caledonia that resembled the new genus and species *Hortia arriuensis* Lozouet, 1999, from the Oligocene of France. Lozouet placed the genotype in the Conoidea, but the radulae of the new living species revealed that it was not Conoidea or even any recognized Recent neogastropod family. The radulae and the genetic composition (of *Vaughanites superstes* Kantor et al., 2014) indicated to Kantor et al. that the family Pyramimitridae should be restored as a valid family, but with no sister group identified in the analysis. The restoration of this "living fossil" family brings into question as to how many of the 102 fossil neogastropod family names (counted by Kantor et al., 2014) that were placed in synonymy with 39 accepted Recent families by Bouchet and Rocrio in 2005 should be restored. Bandel and Dockery placed many Cretaceous neogastropod genera

in the fossil Superfamily Pyrifusoidea Bandel, 2000, while others have placed some of these genera in Recent families. The fact that Ruban (2013) listed 162 gastropod genera that became extinct in the Maastrichtian Stage indicates that their associate families may be extinct as well.

Hall D Room 5

12:15 3rd Meeting of the Mississippi Chapter of the Association for Women Geoscientists

Thursday, March19, 2026
AFTERNOON

Hall D Room 5

O6.09

1:40 Geologic Mapping of the Mississippi Gulf Coast Jackson, Harrison, and Hancock Counties

Jonathan Leard, James Starnes, Tim Palmer

Mississippi Office of Geology, Jackson, MS

The Mississippi Gulf Coast geologic map encompasses Jackson, Harrison, and Hancock Counties and was produced by the Mississippi Office of Geology (MOG) as Open-File Report 355. The MOG mapped this quadrangle in 2025 under USGS cooperative STATEMAP grant award number GS24AS00043. This mapping updates and extends previous mapping in Jackson and Harrison counties in Open-File Report 285. The region includes major coastal drainages and strandline evolution recorded through extensive terrace development from fluctuation in eustatic sea level during the Pleistocene epoch. The 100x vertically exaggerated LiDAR basemap highlights the Pamlico (~25 ft msl), Big Ridge (~50 ft msl), and Good Hope (~100 ft msl) coastal terraces and the Wade (~50 ft msl), Big Point (~70 ft msl), Hurley (~100 ft msl), Harleston (~130 ft msl), and Movella (~150 ft msl) river terraces. These terraces consist of quartzose sands, kaolinitic clays, and ferruginous sandstones where they unconformably overlie older formations of the Grand Gulf Group. Holocene to Pleistocene deposits were mapped including thick flood plain alluvium exceeding 140 feet along the mouth of the Pascagoula River and Cut-off Channels (Holocene to Pleistocene), or oxbow lakes, composed of carbonaceous, which give insight into past flow regimes, such as an ancestral Pearl River that flowed east into St. Louis Bay and a confluence of the Pascagoula and Escatawpa entering Grand Bay. Subsurface mapping structural control is based on the occurrence of the top of the Glendon Limestone (Oligocene) in well logs (-2450 ft msl) at the Graham Ferry Formation (Pliocene) on the west bank of the Pascagoula River at Wade to Vancleave Road Sec.37 T.5S. R.7N. The Graham Ferry Formation consists of glauconitic and micaceous quartz sand with chert-bearing graveliferous lenses, mottled clays, and diagenetic ironstone at the basal contact where it unconformably overlies the Pascagoula Formation. The Pascagoula Formation (late Miocene) is comprised of estuarine to deltaic deposits composed chiefly of carbonate-rich teal green colored clays that are locally lignitic clays with interbedded sands. The Pascagoula Fm. containing the invertebrate marker fossil *Rangia johnsoni* along with sparse terrestrial vertebrate fauna. Also mapped are Barrier Islands (Holocene) composed of laminated quartzose sands with stacked heavy mineral concentrations, Alluvial Fans (Holocene to Pleistocene) comprised of fine- to coarse-grained quartz sand, and eolian Dunes (Holocene to Pleistocene) comprised of frosted quartz sand. Groundwater resources are documented in multiple wells across the coastal counties, ranging from shallow depths of ~110-140 feet in Jackson County Utility Authority wells to deeper artesian aquifers exceeding 1700 feet in Hancock County. Borehole data from the Mississippi Office of Geology and the U.S. Geological Survey are incorporated into three regional cross sections that illustrate aquifer sand distribution and stratigraphic relationships. Heavy mineral concentrations in barrier island and strandline sands represent potential economic resources. The architecture of Holocene coastal deposits, Pleistocene terraces, and Miocene-Pliocene formations provide a comprehensive record of Gulf Coast geomorphic and stratigraphic evolution.

O6.10

2:20 Opalescent Catahoula Orthoquartzite Utilized as a Lithic Material in Mississippi

James Starnes, Natalya Usachenko

MDEQ. Mississippi Office of Geology, Jackson, MS

Anthropological theory of prehistoric cultures in the southeastern United States is developed largely on the examination of lithic assemblages. A comprehensive understanding of the distribution of naturally occurring lithic resources in relation to geology is vital to archaeology. Lithic sourcing provides insight into the trade networks of prehistoric cultures, their relationship with their environment, and how these connections evolved over time. Mississippi's prehistoric indigenous inhabitants predominantly utilized varieties of local chert and orthoquartzite resources to produce knapped stone tools. Several prehistoric quarry sites have been documented through field research by the state geological survey. Many of these quarries were in operation for thousands of years and extensive quarries reached the sizes of major-level industries. New quarry sites and lithic types discovered during geologic mapping change the understanding of natural resource availability, exploitation, and trade networks in the archeological record. The outcrop belt of the Upper Oligocene Catahoula Formation in south Mississippi contains lithic quality opaline cemented orthoquartzite but little is known about its exploitation or distribution in the archaeological record. In rare cases, Catahoula outcrops contain precious opal, but no artifacts

have been documented at quarry sites or in other lithic assemblages. Speculation could only be given that opalescent material was also exploited from the Catahoula Formation until a vibrantly opalescent spall was found among debitage of non-opalescent Catahoula Orthoquartzite at a prehistoric quarry in Claiborne County. Only a small number of Catahoula Orthoquartzite artifacts have been identified in Mississippi, as it has only recently been recognized as a lithic material. Like other opaline-cemented orthoquartzites in Mississippi, Catahoula Orthoquartzite tends to be unstable over time and environment, leading to poor preservation in the archaeological record. Following the discovery of the opalescent quarry spall, known artifacts of Catahoula Orthoquartzite were reexamined for indications of being manufactured from opalescent material. Under magnification, residual opalescent cement was found preserved between sand grains in a fragile waterworn and deeply chemically weathered projectile point. The once vibrantly opalescent artifact was discovered in a creek near Clinton in Hinds County, Mississippi by artifact collector, Richard McGayhe. The once opalescent projectile point artifact is made in a non-age diagnostic style. Opalescent orthoquartzite was once both mined, utilized, and likely prized by Mississippi's ancient indigenous inhabitants. This observation adds a unique story to Mississippi's rich archaeological record. The selective quarrying of opalescent orthoquartzite for lithic tool manufacturing across indigenous prehistoric procurement industries has not been documented in eastern North America. Future archaeological discoveries will shed light on the timing and use of opalescent Catahoula Orthoquartzite by Mississippi's prehistoric indigenous inhabitants.

THURSDAY, March19, 2026

EVENING

Hall B

3:30 DODGEN LECTURE /AWARDS CEREMONY

THURSDAY, March19, 2026

EVENING

Hall C

5:00-7:30 Reception and General Poster Session (Immediately following Dodgen Event)

All posters should be placed in the poster all by 12:00 pm on Thursday, March 19, 2026

Odd poster numbers will be presented from 5 -6

Even poster numbers will be presented from 6-7

P6.01

Geologic Mapping of the Mississippi Gulf Coast Jackson, Harrison, and Hancock Counties

Jonathan Leard, James Starnes, Tim Palmer

Mississippi Office of Geology, Jackson, MS

The Mississippi Gulf Coast geologic map encompasses Jackson, Harrison, and Hancock Counties and was produced by the Mississippi Office of Geology (MOG) as Open-File Report 355. The MOG mapped this quadrangle in 2025 under USGS cooperative STATEMAP grant award number GS24AS00043. This mapping updates and extends previous mapping in Jackson and Harrison counties in Open-File Report 285. The region includes major coastal drainages and strandline evolution recorded through extensive terrace development from fluctuation in eustatic sea level during the Pleistocene epoch. The 100x vertically exaggerated LiDAR basemap highlights the Pamlico (~25 ft msl), Big Ridge (~50 ft msl), and Good Hope (~100 ft msl) coastal terraces and the Wade (~50 ft msl), Big Point (~70 ft msl), Hurley (~100 ft msl), Harleston (~130 ft msl), and Movella (~150 ft msl) river terraces. These terraces consist of quartzose sands, kaolinitic clays, and ferruginous sandstones where they unconformably overlie older formations of the Grand Gulf Group. Holocene to Pleistocene deposits were mapped including thick flood plain alluvium exceeding 140 feet along the mouth of the Pascagoula River and Cut-off Channels (Holocene to Pleistocene), or oxbow lakes, composed of carbonaceous, which give insight into past flow regimes, such as an ancestral Pearl River that flowed east into St. Louis Bay and a confluence of the Pascagoula and Escatawpa entering Grand Bay. Subsurface mapping structural control is based on the occurrence of the top of the Glendon Limestone (Oligocene) in well logs (-2450 ft msl) at the Graham Ferry Formation (Pliocene) on the west bank of the Pascagoula River at Wade to Vancleave Road Sec.37 T.5S. R.7N. The Graham Ferry Formation consists of glauconitic and micaceous quartz sand with chert-bearing graveliferous lenses, mottled clays, and diagenetic ironstone at the basal contact where it unconformably overlies the Pascagoula Formation. The Pascagoula Formation (late Miocene) is comprised of estuarine to deltaic deposits composed

chiefly of carbonate-rich teal green colored clays that are locally lignitic clays with interbedded sands. The Pascagoula Fm. containing the invertebrate marker fossil *Rangia johnsoni* along with sparse terrestrial vertebrate fauna. Also mapped are Barrier Islands (Holocene) composed of laminated quartzose sands with stacked heavy mineral concentrations, Alluvial Fans (Holocene to Pleistocene) comprised of fine- to coarse-grained quartz sand, and eolian Dunes (Holocene to Pleistocene) comprised of frosted quartz sand. Groundwater resources are documented in multiple wells across the coastal counties, ranging from shallow depths of ~110-140 feet in Jackson County Utility Authority wells to deeper artesian aquifers exceeding 1700 feet in Hancock County. Borehole data from the Mississippi Office of Geology and the U.S. Geological Survey are incorporated into three regional cross sections that illustrate aquifer sand distribution and stratigraphic relationships. Heavy mineral concentrations in barrier island and strandline sands represent potential economic resources. The architecture of Holocene coastal deposits, Pleistocene terraces, and Miocene-Pliocene formations provide a comprehensive record of Gulf Coast geomorphic and stratigraphic evolution.

END OF THURSDAY'S PROGRAM

Friday, March 20, 2026
MORNING
Hall D Room 5

8:50 Welcome

O6.11

9:00 Description of non-dinosaurian material from the site of the most complete dinosaur thus far discovered in Mississippi - Coffee Formation (Late Cretaceous, Campanian)

Keishawn Smith, Alyson A. Brink

The University of Southern Mississippi, Hattiesburg, MS

The Selma Group consists of Late Cretaceous marine units that extend northeastward, outcropping in Tennessee, Mississippi, and Alabama. The Coffee Sand Formation, a shallow marine to transitional sand and clay unit within the Selma Group, is divided into a sandy upper section, the Tupelo Tongue, and a clay-rich lower section. The formation is exposed in the northeastern region of Mississippi and is noted for its diverse assemblage of mollusks. This project is primarily concerned with the invertebrate fauna from the Boonville locality, where the most complete dinosaur specimen in Mississippi was recently described. The site, which is composed of the clay-rich lower section of the Coffee Sand, represents a nearshore, high-energy transitional depositional environment based on the abundance of infaunal, shallow-burrowing suspension feeders (Pterotrigonidae indet., *Eufistulana* sp.), along with an apparent lack of deeper-burrowing bivalves. Vertebrate material includes freshwater turtles (*Chedighaii* sp., *Leiochelys* sp.), coastal sharks (*Scapanorhynchus* sp., *Squalicorax yangensis*, *Squatina* sp., *Ischyodus* sp.), and mosasaur vertebrate material, which suggests an interaction between marine and freshwater conditions. Furthermore, palynological and stratigraphic data suggest a freshwater influence with estuarine implications. Another interesting aspect of the Booneville locality is the ammonite assemblage (*Placenticeras*, *Menabites*), which enables more precise dating. Evidence from palynology (*Holkopollenites*, *Tschudypollis*) and ammonite biostratigraphy supports a late-early Campanian age. In summary, the data indicate that the Booneville site is early Campanian in age, representing possible intertidal deposition within a nearshore environment. This interpretation designates the hadrosaurid found at the site as the youngest and the only southeastern hadrosaur discovered in a nearshore, intertidal depositional environment.

O6.12

9:20 Discovery, Spatial Analysis, and Geomorphic Interpretation of Methane Seeps on the U.S. Atlantic Margin

Hannah Baxter, Grace Lane, Adam Skarke

Mississippi State University, Mississippi State, MS

Widespread methane discharge from seafloor gas seeps on the U.S. Atlantic Margin (USAM) has been recognized since 2012. Over the past decade, research has refined seep inventories, examined spatial distributions, and explored the geologic processes that control gas transport along this passive margin, primarily using shipboard multibeam echosounder (MBES) water column backscatter data (12-30 kHz). Recently, we acquired 386 km of very high-resolution (200 kHz) MBES water column and bathymetry data with the autonomous underwater vehicle (AUV) Sentry at seep locations on the central USAM, covering 45.1 km² of the continental shelf and slope (150-1200 m depth). Analysis of these AUV data revealed over 2800 gas seeps which is comparable to the identified 171 seeps previously detected within the same area using shipboard MBES, thus highlighting the significant improvement in detection capability afforded by higher-frequency AUV-based surveys.

Spatial analysis indicates that these newly identified seeps occur both in clusters and isolation, with distributions broadly consistent with previously mapped seeps, but with much greater definition of seep clustering along ridge crests and around upper-slope canyon heads. Over 200 of these seeps are associated with pockmark features concentrated on the upper continental slope (150-480 m depth). Pockmarks were identified through visual and quantitative geomorphologic analyses of MBES bathymetry using the Bathymetry Position Index and morphological classification, while seep bubble plumes were extracted and visualized in three dimensions. Sub-bottom profiler data collected concurrently enabled interpretation of subsurface conditions beneath pockmark-associated seeps, revealing three distinct classes of pockmark-associated seepage.

Together, these results demonstrate that shipboard MBES seep inventories likely underestimate total seep abundance and associated methane flux on the USAM. The new high-resolution AUV MBES dataset provides an unprecedented view of the fine-scale morphology and spatial organization of methane seepage sites, advancing understanding of the geologic controls on fluid transport and discharge along the U.S. Atlantic Margin.

O6.13

9:40 Diversity and Abundance of Bivalve Assemblages within the Cretaceous Demopolis Formation, West Point, MS

Ethan Hogg[1], Renee Clary[1], Athena Nagel[1], Christy Visaggi[2]

[1]Mississippi State University, Mississippi State, MS, [2]Georgia State University, Atlanta, GA

Bulk samples were collected in September 2025 from the Cretaceous Demopolis Formation at an agricultural lime quarry in Mississippi to study the distribution of bivalve faunas and related paleoenvironmental interpretations. The samples were collected along a 30-meter transect in ten sections; each section measured 1 m^2, with sections centered every 3 meters. Within each square meter, all surface fossils were collected (N ≈ 2,060). Additional samples were collected along the transect post-collection between sections, and/or from nearby fossils that had naturally eroded out. Samples were separated according to genus, and then species if identifiable. The ability to identify each sample was based on specimen completeness and what parts of each sample were preserved. The genera collected include *Acutostrea*, *Arctostrea*, *Anomia*, *Exogyra*, *Paranomia*, *Pododesmus*, and *Pycnodonte*, as well as a few vertebrate teeth, encrusting bryozoans (cheilostome), serpulid tubes, echinoderm spines, and steinkerns. The samples were also counted as left, right, or both valves (when both mollusk valves were found together). In terms of abundance within the samples, the cementing oysters (*Acutostrea*, *Arctostrea*, *Exogyra*, and *Pycnodonte*) were by far the most abundant, with *Arctostrea* being the most abundant of all the collected samples (>50% of all samples). *Pododesmus*, *Anomia*, and *Paranomia*, which are all anomiid clams, were significantly less abundant and *Paranomia* was the most abundant of the anomiids. This abundance of both cementing oysters and byssal bivalves indicates that the area was a shallow reef environment that was very diverse in invertebrate fauna, but mostly dominated by encrusting/cementing invertebrates, particularly cementing oysters.

O6.14

10:00 The First Report of Columbian Mammoth (*Mammuthus columbi*) Fossils from the Mississippi Gulf Coast

James Starnes

MDEQ, Mississippi Office of Geology, Jackson, MS

The last interglacial of the Pleistocene epoch, the Eemian stage, was a period of warm climate between ~129,000- and 116,000-years BP. At the height of this interglacial stage, temperatures were up to 2 degrees Celsius higher on average in the Northern Hemisphere and sea levels were approximately 25 feet higher than that of today. This

created a coast-parallel marine terrace bordering the Mississippi Sound. Mississippi Office of Geology OF-355 Geologic Map of the Mississippi Gulf Coast Jackson, Harrison, and Hancock Counties depict this feature as the Pamlico Terrace. As the last interglacial ended and the next glacial cycle began, sea levels fell drastically. At the height of the Last Glacial Maximum, 20,000 years ago, sea levels were 400 feet lower than today. At that time, Mississippi had significantly more land mass due to more of the continental shelf being exposed. The environment consisted of broad coastal meadows dissected by coastal streams. Now buried beneath the waters of the Mississippi Sound, this ice-age environment was teaming with a rich abundance of Pleistocene megafauna. Large mammals such as herds of horses, giant bison, saber-toothed cats, American lions, giant ground sloths, tapirs, and elephant relatives such as mastodon would have occupied this lost world. Also, Paleoindian, the ice age indigenous hunters that were the first people to call Mississippi home, found a bounty of game on this land now buried beneath the Gulf waters. Evidence from this lost ice-age coastal lands comes largely from fossils and artifacts better preserved and discovered in other places along the Gulf, particularly in Florida and Texas. Those records indicate that Mississippi was once much the same during that time. An important fossil find made in June of 2025 by Cole Moody, wading at low tide off the beach in Harrison County, was the first direct evidence in Mississippi. Cole found two, fossil fragments of a Columbian mammoth. His discovery was the first record of mammoth for the Mississippi Gulf Coast region. Because mammoths were grazers, they inhabited grassland environments. This is unlike their cousins, the mastodon, who were browsers and inhabited a wide variety of environments. This fossil provides State Survey geologists with a better understanding of the ice-age landscape now lost beneath the sea. The discovery of mammoth remains paints a picture of ice-age grassy coastal meadows bordered by woodland corridors occupied by streams. This last glacial cycle ended ~11,700 years ago as the last of the continental glaciers melted and sea levels began to rise to the modern coastline. The fossil remains of the Columbian mammoth were buried in the Pleistocene meadow soil, now drowned by the Mississippi Sound. The fossils were then re-exhumed from the seabed by strong storms and ocean currents. The fossils were quickly colonized by sea life on the modern seabed. The mammoth tooth fossils are now encrusted with the remains of bryozoans, barnacles, corals, and oysters. Cole's fossil Columbian mammoth tooth finds were confirmed and documented by State Survey scientists studying the geology of the coastal region and reposited in the Mississippi Museum of Natural Science's paleontological collections for further study.

10:20 Break

O6.15

10:40 A New Columbian Mammoth (*Mammuthus columbi*) Discovery near Lake in the Jackson Prairie Region of Central Mississippi

James Starnes[1] , Waylen Miller[2]

[1]MDEQ, Mississippi Office of Geology, Jackson, MS, [2]Ponderosa Farms, Taylorsville, MS

The physiographic region known as Jackson Prairie runs through central Mississippi and is underlain by the late Eocene (Bartonian) marine deposits of the Yazoo Formation. The rich soils of the Jackson Prairie are a regolith that took tens of thousands of years to form and have been historically important to Mississippi's agricultural industry. On August 14th, 2025, Newton County resident Waylen Miller decided to look for fossils in a nearby creek that runs through his family's farmland property where he had previously found a number of marine fossils from Yazoo Formation outcroppings. However, this particular fossil hunt yielded something much different, which he described as looking like "petrified lasagna". Waylen's find was not a marine fossil, but something directly tied to the evolution of the Jackson Prairie region itself: a portion of a Columbian mammoth tooth from the Pleistocene epoch. The discovery that Columbian mammoths once occupied the Jackson Prairie was first reported last year, when scientists from MDEQ Geological Survey excavated a complete tusk in the Loess Bluffs region of western Madison County. The tooth Waylen found was much further east than this region and thus has important implications on the broader landscape and ecology of the Jackson Prairie during the Pleistocene. Mississippi was home to three known Proboscideans during the late Pleistocene: American Mastodon, Gomphothere (Cuvieronius), and Columbian mammoth. These animals, along with other herbivores such as horses, antique bison, and ground sloths, played an important role in maintaining the fertile soils and ecosystems that evolved on the Jackson Prairie over this time period. Mastodons were browsers that inhabited a variety of coastal plain environments and are the most common proboscidean finds in Mississippi. Alternatively, mammoth finds are far less common in Mississippi since they were open grassland grazers and therefore more confined to the state's prairie regions. Gomphotheres were also browsers and are only known by a few isolated teeth found along the Mississippi River. Waylen's discovery offers further insight into the distribution of Columbian mammoths that once roamed central Mississippi's Jackson Prairie. It is now known that mammoths were much more widespread across the Jackson Prairie than just the edge of the Loess Bluffs region.

O6.16

11:00 A Paleoenvironmental Study of the Eutaw Formation: Two NSF-Funded REU Projects

Alyson A. Brink

University of Southern Mississippi, Hattiesburg, MS

In summer 2025, ten undergraduate students from around the United States accepted positions at the University of Southern Mississippi through the NSF-funded Research Experiences for Undergraduates (REU) program. The REU program is designed to engage a cohort of undergraduate students in projects related to a theme. The USM theme centered around Gulf Coastal Plain ecology, present and past, but students also received training in research ethics, lab and field safety, data management / record keeping, GIS, written and oral communication, and preparation for graduate school or a career in their chosen field. Two of the REU students selected to work in the Brink Bones and Teeth Lab.

During their two-month-long project, they selected a research topic Fauna of the Eutaw Formation, designed questions about that topic, and completed a mini-project from start to finish. This involved planning fieldwork, collecting matrix, wet-sieving the matrix, picking fossils from the concentrate, identifying the fossils, analyzing sediments, and preparing a poster to present at the end of the summer. After visiting two sites a diverse array of fauna was collected including rays, sharks, and fish such as *Cantioscyllium grandis, Ptychotrygon* sp., *Scapanorhynchus* sp., *Squalicorax* sp., and a lepisosteid (gar), and invertebrates such as *Baculites* sp. One of the students presented their REU research at the national GSA conference in San Antonio, and both students will be presenting a poster at the regional GSA conference in Memphis.

O6.17

11:20 Geology and Paleontology for Everyone: Leveraging Community Resources in the Geoheritage Development Of The Dr. John 'Jack' Kaye Cretaceous Fossil Park in Columbus, MS

Renee Clary

Mississippi State University, Mississippi State, MS

Fossil parks are unique informal US venues where, for free or a minimal fee, visitors are allowed to collect and retain a small number of personal fossils while also learning about fossils, local geology, and paleoenvironments. The recently established Dr. John 'Jack" Kaye Cretaceous Fossil Park, part of Propst Park in Columbus, is Mississippi's second fossil park. Collecting opportunities abound within a Eutaw Formation lag deposit that is exposed within the banks of the Luxapallila Creek. The site provides excellent collecting opportunities of 85-million-year old vertebrates - including shark teeth, marine reptiles, and an occasional dinosaur bone; the site was identified as Mississippi's most fossiliferous area for dinosaur remains. Importantly, community leaders are united in developing a quality fossil park that serves all the members of the community. Columbus had the foresight to seek multiple perspectives for a multidisciplinary project—and as a result, dedicated community members are joined by experts in paleontology, geology, and geoscience education, a local historian, paleontological artist, and social media influencers. When evaluated against US geoheritage criteria, the Columbus fossil park possesses scientific value, addresses sustainable economic development via geotourism, and promotes geoscience education. Not only has the area yielded multiple scientific research papers, but the city is actively pursuing geotourism opportunities to be considered in park development. Geoscience education within the park is robustly addressed through the fossil park's collaboration with Mississippi State University's students through community-engaged learning. The Jack Kaye Fossil park leverages community resources and preserves unique geoheritage; it showcases a rare opportunity of successful multidisciplinary collaboration for a common goal.

O6.18

11:40 Engaging Local Communities in the Co-Production of Scientific Knowledge

Wei Wu[1], Patrick Biber[1], Kelly San Antonio[2], Matthew Bethel[3]

[1]The University of Southern Mississippi, [2]Bethune-Cookman University, [3]Louisiana Sea Grant

Coastal communities urgently need high-quality scientific information to guide the development of effective policies that enhance resilience to a wide range of environmental stressors. At the same time, these communities provide essential local knowledge that can strengthen scientific understanding and data interpretation. I will present two coastal case studies: one involving collaboration with an Indian Tribe to vision coastal wetland change under accelerated relative sea-level rise (RSLR), and another working with an underserved, predominantly African American city to employ nature-based solutions to mitigate longstanding flooding risks.

The first case study demonstrates that engaging the Tribe in mapping their traditional ecological knowledge not only improves experimental design for field data collection, corroborates biophysical model predictions, and deepens understanding of wetland vulnerability under RSLR, but also helps identify priority areas for protection. The second case study illustrates how participatory mapping of flooding over recent decades enables communities to better understand the primary drivers of flood risk and collaboratively develop effective nature-based mitigation strategies.

Together, these case studies highlight the value of reciprocal, community-scientist co-production processes

and encourage their adoption as a standard practice in applied environmental research.

12:00 Lunch

Friday, March 20, 2026
AFTERNOON
Hall D Room 5

1:00 Business Meeting with 2026 Chairperson Elections (Attendance required for nomination)
Student Awards (Attendance required for award)

Health Sciences

Chair: Merlin M. Manogaram
University of Mississippi Medical Center
Co-Vice: Poonam Sharma
University of Mississippi Medical Center
Co-Vice-Chair: Jacob Daniels
University of Mississippi Medical Center
Co-Vice-Chair: Driscoll DeVaul
University of Mississippi Medical Center
Program Coordinator: Lance Keller
University of Mississippi Medical Center
Committee Members:
Olga McDaniel
University of Mississippi Medical Center
Lamar Hamil
University of Mississippi Medical Center
Xiaoshan Judy Gordy
University of Mississippi Medical Center
David Gordy
University of Mississippi Medical Center
Jonathan Lee
University of Mississippi Medical Center

Thursday, March 19, 2026
MORNING
Hall B Room 3

8:30 AM Welcome
Dr. Merlin Margaret Gnanasigamani Manogaram

8:35-10:00 AM
Oral Presentation Session A
Topics:
HEALTH DETERMINANTS, GENOMICS, TECHNOLOGY AND DISEASE
Moderators:
Drs. Olga and Merlin Margaret Gnanasigamani Manogaram
University of Mississippi Medical Center and Belhaven University

O7.01
8:35 Associations Between Renal Imaging Biomarkers, Body Composition, and Metabolic Burden in Metabolic Dysfunction-Associated Steatotic Liver Disease

Aubrey Smyly M.D.[1, 2], *Seth Lirette Ph.D.*[3], *Candace M. Howard M.D., Ph.D.*[1, 2]

[1]*Department of Radiology, University of Mississippi Medical Center, Jackson, MS,* [2]*Department of Biomedical Sciences, School of Graduate Studies in Health Sciences, University of Mississippi Medical Center, Jackson, MS,* [3]*Department of Biostatistics and Bioinformatics, University of Mississippi Medical Center, Jackson, MS*

Background: Metabolic dysfunction-associated steatotic liver disease (MASLD) is characterized by multisystem involvement, yet renal imaging features remain understudied. While hepatic and cardiac markers have been explored, the interplay between MASLD and renal morphology has not been widely evaluated. The objective of this study is to investigate associations between renal imaging biomarkers—length and parenchymal thickness—and clinical measures in MASLD, including anthropometrics, serologic fibrosis scores, and liver attenuation.

Methods: A retrospective, IRB-approved, HIPAA-compliant review of CT imaging and clinical data from 589 MASLD patients (2004-2016) was performed. Patients with confounding renal anomalies were excluded. Renal measures were assessed in coronal and sagittal planes bilaterally. Anthropometric measures (BMI, waist circumference, sagittal abdominal diameter), serologic scores (FIB-4, NAFLD fibrosis score), and liver attenuation index (LAI) were evaluated. Associations were tested using multivariable regression adjusted for sex and race.

Results: Parenchymal thickness was positively associated with anthropometric burden (e.g., sagittal left thickness vs. waist circumference: β=1.24 per mm, $p<0.001$). Renal length also correlated with body habitus, though modestly. Importantly, right renal length exhibited a significant inverse association with NAFLD fibrosis score (β=-0.017 per mm, p=0.012), while left coronal parenchymal thickness showed a negative correlation with liver attenuation index (β=-0.36 per mm, p=0.011). FIB-4 associations trended negative but were not statistically significant. As renal length and parenchymal thickness increased, blood urea nitrogen (BUN), creatinine, aortic calcifications, and renal artery calcifications decreased. BUN decreased by 0.6575 units for every 1 mm increase in parenchymal thickness in the left kidney, as measured on coronal view. On average, the odds of aortic calcification decreased by 8% for every 1 mm increase in parenchymal thickness in the left kidney, as measured on coronal view.

Conclusion: Renal imaging biomarkers, especially parenchymal thickness, strongly reflect metabolic burden in MASLD. Notably, inverse correlations with hepatic fibrosis and liver attenuation suggest that renal morphology may mirror systemic metabolic stress. These findings support expanding risk stratification frameworks to include renal imaging features, potentially linking structure to function in multisystem disease. In future studies, renal imaging biomarkers and lab values will be assessed over time to better assess different stages of the multisystem disease process.

O7.02

8:45 Surface Engineering of Polymeric Implants for Enhanced Cellular Response

Shruti Chhabra[1], Michelle Tucci[1], Lir-Wan Fan[1], Amisha Parekh[2], Randall Scott Williamson[1]

[1]University of Mississippi Medical Center, [2]ADA Forsyth Institute

Objective: This study aimed to evaluate the effect of sulfonation on the surface properties and biological performance of polyetheretherketone (PEEK) and polyetherketoneketone (PEKK) implants, focusing on enhancing cellular response for potential dental and craniofacial applications.

Methods: Implants were fabricated in four groups: untreated PEEK (PEEK), untreated PEKK (PEKK), sulfonated and hydrothermally treated PEEK (sPEEK), and sulfonated and hydrothermally treated PEKK (sPEKK). Surface characterization was performed using scanning electron microscopy (SEM), Fourier-transform infrared spectroscopy (FTIR), contact angle analysis, and surface topography with a Keyence 3D Surface Profilometer. SEM and confocal images were used to assess porosity and surface roughness, respectively, while FTIR confirmed chemical modification. Hydrophilicity was evaluated by contact angle analysis. *In vitro* studies using MC3T3 osteoblastic cells assessed cytocompatibility via MTT assay, DNA quantification, alkaline phosphatase (ALP), and Alizarin Red assays. *In vivo* studies were initiated on rats ($n=5$ per group) with cranial implantation of samples; animals were sacrificed for subsequent micro-CT, histological, toxicity, and mechanical push-out evaluations, which are currently ongoing.

Results: SEM and confocal analyses revealed markedly increased surface roughness and porosity in sPEEK and sPEKK compared to untreated controls. FTIR spectra confirmed sulfonic acid groups after sulfonation and their subsequent removal after hydrothermal treatment. Contact angle measurements showed enhanced hydrophilicity for all sulfonated surfaces. Cell culture assays demonstrated significantly higher cell viability, DNA content, ALP activity, and mineralization in sulfonated samples, confirming improved osteogenic potential. Statistical analysis confirmed significant differences ($p < 0.05$) among groups.

Conclusion: Sulfonation followed by hydrothermal treatment effectively modified PEEK and PEKK implant

surfaces, creating micro-rough, porous, and hydrophilic morphologies conducive to enhanced cellular activity. These findings suggest surface-engineered PEEK and PEKK polymers as promising next-generation biomaterials for dental and craniofacial implant applications. *In vivo* outcomes are currently being processed to validate their performance further.

O7.03

8:55 Primary Pulmonary Extranodal Marginal Zone B-cell Lymphoma of Mucosa-Associated Lymphoid Tissue (MALT lymphoma) Masquerading as Recurrent Pneumonia: A Diagnostic Challenge on Small Biopsy

Swathi Yarlagadda, Tejas Maheshwari, John Lam

University of Mississippi Medical Center, Jackson, MS

INTRODUCTION: Extranodal marginal zone lymphoma of mucosa-associated lymphoid tissue (MALT lymphoma) is a rare form of indolent B-cell lymphoma that can arise in a variety of extranodal sites, most commonly the stomach. Primary pulmonary involvement is uncommon, accounting for less than 1% of all lymphomas. Because its radiologic presentation often mimics infection or inflammatory lung disease, establishing a diagnosis is challenging and frequently delayed. We report here the case of pulmonary MALT lymphoma, initially misinterpreted as multifocal pneumonia and later as an inflammatory interstitial process, underscoring the diagnostic complexity of this rare entity.

CASE PRESENTATION: A 52-year-old woman with no history of smoking presented in April 2024 with acute abdominal pain and was found to have colitis on CT abdomen and pelvis. Incidentally, multifocal pulmonary infiltrates were noted, initially interpreted as multifocal pneumonia. She was treated empirically with antibiotics. Follow-up imaging demonstrated persistent bilateral consolidative and ground-glass opacities that slowly evolved over several months on imaging into mixed solid and ground-glass infiltrates without associated lymphadenopathy or pleural effusion.

Clinical evaluation showed positive ANA with negative inflammatory markers, and an inflammatory interstitial process such as nonspecific interstitial pneumonia (NSIP) was suspected. Bronchoscopy with lavage in July 2024 revealed rare filamentous bacteria interpreted as *Actinomyces* contamination. A trial of corticosteroids was initiated for presumed NSIP, leading to partial radiologic improvement. However, repeat CT scans in 2025 demonstrated new and enlarging lower lobe ground-glass opacities, prompting repeat bronchoscopy and, eventually, a CT-guided lung biopsy.

Core biopsy revealed small aggregates of lymphocytes. Immunohistochemistry demonstrated a polymorphous population of small lymphocytes with mild predominance of B cells. These morphologic findings were considered nonspecific and initially favored a reactive process. However, given the atypical imaging features and clinical presentation, the case was referred to a higher hematopathology reference laboratory, where molecular studies revealed clonal IGH gene rearrangement, confirming the diagnosis of extra nodal marginal zone lymphoma (MALT lymphoma). Subsequent PET-CT imaging revealed FDG-avid bilateral pulmonary opacities and splenic lesions, consistent with multisite disease involvement.

DISCUSSION: The present case highlights the significant diagnostic challenges associated with pulmonary MALT lymphoma. The patient's clinical course was characterized by nonspecific respiratory findings and imaging abnormalities that initially suggested infectious or inflammatory etiologies. Multifocal pulmonary infiltrates with ground-glass and consolidative components were first attributed to pneumonia and later suspected to represent nonspecific interstitial pneumonia (NSIP) based on autoimmune serology and partial steroid responsiveness.

Minimally invasive investigations, including bronchoscopy and CT-guided biopsy, yielded inconclusive findings showing predominantly reactive lymphoid aggregates without definitive features of lymphoma. This diagnostic ambiguity reflects a well-recognized limitation of small biopsy specimens, where sampling error and architectural distortion may obscure malignant patterns. The final diagnosis required confirmation through immunoglobulin gene rearrangement studies, illustrating the necessity of molecular testing in cases with atypical or indeterminate histology. The integration of clinical, radiologic, pathologic, and molecular findings is essential to achieve a definitive diagnosis

CONCLUSION: Pulmonary MALT lymphoma remains a diagnostic challenge due to its rarity, indolent course, and nonspecific imaging appearance that frequently mimics infection or inflammation. Early consideration of a lymphoproliferative process in persistent or atypical pulmonary infiltrates, coupled with timely use of molecular studies or surgical biopsy, is crucial for accurate diagnosis and appropriate therapeutic planning.

O7.04

9:05 The Impact of Contrast Use in Determining Bone Density in a MASLD Population

Emilia Patiño[1], Mary Madison Pevey[1], Aubrey Smyly,.[2, 3], Seth Lirette.[4], Candace M. Howard.[2, 3]

[1]School of Medicine, University of Mississippi Medical Center, Jackson, MS, [2]Department of Radiology, University of Mississippi Medical Center, Jackson, MS, [3]Department of Biomedical Sciences, School of Graduate Studies in Health Sciences, University of Mississippi Medical Center, Jackson, MS, [4]Department of Biostatistics

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Background: Metabolic dysfunction-associated steatotic liver disease (MASLD) is estimated to have a global prevalence of about 38% and is the most common cause of chronic liver disease in the United States. MASLD is a multisystem disease process where cardiac and hepatic systems have been studied extensively. However, data is needed on various other aspects of the disease process to allow for optimal care for these patients. Bone density assessment is important in patients with MASLD because the metabolic dysfunction contributes to systemic inflammation, insulin resistance, and altered hormonal pathways that negatively impact bone remodeling. These patients typically have overlapping risk factors such as obesity, vitamin D deficiency, sarcopenia, and physical inactivity - that accelerate bone loss and increase fracture risk. Some studies have shown data suggesting that hepatic steatosis and fibrosis are independently associated with reduced bone mineral density through shared pathways of chronic inflammation and impaired osteoclast function. Since this dysfunction can lead to osteoporosis, further studies into the interplay between MASLD and osteoporosis are needed to allow for treatment before a fracture occurs.

Objective: To evaluate how bone density varies over different phases of contrast imaging on CT in MASLD patients.

Methods: This retrospective single-center observational study included 621 patients of age 18 and above with a diagnosis of NAFLD with non-contrast or contrast and non-contrast CT imaging from January 1, 2004, to June 30, 2016. Attenuation measurements of the L1 vertebra, and L2 vertebra were made using circular region-of-interests (ROI) on non-contrast, portal venous, arterial phase, and delayed phase imaging. Linear regression analyses were conducted to determine associations between L1/L2 bone attenuation, NAFLD fibrosis score (calculated from serum laboratory values), liver attenuation, and any variation between phases of contrast on CT imaging.

Results: Statistical analysis showed an association between NAFLD fibrosis score and Fibrosis-4 score. At the L1 vertebral level, for every 1 HU increase in bone density on non-contrasted phase imaging, NAFLD fibrosis score decreased 0.0061 (p=0.002) and fibrosis-4 score decreased 0.0063 (p=0.004). On the arterial phase, for every 1 HU unit increase in bone density, NAFLD fibrosis score decreased 0.0082 (p=0.006). At the L2 vertebral level, for every 1 HU increase in bone density on the non-contrasted phase, NAFLD fibrosis score decreased 0.0060 (p=0.003) and fibrosis-4 score decreased 0.0061 (p=0.006). For every 1 HU increase in bone density on the arterial phase, NAFLD fibrosis score decreased 0.0094 (p=0.006). No significant association was appreciated with portal venous and delayed phase imaging.

Conclusion: These findings suggest that higher vertebral bone density, particularly in the non-contrast and arterial phases, is significantly associated with lower NAFLD fibrosis and Fibrosis-4 scores, indicating less severe liver fibrosis. In contrast, no meaningful associations were observed in the portal venous or delayed imaging phases, highlighting the importance of imaging phase selection when evaluating bone-liver relationships.

9:15 Break

O7.05

9:20 Renal Function, Morphology, and Arterial Atherosclerosis in Metabolic Dysfunction-Associated Steatotic Liver Disease

Mary Madison Pevey[1], Emilia Patiño[1], Aubrey Smyly M.D.[2, 3], Seth Lirette Ph.D.[4], Candace M. Howard M.D., Ph.D.[2, 3]

[1]School of Medicine, University of Mississippi Medical Center, Jackson, MS, [2]Department of Radiology, University of Mississippi Medical Center, Jackson, MS, [3]Department of Biomedical Sciences, School of Graduate Studies in Health Sciences, University of Mississippi Medical Center, Jackson, MS, [4]Department of Biostatistics and Bioinformatics, University of Mississippi Medical Center, Jackson, MS

Introduction: Metabolic dysfunction-associated steatotic liver disease (MASLD) is characterized by multisystem involvement. MASLD is a leading cause of liver transplantation in the United States and is estimated to have a global prevalence of approximately 38%. While hepatic and cardiac markers have been explored, the interplay between renal labs, cardiovascular risk, and imaging biomarkers have not been widely evaluated. The objective of this study was to assess the correlation between renal morphology and other signs of systemic disease processes such as atherosclerosis and anthropometric measurements in a MASLD population.

Methods: A retrospective, IRB-approved, HIPAA-compliant review of CT imaging and clinical data from 589 MASLD patients (2004-2016) was performed. Patients with confounding renal anomalies were excluded. Renal measures were assessed in coronal and sagittal planes bilaterally. Visual assessment for the presence of atherosclerosis on imaging was performed by assessing the renal arteries and abdominal aorta. Anthropometric measures (BMI, waist circumference, sagittal abdominal diameter) were evaluated. Associations were tested using multivariable regression adjusted for sex and race.

Results: Statistical analysis showed that increased renal parenchymal thickness and kidney length were significantly associated with favorable clinical and imaging outcomes. Specifically, increased thickness was significantly linked to lower waist circumference (β = -0.4168, $p < 0.001$), BMI (β = -0.2176, $p = 0.003$), and BUN (β = -0.6575, $p < 0.001$), indicating better metabolic and renal function. Notably, thicker renal parenchyma was associated with decreased odds of aortic calcification (OR = 0.918, $p = 0.001$) and renal artery calcification (OR = 0.892, $p = 0.001$), particularly in the coronal view. These findings underscore the clinical relevance of renal morphometric measurements as potential indicators of systemic health and vascular risk.

Conclusion: Increased renal parenchymal thickness and length are significantly associated with improved metabolic parameters and reduced vascular calcification. These findings suggest that renal structural measurements, particularly in the coronal view, may serve as non-invasive indicators of broader systemic health. The strong associations with BMI and vascular calcifications highlight the potential kidney morphometry in assessing metabolic and cardiovascular risk. Further investigation is warranted to explore these relationships longitudinally and across diverse populations.

O7.06

9:30 Eosinophilic Granuloma in a 10-Day-Old Newborn: Expanding the Differential for Neonatal Skull Lesions

Sabeen Wazir, Kyra Salinkas, Berony Geneste, Stephen DiGiuseppe, Michael Marzullo

Edward Via College of Osteopathic Medicine, Monroe, LA

Eosinophilic granuloma (EG) is a localized form of Langerhans cell histiocytosis characterized by the abnormal proliferation of Langerhans cells within bone or surrounding soft tissue. In pediatrics, EG most commonly affects children between 5 and 14 years old and typically presents as a solitary lytic lesion involving the frontal bone, mandible, ribs, or thoracic spine. While older children may exhibit focal pain, swelling, or tenderness, younger infants rarely present with this condition, and true neonatal cases are exceedingly uncommon.

In newborns, cranial lesions pose a broad differential diagnosis—including cephalohematoma, dermoid cysts, osteomyelitis, vascular malformations, and metastatic neuroblastoma—making prompt diagnosis challenging. Furthermore, concerns regarding radiation exposure, anesthesia risks, and evolving cranial anatomy complicate decisions regarding biopsy or surgical intervention in this population.

We present a 1-year-old newborn with eosinophilic granuloma managed through a multidisciplinary conservative monitoring strategy since the age of 10 days. By reporting this case, we aim to contribute to the limited literature on neonatal EG, underscore the importance of considering EG in the differential diagnosis of skull lesions in early infancy, and highlight circumstances in which an observation-based management approach may be safe and appropriate.

O7.07

9:40 Transvenous Repositioning of a Distal Ventriculoatrial Shunt Catheter Terminating in the Coronary Sinus in a Pediatric Patient with a Duplicated Superior Vena Cava

Tyler Trussell, Hunter Hammett, Daniel Duran, Nicholas Derrico, Madhav Sankhyan, Kristin Weaver, Allison Strickland

University of Mississippi Medical Center, Jackson, MS

Ventriculoatrial shunts (VAS) are a well-established alternative to ventriculoperitoneal shunts (VPS) for cerebrospinal fluid diversion in patients with peritoneal contraindications. Although rare, complications such as catheter migration or malposition can occur and may be exacerbated by underlying congenital venous anomalies. Endovascular techniques have emerged as a minimally invasive option for VAS revision yet reports remain limited and primarily focus on acquired malpositions. To our knowledge, no prior case describes endovascular VAS repositioning in the context of a duplicated superior vena cava (SVC) with catheter termination in the coronary sinus. In this case, a 15-year-old female with a history of congenital hydrocephalus and prior VPS placement underwent conversion to a VAS due to abdominal pseudocyst formation. Postoperative imaging revealed the distal catheter coursing through a duplicated left SVC and terminating in the coronary sinus. To avoid the risks associated with open surgical revision, such as vascular injury, infection, and compromised venous access, an endovascular approach was selected. Using transfemoral venous access and fluoroscopic guidance, the catheter was successfully repositioned from the coronary sinus into the right atrium. The patient had no procedural complications, with symptom resolution at three-month follow-up and stable shunt position confirmed on X-rays at one and two years. This case demonstrates that endovascular repositioning can be a safe and durable option for managing VAS malposition in patients with complex venous anatomy. Preoperative imaging, especially with CT venography, is essential for identifying anatomical variants and guiding procedural planning, and endovascular techniques may offer a preferable alternative to open revision in select, high-risk patients.

O7.08

9:50 - Utilizing Home-Based Telerehabilitation to Improve Patient Access Following Orthopedic Surgery

Johnathan Riley[1], Clarence Clark[1], Jacob Daniels[2], Ryan McGlawn[2], William Pannell[2], Derrick Burgess[1], Lindsey Kuiper[3]

[1]University of Mississippi Medical Center Department of Orthopaedic Surgery and Rehabilitation, Jackson, MS, [2]University of Mississippi Medical Center Department of Physical Therapy, Jackson, MS, [3]University of Mississippi Medical Center, Jackson, MS

Background: Anterior cruciate ligament (ACL) reconstruction necessitates physical therapy as soon as possible to ensure patients regain adequate range of motion (ROM) without permanent functional deficits. However, rural Mississippi presents unique challenges to early access to physical therapy, including barriers to transportation, limited access to local physical therapists, family support issues, or scheduling conflicts. Telehealth is rising as a potential solution to help prevent poor outcomes associated with delayed or missed follow-ups and physical rehabilitation. This pilot study aims to assess the feasibility of telehealth services in remote rehabilitation of patients undergoing ACL reconstruction.

Methods: A prospective study which aims to preoperatively enroll 20 patients aged 13 years or older undergoing ACL reconstruction with a Mississippi orthopedic surgeon, as well as 10 providers. Patients are trained on the use of the WizeCare telehealth application, and both patients and providers will complete post-treatment surveys to assess satisfaction and compliance rate. Patients will use the telerehabilitation application until their first face-to-face appointment.

Results: This project is ongoing with 7 patients currently enrolled and an additional 2 patients withdrawn. Results will assess feasibility via patient and provider satisfaction, compliance, and completion rate via post-session surveys. This study will also assess potential difficulties of future implementation of telerehabilitation.

Conclusions: The authors aim to assess the feasibility of telehealth in remote physical rehabilitation following ACL reconstruction among the Mississippi population. If telerehabilitation is determined to be a feasible strategy for post operative rehabilitation care, this could have significant implications for reducing patient burden and improving access to care.

HRSA Acknowledgement: This project was made possible by the Health Resources and Services Administration (HRSA) of the U.S. Department of Health and Human Services (HHS) as part of the National Telehealth Centers of Excellence Award (U66RH31459).

The contents are those of the author(s) and do not necessarily represent the official views of, nor an endorsement by, HRSA, HHS, or the U.S. Government.

O7.14 (moved from Session B)

10:00 Upstream Prevention: Linking Teen Pregnancy, Sex Education Policy, and Low Birth Weight in Mississippi

Courtney Detwiler

University of Mississippi Medical Center, Jackson, MS

Background: Low birth weight (LBW), defined as <2,500 g (5 lbs., 8 oz.), is a key indicator of infant morbidity and mortality, with a national rate of 85.8 per 1,000 live births in 2023. Mississippi's LBW rate is 134 per 1,000, alongside one of the nation's highest teen pregnancy rates (24.9 per 1,000). Low birth weight is a complex outcome influenced by intersecting biological, social, and educational factors. Because adolescent pregnancies increase LBW risk, this study examines age-related LBW differences across Mississippi counties to inform upstream prevention strategies, including comprehensive sex education.

Methods: A cross-sectional analysis was conducted across 82 Mississippi counties using 2013-2022 birth records from the Mississippi Department of Health. LBW rates per 1,000 live births were calculated for mothers less than 20 years of age and for those 20-39 years of age. Descriptive statistics were computed in Excel, and group differences were tested with a two-sample t-test assuming unequal variances. A simple linear regression was performed to examine the association between county-level LBW rates among mothers under 20 and the percentage of families living below the poverty line.

Results: Among mothers under 20, LBW rates ranged from 0 to 211.9 per 1,000 (mean = 124.3, SD = 36.6). Among mothers aged 20-39, rates ranged from 67.3 to 160.4 per 1,000 (mean = 110.8, SD = 21.7). The difference in LBW rates between age groups was statistically significant ($t = 2.87$, $df = 132$, $p = 0.0048$). A simple linear regression examining the relationship between county-level poverty and LBW among mothers under 20 showed a positive but non-significant association ($\beta = 1.14$, $p = 0.095$, $R^2 = 0.034$).

Conclusion: Adolescent mothers in Mississippi experience significantly higher LBW rates than adult mothers, underscoring the need for upstream, education-based prevention. The absence of a strong association between poverty and LBW among young mothers highlights that economic status alone does not determine risk. For adolescents, upstream interventions, particularly comprehensive, early, and continual sex education, represent an essential preventive strategy. By improving health literacy and agency before pregnancy occurs, Mississippi can address root causes of both teen pregnancy

and adverse birth outcomes more effectively than through downstream clinical interventions alone.

Thursday March 19th, 2026

Morning Room B3

10:20- 12:30 Interactive workshop

Time: 10:30-11:15 AM

Speaker I: Jake R. Johnston,

Cell and Molecular Biology

University of Mississippi Medical Center

Topic: Precision at the Core: Molecular Instrumentation Behind the Data

Time: 11:30-12:15 PM

Speaker II : Dr. Lavanya Challagundla,

Cell and Molecular Biology

University of Mississippi Medical Center

Topic:"Comprehensive Insights into Rat model for Preeclampsia Using Multi-Modal Transcriptomics"

12:30 Lunch Break

Thursday, March19, 2026

AFTERNOON

Hall B Room 3

Symposium I

1:00-3:00 Theme: Pediatrics and Maternal-Fetal program

Speaker I: Dr. Miriam Hankins,

Obstetrics & Gynecology,

University of Mississippi Medical Center

Topic: "Pregnancy: A Time of Missed Opportunity"

Speaker II: Douglas McLaurin, PhD.,

Cell and Molecular Biology,

University of Mississippi Medical Center

Topic: Project Baby Magnolia:

"A Genomic Research Program for Critically-Ill Newborns"

Speaker III: Video presentation

Topic: Comparing the Diagnostic Capability of Large Language Model and Clinical Geneticist

3:00-3:15 Group questions and discussion

3:15-3:30 The Health Sciences Business Meeting

THURSDAY, March19, 2026

EVENING

Hall B Room 5

3:30 DODGEN LECTURE /AWARDS CEREMONY

THURSDAY, March19, 2026

EVENING

Hall C

5:00-7:30 Reception and General Poster Session (Immediately following Dodgen Event)

All posters should be placed in the poster all by 12:00 pm on Thursday, March 19, 2026

Odd poster numbers will be presented from 5 -6

Even poster numbers will be presented from 6-7

Coordinators for General Posters:

Drs. D. Olga McDaniel, Michelle Tucci

Coordinators for HSD Posters:

Drs. Merlin M. G. Manogaram and David Gordy

P7.01

Impact of Malnutrition on Post-Operative Outcomes in Orthopaedic Trauma Patients

Fibiana Oladipo, MPH[1], Johnathan Riley[1], Jaccare Ulloa, DDS., MSc., Ph.D.[1], Julian Clark, MD[1], Aswin Arunachalam[2], Ta'quoris Newsome[2], Priyanka Nehete, BDS, MPH[1], Tyler McGee, MD[1], Patrick Bergin, MD[1]

[1]Univeristy of Mississippi Medical Center Department of Orthopedic Surgery, Jackson, MS, [2]University of Mississippi School of Medicine, Jackson, MS

Pilon fractures are severe lower-extremity injuries that typically result from high-energy trauma and are known for their complex surgical management. Because the soft tissues around the distal tibia are thin and vulnerable, these injuries carry an elevated risk of postoperative wound complications. Patient-specific factors, such as nutritional status, may further influence healing and recovery.

Albumin, the most abundant circulating protein, plays a key role in maintaining fluid balance, transporting molecules, and supporting tissue repair. Low serum albumin (hypoalbuminemia) is commonly used as a marker of malnutrition. Poor nutritional status has been associated with delayed wound healing, increased infection rates, and prolonged hospital stays. However, limited research has evaluated the specific impact of malnutrition on patients undergoing operative fixation of pilon fractures.

This study assessed whether hypoalbuminemia at

admission is associated with postoperative complications, specifically infection and return to the operating room, in patients with pilon fractures. We performed a retrospective review of 193 patients treated operatively at the University of Mississippi Medical Center between January 2016 and November 2021, all of whom had a documented preoperative albumin level. Patients were categorized as nourished (albumin ≥3.5 g/dL) or malnourished (albumin <3.5 g/dL). The primary outcome was the rate of postoperative infection requiring operative treatment. We aimed to determine whether malnourished patients experienced higher rates of operatively managed infection compared with nourished patients.

Overall, infection rates were similar between groups. Of the 193 patients, 85 were classified as malnourished and 108 as nourished. Eleven malnourished patients developed infections requiring operative management, compared with 13 nourished patients. Chi-square analysis showed no significant difference between the groups ($p = 0.85$).

Within the limitations of this study, preoperative albumin level does not appear to significantly influence postoperative infection rates in patients with operatively managed pilon fractures. Further research may help clarify the relationship between nutritional status and postoperative outcomes in this patient population.

P7.02

Neonatal Inflammation Induces ADHD-like Behaviors and Homeostatic Responses to Sleep Disturbances in Adolescent Rats with Sex-Specific Effects using Machine Learning-Based Analysis

Jonathan Lee[1], Silu Lu[1], Joseph Crosby[1], Charles Matheny[1], James Shaffery[2], Norma Ojeda[3], Haifeng Wang[4], Md Rokibul Hasan[5], Md Mushfiqur Rahman[5], Vignesh Nayak[6], Michelle Tucci[7], Yu-Ching Tu[8], Lu-Tai Tien[9], Lir-Wan Fan[1]

[1]Department of Pediatrics, Division of Newborn Medicine, University of Mississippi Medical Center, Jackson, MS 39216, USA, [2]Department of Psychiatry and Human Behavior, Animal Behavior Core, University of Mississippi Medical Center, Jackson, MS 39216, USA, [3]Department of Advanced Biomedical Education, University of Mississippi Medical Center, Jackson, MS 39216, USA, [4]Department of Industrial and Systems Engineering, Mississippi State University, Mississippi State, MS 39762, [5]Department of Data Science, University of Mississippi Medical Center, Jackson, MS 39216, USA, [6]Department of Pediatrics, Division of Pediatric Pulmonary, University of Mississippi Medical Center, Jackson, MS 39216, USA, [7]Department of Anesthesiology, University of Mississippi Medical Center, Jackson, MS 39216, USA, [8]Department of Long-Term Care Management, Chung Hwa University of Medical Technology, Rende Dist, Tainan City, 71703, Taiwan, [9]School of Medicine, Fu Jen Catholic University, Xinzhuang Dist, New Taipei City 24205, Taiwan

Perinatal exposure to inflammation may play an important role in the association between sleep disturbances and neurodevelopmental disorders such as attention-deficit/hyperactivity disorder (ADHD) development. This study examined whether machine learning-based pattern analysis identified sleep patterns associated with ADHD in juvenile rats exposed to perinatal inflammation and sleep disruptions. Sprague-Dawley male rat pups received intraperitoneal injections of lipopolysaccharide (LPS) (2 mg/kg) or saline on postnatal day 5 (P5). Behavioral testing was performed at P35, followed by implantation of a sleep recording electrode on P39, and exposure to sleep disruptions on P47. Baseline sleep, sleep disruption, and recovery sleep were recorded on P46, P47, and P48, respectively, for 24 hours. Four groups (n=5/sex/group) were included: Saline-Baseline, Saline-Recovery, LPS-Baseline, and LPS-Recovery. Our results showed that neonatal LPS treatment induced ADHD-like behaviors, including hyperactivity and inattention at P35 in both male and female rats, with a higher effect in males. Additionally, neonatal LPS treatment interfered with REM sleep and sleep homeostatic responses (recovery sleep) to sleep disturbances in adolescent rats (P49). Six unsupervised machine learning models were recruited to analyze the feature interaction patterns among the collected high-dimensional sleep data. These models identified relative theta power and relative spindle power as features significantly associated with ADHD and perinatal inflammation in this experimental model of sleep disruption in male rats. These results suggest that machine learning-based analysis has substantial potential as a tool for identifying neurodevelopmental disorders utilizing sleep data in subjects exposed to perinatal inflammation and sleep disruptions. In addition, these results may inform the development of new treatments for sleep disorders associated with ADHD.

P7.03

Effectiveness of Nurses' Hand Hygiene Methods on the Bacterial Contamination Level on Hands

Yu-Ching Tu[1], Md Mushfiqur Rahman[2], Md Rokibul Hasan[2], Jonathan Lee[3], Haifeng Wang[4], Lir-Wan Fan[3]

[1]Department of Long-Term Care Management, Chung Hwa University of Medical Technology, Rende District, Tainan City, 71703, Taiwan, [2]Department of Data Science, University of Mississippi Medical Center, Jackson, MS 39216, USA, [3]Department of Pediatrics, Division of Newborn Medicine, University of Mississippi Medical Center, Jackson, MS 39216, USA, [4]Department of Industrial and Systems Engineering, Mississippi State University, Mississippi State, MS 39762

Healthcare-associated infections (HAIs) are a major cause of death and disability among medical and patient

populations worldwide, and hand hygiene is closely linked to HAIs. Implementing hand hygiene strategies is therefore essential in HAI prevention, thereby promoting patient safety, improving the quality of care, and reducing medical costs. The aim of this study was to investigate the effectiveness of hand hygiene knowledge, attitudes, and practices, as well as various hand hygiene methods, on the mean bacterial colony-forming unit (CFU) counts and the types of bacteria present on the hands of nurses. A total of 75 nurses from various clinical grades and departments within a hospital in southern Taiwan were included in the study. A self-administered questionnaire was used to assess the knowledge, attitudes, and practices of all participants regarding hand hygiene. Handprints of the dominant hand from each participant were pressed onto agar plates during the same clinical session at various time points: before contact with patients and the clinical environment, after contact with patients and the clinical environment, and after hand hygiene, using standard hand hygiene methods with either water and soap or alcohol, or nonstandard hand hygiene methods with either water and soap or alcohol. Bacterial colony-forming units (CFUs) on each plate were recorded and identified microbiologically. Our results indicated a positive correlation between attitude and practice ($r = 0.449$, $p < 0.01$). There was no significant difference in the mean CFUs of Gram-positive cocci (GPC), Gram-negative bacteria (GNB), and Gram-positive bacteria (GPB) among groups before contact with patients and the clinical environment**.** Following hand hygiene, the mean CFUs of GPC, GNB, and GPB were significantly decreased in all groups compared to counts after contact with patients and the clinical environment ($p < 0.05$). In addition, the mean CFUs of GPC following hand hygiene were significantly lower for the standard hand hygiene method compared to the nonstandard hand hygiene method ($p < 0.001$). There was no significant difference observed between standard hand hygiene methods using handwashing with water and soap and those using alcohol-based hand rubs. The effectiveness of both hand hygiene methods in reducing bacterial contamination on hands, along with the positive correlation between attitude and practice, suggests that continuous education and frequent training sessions are warranted to reinforce hand hygiene compliance and reduce cross-contamination.

P7.04

Cardiovascular Disease Risk in Cancer Survivors: A Systematic Review and Meta-Analysis

Manthar Ali Mallah, Zafar Iqbal

Mississippi Valley State University, Itta Bena, MS

Background: Cancer survivorship has significantly increased due to advances in early detection and treatment. Nevertheless, new research indicates that cancer survivors are more likely to develop cardiovascular disease (CVD), possibly as a result of lifestyle modifications, cancer treatments, and shared risk factors. It is essential to quantify this risk in order to guide therapeutic therapy and preventative measures.

Objective: The objective of this meta-analysis and systematic review is to thoroughly assess the relationship between cancer survival and the risk of cardiovascular disease, including heart failure, stroke, coronary artery disease, and other significant cardiovascular events, in the future.

Methods: The PubMed, Scopus, Web of Science, and EMBASE databases were used to do a thorough literature search from the beginning in January 2015 to July 2025. Studies that assessed the incidence or mortality of CVD in adult cancer survivors to non-cancer controls were considered eligible, as were observational cohorts and case-control studies. Using random-effects meta-analysis, data were combined to estimate hazard ratios (HR) or relative risks (RR) with 95% CI. The effects of treatment mode, follow-up time, and cancer type were examined by subgroup analysis.

Results: There were 80 studies with cancer survivors in all. Compared to controls, cancer survivors had a noticeably higher chance of getting cardiovascular disease (pooled RR = 1.45; 95% CI: 1.30-1.62). Several CVD outcomes showed elevated risks, with ischemic heart disease (RR = 1.38; 95% CI: 1.22-1.56) and heart failure (RR = 1.72; 95% CI: 1.40-2.12) showing very significant risks. According to subgroup studies, survivors with hematologic, lung, and breast malignancies as well as those undergoing cardiotoxic treatments including radiation and anthracyclines were at increased risk. Risk remained after therapy for five years.

Conclusions: Cancer survivors face a substantially increased risk of cardiovascular disease, underscoring the need for integrated survivorship care that includes cardiovascular risk assessment and management. Future studies should concentrate on efficient therapies and molecular mechanisms to reduce the risk of CVD in this susceptible group.

P7.05

A Preliminary Study: The Relationship Between Functional Reach, Arm Length, and Body Height in Undergraduate Students

Shavonda Jackson

Alcorn State University, Lorman, MS

The Functional Reach Test (FRT) is a simple and reliable test used in clinical and research settings to measure an individual's ability to maintain balance during forward reaching. While widely applied in assessing older adults or individuals with neurological impairments, its use among healthy young adults has received less scrutiny in terms of

proportional influences.

Previous studies (Duncan et al., 1990; Newton, 2001) have established normative values for the FRT, but few have explored the anthropometric factors that may affect outcomes. Misinterpretation of FRT scores may lead to inaccurate assumptions regarding postural stability. This study aims to determine whether functional reach distance is more strongly associated with arm length or body height than with trunk flexibility (bending at the waist). Using a sample of undergraduate students (n=80), the study will quantify arm length, body height, and FRT scores to analyze correlations between these variables. It is hypothesized that greater reach distances are primarily due to longer arm length and body height, rather than superior flexibility or core control.

P7.06

The Efficacy of Nano-hydroxyapatite in Caries Prevention

Headley, Mary Kyle; Thomas, Kaitlyn; White, Madisyn; Ybos, Kaitlyn; Welch, Kelsey

School of Dentistry Department of Dental Hygiene, University of Mississippi Medical Center, Jackson, MS

Objective: In dentistry, what is the effect of nano-hydroxyapatite compared to fluoride in caries prevention?

Introduction: Dental caries continues to be one of the most common chronic conditions worldwide, often resulting from shifts in the oral microbiome and acid production by *Streptococcus mutans* that contribute to enamel breakdown. With growing interest in biomimetic approaches, nano- hydroxyapatite (nano-HAp), a material closely resembling natural enamel, has gained attention as a potential alternative or complement to fluoride for supporting remineralization and managing early carious lesions.

Aim: This study aimed to assess the effectiveness of nano-HAp in arresting dental caries, identify optimal concentrations, and explore practical delivery methods. An additional goal was to help dental hygienists provide clear, evidence-based information on emerging preventive options.

Methods: Using the PICOS framework, a focused research question guided a thorough literature search across PubMed, Cochrane Library, and Google Scholar. Keywords included nano- hydroxyapatite, caries prevention, fluoride alternatives, artificial carious lesions, and remineralization. Studies that met inclusion criteria were independently reviewed, and findings were collected and summarized collaboratively.

Results: Current evidence indicates growing interest in nano-HAp, with overall positive trends. Toothpastes formulated with 10% nano-HAp showed remineralization and caries-preventive results similar to 1,000-ppm fluoride toothpaste. Nano-HAp gels at 250-400 parts per 1,000 enhanced calcium and phosphate availability and increased enamel hardness. Because nano-HAp is biomimetic, it helps replenish lost minerals and create a protective enamel-like layer, and it may offer an added benefit by avoiding the risk of fluorosis. Across studies, nano-HAp performed comparably or was non-inferior to fluoride in reducing early carious lesions.

Conclusion: Nano-hydroxyapatite demonstrates meaningful potential as an alternative option for early caries prevention and enamel repair, particularly at concentrations of 10% in toothpaste and 250 parts per 1,000 in gel formulations. While the available research is encouraging, additional studies are needed to better understand its influence on host response and to establish consistent clinical recommendations.

Acknowledgments: This review was supported by the Department of Dental Hygiene and the DH417 Evidence-Based Dental Hygiene course.

P7.07

Does Using AI Powered Tools Aid in A Healthier Outcome for Periodontally Involved Patients?

Harrison, Gillian; McGowan, Taylor; McNeese, Mary Daley; Wingfield, Maggie; Quon Brett,

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Objective: Can AI-powered periodontal imaging improve patient comprehension, engagement, and adherence?

Methods: A literature review was conducted to evaluate whether AI-powered tools improve periodontal health outcomes. Peer-reviewed articles from 2015–2025 were identified through PubMed, Google Scholar, and the Journal of Clinical Periodontology using terms related to AI and periodontal disease. Studies were included if they assessed AI applications in periodontal diagnosis, treatment planning, or patient education and provided outcome-based data. Each study was reviewed for diagnostic accuracy, reproducibility, and clinical improvements. A major limitation was the limited number of studies directly comparing AI systems with human clinicians.

Results: Across studies, AI systems consistently improved diagnostic precision and reduced variability in radiographic interpretation. Convolutional neural networks demonstrated high sensitivity for early bone-level changes, while machine-learning models enhanced reproducibility of periodontal assessments. The Videa Perio Assist platform showed strong performance in standardizing measurements of bone loss across clinicians. Use of these AI tools was associated with earlier detection of periodontal disease, more individualized treatment planning, and improved long-term outcomes including

reduced disease progression and decreased incidence of tooth loss.

Conclusion: Evidence indicates that AI-assisted diagnostic systems significantly strengthen the accuracy, consistency, and clinical utility of periodontal evaluations. While AI does not replace clinician expertise, it serves as a powerful adjunct that enhances precision in diagnosis and supports improved patient outcomes. Future studies should further evaluate real-world integration, compare AI with human-based diagnosis, assess cost-effectiveness, and diagram predictive capabilities of AI in periodontal care.

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P7.08

Dental Hygiene Strategies for Autistic Patients

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Objective: In patients with autism spectrum disorder, how do dental hygiene strategies such as visual aids and caregiver involvement, compared with standard dental hygiene care, influence patient cooperation?

Methods: Autism spectrum disorder (ASD) is a neurodevelopmental condition associated with challenges in communication, atypical sensory processing, and behavioral differences, all of which can significantly impact dental care. To investigate evidence-based strategies that improve dental experiences for autistic patients, a comprehensive literature search was conducted as part of an Evidence-Based Dental Hygiene research project. Scholarly databases, including PubMed, EBSCO Research, and Google Scholar, were systematically searched using terms such as autism, behavioral management, visual aids, caregiver involvement, and dental care. Articles selected for inclusion represented a range of study designs including systematic reviews, observational studies, mixed-methods analyses, qualitative research, and interventional trials. Data were extracted regarding patient characteristics, sensory and behavioral factors influencing dental visits, and the effectiveness of various intervention strategies, particularly visual supports and

caregiver-assisted approaches.

Results: Across the reviewed studies, individuals with ASD were found to exhibit heightened sensory sensitivities, elevated dental anxiety, and lower tolerance for unfamiliar procedures,

which often resulted in poor cooperation, increased caries risk, periodontal concerns, and occasional self-injurious or avoidant behaviors during dental treatment. Evidence consistently demonstrated that structured behavioral and visual strategies significantly improved treatment outcomes. Visual aids such as picture schedules, step-by-step guides for toothbrushing and dental appointments, and video-based modeling were shown to reduce fear, enhance predictability, and increase patient engagement. Caregiver involvement further strengthened patient cooperation by reinforcing routines and facilitating gradual desensitization. Studies reported increases in successful dental visits, better home-care behaviors, and reduced reliance on general anesthesia when visual pedagogy and caregiver participation were integrated into care plans. Both home-based and clinical interventions using visual tools improved communication, behavior, and oral hygiene performance.

Conclusion: The findings across multiple research designs strongly support the use of individualized visual aids and caregiver involvement as effective, evidence-based strategies to improve dental outcomes for patients with ASD. By addressing the unique sensory, communicative, and behavioral needs of autistic individuals, dental professionals can create dental experiences that are more accessible, predictable, and successful. These approaches not only enhance cooperation during appointments but also strengthen long-term oral health habits, underscoring their essential role in patient-centered dental hygiene care.

Acknowledgements: This review was supported by the Department of Dental Hygiene and the DH417 Evidence-Based Dental Hygiene course.

P7.09

Benefits of Providing Oral Education to Caregivers of Patients with Dementia

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Objective: In patients with progressive cognitive decline, what is the effect of professional oral hygiene programs compared to routine daily care provided in long-term care facilities on maintaining oral health and preventing periodontal disease?

Methods: This review aimed to identify effective oral health education strategies for caregivers of patients with dementia. Articles published between 2020 and 2025 were searched in PubMed using the terms Alzheimer's, periodontal disease, dementia, and oral hygiene. Twelve articles were identified, and six were selected precisely based on their relevance to oral hygiene instruction for those with dementia, including systematic reviews and randomized controlled trials. Observations indicated that caregiver training programs, simplified oral hygiene

protocols, and hands-on instruction improved overall oral health care practices with patients with cognitive decline. Several studies reported a significant relationship between poor oral hygiene and periodontal disease. Collectively, these articles highlighted the essential link between effective caregiver education and positive oral health outcomes for patients with cognitive decline.

Results: Caregiver education produced several benefits, including increased time spent on oral care, greater confidence and knowledge, and improved patient oral health, such as reduced plaque and gum inflammation. It also helped caregivers recognize oral hygiene as an essential daily activity, and oral care guides were added to patient records for easy access. However, challenges were noted, including increased patient resistance, legal limits in nursing homes when patients refused care, ongoing caregiver difficulties, and limited diversity in the studies.

Conclusion: Studies show that educating caregivers improves oral health in dementia patients by reducing resistant behaviors, increasing time spent on oral care, and boosting caregiver knowledge. However, the research is limited by small sample sizes, focus on assisted-living settings, and lack of comparison across dementia severity. More comprehensive studies are needed for stronger conclusions.

Acknowledgement: Supported by the Department of Dental Hygiene and the DH417 Evidence-Based Dental Hygiene course.

P7.10

Curodont Repair: A Non-invasive Approach to Early Caries

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Objective: In patients with early carious lesions, does Curodont Repair, compared to fluoride therapy, prevent lesion progression over 6–12 months?

Methods: A comprehensive literature review was performed to assess the safety and effectiveness of Curodont™ Repair Fluoride Plus. Curodont™ was compared with standard treatments including fluoride varnish, silver diamine fluoride, and chlorhexidine. Relevant studies were identified through searches of PubMed, Google Scholar, Scopus, and ScienceDirect using keywords such as Curodont, P11-4, remineralization, white spot lesions, fluoride varnish, and silver diamine fluoride. Although silver diamine fluoride was not an initial search term, it was ultimately included due to its frequent appearance in related studies.

Results: Curodont™ Repair Fluoride Plus offers a non-invasive method for managing early caries by promoting enamel remineralization through the self-assembling peptide P11-4. Compared with traditional treatments, it demonstrated a favorable balance of high effectiveness (approximately 90% remineralization) and moderate safety (60% cytotoxicity). SDF showed the highest antibacterial activity but was the least safe overall due to staining and elevated cytotoxicity (20% safety). Curodont™ exhibited no measurable antibacterial effect, distinguishing it from SDF. Overall, Curodont™ appeared safe and effective, especially when paired with fluoride to enhance remineralization, though additional research is needed to clarify its soft-tissue safety profile.

Conclusion: Curodont™ Repair Fluoride Plus shows strong potential as a safe and effective remineralizing option for early enamel lesions. It supports a minimally invasive and esthetically favorable approach by facilitating enamel regeneration rather than relying primarily on antibacterial action. Although one study reported possible gingival cytotoxicity, Curodont™ generally supported healthy cell growth, indicating good overall biocompatibility. Future research should explore long-term clinical outcomes, ideal application protocols, and risks associated with soft-tissue exposure.

Acknowledgment: This project was supported by the Department of Dental Hygiene and the DH417 Evidence-Based Dental Hygiene course.

P7.11

Ghost Cell Odontogenic Carcinoma of the Anterior Mandible: A Case Report

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Introduction: Ghost Cell Odontogenic Carcinoma (GCOC) is an extremely rare malignant odontogenic tumor. It can develop de novo or arise from benign precursors, such as calcifying odontogenic cysts (COC) or dentinogenic ghost cell tumors (DGCT). This tumor is known for its local aggressiveness and high recurrence rates, with fewer than 50 cases reported worldwide. We present a case of anterior mandibular GCOC in a 32-year-old female highlighting the clinical presentation, imaging and histopathologic findings, surgical management, and follow-up.

Case Presentation:

Clinical History: A 32-year-old female presented with a progressively enlarging mass on the lower gingiva in the anterior mandible, first noticed in January 2024. She denied pain, numbness, discharge, fever, or other systemic symptoms. On examination, mild mandibular prognathism and oral incompetence (~2-3 mm), while temporomandibular joint function was normal. Intraorally, there was a bulbous, granular, erythematous gingival growth measuring 2.5 × 3 × 1.5 cm, spanning teeth #21-27.

Imaging: CT imaging demonstrated a 5 cm expansile, destructive lytic lesion involving the mandibular symphysis, with extension into premandibular soft tissues. Bilateral moderately enlarged level 1B lymph nodes and a 0.3 cm left level 2A lymph node was observed.

Histopathologic Findings: Histopathologic examination of the resected anterior mandible (5.9 × 5.5 × 4.0 cm) revealed a tan-white, exophytic mass infiltrating both bone and oral mucosa. There was solid-to-cystic basaloid proliferation in trabecular and plexiform patterns, with basaloid cells transitioning to a spindled morphology and intermixed stellate reticulum-like cells. Peripheral palisading and areas of "wet keratin" with ghost cells were present. Mild to moderate nuclear pleomorphism, elevated mitotic activity, and focal necrosis were observed. Immunohistochemistry showed LEF-1 positivity, while BRAF V600E, RAS Q61R, and nuclear β-catenin were negative; p53 was wild-type. These features were consistent with ghost cell odontogenic carcinoma.

Outcome and Follow-Up: The patient's recovery was uneventful. Follow up, clinical and radiographic assessments showed no evidence of recurrence. Given the high reported recurrence rates of up to 63%, long-term surveillance for at least five years is recommended.

Discussion: GCOC is a rare, locally aggressive tumor defined by ghost cells—eosinophilic, anucleate epithelial cells, possibly resulting from ischemic degeneration or metaplastic changes. Ghost cells are not unique to GCOC and may also occur in pilomatricoma, craniopharyngioma, odontoma, and ameloblastic fibro-odontoma. About 55% of GCOC cases arise de novo, while approximately 32.5% result from malignant transformation of pre-existing lesions. Accurate diagnosis requires thorough sampling to identify malignant epithelial components alongside features of precursor lesions. The five-year survival rate is roughly 73%, though long-term outcomes remain uncertain. Wide surgical excision with clear margins is the primary treatment, with adjuvant radiotherapy used selectively.

Conclusion: GCOC is a rare and aggressive tumor that requires early detection. Diagnosis depends on integrating clinical, imaging, and histopathologic findings. Wide surgical excision with reconstruction is the mainstay of treatment, and careful long-term follow-up is crucial to detect recurrence. Reporting additional cases will improve understanding and guide future management strategies.

P7.12

Solid Papillary Carcinoma of the Breast: A Case Report Highlighting Radiologic-Pathologic Discrepancy and Sampling Importance

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Solid papillary carcinoma (SPC) accounts for approximately 1% of breast tumors, predominantly occurring in older females. It is characterized by a well-circumscribed, tan-pink mass composed of nodules with round to ovoid epithelial cells with low to intermediate nuclear grade and inconspicuous fibrovascular cores. SPC demonstrates in-situ and invasive component, with stromal invasion defining its malignant potential.

We present the case of a 78-year-old female who discovered a palpable knot in her right breast, during a self-examination. On physical examination, tethering of the right lower outer quadrant with a firm, movable mass approximately 5 cm in diameter was noted.

Mammogram demonstrated a BIRADS 5 irregular solid mass measuring 20.4 mm at the 12 o'clock position near the chest wall, with scattered areas of fibroglandular density. Ultrasound revealed a 3.7 cm hyperdense oval mass with spiculated margins at the 8 o'clock position, posterior third, 9 cm from the nipple. MRI was considered to rule out pectoralis invasion; no abnormal lymphadenopathy was detected. Discrepancies were noted between imaging and clinical findings, as the palpable abnormality at 12 o'clock lacked a corresponding suspicious correlate.

Invasive ductal carcinoma with solid papillary and mucinous features, grade 2 with ER 100% positive, PR 80% positive, and HER2 negative was diagnosed on core biopsy.

Excisional biopsy demonstrated a well-circumscribed, firm, tan-white lesion (3.5 × 2.8 × 2.4 cm) with pushing borders. The specimen measured 6.8 cm mediolaterally and was serially sectioned into seven 1.3 cm slices. The invasive disease was present in 4 slices with size of 52 mm. The solid papillary carcinoma in situ component measured 50-55 mm, grade 2, and involved the medial margin (positive for in-situ carcinoma). The staging per AJCC 8th edition was pT3N0.

Post-op pathology demonstrated a more extensive disease than expected based on preoperative imaging. A re-excision of the medial margin revealed residual in-situ disease with negative, final margins (<1 mm).

In our case, radiology estimated a 2-3.7 cm lesion at the 12 o'clock position, while gross pathology identified a 3.5 cm lesion at 8 o'clock. Final histology revealed a 5-5.5 cm in-situ component and 5.2cm of invasive disease, extending to the medial margin. This highlights the potential for imaging and gross examination to underestimate disease extent, particularly in SPC, where the in-situ component may merge imperceptibly with adjacent parenchyma.

Despite its often-indolent behavior, SPC can present with

extensive in-situ disease requiring meticulous sampling and correlation between imaging and pathology. The well-circumscribed appearance may mask microscopic spread, and incomplete excision can result in recurrence.

Therefore, comprehensive gross sampling and radiologic-pathologic correlation are essential for accurate tumor sizing, margin evaluation, and determining the need for re-excision.

SPC carries an excellent prognosis, when completely excised and managed with subsequent therapy even in cases with larger tumor size or limited invasive components.

P7.13

Atypical Parathyroid Adenoma vs. Carcinoma: A Diagnostic Dilemma in a Parathyroid Lesion

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Background: Primary hyperparathyroidism (PHPT) is most commonly caused by benign parathyroid adenomas; however, distinguishing atypical adenomas from carcinoma can be challenging due to overlapping clinical, biochemical, and histopathologic features. We report a case of a parathyroid neoplasm with atypical histologic and immunohistochemical findings suggestive of parathyroid carcinoma.

Case Presentation: A 50-year-old male with a history of recurrent nephrolithiasis presented for evaluation of hypercalcemia. Laboratory testing revealed serum calcium level of 10.7 mg/dL. Concurrent measurement of parathyroid hormone (PTH) demonstrated an elevated level of 123 pg/mL, consistent with primary hyperparathyroidism.

A sestamibi parathyroid scan was performed, which showed focal delayed tracer uptake located inferior to the left thyroid lobe. These imaging findings were highly suggestive of a left inferior parathyroid adenoma. Based on these results, the patient was scheduled for parathyroidectomy.

During surgery, a 2.0 cm parathyroid lesion was identified and successfully excised. Intraoperative PTH monitoring revealed a baseline level of 134 pg/mL. Ten minutes after excision, PTH decreased to 36.2 pg/mL, representing a 73% reduction from baseline. Fifteen minutes post-excision, PTH further declined to 29.2 pg/mL, a total decrease of 78.3%, confirming biochemical cure.

Pathologic Findings: Gross examination revealed a 1.5 cm, 1200 mg firm, gray-white mass—markedly exceeding the normal parathyroid size and weight.

Microscopically, there was a sheet-like proliferation of parathyroid cells which exhibit many atypical features such as mashroom like extension of neoplasm through fibrous band into benign parathyroid tissue. Monotonous nuclei with mild but diffuse nuclear atypia, increased mitotic activity with occasional atypical mitoses and apoptotic cells. There was no definite lympho- vascular, or perineural invasion identified.

Immunohistochemistry showed complete loss of parafibromin expression, positivity for galectin-3, elevated MIB-1 proliferation index (10%), retained Rb, and wild-type p53. These findings along with histopathological features consistent with a well differentiated parathyroid carcinoma.

Outcome and Follow-up: Postoperatively, the patient demonstrated normalization of calcium and PTH levels and remains clinically well with no evidence of recurrence or nephrolithiasis at follow-up.

Conclusion: Differentiating atypical parathyroid adenoma from parathyroid carcinoma can be challenging. Histopathology plays a critical role, as features such as mushroom-like capsular invasion, increased mitotic activity, and nuclear atypia support a diagnosis of parathyroid carcinoma rather than atypical adenoma—especially in patients who have only borderline hypercalcemia, moderately elevated PTH levels, and low clinical or radiologic suspicion. Loss of parafibromin and galectin-3 positivity may serve as useful adjunct markers in distinguishing atypical adenomas from parathyroid carcinoma.

P7.14

Mucinous Non-Neoplastic Cyst of the Pancreas associated with Autoimmune Pancreatitis: A Rare Case Report and Literature Review

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Introduction: Cystic lesions of the pancreas are commonly encountered due to increased use of cross-sectional imaging. These lesions can be broadly categorized as neoplastic or non-neoplastic. Mucinous non-neoplastic cysts (MNCs), first described by Kosmahl et al. in 2002, are rare, benign, cyst-forming mucinous lesions of the pancreas. Radiologically, it can closely resemble MCN or IPMN, posing a diagnostic challenge. Herein, we present a rare case of MNC occurring in a background of autoimmune pancreatitis (AIP), highlighting its distinguishing clinical, radiologic, and pathologic features.

Case Report: A 67-year-old male with hypertension, gastroesophageal reflux disease, dyslipidemia, and hypogonadotropic hypogonadism was incidentally found to have a 6 cm cystic pancreatic mass on computed tomography (CT). He was asymptomatic, denying abdominal pain, nausea, vomiting, diarrhea, or weight loss, and had no history of pancreatitis. CT demonstrated a

multiloculated cyst arising from the pancreatic tail, measuring 6.2 cm, concerning for a mucinous cystic neoplasm. Endoscopic ultrasound (EUS) demonstrated a 34 × 46 mm pancreatic tail cyst. Fine-needle aspiration yielded acellular fluid, rendering cytology nondiagnostic. Laboratory studies showed elevated carcinoembryonic antigen (7.73 ng/mL), leukocytosis (15.38 × 10^9/L), and amylase (208 U/L).

The patient underwent robotic distal pancreatectomy with splenectomy. Grossly, on serial sectioning, an irregular, multiloculated cyst measuring 6.1 × 4.0 × 3.2 cm, was identified, with a thick fibrotic wall containing calcified material. No communication with the pancreatic duct was identified. Microscopically, the cyst wall was lined by benign mucinous epithelium with reactive changes and extensive acute inflammation. No cytologic atypia or dysplasia was seen. Immunohistochemistry showed negative estrogen receptor (ER) in subepithelial stroma, confirming the lack of ovarian type stroma and a wild type p53 expression in the mucinous epithelium. Notably, there was an increased number of IgG4-positive plasma cells (up to 60 per high-power field). Serum total IgG (1592 mg/dL) and IgG subclass 4 (87.9 mg/dL) were elevated, supporting a diagnosis of autoimmune pancreatitis. These findings support a diagnosis of mucinous non-neoplastic cyst of the pancreas associated with autoimmune pancreatitis.

Discussion: MNCs are uncommon benign cystic lesions that can mimic MCNs and IPMNs both radiologically and grossly. They are typically unilocular or multilocular, range from 0.5-3.5 cm, and often arise in the pancreatic head. They are lined by mucinous cuboidal to columnar epithelium without communication with the pancreatic duct and lack ovarian-type stroma. EUS-FNA may help exclude malignancy; however, cyst fluid CEA levels are not reliable in distinguishing benign from malignant cysts.

Autoimmune pancreatitis (AIP) is a fibroinflammatory condition characterized by elevated serum IgG4 and infiltration of IgG4-positive plasma cells. Cystic changes in AIP are rare and usually manifest as pseudocysts or retention cysts secondary to ductal obstruction but an association between MNC and AIP has not been previously described. The chronic inflammatory milieu of AIP may contribute to cystic transformation in the pancreatic parenchyma.

Conclusion: MNCs are rare benign pancreatic lesions that can closely mimic mucinous cystic neoplasms. This case is notable for its coexistence with autoimmune pancreatitis—a previously unreported association—highlighting the importance of accurate workup and diagnosis.

P7.15

Primary Myoepithelial Carcinoma of the Toe Bone: A Rare Case Report

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Introduction: Myoepithelial tumors are a heterogenous group of neoplasms showing myoepithelial differentiation without glandular or ductular features. The malignant counterpart, called myoepithelial carcinoma (MEC), is an aggressive lesion, with primary bone involvement being extremely rare. We present a case of MEC arising in the proximal phalanx of the second toe, emphasizing the clinicopathologic characteristics and the importance of prompt diagnosis and treatment.

Case report: A 45-year-old female with hypertension presented with throbbing, sharp pain in the right foot and toe that began 4 months earlier, with a severity of 7-9, aggravated by standing and activity. There was no history of trauma or injury. Examination revealed mild ecchymosis over the dorsal and plantar aspect of the second toe metatarsophalangeal joint (MTP), with moderate tenderness to palpation. Imaging showed an aggressive expansile lesion involving the second toe proximal phalanx of the right foot with extensive osseous destruction and adjacent soft tissue swelling. An incisional biopsy showed epithelioid-to-spindle-shaped cells with moderate nuclear atypia, prominent nucleoli, and mitoses. Immunohistochemistry (IHC) revealed positive staining for broad-spectrum cytokeratin, S-100, and SOX-10, with patchy SMA positivity. These findings were consistent with a diagnosis of myoepithelial carcinoma of the right second toe. The patient underwent intralesional resection of the right second toe proximal phalanx with a plan for adjuvant radiation therapy and a follow-up PET-CT imaging.

Discussion: Soft tissue and bone myoepithelial carcinomas (MEC) are rare entities that, although histologically resembling the salivary gland counterparts, are genetically distinct. They typically occur between the third and fifth decades of life, with no gender predilection. Histologically, MECs have variable morphology, composed of nests or cords of spindle, epithelioid, clear, squamous, or plasmacytoid cells embedded within a fibrous, hyaline, or myxoid stroma. The most distinctive feature of MEC is the presence of at least moderate nuclear atypia, with prominent nucleoli serving as a diagnostic hallmark. These tumors also demonstrate a high mitotic rate and necrosis, but these findings alone are insufficient for diagnosis. On IHC, they typically express S-100, Cytokeratin, and EMA, along with variable positivity in SMA, GFAP, Calponin, and SOX-10. Molecularly, approximately half of the cases harbor EWSR1 rearrangements, identified by FISH or

next-generation sequencing (NGS) with common fusion partners including POUF51, PBX1, and PBX3.

Clinically, MECs have very aggressive behavior with recurrence in 42% and distant metastasis in up to 52% of cases. The mainstay of treatment is wide surgical excision with long-term follow-up. In our case, on follow-up, PET-CT scan revealed a hypermetabolic right inguinal node suspicious for regional nodal disease, with no evidence of distant metastasis. A lymph node biopsy was planned for further evaluation.

Conclusion: MEC of the bone, particularly small bones of the extremities, is rare and poses significant diagnostic challenges. This case report highlights the characteristic histologic and immunohistochemical features for accurate recognition. Due to the highly aggressive nature, early recognition, a multidisciplinary approach to management, and long-term follow-up are necessary to evaluate for local recurrences and distant metastasis.

P7.16

Eosinophilic Cholecystitis Presenting as Abdominal Pain with Cholelithiasis

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Introduction: Eosinophilic cholecystitis (EC) is a rare histopathological variant of cholecystitis, characterized by a dense eosinophilic infiltration of the gallbladder wall. It may be associated with allergies, parasitic infections, medications, or idiopathic causes. Clinical presentation often mimics acute or chronic cholecystitis, making preoperative diagnosis challenging. We present a case of eosinophilic cholecystitis in a patient with a background of asthma, allergies, and history of steroid use.

Case Presentation: A 64-year-old female with a past medical history of asthma, allergies, and prior nasal polyp excision presented with severe abdominal pain, nausea, and vomiting. One week prior, she developed epigastric pain for which her primary care provider prescribed medications that she could not recall. Her symptoms persisted, and she was evaluated at an outside emergency department 4 days prior, where she was diagnosed with pancreatitis, cholelithiasis, and urinary tract infection. She was discharged on oral Keflex, Zofran, and Norco.

Despite compliance with medications, she reported progressive abdominal pain and persistent nausea with frequent vomiting, resulting in inability to tolerate oral intake. The pain was described as severe (9/10), epigastric, radiating around the upper abdomen. She denied fever, chills, chest pain, dyspnea, dysuria, or flank pain.

Review of Systems: Notable for abdominal pain, nausea, vomiting, and diarrhea. She denied hematochezia, melena, or constipation.

Physical Examination: Afebrile and hemodynamically stable. Abdominal exam revealed right upper quadrant and epigastric tenderness without guarding, rebound, or costovertebral angle tenderness.

Laboratory Findings: Ketonuria, proteinuria, elevated hyaline casts. Normal lactate, lipase, and liver function tests

Imaging: **Ultrasound Gallbladder**: Cholelithiasis without cholecystitis, common bile duct borderline prominent (6.9 mm). **CTA Abdomen/Pelvis**: Cholelithiasis without cholecystitis, no mesenteric ischemia, small volume free pelvic fluid of uncertain etiology.

Clinical Differential Diagnosis: Cholecystitis, pancreatitis, urinary tract infection, hepatitis, peptic ulcer disease, gastritis, gastroesophageal reflux disease, bowel obstruction.

Hospital Course: Given the persistence of symptoms and imaging findings, the patient underwent cholecystectomy.

Pathology: **Gallbladder (cholecystectomy specimen)**: Eosinophilic cholecystitis with cholelithiasis.

Discussion: Eosinophilic cholecystitis is a rare condition comprising less than 1% of cholecystitis cases. It is histologically defined by dense transmural eosinophilic infiltration of the gallbladder wall. The exact pathogenesis remains unclear but has been associated with allergic conditions, parasitic infections, drug reactions, and systemic hypereosinophilic syndromes. In this patient, the history of asthma, allergies, nasal polyps, and prior steroid therapy suggests a possible allergic or immune-mediated mechanism.

Clinically and radiologically, EC is indistinguishable from other forms of cholecystitis. Diagnosis is usually made retrospectively on histopathological examination. Treatment consists of cholecystectomy, which is curative in most cases.

Conclusion: This case highlights eosinophilic cholecystitis as a rare histological diagnosis in a patient with a background of allergic disease. It emphasizes the importance of histopathological evaluation in gallbladder specimens to identify uncommon variants that may have underlying systemic associations.

P7.17

Importance of Updating the Breakpoints for *Pseudomonas aeruginosa* Susceptibility Testing at University of Mississippi Medical Center

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Background: Antimicrobial resistance in *Pseudomonas aeruginosa* continues to rise, and outdated breakpoints can misclassify resistant isolates as susceptible, leading to treatment failure and poor patient outcomes. The Clinical and Laboratory Standards Institute (CLSI) regularly revises the breakpoints for the antimicrobial agents to consider the increasing resistance trends for various microbial agents. This study aims at implementing the current breakpoints for the susceptibility testing to accurately detect resistance at these lower thresholds so that it can be adopted clinically.

Methods: Various patient *Pseudomonas aeruginosa* isolates and CDC Antibiotic Resistance (AR) Bank isolates were tested on Vitek antibiotic susceptibility (AST) N806 and XN30 cards for piperacillin/tazobactam, cefepime, ceftazidime, amikacin (urine only), and tobramycin. For each drug, around 25-30 isolates were used for the verification. Results were compared to AR Bank Minimum Inhibitory Concentration (MIC) data, disk diffusion, and Mayo Clinic MICs. Routine quality control using ATCC strains ensured accuracy across testing runs and technologists. Categorical agreement (CA), minor errors (mE), and major/very major errors (ME, VME) were evaluated using Clinical and Laboratory Standards Institute (CLSI) M52 criteria.

Results: Quality control values were consistently within CLSI-acceptable ranges. Across all five antibiotics, categorical agreement exceeded CLSI acceptability thresholds: 96% for Piperacillin/tazobactam, 100% for Cefepime, 97% for Ceftazidime, 100% for Amikacin (urine isolates only) and 100% for Tobramycin. No major errors or very major errors were observed. Minor errors ranged from 0-4% and fell within acceptable limits.

Conclusion: Transitioning to updated CLSI breakpoints improves detection of resistance in *P. aeruginosa* and enhances antibiotic accuracy. The Vitek AST N806/XN30 system performed acceptably with revised breakpoints, supporting safe implementation for routine patient testing. Updating breakpoints strengthens antimicrobial stewardship, reduces the risk of ineffective therapy, and improves patient safety in Mississippi.

P7.18

Primary Pancreatic Paraganglioma- A Rare Diagnosis

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Introduction: Paragangliomas are rare neuroendocrine tumors arising from paraganglia of the autonomic nervous system. While most occur in the head, neck, or sympathetic chain, *intra-pancreatic paragangliomas are exceptionally uncommon*, with only isolated cases reported. Because pancreatic neuroendocrine tumors (PNETs) are far more frequent and share overlapping morphologic and immunohistochemical features, distinguishing paraganglioma from PNET is clinically important for surgical planning, surveillance, and potential genetic counseling. We present a rare case identified at our institution.

Case Presentation: A 76-year-old man with a history of myocardial infarction and chronic atrial fibrillation was evaluated for a new pancreatic mass after two weeks of epigastric pain. Ultrasound suggested a pancreatic lesion; CT revealed a 4.3 × 3.5 cm homogeneously enhancing solid mass in the pancreatic neck/head. No jaundice, weight loss, glycemic change, or gastrointestinal symptoms were reported.

EUS-guided FNA showed hypercellular smears with monomorphic tumor cells containing granular cytoplasm and enlarged nuclei in a hemorrhagic background. Immunostains demonstrated strong synaptophysin and chromogranin positivity with a low Ki-67 index, consistent with a pancreatic neuroendocrine neoplasm. The patient subsequently underwent elective central pancreatectomy.

Pathology: Gross examination showed a 5.3 × 5.0 × 4.1 cm pancreatic segment with a 4.7 cm cystic cavity filled with clotted blood.

Microscopically, the lesion consisted of a *pancreatic extra-adrenal paraganglioma*. The tumor was unifocal, without necrosis, soft-tissue invasion, vascular/lymphatic invasion, or nodal involvement (0/2). Margins were negative, with <0.1 cm clearance. Ki-67 index was 1.6%. Immunohistochemistry showed synaptophysin, INSM1, and chromogranin positivity, with abundant S-100-positive sustentacular cells. CAIX negativity argued against VHL-associated disease. Pathologic stage: pT1 N0.

Discussion: Primary pancreatic paragangliomas are exceedingly rare and frequently mimic PNETs on imaging, cytology, and immunostaining. Strong neuroendocrine marker expression led to an initial FNA diagnosis of PNET, but the resected tumor's classic architecture and sustentacular cell pattern confirmed paraganglioma. Distinguishing nonfunctional paragangliomas from PNETs can be difficult, as both may appear as hypervascular pancreatic masses with neuroendocrine features. Demonstration of S-100-positive sustentacular cells remains essential when evaluating atypical or hemorrhagic lesions. Pancreatic paragangliomas typically appear as well-defined, hyperenhancing masses and may show cystic or hemorrhagic change. The absence of obstructive jaundice or significant ductal dilation—as in our patient—can help differentiate them from more common pancreatic malignancies.

Management: Given limited data, complete surgical excision remains the preferred treatment. Negative margins and low proliferative index in this case suggest favorable prognosis, although the very close margin warrants

continued surveillance.

Genetic considerations: Paragangliomas may be associated with hereditary syndromes (e.g., SDH mutations). Although CAIX negativity lessens the likelihood of VHL-related disease, genetic counseling may be appropriate depending on clinical context.

Follow-up: Even histologically benign-appearing paragangliomas may recur; thus, long-term monitoring is recommended.

Conclusion: This case of primary pancreatic paraganglioma, initially interpreted as a PNET on cytology, highlights the importance of considering paraganglioma in the differential diagnosis of pancreatic neuroendocrine lesions. Accurate recognition relies on histologic architecture and sustentacular cell staining. Complete resection and ongoing follow-up remain critical as collective experience with this rare tumor grows.

P7.19

A Unique Case of Concurrent Acute Cellular Rejection and Biliary Obstruction After Liver Transplantation

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Introduction: Elevated liver enzymes are common after liver transplantation. Differential diagnosis includes acute cellular rejection (ACR), infection, biliary obstruction, vascular compromise, drug toxicity, and recurrent disease. ACR is frequently confirmed using Banff criteria, but biliary complications—especially anastomotic strictures—also occur commonly and can mimic rejection both clinically and biochemically. Distinguishing between these processes is essential, as rejection requires intensified immunosuppression, whereas obstruction requires mechanical intervention. We report a case in which biopsy suggested severe ACR, yet the clinical course ultimately revealed a tight choledocho-choledochostomy stricture with choledocholithiasis. A repeat biopsy following biliary decompression showed no rejection.

Case Presentation: A 67-year-old woman with type 2 diabetes, CKD3b, and MASH cirrhosis status post orthotopic liver transplant (January 2022, duct-to-duct anastomosis) presented after routine labs showed significantly elevated liver enzymes. She was asymptomatic and reported adherence to tacrolimus and mycophenolate.

Initial Evaluation: Outpatient labs showed ALT 438 U/L, AST 343 U/L, ALP 461 U/L, and total bilirubin 2.1 mg/dL. Tacrolimus levels were subtherapeutic. CMV and EBV PCR were negative, and ultrasound was nondiagnostic. Given the mixed hepatocellular and cholestatic pattern, ACR was suspected.

Initial Liver Biopsy:

Histology demonstrated:• Dense portal lymphocytic inflammation (3/3), Endothelial inflammation of portal and central veins (3/3), • Bile duct epithelial injury (2/3), Mild-moderate lobular inflammationBanff Rejection Activity Score was 8/9, consistent with severe ACR.

Management and Clinical Course: The patient received IV methylprednisolone 500 mg ×2 and increased tacrolimus dosing (goal trough 8-10 ng/mL). Despite treatment, liver tests worsened, with ALP peaking at 1251 U/L and bilirubin at 10.8 mg/dL.

A repeat biopsy two weeks later showed marked centrilobular cholestasis, bile plugs, feathery degeneration, mild neutrophilic inflammation, minimal portal inflammation, and no evidence of ACR—findings consistent with biliary obstruction.

ERCP Findings: • Very tight anastomotic stricture, Extraction of 2-3 mm bile duct stones, • Sphincterotomy for papillary stenosis, • Placement of 10 Fr × 9 cm plastic biliary stent with excellent drainage

These findings confirmed biliary obstruction as the primary cause of injury, with improvement of biochemical tests over the following days.

Discussion: This case illustrates the diagnostic complexity of post-transplant liver enzyme elevation. Although the initial biopsy met criteria for severe ACR, the lack of biochemical improvement prompted reassessment. Key points include:

Biliary obstruction can mimic or coexist with ACR. Banff criteria may indicate rejection even when obstruction predominates.

Steroid-refractory "rejection" warrants biliary evaluation. Anastomotic strictures occur in up to 15% of duct-to-duct transplants.

Diagnosis requires integration of clinical course, imaging, and pathology. No single data point is sufficient.

Repeat biopsy is valuable when trajectory and histology diverge.

Conclusion: A biopsy suggesting severe ACR initially guided treatment, but the patient's failure to respond revealed a tight biliary anastomotic stricture with choledocholithiasis. Repeat biopsy after decompression confirmed absence of rejection. This case emphasizes the need to consider biliary obstruction early in steroid-refractory post-transplant enzyme elevation and highlights the importance of multidisciplinary evaluation.

P7.20

Metastatic Melanoma Masquerading as Renal Cell Carcinoma: A Case Report

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Introduction: The gross and microscopic appearance of high-grade carcinoma or poorly differentiated tumors involving the kidney can be difficult to distinguish from a primary high-grade renal carcinoma. This challenge is further amplified in the absence of a pertinent clinical history or imaging findings, in which a primary renal malignancy would often be favored. Importantly some high-grade renal tumors, particularly translocation RCC or fumarate-hydratase-deficient RCC, may be keratin-negative or keratin-shy, further complicating evaluation. We report a case of metastatic malignant melanoma to the kidney presenting over a decade after initial melanoma diagnosis and initially presumed to be renal cell carcinoma (RCC). This case underscores the importance of maintaining metastatic disease in the differential diagnosis of poorly differentiated renal tumors, especially when histologic appearance is nonspecific.

Case Presentation: A 76-year-old man with grade group 3 prostate cancer status post post-prostatectomy (2015), squamous cell carcinoma of the right forearm (2016), and COPD presented with a rapidly enlarging left renal mass. He denied hematuria, flank pain, or systemic symptoms. Initial CT (January 2025) revealed an ill-defined left renal mass with perinephric inflammation and retroperitoneal adenopathy, suggestive of RCC. Three months later, repeat CT showed a markedly enlarged mixed cystic-solid lesion (10.9 × 13.3 × 18.2 cm) replacing most of the kidney and abutting the spleen, adrenal gland, pancreatic tail, and colon, without renal vein or IVC thrombus. The patient underwent open radical nephrectomy with adrenalectomy.

Pathologic Findings: Grossly, the nephrectomy specimen measured 24.9 × 17.4 × 10.9 cm (2155 g). The tumor (18.1 × 11.2 × 8.0 cm) was tan-white, cystic-solid, extensively necrotic, replacing most renal parenchyma, and infiltrating the adrenal gland and renal sinus. Microscopically, sheets of pleomorphic epithelioid cells with prominent nucleoli, eosinophilic to clear cytoplasm, frequent mitoses, multinucleated giant cells, and extensive necrosis were observed. Tumor invaded perinephric fat, renal sinus, and adrenal gland; one of seven hilar lymph nodes contained metastatic tumor with extranodal extension. Given the undifferentiated morphology, a broad differential diagnosis was pursued. An initial panel—PAX8, CK7, CAIX, GATA3, CD45, broad-spectrum keratins, and NKX3.1—was negative. A second panel with repeated keratins remained negative. Additional stains revealed strong, diffuse expression of SOX10, S100, and MART-1, supporting melanoma. Sequencing detected no pathogenic mutations in ***BRAF*** or ***KIT*.**

Final Diagnosis: High-grade malignant epithelioid neoplasm consistent with metastatic melanoma: 18.1-cm tumor nearly replacing the kidney, invading adrenal and perinephric fat, one of seven hilar nodes positive, with negative margins.

Conclusion: The differential diagnosis of poorly differentiated malignant renal tumors has broadened and now includes several entities that may be keratin-negative or keratin-shy. Although metastatic melanoma to the kidney is rare, it should be considered in any patient with a personal history of melanoma—regardless of how remote—especially when a renal mass appears aggressive or poorly differentiated. Imaging and routine histology alone cannot reliably distinguish metastatic melanoma from high-grade RCC. Comprehensive immunohistochemistry, coupled with detailed clinical correlation, remains essential for establishing the correct diagnosis and guiding management.

P7.21

Herpes Simplex Virus Hepatitis Overlapping with Acetaminophen Toxicity: A Diagnostic Consideration in Pregnancy-Related Acute Liver Failure

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Introduction: Fulminant hepatic failure (FHF) in pregnancy can present a major diagnostic challenge as other conditions like acute fatty liver of pregnancy (AFLP), viral hepatitis, and drug-induced liver injury can share overlapping features. Of these, viral hepatitis, especially herpes simplex virus hepatitis is rare and underrecognized. It can be rapidly fatal without an early diagnosis; thus, making timely identification critical for better outcomes.

Case Report: We report the case of a 26-year-old woman at 30 weeks' gestation who presented with hypotension, syncope, and elevated transaminases following large quantity of acetaminophen ingestion. However, her lab studies showed normal acetaminophen levels [20.3 mcg/ml; reference range: 10-30 mcg/ml] and negative hepatitis serologies. Despite this she developed progressive liver dysfunction with worsening coagulopathy, thrombocytopenia, and fluctuating mental status. Because of clinical concern for AFLP, the patient underwent an emergent cesarean section; however, her condition rapidly deteriorated, resulting in fulminant hepatic failure requiring liver transplantation.

Histopathological examination of the explanted liver (2261 g) showed massive hepatic necrosis with scattered small islands of residual viable hepatic parenchyma. These hepatocytes showed viral cytopathic effects, including multinucleation, ground-glass nuclei, and chromatin margination. Immunohistochemistry for herpes simplex virus (HSV) was diffusely and strongly positive. No malignancy was identified. The findings were diagnostic of HSV hepatitis superimposed on extensive acetaminophen-related hepatic necrosis.

Conclusion: HSV hepatitis in pregnancy is exceedingly rare and often presents without mucocutaneous lesions,

frequently mimicking AFLP or drug-induced liver injury, leading to delayed diagnosis. Available literature also describes a rapidly progressive course leading to FHF, with increased maternal mortality in the absence of timely antiviral therapy, and instances where HSV was identified only on biopsy or explant. Our case underscores the importance of maintaining a high index of suspicion for HSV hepatitis in pregnant patients with unexplained acute liver failure, even when classic herpetic lesions or positive serologies are absent. Early recognition and prompt initiation of acyclovir may be lifesaving.

P7.22

Occult Breast Carcinoma: A Rare Case of Axillary Lymph Node-Only Presentation

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Occult breast carcinoma (OBC) is an uncommon presentation of breast cancer, accounting for less than 1% of all cases. It is typically diagnosed when metastatic disease is identified without an identifiable primary tumor in the breast. We present a rare case of OBC in a 74-year-old woman who presented solely with right axillary lymphadenopathy.

Introduction: Occult breast carcinoma is a rare clinical entity, representing approximately 0.3%-1% of all breast cancers. In an even smaller subset of patients (0.04%-0.09%), axillary lymph node metastasis serves as the *sole* initial manifestation of breast carcinoma. These presentations are particularly challenging, as both diagnosis and management remain complex in the absence of an identifiable primary lesion.

Case Presentation: A 74-year-old female presented with palpable right axillary lymphadenopathy, without any obvious breast lumps or skin changes. She had no history of weight loss, night sweats, or family history of cancer.

Initial diagnostic mammography and breast ultrasound were negative for lesions or calcification in either breast. Excisional biopsy of the three axillary lymph nodes revealed metastatic carcinoma, immunohistochemically positive of CK 7, GATA 3 and PR (15%) favoring a probable breast primary. Stains for markers of other possible primaries (such as TTF-1, PAX8, and CDX2) were negative.

Subsequent PET-CT and breast MRI confirmed multiple right axillary lymph nodes with no identifiable primary lesion in the breast or elsewhere, establishing the diagnosis of carcinoma of occult breast primary (OBC).

Clinically, the patient was staged as cTxN2M0. She received neoadjuvant carboplatin, paclitaxel, and pembrolizumab, resulting in significant reduction of lymphadenopathy. This was followed by right mastectomy with axillary dissection.

The mastectomy specimen was sectioned into thin 3-mm slices, and all fibrotic areas were carefully examined microscopically. No evidence of tumor or prior tumor bed was identified within the breast parenchyma. However, a small 3-mm focus of residual carcinoma was found in a single axillary lymph node, confirming minimal residual disease.

Discussion: Occult breast cancer presenting as axillary lymph node metastasis is a rare presentation, and was first described by Halsted in 1907. The diagnostic process depends heavily on correlating histopathologic features with immunohistochemical profiles consistent with breast origin—commonly positive for ER, PR, GATA3, CK7, and mammaglobin. Equally critical is the exclusion of other potential primaries, including lung, ovarian, thyroid, or gastrointestinal carcinomas, using both imaging and specific immunomarkers.

MRI is currently the most sensitive imaging modality, capable of detecting otherwise occult primaries in up to 75% of cases. However, when both MRI and meticulous pathologic examination remain negative, the diagnosis of true occult breast cancer is confirmed.

Therapeutic approaches for OBC largely mirror those of typical breast carcinoma. Recent evidence supports de-escalation of surgery in select cases, with equivalent outcomes achieved by breast irradiation alone when no primary is identified.

Conclusion: The diagnosis of occult breast carcinoma can be challenging, particularly when it presents as isolated axillary lymphadenopathy. Along with a high index of clinical suspicion, ancillary investigations including breast ultrasonography, mammography, MRI, lymph node biopsy, immunohistochemistry, and relevant tumor marker studies are essential both for establishing the diagnosis and for excluding other possible malignancies.

P7.23

Self-Amplifying mRNA Vaccine Against Chikungunya Virus (CHIKV)

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Chikungunya virus (CHIKV) is a mosquito-borne alphavirus that has emerged as a significant global public health concern due to its ability to cause large-scale outbreaks in tropical and temperate regions. CHIKV infection leads to acute fever, severe joint pain, and myalgia, which can persist for weeks or months. The rare cases involve severe or atypical manifestations such as persistent arthralgia, neurological complications, and occasionally death. According to the WHO, 445,271

CHIKV cases with 155 deaths have been reported worldwide in 2025. Currently, there are two vaccines approved for use in the USA, the live-attenuated vaccine (IXCHIQ) and virus-like particle vaccine (VIMKUNYA). The IXCHIQ vaccine was suspended on August 22, 2025, due to safety concerns. Therefore, safer and effective CHIKV vaccines are still needed. We have generated a flavivirus-based self-amplifying mRNA replicon (FV SAM) with a novel live-attenuated Zika virus strain. Our results showed that the FV SAM exhibited higher efficiency in antigen expression compared to an alphavirus-based SAM replicon (AV SAM), which has been widely used to generate SAM vaccines. This has been confirmed by using confocal imaging, qPCR, flow cytometry, and western blotting. In addition, we also showed that FV SAM reduced type I interferon activity compared to AV SAM. Type I interferons have been suggested to play detrimental roles in inducing antibody production. Our preliminary data suggests that FV SAM can be a novel and powerful platform for self-amplifying mRNA-based vaccines against CHIKV, other viral infections, and even cancers.

P7.24

Who is Left Behind: Spatial Analysis of Service Proximity and Distribution of Mortality from Drug Overdose and Violence

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Introduction: Interpersonal violence (IPV), such as firearm-related homicides, and substance use disorder (SUD) are pressing public health issues in Mississippi, with a recent rise in mortalities. The firearm-related mortality has remained persistently one of the highest in the nation since 2022. Drug overdose (OD) has doubled between 2019 (393 deaths) and 2021 (788 deaths), according to the Mississippi State Department of Health. It is imperative to explore the spatial distribution of homicide and OD mortalities, and service area gaps for healthcare facilities (HFs) offering related services.

Methods: HFs throughout Mississippi catering to IPV (e.g., treatment for posttraumatic stress disorder) and/or SUD (e.g., outpatient or residential treatment) were contacted to confirm their services. Their locations were geocoded, and service areas with 15, 30, and 45-minute drivetimes were delineated. Mortality rates from OD, firearm-related homicide, and all homicides at the aggregated census tract (ACT) were downloaded from the Centers for Disease Control and Prevention (CDC) for March 2024 - February 2025. Spatial patterns of mortalities were tested using Global Moran's *I,* and cluster and outlier analysis identified the hotspots.

Results: Visual analysis indicated a north-south gradient for HFs' distribution. Mortalities from OD and firearm- and all-caused homicides had clustered patterns ($p<0.01$). Firearm- and all-cause homicides hotspots were found in the western parts of Mississippi, while OD hotspots were coastal. Six aggregated census tracts (ACTs) of OD hotspots and one ACT of firearm- and all-cause homicide hotspots fell outside of 30-minute service areas, while four ACTs of OD hotspots fell outside of 45-minute service areas. These ACTs are predominantly located in the southern regions of Mississippi, indicating that the service area gap is occurring due to a shortage of HFs.

Conclusion: This study identified geographic areas in Mississippi characterized by both a high need for, and low access to, IPV and SUD services. The findings of this study have the potential to significantly impact policy initiatives, ensuring that residents at the highest risk for these frequently co-occurring problems do not encounter barriers to accessing needed care.

P7.25

Hotspot Analysis of Humid Heatwaves, the Silent Killer, in Mississippi

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Introduction: Heatwaves are often referred to as the "silent killer" in public health. Heatwaves accompanied by high humidity are known as humid heatwaves (HHW), which are more detrimental as they amplify the apparent temperature (compared to dry-bulb air temperature). HHWs affect the human body's thermoregulation and worsen underlying illnesses. Therefore, it is imperative to understand the spatial distribution of HHWs to enable spatially targeted preventive measures.

Methods: We used the heat index (HI), an established measure of apparent temperature, as a measure of apparent temperature. We used downscaled (1-kilometer) North American Land Data Assimilation System (NLDAS) daily HI data covering 1,848 days of warm seasons (May-September) between 2011 and 2022. HHWs were defined as periods of ≥3 consecutive days with a HI exceeding 90 °F and 100 °F and characterized for frequency, intensity, and duration. Emerging hotspots of these three aspects were determined using ArcGIS Pro. The nonparametric Mann-Kendall test was used for trend analysis.

Results: The hotspots of intense and long HHWs were predominantly persistent in the Mississippi Delta with no change in frequencies at the 95 °F threshold. A mix of persistent and sporadic, intensely hotspots in the Mississippi Delta, with emerging hotspots of varying

duration and oscillating frequencies, was found at the 100 °F threshold. Trend analysis revealed that, over time, a few other parts of Mississippi were experiencing increasing trends in frequency and duration. In Mississippi, the predominant emerging hotspot types are oscillating (a mix of significant hot and cold spots across time), persistent (significant hotspots for 90% of the time), and sporadic (historically on- and off-again hotspots with no historically significant cold spots).

Conclusion: This study improves past research by utilizing high-resolution gridded temperature data. These improvements enable the delineation of zones requiring preventive measures to minimize the adverse impacts of extreme humid heat on human health.

P7.26

Organic Acid-Based Anodization Process to Produce Bioactive Oxides on Titanium Implants

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Statement of Purpose: The study aimed to utilize novel anodization processes to incorporate hydroxyapatite (HA), tricalcium phosphate (TCP), and magnesium (Mg) dopants into the titanium surface oxide layers to enhance implant osseointegration.

Introduction: Titanium alloys are used for making implants because of their excellent mechanical properties and biocompatibility. However, the naturally forming oxide on titanium lacks bioactivity, therefore less than ideal for promoting bone growth. Anodization processes have shown to simultaneously modify the oxide surface topography, chemistry, and crystallinity. Anodized oxides incorporating biologically relevant dopants, such as Ca, P, or Mg have shown to enhance osseointegration. Previous studies have incorporated crystalline calcium phosphate compounds, such as HA or TCP, into the oxides and shown enhanced osseointegration. This study developed three anodization processes to produce oxides containing HA, TCP, and Mg that can enhance osseointegration.

Materials and Methods: Commercially pure titanium grade 4 (CPTi4) discs were cut, ultrasonically cleaned and pre-activated using a NITRADD dip for 30s. Activated discs were then anodized in one of three electrolytes (A, B, or C) using pulsed galvanostatic waveforms. Thin film x-ray diffraction (XRD) and energy dispersive X-ray spectroscopy (EDS) were utilized to characterize the crystallinity and surface composition of the resulting oxides. A 21-day cell culture study was performed to assess the pre-osteoblast cellular responses to each anodized oxide and non-anodized CPTi controls. Specimens were seeded with mouse pre-osteoblastic cells (MC3T3-E1) at a density of 50,000 cells/cm², and tested using DNA and ALP assays at 7, 14, and 21 culture day timepoints. A two-way repeated measures ANOVA ($\alpha = 0.05$) with post hoc Bonferroni analysis was used to determine the influences of the specimen group and culture day on the DNA and ALP assay results.

Results and Discussion: XRD analyses revealed the formation of small amounts of anatase and calcium titanate in each oxide. Oxide C also showed the formation of α-TCP and HA compounds. Additionally, an intensity reduction was shown in the α-titanium XRD peak in Oxide C indicating the formation of a thicker oxide. EDS results revealed Oxide A has the highest Mg dopant uptake. In the cell-culture studies, each oxide supported cell attachment and proliferation as indicated by the increasing DNA levels over the 21-day study. At day 21, all oxides and non-anodized CPTi control specimens showed statistically equivaled DNA levels, indicating the cytocompatibility of the oxides. There was greater ALP activity at day 7 on Oxide A and Oxide C indicating early osteogenic differentiation in these groups.

Conclusion: Each titanium anodization process formed oxides containing Ca, P and Mg dopants, along with anatase and calcium titanate. Additionally, Oxide C showed α-TCP and HA formation. The cell culture response to Oxide A and Oxide C indicated good cytocompatibility and early osteogenic differentiation. These results should be further validated through additional cell culture experiments and animal model studies.

P7.27

Cervical Cancer Detection In Early-Stage: A Public Health Approach Using Machine Learning (Smote and Adasyn)

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Background: Cervical cancer remains fourth most common cancer in women. It continues a serious global health challenge and early detection is critical for effective and improved survival rates. The inherent class imbalance in medical datasets poses challenges for machine learning models often leading to biased predictions that can affect the identification of positive cases.

Method: The study evaluates the impact of Synthetic Minority Oversampling Technique (SMOTE) as well as Adaptive Synthetic Sampling (ADASYN) in handling imbalanced class datasets of cervical cancer. The dataset contains a total of 858 individual records with 36 attributes, including 32 potential independent risk factors and four target variables: hinselmann, cytology, schiller and biopsy. It includes over 800 individuals without cervical cancer and nearly 50 individuals diagnosed with cervical cancer.

This study embeds five machine learning classification models: Random Forest (RF), Logistic Regression (LR), Decision Tree (DT), Support Vector Machine (SVM) and K-Nearest Neighbors (KNN) were trained and evaluated with and without resampling cancer cases. Evaluation uses standard classification metrics. We focus on recall and F1-score because they reflect case finding.

Result: The study findings demonstrate that SMOTE and ADASYN significantly improve recall and F1-score and ensure better identification of positive cases while maintaining competitive accuracy. Among the models, Random Forest exhibited the best overall performance accuracy 96.4%, while SVM, LR, KNN and DT benefited the most from resampling.

Conclusion: The study emphasizes the importance of addressing class imbalance data in medical predictions. It strengthens screening decisions and supports earlier care, especially for rural and underserved women.

P7.28

Better Education Level and Employment Status Can Boost Flu Vaccine Delivery?

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Introduction: Every year, millions of illnesses and doctor visits connected to the flu are avoided because to the flu vaccine. For example, during 2019-2020, the last flu season prior to the COVID-19 pandemic, flu vaccine avoided an estimated 7 million influenza infections, 3 million influenza-associated medical visits, 100,000 influenza-associated hospitalizations, and 7,000 influenza-associated fatalities. Only over half of Americans receive an annual flu vaccination, despite the numerous advantages it offers. The flu can result in tens of thousands of fatalities, hundreds of thousands of hospital admissions, and millions of illnesses throughout a typical flu season. If more people received vaccinations, many more people might be protected from the flu.

Methods: BRFSS annual survey data 2024 for Mississippi state (N=2986) was used to study the association of flu vaccine intake and social factors like education level, income level, gender and employment status. Data was analysed using SPSS software.

Results: Out of the overall sample, 72% of participants did not answer the question "During the past 12 months, have you had either a flu vaccine that was sprayed in your nose or a flu shot injected into your arm?". Amongst the individuals that answered 819 (7.4%), 15% (439) were administered flu vaccine and 11% (321) were not. 2% (59) refused to receive the immunization. Education level (p value=0.000), income level (p value=and employment status were found to be statistically significant to flu vaccine adherence

Conclusion: As we observed a positive trend amongst the college graduates' group towards vaccine adherence compared to the other education levels. We also observe that most participants who have not received flu vaccine are amongst the wages and retired population. Participants with annual income above $100,000 have better vaccine adherence. More ways need to be developed to encourage education and improve the employment ratio which will ultimately lead to improved flu vaccine adherence.

P7.29

Geography of WIC: Distribution of Stores and Population

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Introduction: Early life theory suggests prenatal, fetal, and infant stages are critical periods for growth with lasting impacts on an individual's life. Adequate nutrition during pregnancy and early childhood is a key protective factor. Mississippi experiences high rates of food insecurity along with maternal mortality, infant mortality, low birthweight, and preterm births. The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) is a federally funded program controlled by the U.S. Department of Agriculture's (USDA) Food and Nutrition Service (FNS) aiming to help low-income families, whose household income is below 185% of the federal poverty level, get healthy food for pregnant and nursing mothers, as well as young children under 5 who need better nutrition. Approximately 46 percent of Mississippians utilize WIC. Participants redeem benefits at authorized vendors; therefore, access to WIC foods may depend on proximity to stores. The study aims to identify the distributions of WIC-authorized vendors in Mississippi to find the existing disparities.

Methods: Census tracts in Mississippi were estimated from American Community Survey (ACS) 2019 - 2023 data by filtering the population with income below 185 percent of the federal poverty level as a proxy for WIC eligibility. Details of WIC authorized vendors were collected from the Mississippi State Department of Health (MSDH), geocoded using ArcGIS Pro, and verified using Google Maps and Bing Maps. The number of stores per census tracts were tallied using geoprocessing tools. Spatial distributions of WIC stores and <185% poverty population were mapped using four classes in quartile classification. Differences in store counts across poverty quartiles were examined using Kruskal-Wallis test and zero-inflated negative binomial regression. Additionally, the association between poverty quantiles and presence of at least one WIC store was assessed using logistic regression. Statistical analyses were conducted using Stata 19.5.

Results: The Kruskal-Wallis test (X=3.14, p=0.37)

indicated no statistically significant difference in mean WIC store counts across poverty quartiles. Zero-inflated negative binomial regression found no statistically significant association between number of WIC stores and poverty quartiles ($p = 0.30$). Neither the chi-square test of independence ($p = 0.42$) nor logistic regression ($p = 0.42$) showed a statistically significant association between poverty quartile and presence of at least one WIC store.

Conclusion: The methods utilized returned no significant association between poverty distribution and the number of WIC stores. The findings are useful to address maternal and child food insecurity by targeting the census tracts with high demand for but low availability of WIC stores.

P7.30

Oropouche Virus Infection Interrupts Fetal Neurodevelopment

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Oropouche virus (OROV) is an emerging orthobunyavirus, which is responsible for periodic outbreaks of febrile illness in South and Central America. The virus is primarily transmitted through arthropod vectors, such as biting midges and mosquitoes, but recent clinical reports suggest the possibility of maternal-fetal transmission. However, the experimental evidence on vertical transmission is lacking. To investigate this, we evaluated OROV infection in murine neuroblastoma cells (N2a), mouse embryonic stem cells (ESC), and mouse embryonic stem cells differentiated to neural progenitor-like cells. The RT-qPCR and the plaque-forming assay results demonstrated that these cells are susceptible to OROV infection. In addition, *in vivo* experiments showed that the heterozygous *infar1*$^{+/-}$ fetuses (both head and body) are positive for OROV RNA on embryonic day 10.5, indicating the likelihood of vertical transmission. Moreover, we measured the expression of several neuronal developmental and microcephaly-related genes, including *Sox-1*, *Tbr2, Mmp15,* and *Cenpf*, in N2a, mouse ESC, ESC-differentiated neural progenitor-like cells, and fetal head tissue after OROV infection. The RT-qPCR data showed that OROV infection decreases the neural development regulator genes, such as *Sox-1* and *Tbr2,* in N2a cells and fetuses. In summary, our study provides evidence that the OROV can infect and replicate in neural and embryonic-derived cells, supporting the potential for vertical transmission and neurotropism.

P7.31

Neutrophilic Dermatoses in the Setting of MDS/MPN: A Case Report

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Background: Neutrophilic dermatoses are a group of rare inflammatory skin disorders characterized by a sterile neutrophilic infiltrate in the dermal layers, with two examples being pyoderma gangrenosum (PG) and Sweet syndrome. Since neutrophilic dermatoses are associated with hematologic disorders, they can be very challenging to distinguish from each other, not to mention infection, which is more common and nearly identical to neutrophilic dermatoses. Today we report a rare presentation of dual neutrophilic dermatoses vs infection in the setting of MDS/MPN.

Case Presentation: Five days after a previous hospital admission in which a diagnosis of MDS/MPN was made, a 79 year old male presented to the ED with 2-3 days of fever (T_{max}100.6ºF) and acutely worsening pain at the site of a previous bone marrow biopsy. At the time, there was serosanguinous drainage at the biopsy site, and he also had painful subcutaneous nodules on his left wrist and right forearm that began 2 weeks prior to this admission. He was treated empirically for sepsis and given meropenem and vancomycin as well as prophylactic acyclovir and fluconazole while workup began for an infectious etiology. Ultimately the blood, AFP, fungal, and deep tissue cultures all showed no growth, and MRSA, Aspergillus, Fungitell, and CMV labs were negative. During the length of his hospital course, the biopsy wound and surrounding lesions began to change in appearance, notably developing a grey border characteristic of pyoderma gangrenosum. Acute care surgery, infectious disease, and dermatology were consulted for management recommendations. A skin biopsy of the ulcerating bone marrow biopsy site depicted neutrophilic dermatosis with no infectious pathogen. The lesions were treated with topical 0.05% clobetasol, and the patient was able to discharge home with scheduled follow up with dermatology.

Conclusions: Given the abrupt onset of painful erythematous nodules, the skin biopsy results, and fever in the setting of MDS, the patient met the criteria for Sweet syndrome. Similarly, given the skin biopsy results in combination with pathergy, exclusion of infection, ulceration, and peripheral erythema with a grey border, the patient also met the criteria for PG. Thus, this case depicts a rare example of dual neutrophilic dermatoses complicating recovery in the setting of MDS/MPN. As such, this case highlights the importance of a broad differential and multidisciplinary care in the treatment of abnormal lesions in the setting of hematologic malignancy.

P7.32

Risk Factors for the Development of Heterotopic Ossification After Conversion Total Hip Arthroplasty Following Previous Hip Fracture IMN or Acetabulum Fracture ORIF

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Introduction: Heterotopic ossification is an extensively studied complication of primary total hip arthroplasty; however, there remains a paucity of research as to its incidence with conversion to total hip arthroplasty from prior internal fixation of acetabular or hip fractures.

Methods: The authors conducted a single-center retrospective chart review of patients who underwent conversion to total hip arthroplasty following open reduction internal fixation of acetabular fractures or intramedullary nailing of hip fractures, focusing on analysis of demographics, comorbidities, surgical details, prophylaxis methods, and radiographic Brooker classification.

Results: Among 75 hips, 25 (33.3%) developed progressive heterotopic ossification following conversion surgery. Of these 25 hips, 14 (56.0%) had prior heterotopic ossification following initial surgery, showing a statistically significant 3x increased risk of developing heterotopic ossification in patients who had prior ectopic bone about the operative hip compared to those without. Longer delays from initial injury to initial surgery, younger age at time of initial surgery, and longer operative times at conversion surgery also led to a significantly increased risk for heterotopic ossification. No significant association was observed between prophylaxis following initial surgery and the development of heterotopic ossification following conversion.

Discussion and Conclusion: Our results demonstrated a significantly higher risk of heterotopic ossification following conversion surgery in patients who had prior heterotopic ossification about the operative hip compared to those without. Additionally, prophylaxis after initial surgery had no effect on heterotopic ossification development following conversion surgery. This study highlights the need for further research on heterotopic ossification following conversion total hip arthroplasty.

P7.33

Reduction in Utilization of Radiation for Heterotopic Ossification Prophylaxis Following Acetabular Surgery During the COVID-19 Pandemic

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Introduction: Heterotopic ossification (HO) is the development of ectopic bone in soft tissue that is commonly attributed to osseous and soft tissue trauma. Incidence of HO following acetabular reconstruction ranges from 18-90% amongst current literature. Prior studies have demonstrated conflicting evidence as to the efficacy of external beam radiation (XRT) or nonsteroidal anti-inflammatory drugs (NSAIDS) as prophylaxis against HO. The purpose of this study was to determine if XRT as HO prophylaxis decreased during the COVID-19 pandemic while also analyzing the efficacy of both forms of prophylaxis against HO formation in our patient population.

Methods: We performed a retrospective chart review of patients who underwent open treatment for acetabular fractures at a level 1 trauma center from January 2018-January 2021. Those before March 20, 2020, were placed in the pre-pandemic group, and those after were considered to be intra-pandemic, as local COVID-19 quarantine implementation aligned with this date. Patients who received a Kocher-Langenbeck approach were deemed high risk for HO development and referred for XRT postoperatively. Patients who declined XRT were subsequently treated with indomethacin. Primary outcomes of the study included type and timing of HO prophylaxis, development of high-grade (Brooker class 3/4) HO, and unplanned reoperation for HO resection.

Results: Of the 402 patients treated with open reduction and internal fixation for acetabular fracture, there were 103 eligible patients pre-pandemic and 79 patients intra-pandemic. Prior to the pandemic, 75% of high-risk patients received XRT and only 29% received XRT during the pandemic. Pre-pandemic, 8.9% of patients developed high-grade HO compared to 7.6% during the pandemic. Those who received XRT had a 7.0% incidence of developing high-grade HO, while those who received indomethacin experienced a 9.8% incidence. 3.7% of patients in the indomethacin group underwent resection for symptomatic high-grade HO, while no resections were performed in the XRT group.

Conclusion: While there was a significant decrease in XRT utilization during the COVID-19 pandemic, there was no clinically significant difference in the development of high-grade heterotopic ossification. This suggests that external beam radiation and nonsteroidal anti-inflammatory drugs are both viable options for the prevention of HO following acetabular fixation.

P7.34

Postnatal Regulation of Outer Hair Cell Fate in the Mammalian Cochlea

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The cochlea is the portion of the inner ear that converts sound waves into electrochemical signals, allowing mammals to hear. The cochlea can be subdivided into three regions: apical, middle, and basal, which correspond to low, middle, and high frequency hearing, respectively. Within the cochlea, two main sets of sensory hair cells enable this process: the inner hair cells (IHCs) and the outer hair cells (OHCs). With damage to the ear from noise or simply from aging, hair cells within the cochlea die, and sensorineural hearing loss follows, leading to reduced quality of life as well as other health issues. This loss of hearing is due to the inability of these hair cells to regenerate within the cochlea. Understanding and learning the development of these two sets of hair cells is important to begin experimentation in regenerating these hair cells. This study involves examining p27, a cyclin-dependent kinase inhibitor protein involved with regulating the cell cycle. In the developing ear, p27 is important in facilitating the exit of progenitor cells from the cell cycle, thereby continuing differentiation into specialized cells, including IHCs and OHCs. In this study, we investigated the role of p27 during cochlear hair cell differentiation and cell fate maintenance. Male and Female mice were used in this study under the IACUC protocol. We used a p27 knockout model (p27fl/fl; Atoh1CreERT2) to delete the protein of interest. To carry out this deletion of p27, the mice were injected with tamoxifen, and by using this specific model, deletion of p27 was achieved on or after postnatal days 0-1. The inner ears of the mice used in this study were harvested at days 21 and 41 postnatally. The cochlea of each inner ear sample was then dissected out for further investigation. The IHCs were immunostained for Tbx2, the OHCs were stained for Oncomodulin, and the cytoplasm of the hair cells (both IHCs and OHCs) were stained for Myosin-7a, followed by DAPI staining. The samples were then imaged using a confocal microscope. This immunostaining method allows us to differentiate and analyze between IHCs and OHCs and observe their development when p27 is absent. Our results showed that p27 knockout mice displayed ectopic generation of Tbx2-;Ocm+;Myo7a+ OHCs within the areas usually displaying Tbx2+ IHCs. This information suggests that p27 is important for regenerating OHC. The findings in this study show the importance of p27 in the process of cochlear hair cell differentiation and their positions within the cochlea. Considering most hearing loss results from OHC loss or damage, this study gives insight into a potential target for interventions in OHC regeneration.

P7.35

Diagnostic Delay and Suboptimal Antimicrobial Timing in ENT Infections: Implications for Intracranial Abscess Risk

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Otitis Media (OM) and Sinusitis are very common infections seen in both the primary care and ENT settings in both pediatric and adult populations. While most of the time these infections are self-resolving or respond well to antibiotics, instances where the diagnosis is missed or inadequately treated can result in an increased risk of complications such as intracranial abscesses. When transformation to these abscesses occurs, this introduces a life-threatening complication that can lead to permanent neurological deficits and rapid deterioration. Although the incidence of intracranial abscess transformation is low, literature has shown that delayed diagnosis, late antibiotic initiation, and failure to recognize warning signs can significantly increase the risk of a mostly preventable complication. One factor that goes into missing these diagnoses includes patients presenting with nonspecific symptoms that lead to "watchful waiting" without close follow-up, especially in high-risk patients such as those in immunocompromised states. Another contributing factor for progression to intracranial abscess is the underrecognition of certain red-flag symptoms that require further clinical intervention, such as persistent symptoms, new headaches, and/or irritability in a child despite being treated with antibiotics. Throughout the review, it was found that with delayed diagnosis or treatment, the incidence of intracranial abscess transformation increased by 2 to 5-fold, with an odds ratio (OR) of 3.8. These findings emphasize the importance of prompt, accurate diagnoses and intervention to prevent these severe outcomes. Even though progression to intracranial complications is often a preventable complication, it should remain a critical concern, and can still arise even when correctly identifying the diagnosis and treating properly. Progression of OM and Sinusitis into an intracranial abscess is life-threatening and can be a devastating complication in patients. In addition to diagnostic and treatment-related factors, prevention remains an essential component in reducing severe primary infection that can potentially lead to intracranial complications. In the United States, vaccination rates are declining against the most common and devastating bacterial organisms responsible for these infections, such as Streptococcus pneumoniae and Haemophilus influenzae type B. This review aims to increase awareness of presenting symptoms of these conditions, emphasize the importance of vaccination education, and highlight the

need for close monitoring of treatment response to facilitate early recognition of deterioration and to prevent complications.

P7.36

An Uncommon Neoplasm in an Uncommon Place: Case Report of Myofibroma of Vagina

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Introduction: Myofibromas are rare benign spindle cell tumors that exhibit perivascular myoid features. They typically occur in males under the age of 2 and present as painless red nodules on the extremities, head, neck, and trunk; and they generally have an excellent prognosis following surgical excision. Myofibromas of the female genital tract in adulthood are exceptionally rare.

Histologically, myofibromas display a biphasic zonation. This includes a population of myoid cells forming fascicles, as well as primitive cells associated with vascular structures. The immunohistochemical profile of these tumors shows positivity for smooth muscle actin and may also show variable positivity for desmin and/or h-caldesmon, indicating a myoid lineage.

Case Report: We present a case of a 46-year-old female patient who had a 2 cm mobile submucosal nodule located in the superficial vaginal area. This nodule persisted despite initial treatments, which included Bactrim, doxycycline, and non-steroidal anti-inflammatory analgesics. The lesion was surgically removed and was diagnosed as a benign pericystic neoplasm and was favored to represent a myofibroma. To date, the patient has recovered well and has experienced no complications.

Microscopic: Microscopic examination revealed a well-circumscribed nodule of biphasic zonation, in which the hypercellular zones exhibited perivascular proliferation of myoid cells. These cells stained positive for SMA (smooth muscle actin), ER (estrogen receptor), and Desmin, while ERG (erythroblastosis transformation-specific gene) highlights associated vasculature/endothelial cells.

Discussion / Conclusion: To the best of our knowledge, this is the first documented case report of myofibroma in this specific location, particularly in a 46-year-old female. While the adult form of myofibroma is well-documented, it typically occurs in younger adults and in the extremities. This case report emphasizes the importance of considering a broad differential diagnosis, extending beyond the usual demographics and presentation of patients with myofibroma.

P7.37

Neuropeptide Y1 Receptor Antagonist Attenuates Maternal Inflammation and Reduced-Uterine Perfusion Pressure-Induced Fetal Growth Restriction, Fetal Inflammation, and Neurobehavioral Deficits in Pregnant Rats

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Pregnancy increases uterine blood flow, a necessary condition for normal fetal growth and development. Neuropeptide Y (NPY) mediates various biological effects, including vasoconstriction, which may be associated with preeclampsia, a pregnancy complication usually characterized by persistent high blood pressure, decreased birth weight, and neurological dysfunction. Experimental studies have suggested a connection between reduced uterine perfusion pressure (RUPP), maternal inflammation, and elevated NPY levels, which can lead to impaired fetal development. This study aimed to investigate whether treatment with NPY Y1 receptor antagonist (Y1R-ANT) reduces maternal inflammation, RUPP-induced fetal inflammation, lipid peroxidation, poor fetal development, and neurobehavioral deficits in pregnant rats. Lipopolysaccharide (LPS) (100 μg/kg) was administered intraperitoneally to pregnant rats on day 13 of gestation (G13), and RUPP surgery was performed on G14. Starting from G14, the rats were treated with Y1R-ANT via intraperitoneal micro-osmotic pump infusion at 5 μg/kg/day for 6 days. Y-maze and Plus maze tests were conducted on G19, and placenta and fetal tissue were collected on G20 to assess fetal development. Results indicated that Y1R-ANT treatment reduced short-term memory deficits and anxiety, as demonstrated by the outcomes of the Y-maze and Plus maze tests in G19 pregnant rats. Furthermore, Y1R-ANT treatment reduced maternal inflammation and RUPP-induced reduction in placental efficiency, placental size, and fetal weight. Y1R-ANT treatment also attenuated maternal inflammation and RUPP-induced increases in fetal proinflammatory cytokines and thiobarbituric acid-reactive substances

(TBARS) content at embryonic day 20 (E20). These findings suggest that Y1 receptor antagonization may reduce vasoconstriction-associated maternal LPS exposure and RUPP-induced neurobehavioral deficits in pregnant rats, while also mitigating fetal inflammation, lipid peroxidation, and poor fetal development. Additionally, normalized placental efficiency and fetal weight values may be useful for studying the mechanisms involved in inflammation and RUPP-induced poor fetal development, with potential applications in the development of therapeutic strategies.

P7.38

County-Level Determinants of Colorectal Cancer Mortality in Mississippi: A Multivariable and Geographic Analysis of Social, Behavioral, and Health Access Factors

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Background: Mississippi continues to experience the highest colorectal cancer (CRC) mortality rates in the nation, yet the relative contributions of social vulnerability, preventive care uptake, behavioral health factors, and demographic structure remain poorly defined at the county level. Understanding how these domains jointly shape mortality is critical for identifying high-risk regions and designing targeted interventions.

Methods: County-level data (N = 82 counties) were compiled from CDC PLACES, the U.S. Census/ACS, the Social Vulnerability Index, and state mortality files (MSTAHRS) for the period 2018-2022. Variables included age-adjusted CRC mortality, CRC screening prevalence, uninsured rate, percent below poverty, percent without a high-school diploma, percent Black population, obesity and smoking prevalence, routine check-ups, rural-urban classification (RUCC), median household income, and population age structure. An ordinary least squares (OLS) regression was conducted in GeoDa to identify predictors of CRC mortality. Model diagnostics included tests for multicollinearity, heteroskedasticity (Breusch-Pagan), non-normality (Jarque-Bera), and misspecification (White test).

Results: The multivariable model explained 33% of the variance in county-level CRC mortality ($R^2 = 0.33$, $p < 0.001$). Among all predictors, the proportion of adults aged ≥65 years was the only variable significantly associated with mortality ($\beta = -0.58$, $p = 0.039$), showing lower CRC mortality in counties proportionally older. Social vulnerability, CRC screening prevalence, uninsured rate, education, racial composition, obesity, and routine checkup frequency did not independently predict mortality after adjustment. Behavioral measures demonstrated borderline effects, with smoking approaching significance ($p = 0.07$). Diagnostic testing revealed evidence of heteroskedasticity (Breusch-Pagan $p = 0.006$), prompting the need for spatial or robust model extensions.

Conclusions: Contrary to expectations, county-level indicators of social vulnerability, preventive screening, poverty, and health access did not independently predict CRC mortality once demographic and behavioral covariates were included. The inverse association with older population structure suggests that counties with younger age distributions—many located within the Mississippi Delta—experience greater CRC mortality burden. These findings indicate that mortality patterns are driven by broader structural and demographic dynamics not captured by single-domain predictors. Future analyses should incorporate spatial lag/error models and examine stage-at-diagnosis, healthcare capacity, and historical disinvestment to more precisely identify mechanisms underlying Mississippi's persistent CRC disparities.

P7.39

A Case of Dasatinib Induced Bullous Eruption in Chronic Myeloid Leukemia

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Background: Dasatinib is a Bruton's tyrosine kinase (BTK) inhibitor commonly used in the treatment of chronic myeloid leukemia. Dasatinib does have a proven association with dermatologic side effects, mostly in the form of Stevens-Johnson Syndrome/Toxic Epidermal Necrolysis. There has been little association demonstrated between pemphigus disorders and dasatinib use.

Case: A 65-year-old African American male presented with a four-to-five-day history of left-sided abdominal pain, dyspnea and fatigue with a marked leukocytosis. Electrolytes were significant for tumor lysis syndrome. Abdominal CT revealed splenomegaly. Chromosomal analysis revealed BCR-ABL positivity and chronic processes, suggestive of chronic myeloid leukemia. The patient was prescribed dasatinib and was discharged.

Two months later, the patient presented with a widespread skin rash and endoscopy revealed esophageal ulcerations. Right arm skin biopsy results showed likely bullous pemphigoid with basement membrane immunofluorescence at one location. Another right arm biopsy showed likely pemphigus vulgaris with tombstoning and tombstoning and acantholysis. The esophageal biopsies was negative for HSV, CMV and fungal infection. Antibody studies showed elevated BP180 and BP230, both associated with bullous pemphigoid. However, his condition was stable and treated with steroids. Due to heavy suspicions of dasatinib being the

root cause, on discharge, dasatinib was discontinued and the patient was started on dupilumab. On the patient's next clinic follow up, the care team plans to possibly start the patient on a different generation BTK inhibitor that has yet to be determined.

Discussion: One other case of a pemphigoid reaction with dasatinib use occurred in 2004 and was presented by Nuno-Gonzalez et al. Similar to our case, a blistering reaction appeared multiple months after initiation with dasatinib therapy. However, unlike our case, the Nuno-Gonzalez et al. case had no positive antibodies on ELISA study, as well as a different histologic presentation more aligned with pemphigus foliaceous. Also, unlike our case, restarting dasatinib caused a second, bullous rash.

P7.40

Bladder and Rectal Infiltration by Refractory IgA Kappa Light Chain Multiple Myeloma With Transformation to Secondary AML: A Case Report

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Background: Multiple myeloma (MM) is a plasma cell dyscrasia that typically affects the axial skeleton and bone marrow but rarely causes direct mass effect on pelvic organs. Transformation to secondary acute myeloid leukemia (sAML) is an uncommon but known complication of heavily pretreated MM, often signifying poor prognosis. We report a rare case of MM with retroperitoneal tumor extension causing mechanical urinary and bowel obstruction, along with eventual leukemic transformation.

Case Presentation: A 66-year-old male with IgA kappa multiple myeloma diagnosed in 2022, refractory to multiple lines of therapy (including RVd, CyBorD, and daratumumab-based regimens), presented with bilateral leg swelling, constipation, and acute urinary retention. He had a complex oncologic history including radiation therapy to L3, the sternum, ribs, and right femoral neck for bony plasmacytomas. At an outside hospital, CT imaging demonstrated extensive retroperitoneal and pelvic soft tissue tumor burden with encasement of the rectum, abdominal aorta, ureters, kidneys, and urinary bladder base, leading to bilateral hydronephrosis and bowel dysmotility. A Foley catheter was placed, and he was transferred to a tertiary center for further oncologic management.

On arrival, he was found to have pancytopenia (Hgb 6.8, Plt 110, WBC 6.99), acute kidney injury (Cr 1.33), and hypoalbuminemia (2.4). Despite aggressive supportive care and initiation of V-PACE chemotherapy, he exhibited rapid clinical decline. Bone marrow biopsy revealed progression to secondary AML.

Conclusions: This case illustrates a rare progression of MM with pelvic organ encasement causing obstructive uropathy and GI dysmotility, followed by transformation to sAML. It underscores the convergence of aggressive disease biology and treatment-related complications, highlighting the challenges of managing advanced hematologic malignancies and the need for improved risk stratification and surveillance.

P7.41

Immunoporosis: Investigating Neuronal and Immune Factors Contributing to Bone Loss in SLE Patients- A Pilot Study

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"Immunoporosis" describes the contribution of immune dysregulation to osteoporosis, particularly in chronic inflammatory diseases such as systemic lupus erythematosus (SLE). Beyond traditional metabolic explanations, SLE-related bone loss is influenced by chronic inflammation, altered T- and B-cell activity, reduced physical activity, and obesity. Pro-inflammatory T-cell subsets, especially Th1 and Th17, promote osteoclastogenesis through RANKL and IL-17, while impaired regulatory pathways reduce inhibition of bone resorption. Emerging evidence suggests that neuroimmune mediators, including neuropeptide Y (NPY), may further link immune activation with bone homeostasis.

This prospective study evaluated nine SLE patients and nine age-, sex-, race-, and BMI-matched controls (ages 18-50), excluding participants with major confounders such as glucocorticoid exposure, menopause, nephritis, or other autoimmune diseases. All participants underwent DEXA scanning and provided blood samples for analysis of bone turnover markers, cytokine profiles, T-cell subsets, and NPY variants.

SLE participants demonstrated higher IL-17 levels and increased collagen crosslinks, consistent with enhanced bone resorption. Flow cytometry revealed elevated Th1 and Th9 populations in SLE, while Th17 levels were comparable between groups. LC-MS showed trends toward higher NPY 1-34 and 1-36 in SLE, variants associated with Y1-mediated bone loss. DEXA Z-scores indicated osteopenia-range values in SLE despite the absence of conventional risk factors. Notably, two obese control participants also demonstrated osteopenia, underscoring the pro-inflammatory skeletal effects of adiposity.

These findings support immunoporosis as a central mechanism of bone loss in SLE and highlight the need to explore targeted immunologic pathways as potential therapeutic strategies to preserve bone health in inflammatory disorders.

P7.42

A Pilot Study To Measure and Compare Plasma Concentration of Neuropeptide Y and Truncated Forms Between Lupus and Control Models

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Systemic Lupus Erythematosus (SLE) is a chronic autoimmune disease characterized by systemic inflammation and multisystem involvement, including a heightened risk of osteoporosis. Emerging evidence suggests that Neuropeptide Y (NPY), a 36-amino-acid peptide involved in regulating appetite, stress responses, immunity, and bone metabolism, may serve as a mechanistic link between SLE-associated inflammation and altered bone quality. NPY undergoes enzymatic truncation to form metabolites with distinct receptor specificities, yet the distribution of these metabolites in lupus models remains poorly understood.

This pilot study aimed to develop a quantitative LC-MS/MS method for detecting NPY and its truncated forms (NPY 1-36, 1-34, and 3-36) in murine plasma and to compare their concentrations in SLE versus control mice receiving either saline or a Y1-receptor antagonist (Y1R). Sixteen SLE mice and twelve control mice were assigned to antagonist-treated or untreated groups, and plasma samples were analyzed using heavy-labeled internal standards and anti-adsorption diluents to minimize peptide loss. Calibration curves demonstrated reliable detection over a 0.5-1000 ng/mL range.

In control mice, Y1R antagonism led to a marked increase in total circulating NPY. In contrast, SLE mice exhibited substantially reduced NPY levels following antagonism, consistent with previously reported decreases in NPY mRNA expression. SLE mice also showed a disproportionately high fraction of NPY 1-34 compared to other metabolites. Despite small sample sizes and high variance, these findings suggest potential dysregulation of NPY processing in SLE and a possible normalization of metabolite distribution with Y1R inhibition.

Further investigation is warranted to clarify how NPY dynamics contribute to lupus-related bone pathology and to evaluate the therapeutic potential of receptor-specific modulation.

P7.43

The Relationship between Social Vulnerability and HIV Suppression in Mississippi, 2023

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Background/Purpose: The goal of HIV treatment is to achieve and maintain viral suppression which reduces morbidity, mortality, and transmission. Achieving treatment goals can be influenced by the social determinants of health such as household characteristics, minority status, housing type, and transportation type. To quantify the impact of socioeconomic factors on communities, the CDC has developed the Social Vulnerability Index (SVI). The goal of this study was to assess the relationship between the county-level SVI score and the percentage of virally suppressed HIV-positive individuals.

Methods: Using publicly sourced data from AIDsVu (2023) and the CDC's Agency for Toxic Substances and Disease Registry (2022), this ecological study examined 80 Mississippi counties. Two counties were excluded due to low counts. A linear regression analysis was performed to determine if there was an association between SVI and percentage of virally suppressed individuals at the county level.

Results: The SVI of the counties studied ranged from 0.00 to 1.00 (mean = 0.490). Viral suppression rates ranged from 30.0% to 84.4% (mean = 62.5%). The linear regression yielded statistically significant results, explained 8% of the variance in viral suppression (R^2=0.082), and showed that for every 1 unit increase in SVI, viral suppression decreased by 0.10 ($\beta 1$= -0.10, $p < .001$).

Public Health Implications: These results indicate that there is a statistically significant relationship between higher county-level SVI and lower rates of viral suppression, suggesting that interventions aimed at decreasing SVI may improve the treatment outcomes and survival for individuals living with HIV.

P7.44

Neuroimmune and Inflammatory Biomarkers in Chronic Neuropathic Pain: A Pilot Study of NPY, Cytokines, and T Cell Subsets

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Chronic neuropathic pain is a persistent condition marked by heightened morbidity and reduced quality of life, often unresponsive to conventional therapies such as opioids, which carry risks of tolerance, adverse effects, and addiction. Growing evidence suggests that neuroimmune dysregulation contributes substantially to the development and maintenance of chronic pain. Neuropeptide Y (NPY), a key inhibitory neuropeptide within the dorsal horn of the spinal cord, plays an important modulatory role in nociception through its Y1 and Y2 receptor isoforms. However, the relationship between circulating NPY isoforms, T-cell phenotypes, and inflammatory mediators remains insufficiently defined.

This pilot study evaluated two cohorts—individuals with chronic pain (n=10) and healthy controls (n=10)—to investigate plasma NPY levels, cytokine profiles, and T-cell subset distributions. Blood samples were analyzed using cytokine assays and flow cytometry. Individuals with chronic pain exhibited elevated $CD4^+$ T cells, increased memory T-cell populations, and shifts toward pro-inflammatory Th1 and Th17 dominance with reduced regulatory T-cell balance. Chronic pain participants also demonstrated decreased circulating NPY and increased levels of IL-6 and MMP-2, indicating enhanced systemic inflammation, extracellular matrix remodeling, and neuroimmune sensitization.

Together, these findings suggest that chronic neuropathic pain is associated with a pro-inflammatory immune environment, reduced inhibitory neuropeptide signaling, and heightened neuroimmune interaction. The observed alterations in NPY, Th1/Th2 and Th17/Treg ratios, and cytokine activity highlight potential biomarkers and therapeutic targets for developing novel non-opioid treatments aimed at restoring neuroimmune balance.

P7.45

Impact of County-Level Poverty on Prostate Cancer Mortality in Mississippi

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Background: Mississippi has the second highest prostate cancer mortality rate of any state in the USA. Our state also faces significant socioeconomic challenges. Since poverty has been identified as a social determinant of health that may influence cancer outcomes, we explored this relationship on the county level.

Methods: We conducted a cross-sectional study using county-level data from Mississippi. Poverty rates (percentage of residents living below the federal poverty line) and age-adjusted prostate cancer mortality rates (2018-2022) were merged for 73 counties with complete data. Simple linear regression was used to evaluate the association between poverty and prostate cancer mortality.

Results: Regression analysis demonstrated that county-level poverty was a significant predictor of prostate cancer mortality ($\beta = 99.92$, 95% CI 53.00-146.84, $p < .001$). For interpretation, this corresponds to an estimated increase of ~10 deaths per 100,000 for each 10% increase in poverty rate. The model explained 20.3% of the variation in prostate cancer mortality across counties ($R^2 = 0.203$).

Public health implications: Counties with higher poverty rates generally experienced higher prostate cancer mortality. These findings highlight the role of socioeconomic determinants in cancer outcomes and suggest that targeted interventions in high-poverty areas may help reduce disparities in prostate cancer mortality across Mississippi.

P7.46

Increased Prevalence of Otitis Media Among Pediatric Patients on ADHD Stimulants: A Case-Based Observational Report Using EHR-Derived Cohort Data

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Background: Otitis media is one of the most common pediatric ENT diagnoses. Attention-Deficit/Hyperactivity Disorder (ADHD) is also highly prevalent, with stimulant medications being the mainstay of treatment. Despite the frequency of both conditions, their co-occurrence has not been widely examined.

Objective: To determine whether stimulant medication use in children is associated with increased prevalence of otitis media.

Methods: A feasibility query was performed using Patient Cohort Explorer, evaluating EHR-derived data on children aged 3-12. Medication, diagnosis, and age filters were applied to determine the prevalence of otitis media among children with and without stimulant prescriptions.

Results: Of 301,495 children aged 3-12, 14,701 (4.9%) were prescribed ADHD stimulants. Otitis media was identified in 4,090 (27.8%) of these patients. In contrast, among the 286,794 children not on stimulants, 54,219 (18.9%) had otitis media. The relative risk of otitis media in the stimulant group was approximately 1.47 compared to non-stimulant peers.

Conclusion: These findings suggest an increased prevalence of otitis media among pediatric patients prescribed ADHD stimulants, raising questions about underlying mechanisms and the need for further investigation.

P7.47

Factors Associated with Low Risk C-Sections in Mississippi

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Low risk cesarean deliveries are defined as full term (at least 37 weeks) primary cesarean births that are singleton and cephalic-presenting. They remain a key focus of maternal health quality improvement efforts in Mississippi. This study examines demographic, behavioral, and clinical factors associated with low-risk cesarean section rates across the state, with the goal of identifying populations that are disproportionately affected and informing targeted interventions. Preliminary analysis indicates that factors like maternal age, educational attainment, and pre-pregnancy body mass index (BMI) are some of the most prominent factors linked to low risk C-section occurence in Mississippi. Conversely, conditions traditionally associated with medically indicated C-sections appear less influential in this population. The prevalence of comorbidities such as pre-pregnancy diabetes, eclampsia, gestational diabetes, gestational hypertension, and sexually transmitted infections show low association with low-risk C-section rates, underscoring that most procedures occurred in the absence of clear obstetric complications. These findings suggest that non-medical factors, particularly some factors like age, education, and weight status, contribute disproportionately to low risk cesarean deliveries in Mississippi. Understanding the interplay of these characteristics may help guide strategies aimed at reducing unnecessary cesarean births and promoting equitable, evidence-based maternity care across the state.

P7.48

Impact of Body Surface Area Estimation Method on Indexed Cardiac Measurements: An Echocardiographic Comparison of Predictive Formula

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Background: Body surface area (BSA) is a foundational biometric parameter used to index cardiac dimensions and functional measurements in clinical imaging, yet substantial variability exists among commonly used height-weight equations. These formulas differ in their underlying geometric assumptions and derivation cohorts, resulting in potential inconsistencies when applied to contemporary, heterogeneous populations. Echocardiography-derived BSA, which incorporates measured anatomical parameters, offers a biologically grounded reference for evaluating the accuracy of predictive BSA equations.

Methods: We compared Echo-derived BSA with eight widely used BSA formulas using Bland-Altman analysis to characterize fixed bias, limits of agreement, and proportional error. Formulas assessed included Takahira, Fugimoto, Boyd, Gehan & George, Haycock, Jacobson & Daniels, Schlick (combined male-female), and Mosteller. Agreement was evaluated across the full range of mean BSA values to determine how each formula performed relative to Echo-based measurements.

Results: Substantial variability was observed among formulas. Takahira demonstrated the closest agreement with Echo-derived BSA (95% CI: 0.9998 to 1.0003), showing minimal bias, narrow limits of agreement, and no evidence of proportional error. Fugimoto performed similarly well, (95% CI: 1.0009 to 1.0161), with only mild dispersion. In contrast, Boyd, (95% CI: 1.0697 to 1.1101), Gehan & George (95% CI: 1.0605 to 1.0899), and Haycock (95% CI: 1.0939 to 1.1277), exhibited moderate disagreement marked by systematic underestimation at higher body sizes. Jacobson & Daniels (95% CI: 1.1935 to 1.2676), displayed substantial proportional bias and wide variability, while the Schlick formula showed the poorest agreement (95% CI: 1.0448 to 1.0584), characterized by a pronounced bidirectional proportional error with overestimation at low BSA values and underestimation at higher values.

Conclusions: Takahira and Fugimoto provide the most accurate and consistent alternatives to Echo-derived BSA and are well suited for indexing cardiac imaging parameters. Other widely used formulas demonstrate notable proportional bias and may underestimate BSA in larger individuals, potentially leading to misinterpretation of indexed cardiac measurements. These findings highlight the importance of selecting BSA equations that minimize systematic error and improve the precision of imaging-based normalization.

P7.49

336 - Interval Time to Treatment Initiation of Breast Cancer: Trends and Disparities Among Black Women.

Toluwalope Femi--Awoyale, Erasmus Tetteh-Bator

Jackson State University, Jackson, MS

Timely initiation of breast cancer (BC) treatment following diagnosis is essential for improving patient outcomes and survival. Although Black women experience the highest BC mortality rates, no prior research has explored their interval time to treatment initiation (ITTI). This study assessed temporal patterns and identified disparities and risk factors associated with ITTI among Black women in Tennessee diagnosed with invasive BC.

We analyzed population-based data from the Tennessee Cancer Registry (2005-2017), including 6,601 Black

women diagnosed with invasive BC. ITTI was estimated, and trends over time were evaluated. Bivariate Kruskal-Wallis test was used to examine within-group and pairwise differences in ITTI. Unadjusted and adjusted multivariable Cox proportional hazards models were applied to determine relative risks, temporal trends, and predictors of delayed treatment initiation.

We observed an upward trend in both the crude median ITTI and the relative risk of delayed treatment, with differences noted by age, county of residence, insurance status, and type of treatment received. In adjusted analyses, women aged 65-74 years were compared with those under 45 (adjusted hazard ratio [aHR] = 1.22, 95% CI: 1.06-1.40), residents of Appalachian Tennessee were compared with non-Appalachian areas (aHR = 1.23, 95% CI: 1.12-1.37), and those undergoing surgery (aHR = 1.18, 95% CI: 1.03-1.36), radiotherapy (aHR = 1.19, 95% CI: 1.10-1.28), or chemotherapy (aHR = 1.11, 95% CI: 1.02-1.21) were significantly more likely to experience treatment delays beyond the median ITTI of 3.86 weeks. This study highlights subgroups of Black women who face an elevated risk of delayed initiation of BC treatment. Targeted interventions aimed at improving timely treatment among these populations may help reduce breast cancer patients related mortality among Black women.

P7.50

Exploring Predictors of HIV-Related Stigma: The Roles of Knowledge, Sexual Behavior, and Sexual History

Jerlisa Winston[1], Rhonda Holliday[2]

[1]Tougaloo College, Tougaloo, MS, [2]Morehouse School of Medicine, Atlanta, GA

HIV-related stigma remains a significant barrier to prevention, testing, and care, particularly among Black women, a group disproportionately affected by HIV. Despite efforts to promote awareness and the availability of effective prevention tools such as pre-exposure prophylaxis (PrEP), stigma remains. This study examined whether STI knowledge, PrEP knowledge, sexual behaviors, and STI history were associated with levels of HIV-related stigma. Participants (N = 164) completed a structured online survey assessing sexual health behaviors, history, and knowledge, and stigma was measured as a binary outcome (high vs. low). Logistic regression analyses were conducted, adjusting for age. Findings revealed that age was a consistent and significant predictor of HIV-related stigma: with each one-year increase in age, participants had lower odds of reporting high stigma (AORs ranging from 0.963 to 0.969, $p < .05$). In contrast, STI history, sexual behavior, and STI knowledge were not significantly associated with stigma levels. These findings highlight the importance of tailoring stigma-reduction efforts by age and improving awareness of PrEP as part of HIV prevention strategies.

P7.51

Assessing Respiratory Allergy Inequalities in Cancer Populations: Evidence from NHIS Data Analysis

Christiana Stringfellow, Erasmus Tetteh-Bator

Jackson State University, Jackson, MS

Respiratory allergies have been increasing in recent years, negatively affecting the quality of life of many individuals, particularly those with underlying chronic health conditions. Given that regional and ethnic inequalities significantly influence various health outcomes in the United States (U.S.), this study examined the prevalence, associations, and regional and ethnic disparities in respiratory allergy diagnoses among cancer patients in the U.S.

We analyzed retrospective, cross-sectional household interview data from the 2024 National Health Interview Survey (NHIS), using weighted samples of U.S. adults aged ≥18 years. Bivariate chi-square tests, multivariable logistic regression analyses, and measures of absolute and relative inequalities (including odds ratios) were employed to assess inequalities in respiratory allergies among cancer patients. Analyses were adjusted for sociodemographic factors (age, sex, marital status, and region) and socioeconomic factors (education and health insurance status).

The study assessed the prevalence of respiratory allergies among cancer patients and found significant differences across groups defined by key independent variables. Certain subgroups of cancer patients had significantly higher odds of respiratory allergies than others in sociodemographic, socioeconomic, and fully adjusted models. Additionally, residents of specific regions were more likely to report respiratory allergies compared to their counterparts, even after adjusting for education and health insurance coverage. Overall, the findings indicate that inequalities exist in the diagnosis of respiratory allergies among cancer patients. Targeted interventions should be aimed at addressing these disparities to help improve the quality of life and health outcomes of this vulnerable population.

P7.52

Mental Health Association with Hypertension Among U.S. Adults

Kristen Rhodes, Erasmus Tetteh-Bator

Jackson State University, Jackson, MS

Hypertension remains one of the most prevalent chronic conditions in the United States, and growing evidence suggests that mental health challenges, including depression and anxiety, may increase susceptibility to hypertension through behavioral, biological, and

psychosocial pathways. While previous studies have examined these associations separately, limited population-level research has assessed the combined influence of mental health indicators on hypertension among U.S. adults.

This study used a retrospective cross-sectional design leveraging data from the National Health Interview Survey (NHIS), 2018-2024. The analytic sample consists of U.S. adults aged 18 years and older. The primary independent variables were self-reported depression and anxiety symptoms, categorized by severity. The dependent variable was the reported diagnosis of hypertension. Covariates included age, sex, race/ethnicity, BMI, smoking status, alcohol use, physical activity, income, education, and health insurance status. Chi-square tests assessed group differences, and multivariable logistic regression models estimated adjusted odds ratios (AORs) for hypertension, controlling for covariates.

Preliminary analyses indicate a higher prevalence of hypertension among adults reporting moderate to severe depression or anxiety symptoms compared to those with minimal or no symptoms. Logistic regression findings show that increasing severity of depression and anxiety is associated with significantly higher odds of hypertension ($p < 0.001$). After adjustment, adults with severe depression show the highest odds of hypertension, followed by those with severe anxiety.

These results highlight the importance of integrating mental health screening into routine cardiovascular risk assessments and underscore the need for coordinated prevention strategies targeting both mental and physical health outcomes.

P7.53

Leveraging Tele-Critical Care to Support Rural Hospitals: Insights from a Mississippi Implementation

Md Rokibul Hasan[1], Farhana A. Lima[1], Rhea Arora[2], Lindsey B. Kuiper[3], Saurabh Chandra[3]

[1]Department of Data Science, University of Mississippi Medical Center, Jackson, MS, [2]School of Medicine, University of Mississippi Medical Center, Jackson, MS, [3]Center for Telehealth and Emerging Technologies, University of Mississippi Medical Center, Ridgeland, MS

Background: Rural hospitals often lack access to intensivists, leading to delays in critical care decision-making, higher transfer rates, and increased strain on limited resources. Tele–critical care (TCC) provides a mechanism for real-time specialty support, but implementation in rural Southern hospitals remains limited. To address these gaps, a Tele-critical Care Program (TCCP) was established to provide 24/7 remote intensivist consultation to a rural Mississippi hospital, aiming to enhance clinical decision support, manage complex patients locally, and improve operational outcomes.

Methods: Retrospective chart review (November 2023 – July 2024) examined TCCP utilization and clinical patterns at two rural Mississippi hospitals. Intensivists provided remote consultation via EMR access and an audiovisual cart system integrated into Emergency Department and inpatient workflows. Data included patient demographics, consultation timing, reason for admission, reason for TCC consult, number of follow-up encounters, discharge disposition, and provider order entry. Descriptive analyses characterized utilization patterns across clinical conditions. Analyses also included one-way ANOVA to test differences between discharge disposition and time-to-TCC (defined as time from hospital admission to first TCC consultation) and correlation analysis evaluated the association between time-to-TCC and hospital length of stay (LOS).

Results: Data from 145 patients were included in the analysis. TCC encounters were primarily used for severe conditions such as respiratory, cardiac, neurologic, and infectious/sepsis diagnoses, reflecting selective deployment when local clinical capacity was insufficient. While most patients required one TCC encounter, repeated follow-ups were more frequently seen among patients with complex conditions, especially those with respiratory failure, sepsis, and renal/metabolic disorders. Time-to-TCC varied significantly across discharge outcomes (ANOVA $F = 4.55$, $p < 0.001$). Moreover, a statistically significant moderate positive correlation was identified between time-to-TCC and hospital length of stay ($r = 0.48$, $p < 0.000001$). Patients receiving three or more TCC consultations were more often transferred to inter-facility transfer, reflecting greater illness severity.

Conclusion: At these rural Mississippi hospitals, implementing TCC provided timely access to intensivist expertise and revealed meaningful associations between consultation timing, need for follow-up, and patient outcomes. Earlier involvement of TCC clinicians was associated with more favorable discharge patterns and shorter LOS, supporting the program's role in improving clinical decision support and stabilizing local care delivery. These findings highlight the value of TCC as a scalable model for rural hospitals seeking to enhance complex patient management despite limited on-site critical care resources.

END OT THURSDAY'S PROGRAM

Friday, March 20, 2026

MORNING -Concurrent Sessions (B and C)

Hall D Room 6

Oral Presentation Session B

Topics: Population Health and Socio-Disparities

Moderators:

Drs. Lamar Hamil and David Gordy
Belhaven University and University of Mississippi Medical Center

8:00 Welcome Remarks

O7.09

8:15 Prevalence of Alcohol Consumption and Behavioral Correlates Among African American Students: A Cross-Sectional Survey

Faysal Ahmed Imran, Azad Bhuiyan, Ishmam Bhuiyan, Anika T. Monika, Mst Eshita Khatun

Jackson State University, Jackson, MS

Background: Alcohol use is a leading cause of morbidity and mortality in the United States. CDC reported that about 52.8% of aged 18 years or above report regular alcohol consumption. African American adults have a 7.6 % of past-year prevalence of substance use disorder in national data. Understanding of alcohol consumption interactions with other lifestyle behaviors is important for possible actions. Cigarette smoking, vaping, physical inactivity and poor sleep are behaviors that can cluster with alcohol use leading to negative health outcomes. This study explores the association of alcohol consumption with cigarette smoking, use of electronic vapor products, sleep hours as well as physical activity among African American students.

Method/Materials: We used cross-sectional survey data from 396 self-identified African American students at Jackson State university, an HBCU in Jackson, Mississippi. We applied descriptive statistics, chi-square tests and logistic regression models. Alcohol use in the past 30 days was the dependent variable. Key independent variables included vaping in the past 30 days, cigarette smoking, average sleep duration on school nights and days of physical activity. This survey tool was taken from the Youth Risk Behavioral Surveillance System (YRBSS) by the CDC. Results are expressed as Odds ratios (OR) with 95% confidence intervals (CI) to measure associations. Standard deviations (SD) were reported for continuous variables. Logistic regression models were adjusted for demographic age, sex, and student classification.

Results: The study was conducted with 396 participants and 56% of students reported alcohol use in the past 30 days. Students who smoke cigarettes were more likely to drink alcohol and had higher odds of alcohol use (OR = 2.5, 95% CI = 1.5-4.2, p <.001). A similar pattern was found for vaping. Findings show that participants who used electronic vapor products had significant association with alcohol use (p <.001). Logistic regression confirmed these associations remained significant with adjustment of demographics. This survey reveals that 34.3% of students who sleep 6 hours per night had a greater likelihood of alcohol use (p<.002). Physical activity showed an inverse relationship with alcohol consumption. Majority of students 51% spend more than 5 hours on screen time. The mean age of participants was 25.2 years (SD = 8.4) and females comprised 79% of the sample.

Conclusion: The study finding indicates that participant with alcohol use in the past 30 days had significant association with cigarette smoking, vaping behaviors and short sleep duration. Active physical exercise buffers the risk. Its effect was attenuated after adjustment. These findings are crucial for universities in Mississippi and deep south with African American faces high burden of alcohol and substance use related health disparities. Prevention interventions in universities should target multiple behaviors together reducing alcohol, smoking and vaping to promote adequate sleep and activity.

O7.10

8:25 Assessing Local-Level Stroke Burden Through the Lens of Social Vulnerability: Evidence for Equitable Planning in Mississippi

Minhazul Abedin[1], Fazlay Faruque[1]

[1]School of Population Health, University of Mississippi Medical Center

Background: Stroke is a leading cause of morbidity, mortality, and disability in Mississippi, claiming approximately 1,844 deaths annually and imposing a substantial economic burden. Disparities in stroke prevalence persist due to adverse social determinants of health. Data are publicly available to identify geographic differences in stroke prevalence and social vulnerability. This study assessed census tract-level stroke prevalence through the lens of social vulnerability to inform policy interventions for high-risk areas.

Methods: We analyzed 870 census tracts encompassing 2,277,524 adults using 2022 CDC PLACES data to estimate crude stroke prevalence and the CDC/ATSDR Social Vulnerability Index (SVI). We examined four themes (socioeconomic status, household characteristics, racial and minority status, and housing type and transportation), as well as overall SVI, to create vulnerability profiles, explore geographic patterns, and calculate population estimates by vulnerability level.

Results: Approximately 109,348 adults in Mississippi had

experienced a stroke, with 33,167 residing in tracts with high overall SVI. High-stroke tracts (6.0-11.6%) showed substantially elevated vulnerability (median overall SVI: 0.85; socioeconomic: 0.90; racial and minority status: 0.82). These tracts had median poverty rates of 50.1% versus 14.7% in low-stroke areas, nearly threefold higher minority composition (78.0% vs 26.8%), and fivefold greater vehicle access barriers (10.5% vs 2.2%). Strong correlations emerged between stroke prevalence and socioeconomic vulnerability (ρ=0.75), racial and minority status (ρ=0.60), and overall vulnerability (ρ=0.74) (all $p<0.0001$). The Mississippi Delta exhibited pronounced clustering of high stroke burden with elevated vulnerability across all SVI themes. A secondary high-burden corridor extended southward through central Mississippi. The Gulf Coast exhibited predominantly low prevalence, with variable vulnerability, while the eastern and northeastern regions displayed heterogeneous patterns with scattered high-concordance pockets.

Conclusion: Integrating PLACES and SVI data reveals distinct geographic patterns of stroke burden, aligned with social vulnerability in Mississippi. The Delta region and central corridor emerge as priority areas requiring targeted interventions, informing evidence-based resource allocation for stroke prevention and management in Mississippi's most vulnerable communities.

O7.11

8:35 Dual-Web-Maps Approach to Assess the Gap in Maternal Healthcare Access in the Magnolia State

Salit Chakma, Rohinton Dossabhoy, Thomas Dobbs, Fazlay Faruque

University of Mississippi Medical Center, Jackson, MS

Introduction: Maternal health is a critical concern for Mississippi. According to the March of Dimes' 2024 report, 51.2 percent of the state is maternal care deserts. The disparity in access to care disproportionately affects the rural, low-income, and minority communities. Improving healthcare access requires information tailored to both users and decision-makers. The purpose of this study is to support the utilization of existing resources and to evaluate the gaps for interventions.

Methods: In 2024, healthcare facilities offering prenatal and maternal care across and around Mississippi were contacted to confirm their addresses, service details, and program participation. Addresses were geocoded in ArcGIS Pro and verified utilizing Google Maps and OpenStreetMap. Facilities were categorized based on services (i.e., prenatal care, prenatal and maternal care, and family planning), program participation (i.e., Medicaid, family planning waiver), and intake of Medicaid-eligible/pending uninsured patients. A 30-minute drivetime service area was calculated from each of these locations. Two complementary web applications were developed: an interactive dashboard for providers and policymakers providing details on service areas, and another for mothers-to-be to locate care facilities within 15 miles of their preferred location. The user's application includes a hyperlink to find driving directions using Google Maps.

Results: Both applications were published on the Myrlie Evers-Williams Institute (MEWI) webpage (https://www.umc.edu/evers-williams/Clinical/cSPARKS.html). Based on the American Community Survey (ACS) 2018-2022 estimation, 31,744 (4.69%) reproductive-aged (15-49 years) women fell outside of the 30-minute service area from prenatal and maternal care facilities, while 96,709 (14.13%) reproductive-aged women fell outside of the service area from prenatal care facilities.

Conclusion: The two interactive applications are synergistic. While the user map guides mothers-to-be to care, the other informs strategic efforts to improve access to care. Informed access to care and informed planning, facilitated by these dashboards, can be critical in overcoming barriers to healthcare access in Mississippi.

O7.12

8:45 Assessing Healthy Retail Food Accessibility and Food Insecurity Across Mississippi Communities

Tasnim Tabassu[1], Fazlay S. Faruque

School of Population Health, University of Mississippi Medical Center, Jackson, MS

Understanding and accurately measuring food insecurity is essential for Mississippi, a state that consistently ranks among the highest in the nation for food insecurity. Food insecurity is measured by four components, and accessibility to healthy food is one of the fundamental ones. Policymakers and public health officials cannot effectively allocate resources or design targeted interventions without reliable metrics to identify where communities lack access to nutritious food. This study assessed healthy food retailer accessibility in Mississippi and investigated inequities by building the Modified Retail Food Environment Index (mRFEI) and examining relationships between accessibility and socioeconomic factors. A key strength of mRFEI lies in its recognition that consumers do not necessarily shop within their immediate residential area; instead, they have food purchasing options across surrounding neighboring communities. To capture this reality of shared resources among adjacent communities, a half-mile Euclidean buffer surrounding each census tract was examined to evaluate actual food availability for residents. This half-mile threshold aligns with fundamental urban planning principles regarding accessibility. To build mRFEI, we identified retail store locations and their attributes using Business Analyst 2025 data and North American Industry Classification System

(NAICS) codes. After that, we categorized them as healthy or less healthy according to CDC criteria. These stores were geocoded to identify their locations at the census tract level. The index uncovered significant gaps in food retail distribution across Mississippi. Specifically, findings indicated that 62 census tracts were completely devoid of any food retail establishments, while a substantially larger number, 264 census tracts, lacked access to retailers offering healthy food options for populations of 6% and 29.5% respectively.

The State Health Improvement Plan (SHIP) aims to reduce food insecurity and obesity prevalence by eliminating food deserts. Although the term 'food desert' is not used, state health officials need to identify areas where they can take actionable approaches. In this regard, the study incorporated a comprehensive examination of multiple socioeconomic and health-related variables that intersect with food access through ArcGIS Pro and Stata. These factors included poverty rates, availability of reliable transportation infrastructure, prevalence of obesity within communities, and existing levels of food insecurity in terms of mRFEI. To synthesize these multifaceted findings and facilitate actionable insights, bivariate mapping techniques were employed to visually identify high-vulnerability communities. These maps effectively pinpointed geographic areas characterized by the dual burden of restricted access to healthy food retailers and elevated rates of Supplemental Nutrition Assistance Program (SNAP) participation, high population density, or poverty. Such spatial identification serves as a valuable decision-support tool, enabling policymakers and community stakeholders to develop targeted, evidence-based interventions aimed at promoting more equitable access to nutritious food options across all communities.

O7.13

8:55 SNAP store distribution in Jasper County, Mississippi: An Exploratory Study

Tyus Wilson, Tasnim Tasnim Tabassum, Rebecca Butz, Fazlay Faruque

University of Mississippi Medical Center, Jackson, MS

The Supplemental Nutrition Assistance Program (SNAP) provides food benefits to low-income households, supporting access to nutritious foods that are essential for good health. Mississippi's SNAP participation rate is higher than the national average; in 2024, approximately one in eight Mississippians (384,800 individuals) received benefits. Jasper County is a predominantly rural county with a median household income of $47,157, compared to the state average of $54,915. An estimated 2,367 residents (15.0% of the population) participate in SNAP. The percentage of households receiving SNAP benefits varies widely across the county, ranging from 2.2% to 28.2% by census tract. GIS mapping completed in ArcGIS Pro indicates that the southeast corner of the county has the lowest rate of SNAP-benefiting households, while the northeast has the highest. This study examined the distribution and nutrition environment of SNAP-authorized retailers in Jasper County. USDA SNAP retailer data from May 2025 identified 20 stores; field verification conducted in October and November 2025 confirmed that five of these stores were closed, leaving 15 active SNAP retailers. In-store assessments were conducted using the Nutrition Environment Measurement Survey (NEMS), which scores food environments based on Availability of Healthier Item (0-30), Price (-9 to 18), and Quality (0-6). In Jasper County, Availability scores ranged from 0 to 22, Price scores from 2 to 7, and Quality scores from 0 to 6. Notably, nine of the fifteen stores received the lowest possible Quality score, indicating limited access to acceptable-quality fresh produce. To evaluate whether neighborhood disadvantage was associated with store nutrition environments, Pearson correlation analyses were conducted using total NEMS scores and two contextual indicators: the national Area Deprivation Index (ADI) and the Social Vulnerability Index (SVI). Total score showed a weak positive correlation with national ADI rank ($r = 0.245$), suggesting slightly higher store scores in more socioeconomically disadvantaged block groups. The total score showed a weak negative correlation with the SVI percentile ($r = -0.217$), indicating marginally lower scores in more socially vulnerable census tracts. Both associations were small. Overall, the results reveal a misalignment between areas with the greatest SNAP participation and the availability and quality of SNAP-authorized retailers. The northeast corner of Jasper County, where SNAP participation is highest, has no SNAP retailers, and many existing stores exhibit low produce quality. These findings point to gaps in food access within the county and highlight opportunities to strengthen the local nutrition environment.

9:05 Break

O7.14 Moved to session A

O7.15

9:20 Severe Maternal Morbidity in Mississippi: Risk Factors, Trends, and Outcomes, 2016-2024

Manuela Staneva, Thomas Dobbs

Jonh D. Bower School of Population Health, University of Mississippi Medical Center, Jackson, MS

Background: Mississippi suffers from some of the worst maternal outcomes in the country. During the 2018-2022 period, for instance, it had the nation's second highest rate of maternal mortality. Yet despite these troubling statistics, little is known about the driving forces behind the state's stubbornly high maternal mortality rates. To fill this

knowledge gap, we explored the prevalence and trends in severe maternal morbidity (SMM) events. Specifically, we examined risk factors for SMM, associated outcomes, and trend changes.

Methods: Severe maternal morbidity is defined as unexpected life-threatening outcomes of delivery that result in significant health consequences for the mother. Currently, there are 20 SMM indicators categorized into six main groups: hemorrhage, sepsis, respiratory, renal, cardiac, and other complications. These events are also combined in a composite metric, known as the SMM index. For this retrospective cross-sectional study, we analyzed statewide hospital discharge data for the 2016-2024 period. The study population included Mississippi residents who underwent obstetric in-hospital delivery in the state. Rates were calculated as the number of events per 10,000 obstetric deliveries and trends were evaluated with joinpoint regression analysis. Chi-square tests were used to compare categorical variables and logistic regression was implemented to compute odds ratio.

Findings: There were 2,153 SMM events during the study period; of those, 1,288 (59.8%) were Medicaid patients, 1,216 (56.5%) were Black women, and 432 (20.1%) were 35 years or older. Such deliveries were more likely to occur in metropolitan hospitals (63.6% vs 55.1%, $p < .001$) and facilities with high birth volumes > 1,000 births/year (57.5% vs. 46.5%, $p < .001$). The most prevalent condition was disseminated intravascular coagulation (23.8%), followed by acute renal failure (17.4%), and adult respiratory distress syndrome (16.3%). Hypertension was documented in 1,232 (57.2%) of SMM cases and was a significant risk factor for SMM events even after adjustment for demographics (aOR, 4.87, 95% CI, 4.46-5.31). All 30 in-hospital maternal deaths were associated with SMM. The overall trend of the SMM index was upward, increasing by 2.9% annually, although it should be noted that this increase was not statistically significant (AAPC, -2.90, 95% CI, -2.63 to 8.72).

Conclusions: Our findings demonstrated that black race, advanced maternal age, low socioeconomic status, and hypertension were major risk factors for SMM in Mississippi. Our study also revealed the value of hospital discharge data, a population level data source, to monitor and study SMM. Such surveillance can quantify the SMM burden, demonstrate trends in these "near miss" events, and identify opportunities for their prevention. This task is particularly important given the steady and worrying increase in the trendline for SMM.

O7.16

9:30 A Secondary Analysis of Mississippi Domestic Violence Trends from 2019 to September 2025 Based on The Trace Atlas of Gun Violence Archives

Lashanda Brumfield, Bernice Akinwande, Vickie Reed, Traci Hayes, Tanya Funchess

University of Southern Mississippi, Hattiesburg, MS

Background: Domestic violence remains one of the most heartbreaking yet overlooked public health challenges across the Deep South. Prevention programs and effective policies addressing domestic violence issues must be driven by translatable, applicable, and reliable data in order to see outcome-driven results. **Purpose:** The objective was to identify temporal, regional, and city-level patterns in the frequency and severity of domestic violence gun incidents. **Methods:** This study presents a secondary analysis of domestic violence gun incidents in Mississippi from January 2019 to September 2025. To examine geographic distribution, incidents were aggregated at the regional level: Central, Northeast, Northwest, Southwest, and Southeast, and visualized using bar charts that highlighted regional differences in incident concentration. Annual trends were visualized to show fluctuations in incident counts, fatalities, and injuries over the seven years. **Results**: The summary data for 2019-2025 revealed variations across years, with notable increases observed in recent periods. Further analysis identified the top ten cities by total incidents, with Jackson, Vicksburg, and Natchez among those with the highest counts. **Conclusion:** The findings provide an empirical overview of Mississippi's domestic violence gun trends, illustrating both temporal changes and geographic disparities that can inform future prevention and policy strategies.

O7.17

9:40 Modeling Socioeconomic Determinants and Chronic Disease Disparities Across Mississippi Counties: A Data-Driven Spatial Analysis

Martha Ravola, Babu George, Madhu Manthati

Alcorn State University, Lorman, MS

Chronic diseases including obesity, diabetes, and hypertension disproportionately impact Mississippi's rural and low-income populations. While public health efforts continue, county level quantification of the structural poverty and health link remains limited. This study aims to model associations between socioeconomic determinants and chronic disease prevalence across Mississippi counties using publicly accessible datasets such as CDC PLACES and the American Community Survey (ACS). Independent variables include county level poverty rate, median household income, unemployment, and educational attainment, while dependent variables encompass obesity, diabetes, and hypertension prevalence. Analytical

workflows will be utilized for multiple linear regression and Random Forest regression alongside correlation heatmaps implemented in R and Python to elucidate predictive relationships and interaction effects. Data visualization with Seaborn and ggplot2 provides geographic mapping of disparities, highlighting clusters of counties with elevated socioeconomic barriers and chronic disease burdens. This research further examines how socioeconomic inequities underlie geographic differences in health outcomes, aiming to identify high priority areas for intervention. Expected findings will support evidence-based resource allocation and policymaking by revealing critical economic drivers of health disparities. By integrating advanced statistical and machine learning models with spatial analysis, this study contributes to a comprehensive understanding of socioeconomic factors driving chronic disease in Mississippi. Ultimately, the results aim to inform targeted public health programs and strategies that reduce inequities and advance health equity across vulnerable populations statewide.

Oral Presentation Session C

Hall D Room 7
Topics: Microbes, Genomics, Cell Biology and Health Navigations

Friday, March 20, 2026, 8:15 AM-10:00 AM
Moderators:
Drs. Lance Keller and Poonam Sharma
University of Mississippi Medical Center

8:00 Welcome Remarks

O7.18

8:15 The Role of Bacterial Cellulose in Advancing Regenerative Medicine through Enhanced Healing, Infection Management, and Tissue Engineering

Pranav Reddy[1, 2]

[1]*The Johns Hopkins University, Baltimore, MD,* [2]*St. Andrew's Episcopal School, Jackson, MS*

Bacterial cellulose (BC) is a promising biomaterial for wound healing and regenerative medicine due to its biocompatibility, water retention, and high tensile strength. This study evaluates BC's potential in infection management and promoting fibroblast proliferation for use as an advanced wound dressing/scaffold in tissue engineering. To evaluate BC's antibacterial properties, hydrogels were treated with the minimum inhibitory concentration of amoxicillin (2 μg/mL) of Escherichia coli and tested on Mueller-Hinton agar plates containing E. coli. Eighteen plates were incubated at 37°C for 24 hours, treated, and then incubated for another 24 hours, with bacterial colonies and diameters measured at each time point. After the initial 24-hour incubation, six plates were treated with antimicrobial-infused BC, six with BC alone as controls, and six with no BC as negative controls. Results showed a significant reduction in bacterial growth ($p < 0.0001$) in antimicrobial-treated BC samples compared to untreated controls and negative controls, confirming BC's ability to inhibit bacterial proliferation. To assess cell proliferation, mouse embryonic fibroblasts (MEFs) were cultured in 96-well plates, with BC added after 24 hours to allow cell adherence to wells. MTT assays performed after 48 hours showed a significant increase in fibroblast viability in BC-treated wells ($p < 0.01$), suggesting BC's potential as a scaffold/hydrogel for cell attachment and growth. These findings demonstrate BC's ability to prevent infection and promote tissue regeneration. BC's tissue repair capabilities can be paired with growth factors or stem cells to enhance its regenerative potential, opening new possibilities for its use in tissue engineering, organ scaffolding, and advanced biointegration.

O7.19

8:25 Impacts of Microplastic Exposure on *Streptococcus pneumoniae* Infection and Antibiotic Resistance

Lucas R G Crosby[1], *Lance E Keller*[1], *Fahim Khan*[1], *Eva Bengten*[1], *Norah E Hill*[2]

[1]*University of Mississippi Medical Center, Jackson, MS,* [2]*U University of Mississippi Medical Center, Sure Program, Jackson, MS*

Streptococcus pneumoniae is a gram-positive diplococcus bacterium that is a common colonizer of the human nasopharynx and causes several diseases, such as meningitis, pneumonia, and otitis media. Another common component of the nasopharynx and other host tissues are microplastics. Microplastics have become ubiquitous in the modern world and there is still little known about their effects on bacterial virulence and invasion. Since *S. pneumoniae* and microplastics interact in the same niche in host tissues, this may alter *S. pneumoniae* virulence. We hypothesize that the presence of microplastics affects the immune response to *S. pneumoniae* infection. To examine these relationships between the immune response and *S. pneumoniae* we used murine models with and without the presence of microplastics with different strains of *S. pneumoniae* and microplastic exposure conditions. We also examined immune cell recruitment in murine bronchoalveolar lavage fluid through flow cytometry analysis. Single cell RNAseq analysis was also performed in mice exposed to microplastics compared to a control group. Following infection, we have observed a significantly higher density of bacteria in the lungs of mice that have acute microplastic exposure when strain Tigr4 was used, but the inverse was observed in the strain EF3030. Our findings suggest that microplastics

significantly influence the host immune response to *S. pneumoniae* infection in a strain-dependent manner. The increased bacterial burden observed in mice infected with the Tigr4 strain under acute microplastic exposure indicates that microplastics may enhance virulence or impair host clearance mechanisms

O7.20

8:35 Influence of Amoxicillin/Clavulanate and Enrofloxacin on Canine Gut Microbiota and ESBL producing *E. coli* Carriage

Khadija Ferdous[1], Maclin Miller[1], Joo Youn Park[2], Keun Seok Seo[2], Cooper Brookshire[1]

[1]Department of Clinical Sciences, College of Veterinary Medicine, Mississippi State University, Mississippi State, MS, [2]Department of Comparative Biomedical Sciences, College of Veterinary Medicine, Mississippi State University, Mississippi State, MS

Background: Antibiotics are essential for treating bacterial infections, but their broad-spectrum activity can disrupt the gut microbiome and promote the emergence of antimicrobial resistance. This study investigated the short- and intermediate-term effects of antibiotic administration on gut microbiota composition and the carriage of extended-spectrum β-lactamase (ESBL)-producing *Escherichia coli* in healthy dogs.

Methods: Ten healthy research beagles were orally administered amoxicillin/clavulanic acid and enrofloxacin at typical dosages, with fecal samples collected biweekly over five weeks: two pre-treatments, two during treatment, and six post-treatment timepoints. Selective culture for resistant Enterobacterales and 16S rRNA sequencing analyses were performed on each sample to assess microbial shifts and diversity.

Results: Before antibiotic administration, only 1 of 10 dogs carried ESBL-producing *Escherichia coli*. However, all 10 dogs tested positive for ESBL-producing isolates during and after treatment, representing a 900% relative increase in carriage. Microbiome analysis revealed a marked reduction in alpha diversity and significant increases in the relative abundance of *E. coli*, *Enterococcus* spp., and *Clostridium celatum* during antibiotic administration, followed by a continued post-treatment decline in alpha diversity and an increase in *Clostridium perfringens*.

Conclusions: These findings demonstrate substantial and sustained alterations to the fecal microbiota and increased colonization by antibiotic-resistant organisms following treatment. This pilot study underscores the need for strategies to preserve microbiome resilience during antimicrobial therapy and to mitigate resistance transmission in veterinary and One Health contexts.

O7.21

8:45 Elucidating the Role of Interleukin-17A in Chikungunya Virus-Induced Cardiac Pathology Using a Heterozygous Interferon-Deficient Mouse Model

Shazeed-Ul Karim[1], Prince M. D. Denyoh[1], Sabin Shrestha[1], David S. Bai[2], Ayokanmi Osobukola[1], Fengwei Bai[1]

[1]The University of Southern Mississippi,Hattiesburg, MS, [2]Columbia University, New York, NY

Chikungunya virus (CHIKV) infection in human is frequently associated with cardiovascular complications, yet the underlying mechanisms remain poorly understood due to the lack of suitable animal models. Our preliminary studies revealed that homozygous interferon receptor-deficient mice (*ifnar1*$^{-/-}$ and *ifnag*$^{-/-}$) succumb rapidly to CHIKV infection, while heterozygous *ifnar1*$^{+/-}$ and *ifnag*$^{+/-}$ mice survive the CHIKV infection but develop elevated viral burdens and pronounced leukocyte, particularly neutrophil infiltration in the heart compared to wild-type (WT) mice. Viral localization studies further showed that CHIKV preferentially infects the left atrium, left ventricle, and aorta. Our initial data revealed that interleukin-17A (IL-17A) expression was significantly high in CHIKV-infected hearts compared to non-infected group. Moreover, CHIKV RNA was nearly undetectable in IL-17A-deficient (*Il17a*$^{-/-}$) mice, suggesting a critical role for IL-17A in facilitating viral persistence and cardiac pathology. Given that IL-17A has been implicated in both CHIKV pathogenesis and cardiovascular diseases, this study aims to develop a heterozygous interferon-deficient mouse model to elucidate how IL-17A signaling contributes to CHIKV-induced cardiac injury and to explore IL-17A-targeted therapeutic strategies to mitigate CHIKV-associated heart disease.

O7.22

8:55 One Formulary, Many Gains: A QI Project to Improve Provider Efficiency and Medication Access

Gerri A. Wilson[1], MD, PhD; Sarah Brannan[2], MD; Deewan Bulchandani[1], MD; Michael DePasquale[1], MD; Patrick Fitz-Gerald[1], MD; and Jon C. Jackson[1], MD

[1]Mississippi State Hospital, Whitfield, MS , [2]Elmhurst Hospital, Elmhurst, NY

When the residency program began in 2021, Mississippi State Hospital lacked an updated, easily accessible formulary. As providers, we recognized the lack of a formulary was leading to an increased number of calls to and from the pharmacy, which we suspected was impacting the efficiency of providers and pharmacists. To investigate this, surveys were sent to providers campus-wide before and after the implementation of a new, updated formulary. Prior to the second survey, we 1) collaborated with the pharmacy to determine what medications they had and

what dosages were available, 2) made the formulary easy to locate and navigate, 3) ensured everyone was made aware of how to access it, and 4) allowed adequate time for providers to use it. Only 61.5% of respondents knew how to access the formulary before this project, compared with 94.1% afterward. After implementation, 52.9% of respondents said they called the pharmacy much less often, and 41.2% said that the pharmacy called them much less often. Based on these results, more providers know how to access the formulary, and providers are calling and being called less often. In conclusion, an easy-to-access, up-to-date formulary improves hospital efficiency.

9:05 Break

O7.23

9:10 Enhancing Epstein-Barr Viral Load Testing Through Adoption of an FDA-Approved Nucleic Acid Amplification Method

Samra Mariyam, Swathi Yarlagadda, Brittany Van Buren, Kassandra Moton, Sumit Sontakke, Robert Brodell, Patrick Kyle, William Daley, Poonam Sharma

Department of Pathology, University of Mississippi Medical Center, Jackson, MS

Background: Epstein-Barr virus (EBV) is a herpesvirus associated with various diseases like infectious mononucleosis, Hodgkin and non-Hodgkin lymphomas, post-transplant lymphoproliferative disorder, nasopharyngeal carcinoma, and chronic active EBV disease. Diagnosis relies on both serologic and molecular testing. Serology includes anti-viral capsid antigen (VCA), anti-nuclear antigen (EBNA), anti-early antigen antibodies, while molecular detection of EBV DNA, particularly in immunocompromised or transplant patients where serology is unreliable. Prior to this project, our clinical pathology lab utilized a laboratory-developed test (LDT) for quantitative EBV polymerase chain reaction (PCR) in the Molecular Diagnostics section. To improve accuracy, consistency, and regulatory compliance, we evaluated the FDA-approved cobas® EBV DNA test for implementation in the Serology Laboratory.

Methods: Verification was performed using the Roche cobas® 6800 system. Accuracy was assessed using manufacturer controls, linearity panels, and clinical samples across the manufacturer's stated analytical measurement range. Linearity was evaluated by performing linear regression comparing observed values to expected values. Precision was determined by running two control levels in triplicate over five days to calculate intra-run, inter-run, and total coefficient of variation (%CV). Limit of detection (LoD) was confirmed using 20 replicates at the lowest reportable concentration.

Results: The assay demonstrated excellent linearity (R^2 = 0.9988) across the full reportable range. Accuracy studies showed a mean $\log_{10}$ difference of -0.14 from comparator results, meeting acceptance criteria. LoD was confirmed with 100% detection at the lowest validated concentration. Precision was strong, with total %CV ranging from 1.28% to 2.55%, well below typical acceptance thresholds for quantitative PCR assays. All external quality controls performed within expected ranges.

Conclusion: The FDA-approved cobas® EBV DNA quantitative PCR assay on the cobas® 6800 system demonstrated excellent accuracy, precision, and linearity, supporting its clinical adoption. Transitioning EBV viral load testing from a non-FDA-approved LDT to an FDA-approved assay enhances regulatory compliance, improves inter-laboratory standardization, and strengthens EBV monitoring for immunocompromised and transplant patients.

O7.24

9:20 Enhancing Antimicrobial Stewardship in the Clinical Microbiology and Serology Laboratories at University of Mississippi Medical Center

Tejas Maheshwari, Akhila Arvind, Vamshi Gorantla, Brittany Van Buren, Kassandra Moreland-Moton, Vonda Clack, Sumit Sontakke, Robert Brodell, Patrick Kyle, William Daley, Poonam Sharma

University Of Mississippi Medical Center, Jackson, MS

The increasing threat of pathogens developing antimicrobial resistance demands continuous laboratory adaptation. The Clinical Microbiology Laboratory at the University of Mississippi Medical Center (UMMC) has implemented guidelines in accordance with recommendations outlined in the Clinical and Laboratory Standards Institute (CLSI). First, breakpoints for antimicrobial agents including piperacillin-tazobactam against Enterobacterales and Pseudomonas aeruginosa were updated. In addition, the lab suppressed outdated and inappropriate antibiotics (e.g., gentamicin for P. aeruginosa and ceftazidime for Salmonella and Shigella species). The laboratory also integrated guidelines by removing the spinal fluid warning for fluoroquinolones based on emerging evidence. These measures were strengthened by rigorous quality control (QC) reference range validations (e.g., for aztreonam using E. coli ATCC 25922) and expanded susceptibility testing for resistant organisms including Stenotrophomonas maltophilia and carbapenem-resistant Acinetobacter spp. Also, for fungal pathogens, reflex susceptibility testing was implemented for Candida auris, a multidrug-resistant species of growing clinical concern.

Beyond phenotypic updates, the lab enhanced the molecular detection of resistance genes. The transition from the Cepheid Xpert MRSA G3 to the advanced Xpert MRSA NXG system has improved diagnostic accuracy by

utilizing updated primers and probes that better differentiate mecA and mecC MRSA strains in order to reduce false positive results. This integrated approach updating breakpoints, expanding reflex susceptibility testing, and advancing molecular diagnostics positions UMMC at the forefront of laboratory-driven antimicrobial stewardship and reinforces the institution's commitment to accurate diagnosis, timely intervention, and optimal patient care.

O7.25

9:30 - The Effect of Serum Estrogen and NPY-RA Levels on Body Weight and Structural Integrity of Vital and Reproductive Organs in a Post-menopausal Model

Kenneth Butler[1], Michelle Tucci[1], Hamed Benghuzzi[2], Gary Hamil[1]

[1]University of Mississippi Medical Center, Jackson, MS, [2]Jackson State University, Jackson, MS

Introduction: Menopause-associated estrogen decline leads to metabolic dysregulation, increases in body weight, and regression of reproductive tissues. In parallel, circulating neuropeptide Y (NPY) typically rises, reflecting its regulatory roles in appetite, vascular tone, and reproductive physiology. Because NPY and estrogen exert opposing biological influences, antagonism of the NPY Y1 receptor has gained interest as a potential non-hormonal therapeutic strategy. This study examined the comparative effects of estrogen replacement and NPY1 receptor antagonism on body weight, vital organ structure, and reproductive tissue morphology in an ovariectomized (OVX) rat model of menopause.

Methods: Adult female Sprague-Dawley rats (n=25) underwent bilateral OVX and were assigned to OVX control, OVX + sham implant, OVX + estrogen implant, or OVX + NPY antagonist implant groups; intact females served as baseline controls. Animals were evaluated at 2, 4, and 8 weeks. Measures included serial body weights, wet weights of vital organs (adrenal, kidney, liver, spleen), gross and histologic evaluation of reproductive tissues, and serum estrogen and NPY concentrations. Statistical analyses consisted of one-way ANOVA with Tukey HSD post-hoc testing ($\alpha = 0.05$) and effect size estimation (Cohen's d).

Results: OVX and sham animals gained substantial body weight across all time points compared with intact controls. At 8 weeks, one-way ANOVA confirmed significant differences among the groups ($F = 15.39$, $p < 0.001$). Cohen's d demonstrated very large OVX- and sham-induced metabolic effects versus intact controls ($d = 2.74$ and $d = 2.75$, respectively). NPY antagonist-treated animals also differed markedly from controls ($d = 2.53$), while estrogen-treated animals showed only a moderate effect size ($d = 0.61$), consistent with metabolic normalization. Tukey HSD comparisons showed significant weight differences between controls and the OVX, sham, and NPY antagonist groups ($p < 0.01$). Estrogen-treated animals did not differ significantly from controls but were significantly lighter than sham animals ($p = 0.005$). NPY antagonist treatment produced intermediate effects, not statistically distinct from OVX by pairwise comparisons, but directionally indicative of partial mitigation.

Gross reproductive morphology revealed severe atrophy in OVX and sham animals, while NPY antagonist-treated tracts resembled intact controls, displaying enhanced vascularity. Estrogen-treated organs were enlarged and fluid-filled, representing heightened epithelial activation. Histologically, estrogen restored keratinizing squamous maturation, whereas NPY antagonism improved epithelial thickness and vascularity without inducing estrogenic keratinization. Vital organ wet weights showed no significant differences among groups. Serum analysis confirmed restored estrogen levels only in estrogen-treated animals, with NPY antagonist treatment producing no measurable changes in circulating estrogen or NPY.

Discussion: Estrogen replacement and NPY1 receptor antagonism each ameliorated OVX-induced reproductive and metabolic changes but through distinct physiological mechanisms. Estrogen exerted classical proliferative and metabolic effects, whereas NPY1 antagonism improved tissue vascularity and epithelial organization in an estrogen-independent manner.

Conclusion: These findings demonstrate that NPY1 receptor antagonism provides meaningful structural and metabolic benefits in the post-menopausal rodent model, supporting its potential as a non-hormonal therapeutic approach. While estrogen remains effective for normalizing metabolic and epithelial maturation, NPY1 receptor blockade offers a mechanistically distinct strategy that preserves reproductive tissue integrity without inducing estrogen-dependent effects, warranting further translational investigation.

Friday, March 20, 2026

Day 2

Hall D Room 7

9:15-11:15 Symposium II

Theme: Infectious Diseases and Vaccine

"A new twist"

Speaker I Dr. Fengwei Bai,
University of Southern Mississippi

Topic: Cytokines and viral infections

Speaker II Dr. Justin Thornton,
Mississippi State University

Topic: The first step to preventing pneumococcal disease is the first step

Speaker III: Dr. Claudia Patricia Herrera,
Tulane University

Topic: Chagas Disease

11:15-11:30 Symposium II Questions

Student Awards for Health Sciences Division

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Molecular Center of Health and Disease, UMMC

SGSHS, UMC

SHRP, UMMC

H. Jeff Hicks, CPA

History and Philosophy of Science

Chair: Gregory Johnson

Mississippi State University

Co-Vice Chair: Paula Smithka

University of Southern Mississippi

Co-Vice Chair: Robert Waltzer

Belhaven University

Thursday, March19, 2026
MORNING
Hall D Room 7

8:20 Welcome

O8.01

8:30 The Fall of Emergentism and the Rise of Physicalism Revisited

Kevin Morris

Tulane University, New Orleans, LA

According to a well-known and influential narrative, physicalist approaches to mind and body rose to prominence around the middle of the 1900s due to empirical developments in physics and the study of living organisms, which together provided strong evidence against special mental forces or energies in living organisms (McLaughlin 1992, Papineau 2001). This is sometimes expressed as the "causal completeness of the physical", that physical occurrences, including physical occurrences within living organisms, have sufficient physical causes, if they have sufficient causes at all. According to this narrative, this empirically-based causal thesis explains the rise of physicalist thinking, and the corresponding downfall of various forms of mind-body dualism, especially "emergentist" doctrines according to which, while mental states "emerge" from physical states, they nonetheless confer upon living organisms special powers-based causal capacities. This is the "empirical-causal" narrative.

Despite its continued influence, I argue that this narrative faces interrelated historical, philosophical, and conceptual challenges, stemming from the widespread acceptance - warranted or not - of versions of the completeness of the physical (often expressed in terms of a "mechanistic" conception of the physical, including physical events in the nervous system of living organisms) well *before* the rise of physicalist thinking, and often in the context of *anti-physicalist* conceptions of mind and body. I focus on discussions of mind and body from around 1870 to 1915 and how thinkers during this time understood and reacted to the idea that physical occurrences in living

organisms have sufficient physical causes (Bain 1873, 1891; Clifford 1878; Ladd 1895; Lewes 1893; Stout 1887-88, 1913; Ward 1899/1906, 1899/1903; Strong 1903) . Given the empirical-causal narrative, one would expect these thinkers to have taken seriously the possibility of special mental forces; however, when examining the historical data, this is precisely what we do *not* find. Instead, these thinkers typically sought to make sense of mental causation in a way *consistent with* the completeness of the physical; moreover, despite what would now be regarded as strongly anti-physicalist conceptions of mind and body, the strategies that these thinkers employed to make sense of mental causation were, I argue, very similar to more contemporary strategies typically employed within broadly *physicalist* paradigms.

I conclude by offering a more plausible historical narrative, centered on three related ideas: first, the influence of logical empiricist thinking on discussions of mind and body; second, the move from methodological theses about the practice of psychology to metaphysical theses about the nature of mind; third, the influence of common sense methodology in philosophy.

O8.02

9:00 Hyperdimensional Neutral Monism and the Proto-Panpsychist Structural Solution

Kali Killingsworth[1, 2]

[1]*Arizona State University, Tempe AZ and* [2]*Barrett, The Honors College, Tempe, AZ*

Jason Frenkel's Hyperdimensional Neutral Monism (HNM) offers a novel attempt to move beyond the mind-body impasse in the philosophy of mind by positing a unique metaphysical structural basis of consciousness through spatio-temporal protrusion into a proposed 'consciousth' fifth dimension. While its aim is to preserve monism while avoiding reductive materialism and "spooky" dualism, I argue that HNM's structuralist commitments present an internal friction.

Specifically, Frenkel adopts both type-identity and token-identity, yet he maintains a distinction between mental and physical properties in virtue of their functional relations, giving the physical structural priority but not supervenience over mental aspects. This structuralism, however, forces one to question of how one avoids epiphenomenalism and ontological dualism. Further, Frenkel treats subjectivity as fundamental while simultaneously rejecting cosmopsychism, creating a conceptual contradiction that leaves the metaphysical basis of consciousness unclear and at odds with the claim that consciousness only arises in localized protrusions into the fifth dimension. Finally, Frenkel's theory falls short of sufficiently addressing problems pertaining to causation, and he concedes to the radical claim of denying causal closure of the physical world, which I argue he ought not to endorse.

Motivated by these tensions, and aiming to clarify HNM's framework, I examine three candidate structural accounts available to HNM: 1.) The first-order, dual-aspect identity account. 2.) The First-order Compound view, and 3.) The second-order, dual-aspect without identity account of powerful qualities. I argue these positions face a dilemma by either inflating into a dual property ontology or deflating into a nominalist position by divorcing aspects from causal relevance.

Finally, I introduce a hybrid model that integrates top-down priority with bottom-up modal power realization. On this view, proto-phenomenal qualities are second-order modal powers that are globally instantiated, but token conscious experience is an activation of powers through compositional interaction of dual-aspects within structurally bounded and unified systems. This hybrid model preserves HNM's central monist commitments while resisting the pitfalls of rival accounts by clarifying the structural roles of aspects and affirming their derivative power realization without reversing ontological priority, inflating ontology, or compromising causal symmetry. Ultimately, the view defends a form of structurally constrained proto-panpsychism, where phenomenal character and subjective character are distinct. I conclude the best solution that keeps in the spirit of Frenkel's intended structural neutral monism is to adopt the hybrid view—which would entail Frenkel concedes to proto-panpsychism as a more modest version of the cosmopsychism he so resists.

9:30 Break

O8.03

9:40 Physicalism Degeneration

Fuyao Zhang

Tulane University, New Orleans, LA

The development of the natural sciences—especially fundamental physics—has made physicalism look more attractive than ever. At the same time, philosophers have introduced increasingly fine-grained versions of the view, such as supervenience physicalism and grounding physicalism. In this paper I argue that this trend does not strengthen the plausibility of physicalism as a unified theory of reality. Instead, it leads to a degeneration. My central claim is that physicalism earns most of its credibility from the support it receives from the natural sciences, and must therefore remain constrained by them. Once physicalism drifts away from those constraints, it loses the main reason anyone ever found it plausible in the first place. The argument has two parts. First, physicalism cannot win simply by being more elegant or more powerful at the level of metaphysical explanation or philosophical reasoning than its competitors, such as dualism or idealism. This is not enough. Physicalism is not, and has never been, a position that succeeds by philosophical ingenuity alone. Second, the credibility of physicalism depends on what I

call the “strong evidence” provided by the physical sciences. This kind of evidence supports physicalism’s commitment to explaining the mind-body relation in physical terms. But here a problem appears: the stronger a version of physicalism commits itself to clear claims about the mind-body relation, the more it can be supported—or challenged—by this strong evidence. The weaker the commitment, the less the scientific evidence matters. Strong versions, such as type-identity theory, once received this kind of support but have largely disappeared. Meanwhile, weaker versions, such as supervenience physicalism and grounding physicalism, offer increasingly detailed metaphysical structures but are less tied to what the sciences actually say. This, I argue, is the degeneration of physicalism: the view becomes more sophisticated on the metaphysical side but less connected to the scientific evidence that originally motivated it. A defensible physicalism must remain accountable to the natural sciences, or it risks becoming a purely philosophical position with no empirical grounding.

O8.04

10:10 Mind as Process: Reconstructing Enactivism Through Prigogine and Whitehead

Gregory Ashby[1]

University of New Orleans, New Orleans, LA

This paper defends enactivism as a theory of mind by demonstrating that it is coherent with rigorous scientific and metaphysical principles. Enactivism correctly rejects competing representational and computational models but remains incomplete without a secure footing in a clear and thorough ontology. I argue that cognition is not a product of internal mechanisms; it is a relational process that is only emergent from systems that are (1) thermodynamically open, (2) temporally extended, and (3) self-organizing. Drawing on Ilya Prigonine's theory of dissipative structures, Alfred North Whitehead's process metaphysics, and case studies focusing on the slime mold *Physarum polycephalum*, I will show that enactivism is a scientifically and metaphysically coherent theory of mind.

O8.05 INVITED KEYNOTE

10:30 'The Stories of Neurophilosophy”

John Bickle[1, 2]

[1]*Mississippi State University, Mississippi State, MS and* [2]*University of Mississippi Medical Center, Jackson, MS*

How did it happen? How did the unlikely pairing of intellectual endeavors, neuroscience and philosophy, come together, first in the niche field of neurophilosophy, and later in the philosophy of neuroscience? This is a common topic of after-conference discussions, often with younger scholars in the fields asking their more seasoned colleagues about the “old days.” Accounts exist but are scattered in published interviews, essay-length autobiographies, and footnotes in journal articles and books. Interesting as these may be, they are the recollections of single individuals. Yet the pairing of these fields has been, and is now pursued, by a research *community*. The community narrative, from its beginning to the present day, does not exist.

Until now. Brian Keeley, Marica Bernstein, and I are conducting semi-structured Zoom interviews with philosophers and brain scientists, from those who first forged the fields to those whose ongoing research now sustain them. The product will be a book-length narrative history built around interviewees’ stories: *The Stories of Neurophilosophy: Being the fifty-year history of the Trailblazers and Explorers who brought together Philosophy and the Brain Sciences to open up the Black Box of our Minds.* We also plan to archive the recorded Zoom interviews and full transcripts for other scholars to explore. Although neurophilosophy and the philosophy of neuroscience are of recent origins—less than a half-century—it’s literally now or never to tell this narrative in this fashion. Some of the ‘trailblazers’ who first set out on this interdisciplinary journey are no longer with us or no longer able to tell their stories. Even the ‘explorers’ who followed, many the initial graduate students of the ‘trailblazers,’ are starting to retire.

With more than half of the 90+ projected interviews now completed, this talk will be a progress report of what we’ve found so far. Interesting and unexpected commonalities have emerged: the importance of being on faculty at less “prestigious” institutions, which gave people more freedom to explore neuroscience or philosophy; the impact of “larger-than-life” personalities in the fields’ early days; key conferences and events that brought together the

original community of researchers. Serendipity is a common theme in how individuals first came to see the relevance of neuroscience to philosophy, and vice-versa, and also in meeting and building collaborations with neuroscientists or philosophers. Despite a significant positive shift recently in the recognition of neurophilosophy and philosophy of neuroscience within broader academic philosophy, researchers in these fields still see themselves as part of a fringe, still needing to justify their interests and accomplishments to their colleagues and administrators.

Beyond the inherent interest in a community-focused history of these specific interdisciplinary fields, broader lessons may also abound in these *Stories* for other endeavors that seek to blur academic disciplinary boundaries.

Thursday, March19, 2026
AFTERNOON
Hall D Room 7

O8.06

1:45 Mapping Consciousness Across Species: An Experiment in Epistemic Interface Design

Kelly Dinneen

Graduate School and University Center of the City University of New York, New York, NY

Research on animal consciousness is highly heterogeneous, spanning diverse species, theoretical frameworks, and methodologies. This diversity makes the field difficult to navigate philosophically: empirical research programs inherit theoretical assumptions without acknowledging them, philosophers must interpret vast and uneven bodies of evidence, and a few well-studied or charismatic species have an outsized influence. Conventional scholarly genres (meta-analyses, literature reviews, synthetic essays) can summarize this terrain but struggle to make the structure of the field transparent without flattening biological or conceptual diversity.

This presentation's centerpiece is an exploration in epistemic interface design: an interactive map of consciousness science that links empirical findings across species to competing theories of consciousness. With generative AI supporting large-scale text analysis, the project builds a structured corpus of empirical findings across species and maps each result onto a matrix of major theories of consciousness. The interface lets users toggle among multiple theories and species and watch how the evidential landscape shifts.

The aim is exploratory. The project is not an attempt to produce a final or authoritative synthesis, but to test alternative formats for organizing research in a complex domain with practical stakes. By surfacing empirical claims under multiple theoretical lenses, the interface highlights areas of convergence without neglecting interspecies differences.

More broadly, the project proposes dynamic information architecture as a methodological tool for the history and philosophy of science. Interactive discipline maps can expose tacit structures and illuminate paths of conceptual influence. The interface creates a manipulable space in which relationships can be explored or reframed.

By treating interface design as a form of philosophical inquiry, the project offers a new approach to synthesizing research in fields marked by theoretical diversity and uneven evidence. As a prototype, it shows how corpus-level visualization can support more transparent, pluralistic, and species-sensitive reasoning about consciousness, while raising broader questions about how the design of research outputs can shape inquiry.

O8.07

2:15 Why LLMs Can't Think Like You

Gregory Johnson

Mississippi State University, Starkville, MS

Chirimuuta (2024) argues that neither large language models (LLMs) nor deep convolutional neural networks (DCNNs) can successfully model the human mind. Her skepticism is based on these models' inability to produce conscious experience or demonstrate "general intelligence," which she defines as "the ability to apply learned knowledge to fundamentally novel situations" (p. 247). Her basis for this position is rather thin, however. The brain is, she points out, different than electronic computers in many ways (pp. 115 - 118), and "the material details probably do matter" for how the mind operates (p. 282).

In this talk, I will develop a more complete argument that that these computational models will not be able to successfully model the human mind. I share the intuition that a computer model of the mind won't be able to effectively model (or achieve) consciousness, but explaining consciousness biologically isn't much easier than explaining it any other way, and so I will set consciousness aside and focus on explanations of the cognitive operations of the mind. This might seem to be the aspect the mind most amenable to computational explanation, but I will argue that computational explanations of our cognitive abilities encounter two problems.

First, it's often the case that lower-level changes within a biological system affect the system's operation. For instance, the mutation of a base in a virus's DNA can change the antigen that antibodies detect (McGuinness et al. 1991). This, then, has consequences for how the organism's immune system responds to the virus. Understanding the possible lower-level changes that can affect cognition is impossible when computational models

are used.

Second, besides visual, auditory, olfactory, and tactile inputs from the environment, the brain receives a variety of inputs from the body—for instance, information about the body's internal state (cardiovascular, respiratory, gastrointestinal), its position and location in space (i.e., proprioception), the possibility of tissue damage (i.e., nociception), and levels of hydration, blood sugar, and hormones. Even if this information is secondary to information from the environment, to the extent that it can affect cognition, it cannot be ignored by a successful model of the mind.

Chirimuuta, M. (2024). *The Brain Abstracted: Simplification in the History and Philosophy of Neuroscience*. MIT Press.

McGuinness, B. T., Clarke, I. N., Lambden, P. R., Barlow, A. K., Heckels, J. E., Poolman, J. T., & Jones, D. M. (1991). Point mutation in meningococcal por A gene associated with increased endemic disease. *The Lancet*, *337*(8740), 514-517.

O8.08

2:45 The Illusion of Consciousness in AI Systems

Kenneth Butler[1], Hamed Benghuzzi[2], Michelle Tucci[1], Gary Hamil[1]

[1]University of Mississippi Medical Center, Jackson, MS, [2]Jackson State University, Jackson, MS

The concept of artificial intelligence—first formally introduced by John McCarthy at the Dartmouth Conference in 1956—initiated a profound transformation in how humans understand the mind, cognition, and the boundaries between organic and artificial systems. As AI systems have rapidly infiltrated and integrated into daily life, from conversational "chatbots" to large-scale decision-support platforms, human dependence on these technologies has grown correspondingly. This dependence often amplifies a deeper philosophical tension: the illusion of consciousness projected by advanced AI. Consciousness, traditionally understood as the capacity for subjective experience, self-awareness, and intentionality, remains one of the central unsolved problems in philosophy of mind and cognitive science. While humans possess richly layered consciousness shaped by biology, emotion, embodiment, and lived experience, machines fundamentally lack phenomenology—they do not feel, perceive, or experience reality. Yet modern AI systems can convincingly simulate conversation, emotional understanding, and reflective reasoning. This creates a perceptual illusion in which users attribute conscious states or agency to algorithms that, in essence, execute statistical predictions without awareness. The rise of immersive AI platforms has intensified the blurring of human-machine boundaries, prompting renewed debates about what makes humans unique. The ability to hold intentions, form moral judgments, and experience subjective meaning distinguishes human cognition from even the most sophisticated machines. Nevertheless, AI's capacity to mimic these traits raises ethical and epistemological questions: How should society interpret behaviors that appear intelligent or conscious? And to what extent does human reliance on these systems reshape our understanding of mind itself? In exploring these questions, this paper highlights the historical, technological, and philosophical roots of the enduring tension between genuine consciousness and its increasingly persuasive mechanical imitation.

THURSDAY, March19, 2026
EVENING
Hall B
3:30 DODGEN LECTURE /AWARDS CEREMONY

THURSDAY, March19, 2026
EVENING
Hall C
5:00-7:30 Reception and General Poster Session (Immediately following Dodgen Event)

All posters should be placed in the poster all by 12:00 pm on Thursday, March 19, 2026

Odd poster numbers will be presented from 5 -6

*Even poster numbers will be presented from 6-***7**

P8.01 Ontological Evolution: Aristotle's Relevance in Modern Science

Silvia Boaventura

University of New Orleans, New Orleans, LA

This essay challenges Bertrand Russell's claim, from his book *A History of Western Philosophy* (chapter XXIII), that barely a phrase from Aristotle's notion of physics should be considered in science**.** I argue that his understanding of Aristotle's concept of time is incomplete and possibly misleading. By comparing Aristotle's idea of time with Einstein's concept of space-time, it is possible to show that Aristotle remains relevant to physics. Aristotle's simplistic perceptions and conceptions of existence and how natural phenomena function, even if they are proven false, allow us to perceive the ontological transformation and cognitive evolution that humankind undergoes as it evolves in its historical verve

The most notable misunderstanding from Russell is to state that "Time, he [Aristotle] says, is motion that admits numeration."(Russell 206). Russell understood that time

stands for motion, a movement that enables calculation. Nevertheless, what Aristotle argues is that time is a type of number that counts motion in reference to before and after (Annas 97). Aristotle suggests that *time* is a feature of movement (219a1). Time is a numbered unit we perceive as change occurs, and it comes into existence when it is noticed in change.

By comparing Einstein's sophisticated concept of time from space-time with Aristotle's first perception, it is possible to note similarities. To them, time is a measure of the duration of motion, and an observer is needed to count it. Furthermore, history shows that Aristotle conceived time as relational to the observer; later, Galileo and Newton claimed that time was absolute and independent of the observer. Today, modern science holds that time is relational, linked to space and mass, forming a unified entity known as space-time.

The advancement of science comes with the reflection on the importance of doubting authority figures, institutions, and methods of reasoning. Aristotle took a defamatory stance, questioning Plato in his exploration of the concept of time (Annas 105). Further in history, Galileo questioned Aristotle's authority when he read and taught his theories in natural science (Hawking 394). Einstein revised Newton's ideas in physics, whose theories still held notions from Aristotle. Parts of Aristotle's intuitive ideas can be recognized in scientific texts or used as teaching tools to understand prevailing theories (Dr. Susskind 63). Science benefits more from studying Aristotle's notions of physics than from ignoring them. It helps understand how his hypotheses were disproven, leading to the evolution of scientific knowledge.

Einstein states that Galileo and Newton are among the scientists who began to understand the *language* of nature. Aristotle was part of the origins of thinkers who began systematically investigating natural phenomena. I share Russell's opinion that philosophers studying history must examine Aristotle's ideas of physics (Russell 203). However, I believe their importance extends beyond that, given their core role in science. Rejecting or overlooking the relevance of Aristotle's ideas in physics is like erasing a part of the origins of science. His notions are pertinent to the evolution of modern science and significant to the analysis of how society develops intellectually.

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END of Thursday's Program

Friday, March 20, 2026
MORNING
Hall D Room 12

O8.09

8:30 Homeorhetic Dynamic Kinds: Complement or Replacement of Homeostatic Property Cluster Kinds?

Paula Smithka

University of Southern Mississippi, Hattiesburg, MS

In their forthcoming article, Davide Serpico and Francesco Guala argue that natural kinds are homeorhetic dynamic systems (HDK) (2025). Homeorhesis was coined by Conrad Waddington (1957) and refers to a stable trajectory through developmental space. Using the language from systems theory (e.g. Kauffmann, 1993, 1995), Serpico and Guala contend that natural kinds are best conceived of from a processual, diachronic perspective which, they allege, better accounts for the discontinuity among kinds. Thus, a natural kind is demarcated when the developmental trajectory has become canalized which is characterized by flexibility, that is, systems continuously adapt to their environments, and robustness, wherein a system tends to preserve its properties, manifesting resilience to perturbations. Using examples of natural kinds from medicine, namely, cancer, social political systems, as well as biological species, Serpico and Guala argue that their HDK approach solves the "fuzzy boundaries" of natural kinds that are not explained by either the homeostatic property cluster kind approach (HPCK) (e.g. Boyd, 1991, 2000) or the historical natural kinds approach. They point out that the synchronic approach of HPCK is epistemically limited in that it amounts to a "static" snapshot of natural

kinds, thus failing to recognize that systems are dynamic, whereas the historical approach to kinds (e.g. Griffiths, 1997, 1999; Millikan, 1999, 2017), though diachronic in perspective like HDK, defines kinds "purely by common ancestry," further contending that it is a mistake to "combine historicity and staticity (that is, to focus on property clusters with historical essences)." Serpico and Guala, at times, suggest their HDK "complements" and does not "replace" these other theories, but they continue to defend their HDK theory as a better account of natural kinds, both ontologically and epistemically. Nevertheless, I contend Serpico and Guala misunderstand the concept of homeostasis as being static, rather than a being a dynamic stability. Kenneth Curry and I introduced the concept of homeorhesis at MAS (2018) and I argued for the utility of homeorhesis in the context of defending the fecundity of systems theory for understanding biological species as HPCKs (MAS, 2020). Here, I argue that homeorhesis helps explain natural kinds, in particular biological species, but it is a complement to the HPCK approach due to the epistemic limitations of any diachronic perspective in that we are unable to "see" the stable trajectory, yet it can be inductively inferred as the causal process driving the dynamic system toward an attractor, that is, toward relative stability of properties or homeostasis demarcating a biological species.

O8.10

9:00 The Cultural-historical Lens for Historical Epistemology

Benjamin Aguda

University of New Orleans, New Orleans, LA

Historical epistemology is an approach to understanding knowledge that examines how scientific concepts, methods, and ways of knowing have developed and changed over time. Rather than treating knowledge as timeless or universal, it investigates the historical conditions that made certain forms of knowledge possible. For my presentation I will introduce a framework for historical epistemology that I recently developed while designing a lecture on the history of biology between Aristotle and Darwin. My approach is inspired by cultural-historical psychology. According to cultural-historical psychology, we have a tool-mediated mind. Complex cognition is scaffolded by social and material engagements such as social arrangements and various technologies. We internalize cultural tools such as heuristics, metaphors, and conceptual frameworks, which allows us to achieve complex cognitive abilities. The mind is situated in, distributed throughout, and extended with our social and material environment, which we actively construct to this end. Cultural-historical psychology can provide an interpretive lens for historical epistemology with which we can make sense of the history of ideas and knowledge itself. A direct application for the cultural-historical lens is in hermeneutics when trying to reconstruct the context for obscure and often strange passages in famous text. We should consider the conditions for the possibility of their thoughts rather than immediately dismissing them as ironic or foolish. Writers from different times have very different cultural-historical conditions, which only allow for a range of thoughts to be "thinkable". This phenomenon of unthinkable thoughts was discussed by Foucault while developing his archeological method. Foucault attributed it to different episteme, which are the informal rules about knowledge that govern a time period, and different epistemes are unthinkable to one another by his framework. However, Foucault does not provide any details about episteme and how they change; he never explains what constitutes an episteme, how they change, or why they are unthinkable to one another. My account identifies episteme with particular cultural-historical constellations of material technologies and social interactions. Thoughts are scaffolded by cultural tools derived from the cultural-historical conditions so changes in the conditions create different possibilities for knowledge.

Another application for the cultural-historical lens is in historiography. When reconstructing the history of a discourse, the lens allows us to see what remains continuous despite all of the apparent discontinuity. For example, there is more to biology than just taxonomy, but biology does involve continuous taxonomic practices that began with Aristotle, continued through Linnaeus and the natural historians, and continues up to today. Between Aristotle and Linnaeus, these taxonomic practices persisted, but the criteria for inclusion changed depending on the cultural-historical conditions of the taxonomist. Pliny the Elder, Isidore of Seville, and Albertus Magnus are not typically included in the history of biology, but I would argue that they are continuous with natural history which is continuous with biology. I have applied this to biology, but it could be applied to the history of ideas for other disciplines as well.

O8.11

9:30 The Resilience of Kant's Transcendental Geometry

Lucas Rader

Mississippi State University, Mississippi State, MS

This paper examines the validity of Immanuel Kant's theory of geometry, specifically in relation to modern advances in mathematics and physics. Kant conceived geometry as 'a science that determines the properties of space synthetically and yet a priori.' This position is grounded in Kant's transcendental idealism. He is committed to three fundamental claims: (1) geometrical axioms are synthetic, (2) geometrical theorems are synthetic, and (3) geometrical knowledge is a priori.

The paper traces the origins of these claims first by examining Kant's Critique as a rejection of David Hume's conception of geometry as analytic knowledge. Following this is a brief history of the rise of non-Euclidean geometries in the nineteenth century and their applications in the twentieth century physics. These developments appear to challenge (3) as they imply that geometry is neither in modern mathematics nor in physics a priori but has empirical origins, and therefore is a posteriori.

This paper examines and ultimately rejects the thesis that the emergence and applications of the non-Euclidean geometries render Kant's theory of geometry and space in general hopelessly antiquated. Moreover, the paper will argue that the discoveries of Riemann and Einstein confirm (1), (2), and (3). I will argue that according to Kant geometrical knowledge is possible only through a mental construction and manipulation of spacetime and the discovery of non-Euclidean Geometry confirms that.

10:00 BREAK

O8.12

10:15 Selecting Hypotheses for Philosophical Inquiries

Jiusi Guo

University of Illinois, Urbana-Champaign, IL

Given a set of data points, among a set of hypotheses, which hypothesis should an inquirer select to account for the data distribution? This is the problem of hypothesis selection. This problem has been intensively studied in statistics and machine learning. However, the same cannot be said for philosophy. Aside from a few notable exceptions, such as Glymour and his collaborators, most philosophical methodologies are silent on this issue. In this paper, I aim to sketch a partial response to the problem of hypothesis selection tailored to philosophical inquiries. The response I sketch here is three-fold.

First, I provide an examination of the inferential process underlying hypothesis selection. I argue that hypothesis selection is best understood as a kind of abductive inference. Abduction is the inference underlying hypothesizing; it concerns postulating problem-solving hypotheses that are worth further development. Hypothesis selection belongs to this process because the output of hypothesis selection is not a verdict on the truthfulness of a hypothesis, but a tentative commitment to the feasibility of the hypothesis as a guide for inquiry. In other words, what hypothesis selection provides is a vindication of which hypothesis is worth pursuing, rather than a justification of which hypothesis is true.

Second, I develop a four-dimensional schema for measuring and order hypotheses so that resource-limited inquirers can make principled decisions of selection. The theory-mediation dimension evaluates a hypothesis' compatibility with an inquirer's auxiliary theories; it concerns whether adopting a new hypothesis demands a drastic revision of the inquirer's other commitments. The strategic-relevance dimension evaluates how well adopting a hypothesis can contribute to achieving the long-term goal of inquiry; some of the features under concern here include the testability of a hypothesis, the reliability of the methods by which different hypotheses are generated, etc. The ignorance-preservation dimension assesses how fruitfully a hypothesis can transform a puzzling problem into an informative research program, distinguishing trivial hypotheses from those that open up new, experimentally tractable questions. Finally, the nonmonotonicity dimensions captures the defeasible character of all three assessments above: As new data and theoretical commitments emerge, the ordering of hypotheses can and ought to be revised.

Third, I illustrate how this schema is practicable via a toy case from applied epistemology: the epistemology of the frog's prey-catching system. Based on observations of frog's foraging behaviors, I consider three competing hypotheses about what the frog represents when it shoots its tongue toward the prey. I show how classical ethological and neuroscientific work on the frog's "bug detector," together with more recent evidence about plasticity and motivational-state modulation, can be used to evaluate and re-evaluate these three hypotheses along the four dimensions, including cases where measurements along different dimensions pull the choice in different directions, and the initial decision is defeated as new information becomes available.

The resulting framework does not yet amount to a fully formal method for philosophical inquiries. It does, however, demonstrate that hypothesis selection can be made explicit, principled, and empirically informed in the context of philosophical inquiry.

O8.13

10:45 Tracing the Origins of Malaria Diagnostics: A Comprehensive Review of Aimee Wilcox's Scientific Contributions

Lillian Sisson, Ralph Didlake

University of Mississippi Medical Center, Jackson, MS

Aimee Wilcox, a pioneering microscopist and educator who worked with noted medical illustrator Inez Demonet, to produce some of the earliest detailed diagnostic drawings of *Plasmodium* species. However, her contributions to malaria research have not been comprehensively documented. The University of Mississippi Medical Center houses the complete Wilcox Collection, an extensive archive containing hundreds of original parasite illustrations, unpublished manuscripts, book chapters, presentations, correspondence, personal notes, and biographical materials. This project aims to reconstruct the scientific trajectory of Wilcox's career and contextualize her influence on early malaria diagnostics.

We conducted a qualitative historical review of all available materials and organized them chronologically to identify major phases in her research and artistic development. The documents were thematically coded to evaluate the evolution of her parasite morphology illustrations, her refinement of microscopic diagnostic criteria, and her expanding role in teaching and scientific communication. Preliminary findings demonstrate a clear progression in the precision and complexity of Wilcox's drawings over time, with several depictions of *P. falciparum* and *P. vivax* predating or aligning with later widely adopted diagnostic features. Personal letters and institutional correspondence reveal her close collaboration with physicians, laboratory trainees, and early public health workers, underscoring her significant impact on malaria education and practice. By synthesizing the full scope of her archival materials, this project provides the first cohesive narrative of Wilcox's work and highlights the critical role of medical illustration in the development of infectious disease diagnostics.

O8.14

11:15 Walking Through the Doors of Perception: Gadamer and the Comforting Delusion Objection

Daniel Stearman

Tulane University, New Orleans, LA

Psychedelics provide experiences that hang in tension with a general scientific worldview. Users commonly report undergoing mystical-type experiences, often describing being transported to transcendent realms and even encountering spiritual beings. For example, Aldous Huxley, in his famous trip report "The Doors of Perception," says "A rose is a rose is a rose. But these chair legs were chair legs were St. Michael and all angels." This is complicated by psychedelics' profoundly noetic quality. Huxley, like many users, left with the sense that he learned something: "The man who comes back through the Door in the Wall will never be quite the same as the man who went out. He will be wiser." If scientific naturalism is true, then there are no supernatural entities, thus there are no transcendent realms and no spiritual beings. This line of thought influences the comforting delusion objection (CDO). The CDO says that, despite the noetic qualities, since the metaphysical status of what is experienced is not consistent with metaphysical naturalism, users undergo a "comforting delusion." Since psychedelics are beginning to be used in clinical research and the beliefs that arise upon usage are predictive of positive therapeutic outcomes, then if the CDO is correct, patients may be undergoing some kind of epistemic harm while retaining some therapeutic benefit. In this paper, I show that the CDO is not correct. I argue that the kind of knowledge that psychedelic experience provides is comparable to experiencing works of art. Art, be it in the form of a novel, movie, painting, etc., often depicts fictional worlds that are inconsistent with scientific naturalism. Nevertheless, art provides new knowledge of one's place as an agent in our natural world. I use Gadamer's discussion of art's capacity to increase self-understanding as a framework for understanding the post-experience integration process by interpreting Huxley's trip through a Gadamerian lens. Gadamer's framework is presented in a manner consistent with naturalism. Resultingly, if the noetic qualities of psychedelic experience are congruent to the kind of knowledge gained from art and that knowledge is consistent with naturalism, then the comforting delusion objection is in error, as users do, in fact, learn something that is consistent with scientific naturalism. My argument brings to light an interesting point where the comforting delusion objection goes wrong; it falsely assumes that there must be a metaphysical coherence between the knowledge gained and the metaphysical status of what is experienced itself.

11:45- Break/Lunch

Friday, March 20, 2026
AFTERNOON
Hall D Room 12

O8.15

1:30 Maximal Disability & Mere Difference: An Objection to Barnes

Joseph Aron

The University of Alabama, Tuscaloosa, AL

Philosophers of disability generally divide themselves into two groups: mere-difference theorists, who contend that disabilities are not automatically or independently bad for their subjects, and bad-difference theorists, who contend that they are. In "The Minority Body," Elizabeth Barnes advocates for a mere-difference view by arguing that all disabilities are neutral independently ('neutral simpliciter'), and that empirical harms stemming from them are instead the result of an ableist society that is insufficiently committed to the accommodation of people with disabilities. In particular, Barnes responds to an argument posed by Jeff McMahan, who suggests that the bad-difference view is proved by the fact that disabilities are aggregately harmful—an individual afflicted with every conceivable disability seems to be harmed regardless of society's efforts to accommodate them. Barnes counters that cumulative harm is not sufficient to demonstrate that each component is harmful, in the same way that a visually unappealing outfit may be composed entirely of articles of clothing which are themselves inoffensive.

Although I believe that Barnes's response to McMahan is successful, I argue that a revised version of McMahan's argument survives Barnes's objection and requires

substantial revision to her argument. We need not conceive of this individual as being afflicted by every conceivable disability, but rather a single disability which entails all of these effects as symptoms. It appears that this hypothetical individual is (A) a person, (B) who is subject to a disability, (C) which harms them, (D) and these harms are not merely the result of an unaccommodating society—a set of premises which, if true, contradicts Barnes's view. In this paper, I argue for each of these premises, explore and reject potential objections that a proponent of Barnes could make, and ultimately explore potential revisions to the Barnesian account which allow it to survive this line of argument.

More broadly, this argument addresses the conception of disability used in psychological and medical contexts. By examining whether certain impairments could be intrinsically harmful even in ideal social conditions, this project connects the metaphysics of disability to questions in the biomedical classification of disability, and the role of empirical evidence in defining it.

O8.16

2:00 Balancing Autonomy, Competency, and Self-Determination in Individuals with Neurodegenerative Diseases

Gary Hamil[1], Michelle Tucci[1], Hamed Benghuzzi[2], Kenneth Butler[1]

[1]University of Mississippi Medical Center, Jackson, MS, [2]Jackson State University, Jackson, MS

Balancing autonomy, competency, and self-determination in individuals with neurodegenerative diseases presents one of the most complex ethical challenges in contemporary bioethics. Conditions such as Alzheimer's disease, frontotemporal dementia, and Parkinson's disease involve progressive and often fluctuating declines in cognition, judgment, and functional capacity. This creates shifting levels of autonomy and decision-making competency over time, requiring clinicians, caregivers, and ethicists to navigate a dynamic ethical landscape rather than a fixed threshold of ability. Autonomy—central to modern medical ethics—must be understood as a spectrum rather than an all-or-nothing property. Individuals may retain decisional capacity in some domains while losing it in others, and may express values, preferences, and goals even when they cannot independently manage complex decisions. From a bioethical standpoint, supporting self-determination involves proactively identifying the person's enduring values, employing supported decision-making strategies, and using advance care planning to preserve autonomy as the disease progresses. At the same time, respect for autonomy must be balanced with the ethical principles of beneficence and nonmaleficence when individuals no longer appreciate risks or consequences. This necessitates periodic, context-specific assessments of competency that recognize partial capacity and avoid prematurely transferring decision-making authority. Ethically responsible care requires an individualized approach that honors the person's narrative identity, integrates family and caregiver perspectives, and safeguards against both undue paternalism and uncritical deference to autonomy. Ultimately, the challenge is to maintain the dignity and agency of those living with neurodegenerative diseases while protecting their well-being—achieving a balanced moral framework that evolves alongside the person's changing capabilities.

2:30 Break

O8.17

2:45 Challenges with Informed Consent for Broad Inclusion and Longitudinal Medical Records Retrieval

Kenneth Butler, Gary Hamil

University of Mississippi Medical Center, Jackson, MS

Broad consent models that include contributing a specimen for future research use and permission for ongoing access to electronic medical records (EMRs) have become increasingly common in large-scale biobanking, tissue repositories, and longitudinal research. While these approaches offer substantial scientific value—enabling real-time clinical phenotyping, long-term outcome ascertainment, and linkage to biospecimens—they also raise significant bioethical concerns. First, continued EMR follow-up challenges traditional notions of informed consent, as participants may not fully appreciate the scope, duration, or future uses of their data. Second, risks to privacy and confidentiality increase as more sensitive health information accumulates over time, particularly for vulnerable populations with histories of medical mistrust. Third, dynamic data integration may yield incidental or secondary findings, creating ambiguity about researchers' obligations for the return of results and their communication responsibilities. Fourth, potential commercialization or data-sharing with third parties can undermine trust if participants perceive that the benefits of research do not flow back to the communities that contribute data. Ethically sound solutions require transparent, participant-centered governance. Enhanced consent processes—using layered information, teach-back methods, and multimedia tools—can clarify expectations for longitudinal EMR access. Dynamic consent platforms offer flexible, ongoing opportunities for participants to modify preferences, strengthening autonomy. Robust data-security frameworks, including tiered access controls and continuous auditing, can mitigate privacy risks. Community advisory boards and participant-engagement programs foster shared decision-making and ensure that

data use aligns with communal values. Finally, clear policies for managing incidental findings and equitable benefit-sharing promote fairness and trustworthiness. Together, these strategies support ethically responsible broad consent practices that preserve participant autonomy while enabling high-impact research.

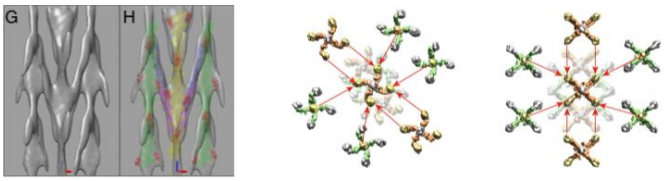
O8.17

3:15 - Stresses and Strains. How is Muscle Designed to Hold Up?

Robert Waltzer Belhaven

University, Jackson, MS

The forces of muscle bear down upon the molecules within it and strain them up to and beyond their limit. The construction of such an organ that demands so much from its molecules is a design problem requiring an exquisite solution. Muscles and the molecules within them have four kinds of responses to these tremendous stresses. 1) They replace those molecules rapidly 2) They arrange the molecules into complex networks that together brace against the forces (illustrations above) 3) They modify the structure of muscle in real time to better adapt to the strains 4) They have signaling networks that detect problems, activate appropriate responses, and fix issues before they interfere with use. An example of #1 is alpha-actinin (illustrations above) in the Z disk which is one of the most rapidly replaced proteins (every 21 seconds). Alpha-actinin also demonstrates #2 above in that it forms complex networks of interacting units that form a "molecular lattice spring" (illustrations above) that absorbs the stress and then returns the spring to its original shape. Related to #3, the thickness of the Z disk and the length of the filamentous protein titin can vary from muscle to muscle and even vary within the same muscle at different states of exertion. #4 is possibly the most difficult to understand and about which the most is written. It is believed that many of the different forms of hereditary muscle diseases, including myopathies and dystrophies, are a result of damage to the repair mechanisms that automatically kick in and maintain continuous adaptation. There are multiple examples of mutations of proteins that cause such diseases. Different mutations of the same protein can cause different diseases and mutations of different proteins can cause the "same" disease. Even though the same name of the disease is used to describe multiple cases, those cases often arise from different causes and result in variations in the symptoms. Often the mutation interferes with a signaling pathway, but exactly what the signaling pathway is and does is not understood. This response and repair mechanism is likely one of the most complex systems in biology. Everything about muscle is rapid and intense; the signal to activate, the contractile mechanisms, and the signaling and repair. The fact that in most circumstances these systems work just fine is truly amazing. And such compensatory mechanisms anticipating damage and initiating repair at a rapid rate indicate genius and foresight. It is analogous to covert military operations, where a threat is identified, targeted, and neutralized. All of this occurs without our awareness. The anticipation of problems and the activation of effective responses displays "mindfulness." Such a system is currently beyond the level of scientists' understanding, and gives some of the strongest evidence for design in biological systems.



Burgoyne et al. 2019, PNAS; Oda and Yanagisawa, 2020, Nature Commun Bio,

O8.18

3:45 - In Defense of the Reality of Biological Information

John Neiswinger

Belhaven University, Jackson, MS

As humans, we are constantly creating and engaging with complex, functional, specified information. This abstract, for instance, is using specifically ordered characters and conventions of English grammar to convey a (hopefully interesting) idea its author has about the concept of information. It is meant to be read and understood by the reader and cause them to be interested in attending a corresponding talk. Without utilizing the agreed-upon rules of the English language, these series of symbols laid out in this abstract would be meaningless and would not achieve its desired end (attendance). Instead, careful attention had to be paid to arrange these characters in this particular order. Claude Shannon, the pioneer of what we now call information theory, described information as being inversely related to uncertainty (deemed Shannon information). The greater the number of possibilities, the greater the *im*probability that one of those possibilities will be actualized, and therefore the more information is transmitted when one of those possibilities *is* actualized. Therefore, the longer the series of characters, the more information content that string of characters can contain. Shannon information is limited, however, when it attempts to distinguish between merely improbably sequences of symbols (a string of 29 random letters) from those that convey a message or produce a specific effect (the string of 29 letters with meaning, like '*time and tide wait for no man*'). The latter exhibits *complex, functional, specified information*, whose only known source is an intelligent mind - one who is capable of actualizing a particular improbable series of characters to achieve a definitive, meaningful end. While studying biological life, we observe many improbable sequences of biological building blocks (sugars, nucleic acids, and amino acids), all of which contain *at least* Shannon information. But do these

branched sugar chains, chromosomes, and proteins that are comprised of these improbable sequences show *only* Shannon information, or do they display something more - complex, functional, specified information? Textbooks throughout academia appear to agree with the latter, describing our DNA as a part of a 'data (i.e. *information*) storage-and-retrieval' system that generates proteins that mediate specific functional effects. Countless studies on the function of these proteins involve site-directed mutagenesis, a technique that understands the rules of syntax of this system and specifically alters the message in order to change its functional output. Scientists, therefore, treat DNA in the same way a book editor treats prose, changing the meaning from one message to another. In doing so, they validate the use of the term 'information' when describing the content found in biological systems. Others disagree, arguing that describing a biological system in this way either depends on a flawed analogy between biology and human artifacts, or that using 'information' metaphorically is an attempt to put a label on something that isn't actually there. However, if what we observe in biological systems is the same kind of complex, functional, specified information in both *content and use* that comprises the sentences in this abstract (which was generated by an intelligent mind), then the inference to the best explanation for its origin is that it also arose from an intelligent mind, calling into question the explanatory power of non-intelligent causes.

4:15 Divisional Business Meeting

Marine and Atmospheric Sciences

Chair: Francis Tuluri
Jackson State University
Co-Vice-Chair: Remata Reddy
Jackson State University
Co-Vice-Chair: Duanjun Lu
Jackson State University
Co-Vice-Chair: Courtney Roper
University of Mississippi

Thursday, March19, 2026
AFTERNOON
Hall B Room 2

8:50 Welcome and Opening

O9.01

9:00 Environmental Health Literacy in Mississippi

Amelia Craze, Bryant Lewis, Courtney Roper

University of Mississippi, University MS

Determining the attitudes, behaviors, and knowledge regarding environmental health of community members in Mississippi is critical, as increased environmental health literacy (EHL) leads to improved overall health. We deployed an EHL survey with a focus on air quality to identify community derived issues and develop solutions in Mississippi. We have collected over 100 surveys with information about community member attitudes, knowledge, and behavior related to the environment and air quality. This includes scale-based statements such as "I consider the air I breathe in my community to be clean" and open-ended questions to allow community lead air pollution source identification. Preliminary findings suggest that over 75 % of participants in Lafayette County, MS consider pollution a problem with ~50 % feeling empowered to make changes in their homes yet under 30 % feel empowered to make community level change. These findings will be used to develop targeted intervention strategies and outreach events to support improved EHL in Mississippi.

O9.02

9:15 Eastern Oyster, *Crassostrea virginica*, Recruitment in the Western Mississippi Sound Before and After Hypoxic Disturbance

Geoffry Spooner, Chet Rakocinski, Katherine VanderKooy

University of Southern Mississippi - Gulf Coast Research Laboratory, Ocean Springs, MS

Oyster reefs have declined globally by 85% over the last

140 years due to several different factors, including overfishing, mismanagement of habitat, disease, prolonged and repeated environmental disturbance. The Eastern oyster, *Crassostrea virginica*, population within the Mississippi Sound has been subject to increased disturbances both environmental and anthropogenic over the last two decades. A 4-year study from 2014 to 2018 quantified the early recruitment of Eastern oyster in the western region of the Mississippi Sound. A spatially hierarchical study design involved three reef complexes (strata) moving seaward from St. Louis Bay, each of which was represented by four sites. For each site event, six spat-settlement plates attached to faunal collection baskets were deployed for 6 weeks. Seven sampling events ensued in the mid-summer and early fall of 2014, 2015, as well as in early fall of 2017, and the mid-summer and early fall of 2018. Spat were enumerated and up to 25 individuals randomly selected and measured from both sides of settlement plates. Comparisons were made between sites within each of the strata, among the three strata, and between the different seasons of collections. The years leading up to 2016 showed substantially higher early recruitment in early fall compared to mid-summer. Early recruitment during the early fall 2017 period was relatively low compared to previous early fall recruitment. Early recruitment was high and normal again in 2018. Thus, recruitment strength was markedly lower after the 2016 hypoxia event. The return to stronger recruitment in 2018 illustrated a delayed recovery by Eastern oyster to hypoxia events.

O9.03

9:30 Carbon fluxes in two coastal Mississippi marshes with contrasting hydrology

Francis Driscoll, Songjie He, Vivian Tidd

University of Southern Mississippi, Hattiesburg, MS

Intertidal marshes are central to coastal biogeochemical processes and play a disproportionately large role in the carbon cycle. Their high rates of primary production and low oxygen soils allow for long term carbon storage, defining them as blue carbon ecosystems. These important systems are under threat due to large scale land loss, with some of the highest rates occurring in the Gulf Coast region. The three primary carbon fluxes in coastal marshes - vertical gas exchange with the atmosphere, lateral exchange through tidal pumping, and carbon burial in marsh sediment - govern the movement of carbon in these systems. The balance between CO_2 sequestration, CH_4 emissions, long term storage, and lateral export of inorganic and organic carbon as well as alkalinity define a marsh's influence on radiative forcing, carbon storage, and coastal acidification. Here, we present a comprehensive assessment of carbon dynamics in two proximal Mississippi tidal marshes with contrasting hydrological settings. Vertical carbon fluxes were quantified using long term automatic flux chamber deployments, lateral fluxes were derived from discrete and high-frequency water measurements, and long-term carbon storage was estimated form soil core analysis. This integrated approach, applied for the first time in Mississippi marshes, will work to constrain the carbon dynamics of these two sites in the northern Gulf Coast. These findings will inform future assessments of land loss, restoration, and resilience in these valuable systems.

O9.04

9:45 Carbon Budgets of Subtropical Seagrass Ecosystems Across the Mississippi Barrier Islands

Vivian C. Tidd, Francis S. Driscoll, Songjie He, Caitlin M. Young, Kelly M. Darnell, M. Zachary Darnell

The University of Southern Mississippi, Hattiesburg, MS

Seagrass meadows play a fundamental role in mitigating climate change by sequestering carbon within their sediments through photosynthetic processes, limiting carbon exchange with the atmosphere. Seagrasses are typically net sources of alkalinity and can therefore buffer ocean acidification, reducing detrimental effects on calcifying marine organisms. Despite this high capacity for carbon storage and alkalinity generation, there remains a research gap regarding how subtropical seagrass meadows perform these ecosystem functions in the Gulf of America. Incorporating different components of the carbon cycle including dissolved inorganic carbon (DIC), total alkalinity (TA), dissolved organic carbon (DOC), pCO_2, and nutrients can provide a more comprehensive understanding of the total carbon budget for the Mississippi Sound. We hypothesized that seagrass beds in Mississippi would exhibit positive TA/DIC ratios, with values varying depending on the prevalent species and seagrass distribution at each site. To test this, we analyzed samples from over 80 locations across four barrier islands: Cat Island, Ship Island, Horn Island, and Petit Bois Island. Preliminary results from DIC and TA analyses suggest that the sampled seagrass meadows were net sources of TA, with TA/DIC ratios exceeding 1 across all four islands. Measurements of DOC, pCO_2, CH_4, and nutrients, are also analyzed and compared with environmental parameters such as salinity, temperature, dissolved oxygen, and pH, as well as physical seagrass meadow conditions, percent cover, species composition, and so on. This study contributes to the limited body of research on subtropical seagrass blue carbon dynamics and provides the first known dataset for this region. The findings highlight the importance of carbon sequestration, transport, and transformation as an ecosystem service of seagrass meadows, offering valuable insights to inform potential restoration and conservation efforts in the Mississippi Sound.

O9.05

10:00 Modeling how Living Shoreline Designs Mitigate Wave Height in Coastal Wetlands Near the Point-Au-Chien Indian Tribe

Alexandria Hancock, Wei Wu

The University of Southern Mississippi, Hattiesburg, MS

Living shorelines are a nature-based solution to help stabilize coastal ecosystems from erosion due to waves, sea-level rise (SLR), and storm surge. There are other benefits to using "soft" shorelines, in addition to combating erosion, such as restoration of critical ecosystem services and creating wildlife habitat. Living shorelines are used across coastal and estuarine areas of the US coming in a variety of designs. Our research focuses on evaluating the ability of these different designs to mitigate waves to facilitate more-informed decisions regarding coastal erosion. Our study area, located in Louisiana, is a coastal wetland near the Point-Au-Chien Indian tribe which is particularly susceptible to SLR and storm surge due to its low-lying location and the surrounding intensive anthropogenic influences related to oil and gas exploration, such as dredged canals. The CSHORE-VEG model, developed by the Army Corps ERDC, is a numerical model that allows us to incorporate hydrodynamic factors, biomechanical features, and vegetation properties, such as structure and density, to determine wave height and other physical variables. This model allows us to predict wave height with and without living shorelines under a variety of SLR scenarios. In order to facilitate the choice of locations, we will apply a wetland change model developed in our lab to identify vulnerability hotspots. The model will calculate accretion and erosion and account for saltwater intrusion due to dredged canals which is important since enhanced salinity and water level both could increase the rate of salt marsh submergence. The results will determine the living shoreline's ability to mitigate wave energy and combat erosion within the salt marsh ecosystems surrounding the tribal communities. Our research will provide refined data that allows the Point-Au-Chien to better identify temporal and spatial impacts of sea level rise and develop mitigation strategies that protect both human infrastructure and critical ecosystems

O9.06

10:15 Quantifying Heat Exposure on Farish Street

MaKenna Collins, Remata Reddy, Francis Tuluri

Jackson State University, Jackson, MS

Heat risk and exposure in marginalized communities is shaped by past planning decisions and contemporary environment and land use patterns. This project examines urban microclimates along Historic Farish Street in Jackson, Mississippi by analyzing heat sensor data collected at four sites in the Farish Street Historic District. In collaboration with CAPA Strategies, four Kestrel sensors were installed at selected sites to record various atmospheric variables during a 6-week summer period. The focus of this student project is the processing, visualization, and interpretation of the collected data. Resulting from data analytic workflows, the project identifies potential spatial and temporal patterns of heat exposure across the four sites. Visual aids illustrate raw data into accessible information that can be integrated into community conversations and future extreme weather planning. Through this analysis, the project demonstrates the value of communal environmental monitoring for understanding the impacts of climate mitigation strategies, such as implementing more urban green spaces in urban heat island areas.

O9.07

10:30 - An Invesgation of Climate Variability, Change and Impacts for the Southeast of the USA

Remata Reddy and Francis Tuluri

Jackson State University, Jackson, MS

Under the U.S Department of Homeland Security (DHS) 2025 Follow Up Program for Minority Serving Institutions, I am investigating, in recent years, the cyberinfrastructure and climate science including climate change research is both interdisciplinary and very data intensive spanning atmospheric, hydrology, ecology, and ocean sciences The southeast portion of the United States is a unique region of the country with an attractive blend of wetlands, plateaus, and everything in-between. This region's ecosystems and population are among many others experiencing the extreme effects of global warming. This includes rising seas levels, increasing average temperature, drought, and saltwater intrusion. The objective of this research is to examine climate variability-how yearly temperature and precipitation values differ when compared to the long-term average- and the impacts within the Southeast Region of the USA. Through our analysis, we observed upward trends of precipitation and temperature within the region, coinciding with human activity. As the southeast region continues to see record-breaking highs in climate data, human health and agriculture will be severely impacted. Also presents that El Nino Phases: Higher average temperatures, less precipitation, and potential droughts may be associated with high pressure systems. La Nina Phases: Lower average temperatures, increased precipitation, potential flooding associated with low-pressure systems. Observations: High precipitation levels in strong La Nina years and low precipitation in strong El Nino years.

O9.08

10:45 Regional Climatic Trends Using Spatial and Temporal Statistical Analytics

Francis Tuluri, Remata Reddy, Rayvn Webster

Jackson State University, Jackson, MS

This study aims to evaluate regional climatic trends across the United States using long-term spatial and temporal statistical analytics, primarily to understand climactic variations in maximum temperature, minimum temperature, and precipitation from 1960 to 2025. For the purpose of climatological analysis, historical data was collected from open-source platforms, including the National Oceanic and Atmospheric Administration (NOAA) and the WorldClim database.

The methodology involves preprocessing the datasets to carry out spatial and temporal variations across wide-range of U.S. states. To examine spatial and temporal variation, spatial statistical analysis of the data sets was conducted in R using geospatial packages, and seasonal trend decomposition and moving average smoothing techniques.

The analysis showed seasonal cycles in both temperature and precipitation, with noticeable warming trends in minimum temperatures across certain western and northern U.S. states. The spatial analysis revealed regional contrasts, indicating that climatic changes are not uniformly distributed.

The study demonstrates a simple method to explore the capability of open-source tools and data in producing transparent, reproducible climate research and supports data science analytics in climate education. Work is still in progress to integrate climate and air quality for studying their impact on health.

11:00 Divisional Business Meeting

THURSDAY, March19, 2026

EVENING

Hall B

3:30 DODGEN LECTURE /AWARDS CEREMONY

THURSDAY, March19, 2026

EVENING

Hall C

5:00-7:30 Reception and General Poster Session

(Immediately following Dodgen Event)

All posters should be placed in the poster all by 12:00 pm on Thursday, March 19, 2026

Odd poster numbers will be presented from 5 -6

Even poster numbers will be presented from 6-7

P9.01

A Study of Ocean Temperatures Associated with the Intensification of Hurricane Melissa

Alison Hart, Remata Reddy and Francis Tuluri

Jackson State University, Jackson MS

Under the U.S Department of Homeland Security (DHS) 2025 Follow Up Program for Minority Serving Institutions, I am investigating the relationship between the ocean temperatures and the intensity of the 2025 Hurricane Melissa. Hurricane Melissa reached peak strength as a Category 5 hurricane when it made landfall at the Southwestern coast of Jamaica on October 28th, 2025 at approximately 9 am. It had peak windspeeds of 185mph with a pressure reading of 892 mb. Melissa caused widespread devastation from Jamaica to Cuba and has been considered one of the worst hurricanes to hit the region in recent memory. The storm's intensification has been partially attributed to the elevated ocean temperatures in the region at the time. I used NOAA Satellite and BUOY data alongside a scientific study about climate change's impact on Hurricane Melissa by Clarke et al. 2025 to collect wind speed, pressure, rainfall, and ocean temperature data. The results show that as Melissa traversed the Caribbean basin, it migrated slowly over waters exceeding 30°C, which is approximately 1.4° C warmer than long-term climatological averages. This anomaly of warm sea-surface temperatures (SSTs), now a more likely occurrence due to climate change, and increases the thermal energy available for the storm to hold its structure. This heat reservoir in the ocean fueled an extremely rapid intensification, taking Melissa from a tropical-storm to a high-end major hurricane within 24 hours. Attribution analysis conducted shortly after the event estimated that the warm sea-surface temperatures likely increased Melissa's top wind speeds by 7-10 mph, as well as causing potential rainfall and destructive intensity to go up ~16%. There is a direct correlation between the rise in sea surface temperatures and the hurricane intensity

P9.02

T Evaluation of Machine Learning Algorithm (Ridge Regression) for Long-Term Surface Weather Forecasting in Jackson, Mississippi

Duanju Lu, Mia Robinson

Jackson State University, Jackson, MS

Accurate localized weather forecasting is critical for agricultural planning and urban resource management. This study investigates the efficacy of one Machine Learning Algorithm, Ridge Regression, for predicting daily maximum surface temperature (Tmax), minimum surface temperature(Tmin), and daily precipitation for Jackson, MS. The observed historic dataset spans the period from January 1961 through October 2025. The

model was trained on sixty (60) years of historical data (1961-2021) and validated against recent observations (2022-2025).

Ridge Regression was specifically chosen for its L2 regularization capability, a unique feature that effectively handles multi-collinearity inherent in meteorological variables, preventing over fitting and ensuring model stability across long time frames. The results demonstrate high predictive accuracy for temperature variables (the mean absolute error of 4.6 and 4.2 for maximum and minimum surface temperatures respectively), with the model tightly tracking seasonal oscillations and daily variances. Conversely, precipitation forecasting revealed limitations; while the model approximated baseline trends with a mean absolute error of 0.24 inch, it struggled to capture high-magnitude rainfall events, resulting in under-predicted peaks. Future research will aim to address this disparity by integrating non-linear approaches, such as Long Short-Term Memory (LSTM) networks or hybrid ensemble methods, to better resolve the stochastic nature of extreme precipitation.

P9.03

Low Cost Air Quality Monitors in Mississippi

Logan Harden, Courtney Roper

University of Mississippi, University, MS

Air pollution - especially fine particulate matter ($PM_{2.5}$) - is detrimental to human health. Quantifying air quality can be very important for informing communities about pollution locally and for advising safe activities; however, many methods of quantifying this are resource and time intensive. This study focuses on the efficacy of using PurpleAir sensors as an accessible and affordable method of assessing air quality in Mississippi particularly in rural or underserved areas. To do this, PurpleAir sensors were used to measure levels of particulate matter including $PM_{2.5}$ throughout 2025 at multiple locations in Mississippi. Data collection is ongoing at locations in Greenville, Oxford, and Shellmound, MS with real-time measurements of particulate matter. Measurements will be averaged by hour, day, and week to compare between locations and time periods. Data analysis is ongoing but preliminary results indicate that PurpleAir sensors are a feasible low-cost monitoring system that can be deployed in Mississippi. Ultimately this data will be shared with community members at outreach events designed to support improved environmental health

P9.04

Variations in PM2.5 and Black Carbon Concentrations during Prescribed Burn and Burn-Ban Seasons in Georgia

Brooklyn Johnson, Logan Harden, Khloe Osborne, Courtney Roper

University of Mississippi, University, MS

Prescribed burns manage wildfires by weakening fuel loads which lowers intensity and fire duration. The burning of trees is a significant contributor to air pollution, releasing fine particulate matter ($PM_{2.5}$) composed of harmful chemicals including black carbon and other hazardous air pollutants. Prescribed burns are common in the southeastern United States mainly for wildfire prevention and ecosystem management purposes with Georgia burning 1.4 million acres annually. This study aims to investigate $PM_{2.5}$ and black carbon concentrations in Georgia during 2015, specifically comparing concentrations during the prescribed burn (October 1-April 30) and burn-ban (May 1-September 30) seasons.

$PM_{2.5}$ was collected on Teflon filters by the Environmental Protection Division of the Georgia Department of Natural Resources (GDNR) throughout 2015 at 8 locations in Georgia every 3 days. $PM_{2.5}$ concentrations were determined through gravimetric analysis by the GDNR. All collected filters were then analyzed for black carbon at 880nm. Average $PM_{2.5}$ and black carbon levels were compared between sites and compared between seasons (burn vs. burn ban).

Preliminary data for four of the sampling sites (Albany, Macon, Atlanta, and South Dekalb) showed average $PM_{2.5}$ concentrations across locations were 11.37 ± 3.87 $\mu g/m^3$. Average black carbon concentrations across locations were 2.18 ± 2.21 $\mu g/m^3$. $PM_{2.5}$ concentrations were significantly different between Atlanta and the Albany and South Dekalb sites. Black carbon concentrations were also significantly different between Atlanta and all other locations (one-way ANOVA, $p \leq 0.05$). Macon and South Dekalb showed variations between burn-ban and burn seasons in $PM_{2.5}$ concentration, with increases in $PM_{2.5}$ concentration in burn-ban months (two-way ANOVA, $p \leq 0.05$). However, Albany, Macon, Atlanta, and South Dekalb all showed seasonal differences for black carbon concentrations which were elevated during the burn season (two-way ANOVA, $p<.001$). Data collection and analysis for four additional sampling locations is currently underway and will be compared to the preliminary data described above.

Though seasonal differences in $PM_{2.5}$ were not present in all sites, there was significant seasonal variation in black carbon at all sites with elevated black carbon during the burn season. This demonstrates that exploring individual components of $PM_{2.5}$, such as black carbon, may provide

more insight into the pollutants released during prescribed burns than measuring $PM_{2.5}$ alone. Future directions include using prescribed burn records to compare $PM_{2.5}$ and black carbon data at specific sites during prescribed burn events and expanding ambient characterization to more sites throughout the state.

Mathematics, Computer Sciences and Statistics

Chair: Caixia Chen,
Jackson State University

Co-Vice Chair: Ping Zhang,
Alcorn State University

Co-Vice Chair: Yonghua Yan,
Jackson State University

Program Committee: Jamil Ibrahim,
Independent Scientist

Thursday, March19, 2026
MORNING
Hall D Room 11
8:20 Welcome and Opening

Thursday, March 19, 2026
MORNING
8:20 Welcome and Opening

O10.01

8:30 Numerical Exploration of Mapping Properties of Holomorphic Functions

Zheng Chen

Alcorn State University, Lorman, MS

This project investigates the geometric and analytic properties of holomorphic functions through numerical experiments. We begin with cubic polynomials, such as $f(z)=z^3 -3z+2$, analyzing how these maps deform domains in the complex plane. Using grid-based numerical methods, we visualize image deformation, critical points, and level curves of magnitude and argument. The study further examines stretching and folding behaviors via derivative magnitude, revealing the conformal nature of holomorphic maps except at critical points. Building on these insights, the project extends to more complicated transcendental functions, such as $f(z)=e^z +z^2$ and $f(z)=\sin z+z$, to explore intricate domain deformations and branch structures. Through these experiments, the project highlights the interplay between analytic properties and geometric transformations, offering both visual and quantitative understanding of complex mappings and their parameter-dependent behaviors.

O10.02

8:45 Computer Coding Assignment Plagiarism and Plagiarism Detection in the AI Era

Dillon Brown, Olivia Cunningham, Pearl Kandikatla, Shuchen Meng, Bhavya Purushothama, Desmond Stewart, Manoj Bolugallu Padmayya, Jermiah Billa, Lixin Yu

Alcorn State University, Lorman, MS

Artificial Intelligence coding tools, such as ChatGPT and claude.ai, make plagiarism on computer program coding assignments easy. The literature study shows that students use AI to get quick answers, debug code, and test programs. In addition to the violation of academic code, students miss the opportunity to develop their problem-solving and coding skills because of plagiarism. Copy and paste a coding assignment question into the website as a "topic" may generate the answer code right away. On the other hand, the AI can help to detect plagiarized answers too. Many studies have been done to detect plagiarized code. Plagiarized code can be detected using text-based, token-based, syntax tree-based, and other methods. The plagiarism detection has gone beyond simple comparison of codes for similarities. The code can be transformed into token for comparison to detect cases when variable names in a program are changed to get a different look. Scholars also combine structural code analysis with decision-support modelling to detect plagiarized work. An interesting finding of this study is that AI sites that help to generate answer code can also detect plagiarized work. This study compares the features of several AI sites using real computer science entry-level course assignments. Assignment questions are entered into the selected AI sites for answers. Student researchers also made some authentic answers. The AI generated answers, together with the authentic answers, are used to feed the AI sites for plagiarism detection. The AI-generated answers are also slightly modified to test the plagiarism detection capability of the AI sites. Recall and precision are used as measurements to compare the functionality of the AI supported websites included in this study. This study also reviews what suspected submission can be treated as plagiarized work, since previous studies have found that determining plagiarism is more complicated than identifying code similarity.

O10.03

9:00 A new site index equation for shortleaf pine plantations in the western half of the Southeastern United States

Curtis VanderSchaaf

Mississippi State University, Mississippi State, MS

A system of growth and yield equations for shortleaf pine (*Pinus echinata* Mill.) plantations using data from across the western half of the southeastern United States was developed. Data used in model fitting were obtained from Arkansas, Mississippi, Oklahoma, and Tennessee (n = 168). Site index ranged from 45 to 68 feet (base age 25), planting densities ranged from 194 to 1,742 seedlings per acre, and measurement ages ranged from 1 to 30 years. The majority of the measurement ages were 16 years of age or less (n = 148). A mix of cutover and old-field sites were included in the model fitting dataset.

A simple anamorphic, Schumacher model site index equation that predicts dominant height across time was developed as part of this system. This equation drives the model system since other variables are either predicted as a direct function of this equation or indirectly through the prediction of other variables that are functions of the site index equation.

A validation analysis conducted using independent data from two plantations in Oklahoma found that this equation did not predict well when using younger ages, perhaps due to the model form. Thus, it was attempted to develop a new dynamic site index equation using the previous dataset plus newly acquired data.

O10.04

9:15 AI Network for Academic Collaboration

Bhavya Kaanadka Purushothama[1], Ping Zhang[1], Manoj Bolugallu Padmayya[2], Jermiah Billa[2]

[1]Department of Math and Computer Science, and [2]Department of Advanced Technologies, Alcorn State University, Lorman, MS

This project introduces an intelligent platform designed to help students, faculty, and researchers discover suitable collaborators across universities based on common research interests. The system employs Natural Language Processing (NLP) to analyze academic content such as papers, abstracts, and project summaries, extracting essential keywords and identifying major research themes. Through machine learning-based clustering and recommendation techniques, it compares researcher profiles and recommends the most compatible collaboration opportunities.

The platform gathers information from institutional research portals, publications, and user-submitted profiles to provide precise and diverse recommendations. A web interface enables users to browse, filter, and communicate with suggested collaborators, encouraging partnerships across departments and universities. Moreover, it integrates with academic databases to maintain up-to-date and reliable results.

By combining AI, NLP, and intelligent recommendation models, the system promotes innovation through seamless academic networking. It minimizes the time and effort needed to find research partners while supporting interdisciplinary collaboration. Ultimately, this project

enhances research efficiency, fosters knowledge exchange, and strengthens global academic connections through data-driven insights.

O10.05

9:30 Theory of Computation Application in Pattern-based Threat Detection

Shuchen Meng, Ping Zhang

Department of Math and Computer Science, Alcorn State University, Lorman, MS

Pattern-based threat detection is a core technique in modern network security systems such as firewalls and intrusion detection systems (IDS). Many cyberattacks exhibit recognizable patterns in their payloads, including suspicious keywords, directory traversal attempts, or encoded binary signatures. These patterns can be represented compactly using regular expressions, which belong to the class of regular languages and are supported theoretically by finite automata. By converting regular expressions into nondeterministic finite automata (NFA) and then into deterministic finite automata (DFA), pattern-matching engines are able to scan continuous network traffic streams efficiently, maintaining high throughput with predictable performance.

This report investigates how the theoretical models of NFA and DFA are applied in practical cybersecurity tools. We first review the fundamental concepts of regular languages and automata and explain the construction algorithms used to compile regex signatures into executable matchers. We then explore three representative applications: malicious URL detection, SQL injection signature matching, and malware signature recognition, each illustrated with real-world rule examples used in systems like Snort. Challenges and limitations, including state explosion caused by complex regex patterns, streaming across fragmented packets, and adversarial obfuscation techniques, are analyzed to demonstrate the gap between theoretical design and practical deployment. Additionally, risks such as Regular Expression Denial of Service (ReDoS) are discussed as important operational concerns.

Finally, the report outlines potential improvements in future pattern-matching systems, such as hardware-accelerated DFA execution, hybrid detection strategies that combine signatures with context awareness, and machine-assisted generation of security rules.

O10.06

9:45 PlantView: A Proof of Concept for ML Crop Recognition and Analysis

Sanjida Islam, DaShawn Cooley, Hayden Arseneaux, Pratima Rajbanshi, Sarah Mirza, Corban Thayer

University of Southern Mississippi

PlantView is being developed as a proof of concept for applying machine learning to automated crop recognition and disease analysis. The system is structured as a web-based application that integrates deep learning with a lightweight Flask framework to analyze plant images and deliver real-time diagnostic feedback. Users can upload static images or stream live video to obtain predictions of plant diseases, probability scores, and basic treatment recommendations. By combining accessible web technologies with trained neural network models, PlantView demonstrates how intelligent automation can enhance agricultural analysis and support data-informed decision-making.

The system follows an MVC design pattern, where the Model utilizes a convolutional neural network based on transfer learning (such as ResNet50) to perform classification. Input images are preprocessed through resizing and normalization, then passed through the trained model to generate a disease prediction and confidence probability. The View consists of Jinja2 templates rendered through Flask, providing a user-friendly interface with HTML, CSS, and JavaScript. AJAX-based asynchronous updates are used to deliver results dynamically, allowing continuous real-time interaction between users and the model. The Controller manages all routing and API logic through endpoints such as /predict and /stream, coordinating data flow from input to inference and formatted output, while also handling session management and error control.

The data pipeline and system logic are designed for efficiency and modularity. All predictions, metadata, and user logs are stored in a relational database such as SQLite or PostgreSQL. The backend supports scalability through RESTful endpoints and containerized deployment using Docker or a Gunicorn + Nginx stack. System reliability and performance are maintained through regular testing and retraining as new datasets are introduced. UML-based models: including component, activity, and state diagrams; are used throughout the design process to illustrate interactions, data flow, and system behavior at various levels of abstraction. These diagrams assist in visualizing the data lifecycle; from image upload to disease prediction and result generation. Through these processes, PlantView demonstrates the practicality of combining machine learning and structured software modeling in a single, integrated framework for agricultural analysis.

PlantView emphasizes the importance of integrating computing and data-driven techniques to advance precision agriculture. By merging deep learning, web technologies, and modular software design, the project illustrates how artificial intelligence can be applied to identify crop diseases efficiently and accurately. Its architecture reflects scalability, transparency, and maintainability, ensuring that each component can evolve as research progresses. Beyond serving as a technical prototype, PlantView stands as a

learning model for understanding how machine learning, data processing, and real-time web systems operate together in agricultural contexts. The project highlights how accessible, data-informed systems can contribute to sustainable farming, better resource management, and long-term agricultural innovation.

O10.07

10:00 IMaCS : Lessons learned from the Design and Delivery of an Integrated Math and Computer Science (IMaCS) Professional Development Opportunity for 6th grade teachers

Dakota Price, Loretta Moor, Jacqueline Jackson, Jana Talley, Deidre Wheaton, Carmen Wright

Jackson State University, Jackson, MS

This presentation will discuss lessons learned from the NSF-funded IMaCS project designed to demonstrate the efficacy of a sixth grade focused teacher capacity building instructional framework to model ways in which concepts of math and computer science can be integrated and taught within both courses. This project addresses several urgent societal challenges and needs, which are also critical matters affecting Mississippi's education system. The first is the need to educate and train more individuals with digital skills, computational thinking, and other computer science competencies, many of which require strong mathematical foundations. The second imperative is to develop effective methods for training existing teachers who might not have degrees in computer science to be highly skilled computer science teachers. The third challenge is to create innovative on-ramps into teacher education to address significant teacher shortages. This aligns with and supports the Mississippi Computer Science and Cyber Education Equality Act, which requires public schools to offer computer science education. By addressing these matters, the project aims to demonstrate the efficacy of an integrated mathematics and computer science instructional framework as a sixth-grade focused teacher capacity building strategy. Several key objectives have been achieved and will be discussed during this presentation. They include: 1) Design and formation of an IMaCS Research Practice Partnership with a leadership team with varying expertise across Departments of Education, Mathematics, and Computer Science along with individuals in leadership from our partner school district; 2) Identification of appropriate topics for the integration of Math and Computer Science that would be exciting for 6th grade students, aligned with appropriate Mississippi Math and Computer Science/Cyber Foundation standards, and that would also be interesting and could integrate well within the teachers' lesson plans for the upcoming school year or where new lesson plans were being developed; 3) Design and delivery of a week long professional development workshop with sessions that ranged from the introduction to cryptography and the elegant math that supports it, which were supported by a suite of ways to infuse it within both the mathematics and cyber foundations lesson plans; to cultural representations of numbers; and 4) Dissemination of key findings to pre-service and in-service teachers. This presentation will conclude with a discussion of the external evaluation conducted at the conclusion of our first phase along with Lessons Learned.

O10.08

10:15 An observational study of New Age Programming: Vibe Coding and Prompt Engineering with Coding Agent and AI Tools.

Sachin Karki, Yufeng Zheng

University of Mississippi Medical Center, Jackson, MS

Abstract: Since the introduction of OpenAI's instantly popular large language model (LLM) ChatGPT in 2022 world has been on an AI frenzy. A study from the National Bureau of Economic Research (NBER) finds that around 700 million people worldwide use ChatGPT weekly. This number is over a billion when combined with similar other competitive LLMs like Gemini, Grok, Perplexity, and Claude. Among those numbers, a large mass uses these AI tools for *vibe coding* and *prompt engineering,* which are currently two hot topics in the AI world. Both of this term explores the idea of using artificial intelligence (AI) as an assistant to help with programming or coding-related tasks to do professional, personal, or even scholarly work. The objective of this study is to conduct a literature exploration of the rapidly growing methodology in programming/coding practices. This research studies the ongoing phenomenon and growing use of AI tools by students, researchers, and instructors. The observational findings conclude that vibe coding is preferred by users of different backgrounds as it's effective, enjoyable, and productive.

10:30 BREAK

O10.09

10:50 Computer Simulation of Snowflakes

Malick Mhando

Mississippi Valley State University, Itta Bena, MS

Snowflakes are a natural phenomenon in the north. They are beautiful. They have many applications within the industry. The question is, what is the mathematics behind the structure of snowflakes? How can we simulate this using technology? Can we use the knowledge of trigonometry and geometry to implement this? We will attempt to simulate the structure of snowflakes using Python and explore the mathematics.

O10.10

11:05 A Machine Vision and Deep Learning Framework for Aerial Smoke Detection in Wildfire Prevention

Jose Martinez, Satyam Dwivedi, Gabriel Law

University of Southern Mississippi, Hattiesburg, MS

The rising frequency and severity of wildfires and industrial accidents underscore the urgent need for rapid, reliable early-stage smoke detection systems. This research presents a machine vision and deep learning framework that integrates the YOLOv8 (You Only Look Once) object detection model for identifying early smoke plumes that may develop into large-scale forest fires. A custom forest fire and aerial smoke dataset was implemented to train and fine-tune the model, and its detection performance was preliminarily evaluated under real-world outdoor conditions. The system is deployed on a lightweight embedded platform (Raspberry Pi 5) and mounted on a custom-built drone to assess the feasibility for aerial surveillance. Preliminary laboratory tests report a recall of 44% and a precision of 30% for smoke imagery, indicating promising detection sensitivity but also revealing challenges associated with aerial implementation, including model generalization, variable lighting conditions, and background image noise. These results emphasize the need to optimize the model's hyperparameters, dataset diversity, and on-board inference strategies to improve early smoke-detection accuracy for practical wildfire-prevention applications. The next stage of this research presents the improvements made to the model and on-board hardware to increase the performance of the framework. The model is being tested on the southeast region of the state of Mississippi (Wiggins) over a typical forest mix of pine (loblolly-shortleaf and longleaf-slash pine).

O10.11

11:20 A Vortex-based Prediction Method for Complex Fluid Dynamics

Caixia Chen, Yonghua Yan

Jackson State University, Jackson, MS

This work presents a data-driven framework for forecasting complex fluid flows by combining vortex decomposition with time series analysis of reduced-order models. Using advanced modal decomposition techniques—specifically proper orthogonal decomposition (POD), with a newly developed novel vortex identification method designed to isolate coherent structures across multiple vector fields, the method extracts low-dimensional temporal coefficients that preserve essential flow dynamics and coherent structures. An efficient time series prediction model then forecasts the evolution of these coefficients, enabling accurate reconstruction of the full flow field with minimal computational cost. This approach captures the emergence, interaction, and breakdown of vortices in high-speed boundary layers and extends naturally to transitional, turbulent, and shock-affected regimes. Its localized interpretability and scalability make it well-suited for real-time flow control, design optimization, and uncertainty quantification, offering a powerful analysis tool to traditional high-fidelity simulations for modeling unsteady, high-dimensional fluid systems.

O10.12

11:35 A Zero Trust Multi Agent Architecture for Secure AI to AI Communication

John Black, Bilal Abu Bakr

Collin College, McKinney, TX

As AI systems become more interconnected, the communication pathways between autonomous agents have emerged as a new and largely unprotected attack surface. Most existing AI workflows assume that internal agent traffic is safe by default. This assumption creates opportunities for adversaries to inject malicious inputs, impersonate legitimate agents, manipulate internal decisions, or interfere with system coordination. To address this challenge, this study presents a design focused on creating a zero-trust communication architecture for AI agents that must operate collaboratively while maintaining continuous verification of all interactions.

The system is built around a cooperative network of lightweight agents, each running within its own isolated microcontainer environment. Every agent is responsible for a specific security or validation function. Communication between agents is never trusted solely on identity. Instead, each interaction must be validated through a sequence of independent checks performed by separate agents that operate in parallel. This introduces redundancy, reduces single points of failure, and increases resistance to compromised components.

The architecture allows messages to be inspected, scored, filtered, or challenged before being accepted. Each agent maintains its own understanding of the message context, and the system resolves these perspectives into a final decision. The goal is to create a communication model where no single component can authorize or approve an action by itself. The multi-agent design adds resiliency by requiring agreement from several independent validators before any message is executed or forwarded.

To support this workflow, the system uses structured metadata attached to every message, along with continuous monitoring of behavioral patterns. Messages are tracked from origin to output to establish a complete interaction chain. The system evaluates attributes such as timing, frequency, content patterns, and internal consistency.

These factors help identify anomalies that indicate misuse, poisoning attempts, or internal compromise.

The system was tested in controlled conditions using simulated agent clusters and scripted adversarial behaviors. Early results show that the multi-agent structure can significantly reduce the risk of unauthorized actions by ensuring that every communication event is evaluated in multiple independent ways. The architecture also helps prevent cascading failures since isolating one compromised validator does not allow the adversary to bypass the others.

Future research should focus on enhancing system efficiency, accelerating the speed of multi-agent consensus, and incorporating adaptive techniques that adjust validation based on observed behavior. This design approach provides a foundation for secure AI-to-AI coordination, highlighting the importance of treating internal communication as a potentially untrusted surface that requires continuous verification.

11:50-12:00 DIVISION MEETING

THURSDAY, March19, 2026

AFTERNOON

Hall D Room 11

1:00-1:50 Keynote

Title: Neural Operator Learning Applied to Multimodal Fusion and Model Discovery from Data

Dr. Zhen Li

College of Engineering, Computing and Applied Sciences

Clemson University, Clemson, South Carolina

Intrinsic multiscale features in various physical systems stem from hierarchical structures that span a broad spectrum of temporal and spatial scales beyond the reach of any single simulation method, which have been recognized as significant challenges in multiscale engineering, especially for complex fluids and multifunctional materials where multi-physics, multis-cale models, and multi-fidelity data meet. Recent advancements in deep learning, particularly in deep neural networks, have shown remarkable success in different scientific research fields. In this talk, I will introduce two deep-learning-enabled strategies for addressing such challenges on multimodal fusion and model discovery from data. First, I will introduce a deep neural operator approach for predicting multirate bubble growth dynamics across scales, bridging nanoscale mechanisms to macroscopic continuum behavior. Subsequently, I will describe a combined neural operator learning and physics-informed symbolic regression to discover interpretable mathematical models directly from computational data, demonstrated on the spreading dynamics of highly viscous liquids. Also, I will briefly introduce some of our ongoing efforts that extend neural operator learning to accelerate the design of composite materials and to optimize their manufacturing process.

O10.13

2:00 Generalized Frobenius-Perron Operators and Optimal Transports

Jiu Ding[1], Huijian Zhu[2]

[1]University of Southern Mississippi, Hattiesburg, MS, USA, [2]Nanfang University, Guangzhou, China

We define the concept of the generalized Frobenius-Perron operator associated with a nonsingular transformation between two measure spaces and study its fundamental properties. This extends the notion of the Frobenius-Perron operator with respect to a self-transformation in ergodic theory. We give some applications of the new operator to optimal transports.

O10.14

2:15 Compact-Corrected MUSCL: A Flexible, Low-Cost High-Accuracy Scheme for High-Speed Flow Simulation

Yonghua Yan, Caixia Chen

Jackson State University, Jackson, MS

This study introduces a two-step compact scheme-based high-order correction method to improve the accuracy and robustness of numerical simulations in computational fluid dynamics (CFD). By refining flux values using compact scheme outputs on the same stencil—conditioned by a smoothness indicator—the method enhances shock resolution and stability, particularly when integrated with compact-corrected WENO schemes. Benchmark tests, including interacting blast waves, confirm its effectiveness. Beyond high-order frameworks, the method is especially impactful when applied to lower-order schemes such as MUSCL. Known for its simplicity, robustness, and low computational cost, MUSCL remains a popular choice in CFD, particularly for problems involving shocks and discontinuities. The proposed correction can be applied locally—only in regions where higher accuracy is needed, making it highly flexible and computationally efficient. This localized enhancement allows MUSCL to achieve accuracy comparable to or exceeding that of traditional WENO schemes, without the associated overhead. As a result, the method offers a practical and scalable strategy

for reducing numerical dissipation and improving solution fidelity in targeted subdomains, making it well-suited for adaptive and resource-constrained simulations.

O10.15

2:30 AI-Powered Journaling for Mental Health

Pearl Priyadarshini Kandikatla[1], Lixin Yu[1], Jermiah Billa[2], John Adjaye[2], Manoj Bolugallu Padmayya[2]

[1]Department of Math and Computer Science, Alcorn State University, Lorman, MS, [2]Department of Advanced Technologies, Alcorn State University, Lorman, MS

In an era of digital overload and rising emotional stress, mental health support has become increasingly vital, especially for students and young professionals. This project, AI-Powered Journaling for Mental Health, explores how Artificial Intelligence can transform traditional journaling into an intelligent and empathetic tool for emotional well-being. The proposed system integrates Natural Language Processing (NLP) to analyze journal entries, detect emotional tone, and identify stress or mood patterns over time. Using sentiment analysis and lightweight machine learning models, it provides reflective prompts, personalized feedback, and visual summaries that help users recognize emotional triggers and personal growth trends.

Focusing on ethical AI practices, the journaling platform protects user privacy by processing data locally and providing transparent emotional insights. Interactive data visualizations help users monitor their emotional progress, encouraging mindfulness and self-awareness. This project shows how AI can go beyond automation to foster empathy, trust, and well-being—highlighting technology's ability to support human reflection and personal growth instead of replacing it.

O10.16

2:45 Computation in Traffic Lights

Keyera Shorter[1]

Alcorn State University, Lorman, MS

This report explores traffic light systems as a real-world application of Theory of Computation. It demonstrates how finite automata, formal languages, computability, and complexity theory are used to model, verify, and optimize traffic control. Automata theory models behavior that is based on how the system would work or would operate in the process. The formal language has helped in understanding the formal languages that would help in defining how the sequence would be used or would be followed towards delivering the desired outcomes. The compatibility ensures that the developed algorithm can be solved based on the need. The complexity theory is used to ensure that the right tests are conducted and ensure that there are no failures in the process. Through a case study using NuSMV and timed automata, the report illustrates how theoretical models ensure safety, efficiency, and scalability in urban infrastructure. The findings highlight the relevance of computation theory in designing intelligent systems for smart cities. The future will involve the use of modern technologies such as AI algorithms, IoT, and machine learning.

O10.17

3:00 Detecting Hidden MPLS Tunnels Using Active Network Probing

Eyimofe Ajagunna, Blessed Kutyauripo, LeDarius Robinson

Mississippi Valley State University, Itta Bena, MS

This research focuses on developing a reliable methodology for detecting hidden MPLS (Multiprotocol Label Switching) tunnels using active network probing.

Our proposed algorithm combines geographic anomalies, RTT behavior, hostname patterns, and backbone routing characteristics to distinguish MPLS tunnels from ordinary routing behaviors such as load balancing. Furthermore, our detection pipeline is implemented to automate tunnel identification, estimate tunnel boundaries, and visualize hop-level behavior. The purpose of this research is to create an accurate, reproducible framework for uncovering concealed MPLS structures in modern networks, enabling improved transparency, routing analysis, and network measurement accuracy.

THURSDAY, March19, 2026

EVENING

Hall B

3:30 DODGEN LECTURE /AWARDS CEREMONY

THURSDAY, March19, 2026

EVENING

Hall C

5:00-7:30 Reception and General Poster Session (Immediately following Dodgen Event)

All posters should be placed in the poster all by 12:00 pm on Thursday, March 19, 2026

Odd poster numbers will be presented from 5 -6

*Even poster numbers will be presented from 6-***7**

P10.01

DANTE.v2: A Scenario-Specific Breakdown of an LSTM-based Approach to Predict Insider Threat on Daily System Logs

Alabhya Pahari, Aryan Adhikari

The University of Southern Mississippi, Hattiesburg, MS

Insider Threat Detection ("ITD") is a topic under intense study from cybersecurity and AI professionals. The main challenge in building systems to autonomously detect insider threats arises due to the inherent ambiguity in identifying subtle differences between harmful and benign actions. Several approaches that use deep learning methods on system logs have been tested on CMU's CERT datasets—the most commonly used synthetic data for ITD research. While this dataset specifies four insider-threat scenarios (relating to data exfiltration, intellectual property theft, and IT sabotage), there is minimal literature on scenario-specific examination of various model architectures. In addition, large corporations, based on their existing information security setup, are more concerned with detecting specific kinds of insider threats over others. To bridge this gap, we developed DANTE.v2, an improvement on an LSTM-based approach called DANTE. We chose LSTM over the contemporary transformer architecture because of its faster inference time, which is crucial for real-time prediction. Our model managed to exceed an accuracy of at least 90% on each scenario—with F1-scores of 0.55, 0.71, 0.375, and 0.74. These scores from DANTE.v2 are significant, as the dataset has high class imbalance, and similar work even shows F1-scores around 0.1. Hence, we optimized and showcased the possibility of LSTM-based models being used in real-time ITD as a computationally economic alternative to more sophisticated transformer models.

P10.02

CampusConnect

Adin Lindsey

Mississippi Valley State University, Itta Bena, MS

CampusConnect is a relational database system designed to enhance student engagement by centralizing information about campus communities, events, and involvement opportunities. Many students struggle to connect with organizations outside the classroom, often due to scattered or inaccessible information. CampusConnect addresses this challenge by integrating student, community, event, membership, and location data into a unified structure that supports efficient querying and meaningful insights. The system utilizes a normalized database schema with well-defined entities and relationships, including a many-to-many student-community connection resolved through a Memberships table. This design enables users to track community participation, explore upcoming events, and identify trends in student involvement. For administrators, the database provides valuable analytics on organizational activity and engagement patterns, supporting data-driven decisions that strengthen campus culture. Deliverables include a crow's-foot ERD, SQL schema, example queries, and an optional interface, demonstrating both the technical construction and practical applications of a campus engagement platform.

P10.03

Radiation Studies on Local Fertilizers

Taylor Brown, Antonica Jefferies, Jermiah Billa, John Adjaye, Manoj Bolugallu Padmayya

Department of Advanced Technologies, Alcorn State University, Lorman, MS

Naturally occurring radioactive materials (NORM) such as ^226Ra, ^232Th, and ^40K are present in fertilizers due to the geological origin of their raw materials. Continuous fertilizer use can lead to the buildup of these radionuclides in agricultural soils, posing potential radiological risks to farmers, consumers, and the environment. This study aimed to quantify the levels of ^226Ra, ^232Th, and ^40K in three commercial fertilizers—phosphate (0-46-0), potash (0-0-60), and NPK (13-13-13)—commonly used in the southern United States. Gamma spectrometry was used to determine activity concentrations and to calculate radiological hazard indices, including radium equivalent activity, absorbed dose rate, and annual effective dose.

Results showed that phosphate fertilizers had the highest ^226Ra activity, while potash contained the greatest concentration of ^40K. Although a few samples exceeded recommended limits for certain radionuclides, the overall radiation doses associated with typical fertilizer application remained within international safety standards. It is recommended that fertilizer products be periodically monitored for NORM concentrations to ensure radiological safety in agricultural practices. Additionally, awareness programs should be developed to inform farmers about the long-term environmental impacts of continuous fertilizer use.

P10.04

PeerConnect: Optimizing Peer Tutoring with Predictive Analytics and Intelligent Matching

Teniola Oluwaseyitan

Mississippi Valley State University, Itta Bena, MS

PeerConnect is an advanced mobile application designed to enhance academic support and peer-led learning by connecting students with compatible tutors based on their strengths, learning needs, and performance data. Addressing the challenges students face in finding effective academic assistance, the platform leverages predictive analytics and intelligent matching algorithms to

recommend the most suitable tutors, optimize session scheduling, and monitor student progress, creating a personalized and data-driven learning experience.

The application incorporates features such as user registration, detailed tutor profiles with performance statistics, progress tracking dashboards, session scheduling with conflict detection, and AI-driven recommendations for study materials and tutors. Built as an iOS application using Swift with a Python-powered backend and MySQL database, PeerConnect prioritizes accessibility, user experience, and responsive design, making it suitable for students across diverse academic disciplines.

By integrating mathematical concepts such as weighted scoring, regression analysis, graph-based network modeling, and predictive probability, PeerConnect not only strengthens the peer tutoring process but also provides measurable insights into student performance and learning outcomes. The platform fosters a culture of collaborative learning, academic improvement, and knowledge sharing, offering a structured, reliable, and scalable alternative to informal or traditional tutoring services.

PeerConnect ultimately aims to enhance student academic performance, engagement, and retention by providing a robust, technology-driven peer support system. Future development may expand AI-driven analytics, subject coverage, and integration with institutional learning management systems, highlighting the transformative potential of math-informed, data-driven educational technology in higher education.

P10.05

Enhancing Phishing Detection Using Generative AI: A Comparative Study of Human vs. AI-Generated Threats

Anna Essel[1], Kwbena Agyepong[1], Erol Sarigul[1], Manoj Bolugallu Padmayya[1]

[1]Department of Advanced Technologies, Alcorn State University, Lorman, MS 39096

Phishing remains one of the most prevalent cybersecurity threats, exploiting human vulnerabilities to gain unauthorized access to sensitive data. Traditional detection systems rely on manually labeled datasets and fixed linguistic patterns, limiting their adaptability to emerging, sophisticated attacks. With the rise of Generative Artificial Intelligence (GenAI), attackers can now produce realistic, multilingual phishing emails that mimic human tone and organizational style. Thus, detecting phishing messages is now one of the most important challenges in cybersecurity.

In this study, I trained a computer model to tell the difference between real and fake (phishing) emails. Using Python, Pandas, and scikit-learn, I cleaned the email text by changing all letters to lowercase, removing common stopwords, and turning the text into numbers using TF-IDF. Then I trained a Logistic Regression model to classify emails as phishing or legitimate. I tested the model using a confusion matrix along with precision, recall, and F1 score to see how well it worked.

The model did a good job on regular phishing emails from the dataset. However, when I used an AI tool to create new phishing messages in both English and French, the model missed some of them. This showed that even strong models can be fooled by realistic, AI-generated messages.

Overall, this study shows that machine learning can help detect phishing, but attackers using AI are making it harder. To stay ahead, future systems should train on AI-created examples and learn to catch subtle patterns that make phishing emails seem human-written.

P10.06

Virtual STEAM Outreach for Middle School Learning in Southwest Mississippi

Samuel Ratan Bunga, Pavan Gorthi, John Adjaye, Jermiah Billa, Kwabena Agyepong, Manoj Bolugallu Padmayya

Department of Advanced Technologies, Alcorn State University, Lorman, MS

Students in rural Mississippi often face limited access to advanced educational tools and modern learning environments, particularly in Science, Technology, Engineering, Arts, and Mathematics (STEAM) subjects. To address this challenge, the Department of Advanced Technologies at Alcorn State University initiated the Virtual STEAM Outreach Program to integrate immersive learning technologies into middle school education.

The program was implemented across four middle schools serving grades 6-8. Two groups were created: a traditional control group and a virtual STEAM group using Virtual Reality (VR) headsets. In partnership with M/s Beta Flix inc, the university developed interactive VR modules aligned with the Mississippi state curriculum, focusing on topics such as Light and Matter, Plate Tectonics and Rock Cycling, Ecosystem Dynamics and Biodiversity, and Space in Earth.

Students in the VR-based STEAM group showed higher engagement, enthusiasm, and understanding of scientific concepts compared to those in traditional instruction. Teachers reported noticeable improvements in participation, focus, and conceptual retention during lessons.

Integrating VR into classroom instruction can enhance student motivation, bridge learning gaps, and make STEAM subjects more interactive and accessible. Future expansions of this outreach program can strengthen community engagement and continue to promote educational innovation in Southwest Mississippi.

P10.07

Motion Of Projectiles in Parabolic Mountains

Jaylan Phillips

Mississippi Valley State University, Itta Bena, MS

This project discusses the motion of projectiles launched across parabolic mountains and valleys. By analyzing how launch angle, gravitational acceleration, mountain curvature, and initial speed affect impact distance, we derive optimal-angle formulas and identify conditions guaranteeing maximized projectile range. Numerical exploration illustrates cases with unique optimal angles, no optimum, or critical thresholds. Graphs and trajectory animations further demonstrate how varying parameters influence projectile behavior across parabolic terrain.

P10.08

Circuit Breaker Robot: Claw Design and Development

Latreveon Gibson, Kwabena Agyepong, Erol Sarigul, Jermiah Billa, John Adjaye

[1]Department of Advanced Technologies, Alcorn State University, Lorman, MS

This project focuses on the design and development of the robotic claw attachment for the Circuit Breaker robot, a TETRIX-based. The purpose of the claw was to serve as the robot's primary end-effector for grasping, lifting, and releasing objects of varying shapes and sizes while navigating a predefined course. Majority of this project focuses on the design and construction of the claw mechanism, including its mechanical structure, motion system, and integration with the robot's control electronics, navigation, programming, and sensor integration. Using Autodesk Fusion 360, I designed a compact 3×3×0.5-inch frame capable of holding two aluminum arms and accommodating a rack-and-pinion mechanism powered by a 12V servo motor. This system converts rotational motion from the servo into horizontal linear motion of the arms allowing precise opening and closing for object retrieval. The claw was mounted on the robot and initially tested for smooth movement, structural stability, and gear engagement. While the mechanism demonstrated proper function during early trials, the project was not fully completed due to limited time, and final calibration and software integration with the robot's color-detection sensors were still pending. Future improvements include increasing servo torque for stronger gripping, refining the rack-and-pinion alignment for smoother operation, and incorporating automated feedback for adaptive control. These modifications would allow the claw to handle a wider range of objects and enhance the robot's capabilities for tasks such as automated sorting or search-and-rescue operations. The design of claw was critical to this project's functionality and project focuses on demonstration of importance of interdisciplinary teamwork in robotic design.

P10.09

Budget Aware Traceroute Tool

Bakri Diyaolu, Adin Lindsey, Jeremiah Adderley

Mississippi Valley State University, Itta Bena, MS

Traditional traceroute tools send a fixed number of probes per hop, leading to redundant measurements and inefficient use of network resources. This research introduces a budget-aware traceroute system (BAT) designed to optimize probing efficiency while preserving accurate path discovery. Using Scamper as the probing engine, BAT dynamically allocates probe "credits" across hops based on per-hop confidence levels. This work highlights the potential for adaptive network measurement systems that balance precision, responsiveness, and bandwidth efficiency in large-scale Internet topology mapping.

P10.10

Advancing Academic Computing Through Infrastructure Modernization and Network Optimization

Ricky Downer, Jermiah Billa, John Adjaye, Manoj Bolugallu Padmayya, Pavan Kumar Gorthi

Alcorn State University, Department of Advanced Technologies, Lorman, MS

Rapid developments in information technology make it essential for institutions to regularly update computing and networking infrastructures to maintain high performance, security, and scalability. The Simmons Industrial Technology Building, a key facility within Alcorn State University's Advanced Technologies Department, recently underwent a comprehensive modernization initiative designed to enhance academic and research capabilities. The project encompassed three main components: replacement of legacy computer lab workstations with high-performance systems, installation of updated software to improve operational efficiency and data protection, and integration of advanced network switches offering enhanced traffic control, greater bandwidth capacity, and built-in security functions.

In addition, new cybersecurity protocols were implemented to protect sensitive information and reduce exposure to potential threats. Post-implementation analysis revealed marked improvements in computing speed, network stability, data security, and overall system reliability. The upgraded infrastructure establishes a resilient and scalable foundation capable of supporting future technological integration, promoting innovation, and ensuring a secure and efficient academic computing environment for years to come.

P10.11

Characterization of Legacy Waste at the TRIGA (Training, Research, Isotopes, General Atomics) Reactor

Sedomda Kpikpitse, Jermiah Billa, John Adjaye, Manoj Bolugallu Padmayya

Department of Advanced Technologies, Alcorn State University, Lorman, MS

Waste is generated in the laboratory every day. Typically, through contamination with radioactive materials that are beyond the background level. In the Utah Nuclear Engineering Facility lab, much of the waste generated is not well labeled, and so it is hard to determine its possible contamination; thus, considered a legacy waste. This study aims to utilize gamma spectroscopic techniques to identify the radioisotopes that are present with detailed analysis for calculations for activity.

Since Gamma radiation can penetrate very deep into the body and requires several centimeters of lead shielding and water, contaminated objects must be tested with such advanced techniques for proper management. Using a selection criterion, 27 items from the shelf in the Utah Nuclear Engineering Facility lab were characterized. The criteria involve using the GM counter to measure the count per minute (cpm). If the cpm is doubled and/or more than the background, we proceed to count the items using the High-Purity Germanium detector (HPGe).

The results indicate the presence of some Naturally Occurring Radioactive Materials (NORM). The isotopes that were found include: CO-60, CO-59, CS-137, K-40, ZN-65. A further analysis of the peak and energy levels were used to calculate the Full Width Half Maximum (FWHM), activity, and efficiency manually to confirm consistency with the HPGe and to help document a catalog for proper waste management in the future. All items that remain background counts were thrown away since they do not pose any potential threat to living organisms and the environment.

P10.12

Detecting and Labeling Hidden MPLS Tunnels

Anthony Nwafor, Madison Conley, Tristian-Connor Thomas

Mississippi Valley State University, Itta Bena, MS

Standard traceroute often yields inaccurate Internet maps due to **MPLS** Tunnels hiding the true path, but this work improves a framework to detect and classify these tunnels—categorized as **EXPLICIT**, **IMPLICIT**, **OPAQUE**, or **INVISIBLE**—by utilizing two key features: the **ttl-propagate** status and RFC 4950 extensions. The framework uses the scamper tool to gather essential metadata like the ttl-propagate value and applies three techniques—Quoted-TTL Signature, Opaque Tunnel Estimation, and Invisible Tunnel Inference—to accurately identify and label all tunnel types

P10.13

Optimizing Retail Forecasting Through Big Data Analytics

Briana Gresham, Kwabena Agyepong, Jermiah Billa, Manoj Bolugallu Padmayya

Department of Advanced Technologies, Alcorn State University, Lorman, MS

Understanding sales trends is critical for businesses seeking to improve forecasting accuracy and respond effectively to shifts in consumer demand. Many retail organizations face challenges interpreting large volumes of sales data, which limits their ability to make timely, data-driven decisions.

This project applies big data analytics techniques to analyze historical retail sales data obtained from public sources such as Kaggle and the U.S. Census Bureau. Using Python, Pandas, and PySpark, the data were cleaned, transformed, and analyzed to identify seasonal patterns, product category trends, and regional variations in sales performance.

The results reveal clear seasonal peaks during holiday months and significant differences across product categories and geographic regions. Time-series forecasting models that incorporate historical seasonality achieved greater predictive accuracy than baseline methods.

These findings demonstrate how predictive analytics can improve inventory management, marketing strategies, and business planning. Future work will explore integrating live-streaming sales data and real-time forecasting models to enhance decision support in the retail sector.

P10.14

The Construction of the Circuit Breaker Robot

Anthony Barnes, Kwabena Agyepong, Erol Sarigul, Jermiah Billa, John Adjaye

Department of Advanced Technologies, Alcorn State University, Lorman, MS

Manual sorting of objects based on visual characteristics is time-consuming and prone to error, especially in dynamic environments. To address this challenge, we investigated the development of a robot capable of autonomously identifying and sorting objects by color.

It was designed and assembled using Tetrix aluminum components and integrated a color-detection sensor to distinguish between colored balls. The robot was programmed using the Arduino IDE, combining autonomous control via the PRIZM Pro controller and manual override through a Tele-Op module.

System evaluation confirmed stable locomotion, responsive obstacle avoidance, and reliable transitions between manual and autonomous control modes. The integration of sensor feedback with motor control logic allowed the robot to adapt effectively to varied terrain and environmental conditions.

We recommend expanding the robot's capabilities to include shape and size recognition for broader sorting applications. The modular hardware and programmable control system make this robot a strong candidate for scalable automation and STEM education.

P10.15

Enhancement of Outdoor Wi-Fi Coverage at Alcorn State University

Kiranmai Kondeti, Kwabena Agyepong, Pavan Gorthi, Manoj Bolugallu Padmayya, Jermiah Billa

Alcorn State University, Department of Advanced Technologies, Lorman, MS

Reliable outdoor Wi-Fi access is essential for supporting digital learning, communication, and campus engagement. At Alcorn State University, several outdoor and common areas showed limited wireless coverage, reducing students' ability to stay connected during academic and social activities. Strong, uninterrupted Wi-Fi connectivity across open spaces became a priority to improve the overall campus experience. To address this, the Department of Advanced Technologies conducted a detailed wireless site survey using the Ekahau Sidekick 2 analysis system to locate signal dead zones and visualize weak coverage areas through high-resolution heat maps. Guided by these data-driven insights, XV2-23T Wi-Fi 6 outdoor access points were installed strategically across major zones such as dormitories, the Student Union, cafeterias, and libraries. In addition, X7-35X Wi-Fi 7 indoor access points were deployed nearby to ensure seamless connectivity transitions between indoor and outdoor spaces. Post-installation analysis confirmed significant gains in signal strength, coverage consistency, and connection reliability throughout the campus exterior. Students experienced faster speeds and stronger access in recreational, study, and gathering areas. This initiative showcases Alcorn State University's ongoing commitment to creating a smart, connected campus environment. The improved network supports enhanced learning, collaboration, and innovation while laying the foundation for future expansion into Wi-Fi 7 and emerging smart-campus technologies.

P10.16

Comparative Analysis of Radiation Attenuation in Cobalt-60 and Cesium-137 Using Copper, Lead, and Aluminum Shielding

Chukwuka James, Jermiah Billa, John Adjaye, Manoj Bolugallu Padmayya

Department Of Advanced Technologies, Alcorn State University, Lorman, MS

Health physics and nuclear safety require consideration of radiation protection, especially with high-energy gamma-emitting isotopes, for example, cobalt-60 (^{60}Co) or cesium-137 (^{137}Cs). Effective shielding materials assist in dose reduction and implementation of the As Low As Reasonably Achievable (ALARA) principle. This study evaluated by an experimental method, the attenuation effectiveness of three commonly utilized shielding materials; copper, lead, and aluminum exposure from ^{60}Co, and ^{137}Cs, sources. In the experimental tests, a variety of material thickness was utilized as directed, while a calibrated detector detected dose rate reductions. Distance and mass attenuation coefficients were calculated to provide material comparisons. Lead attenuated maximum dose rates in front of both isotopes, and then copper and then aluminum, typically based on density and atomic number. Copper also provided adequate, effective shielding that could be used due to a cost-benefit effect. In the shield design phase, while lead provided maximum attenuation performance. Copper provided usefulness in quality, weight, or cost. While recognizing the utility of the material to radiation protection is important, the validation of experimentally created data was an addition beyond the minimum degree an application would attenuate with shielding in the performance use with an application design.

P10.17

Efficient Prediction of Water Quality Index (WQI) Using Machine Learning Algorithms

Md Mushfiqur Rahman[1], Md Mehedi Hasan[2]

[1]Department of Data Science, University of Mississippi Medical Center, Jackson, MS 39216, USA, [2]Department of Computer Science and Engineering, Northern University, Bangladesh

Background: The quality of water has a direct influence on both human health and the environment, making the Water Quality Index (WQI) a critical indication for proper water management. As water contamination becomes increasingly significant due to economic growth and urbanization, predicting water efficiency factors remains a troublesome element of hydrophyte system examinations. The purpose of this work is to develop a computationally efficient and reliable method for estimating water quality characteristics to assist decision-makers in making appropriate decisions at the appropriate time.

Methodology : This research utilizes machine learning techniques, specifically Random Forest (RF), Neural Network (NN), Multinomial Logistic Regression (MLR), Support Vector Machine (SVM), and Bagged Tree Models

(BTM), to categorize a dataset of water quality from various locations across India. The prediction model relies on six key features- dissolved oxygen (DO), total coliform (TC), biological oxygen demand (BOD), Nitrate, pH, and electric conductivity (EC). The methodology involves handling these features in five steps, including data pre-processing using min-max normalization, missing data imputation using RF, and feature correlation.

Results:The experimental results demonstrate high predictive capabilities across the models tested. The Multinomial Logistic Regression (MLR) model achieved the highest performance, with Accuracy, Kappa, and Accuracy Upper findings of 99.83%, 99.17%, and 99.99%, respectively. In comparison, the SVM model recorded the lowest accuracy at 96.98%. The findings also highlighted that Nitrate, pH, conductivity, DO, TC, and BOD are the key qualities contributing to the orderly classification of water quality.

Conclusion: The study concludes that the applied machine learning models perform well in forecasting water quality parameters, with the greatest performance linked to the MLR model. By accurately predicting WQI and Water Quality Class (WQC), these models provide a robust framework for identifying water contamination processes. Future research will aim to combine the proposed method with deep learning approaches to further improve the efficacy of the selection process

P10.18

Evaluating the Performance of PPO+ICM Reinforcement Learning Agents for Navigation in Unity

Miah Robinson

Jackson State University, Jackson, MS

Ensuring the safety of Artificial Intelligence (AI) is crucial for delivering reliable services across diverse industries, including the military, education, healthcare, and automotive sectors. A highly effective strategy to enhance the accuracy and performance of an AI agent is through multi-configuration training, followed by rigorous evaluation in a specific environment to assess results. This study decisively examines the design of three AI agents, each configured with a distinct number of hidden units. The first agent uses 128 hidden units, the second uses 256 hidden units, and the third uses 512, all driven by the Proximal Policy Optimizer (PPO) algorithm. Notably, all agents are trained in a consistent environment using Unity, employing the Machine Learning Agents Toolkit (ML-agents) alongside the PPO algorithm integrated with an Intrinsic Curiosity Module (PPO+ICM). The primary objective of this study is to clearly illustrate the advantages and drawbacks associated with increasing the number of hidden units. The findings robustly demonstrate that increasing the number of hidden units to 512 results in improved agent's Goal (G) and reduced Collision (C) value.

END of Thursday's Program

Friday, March 20, 2026

MORNING

Hall D Room 12

8:20 Welcome

O10.18

8:30 Flipped Classroom vs Traditional Lecture-Based Instruction: A Comparative Study

Jamil Ibrahim[1], Ibrahim J Ibrahim[2], Saja Ibrahim[3], Waseem Ibrahim[4], Hidaya Ibrahim[5]

[1]University of Mississippi Medical Center, Jackson, MS, [2]4D Implant Prosthodontic Center, 230 Trace Colony Park Dr STE 1, Ridgeland MS, [3]University of Jordan Medical School, [4]Arab American University, School of Dentistry, [5]Al-Najah University, School of Pharmacy

This study investigated the effectiveness of a flipped classroom approach compared to traditional lecture-based instruction in an introductory statistics course at a selected southern university in the fall of 2024 . Fifty-eight undergraduate students were randomly assigned to either a flipped classroom group (n = 29) or a traditional lecture-based instruction group (n = 29). The results of an ANCOVA model indicated that the flipped classroom group had significantly higher post-test scores compared to the traditional lecture-based instruction group, controlling for pre-test scores ($F(1, 55) = 5.12$, $p = 0.0275$, Cohen's $d = 0.54$). Additionally, students in the flipped classroom group reported higher levels of engagement and satisfaction with the course material.

The findings of this study suggest that the flipped classroom approach is an effective way to improve student learning outcomes and student scores in an introductory statistics course. All statistical analyses were calculated with Statistical Program for the Social Sciences (SPSS) statistical software for Windows, version 26.0 and excel.

O10.19

8:45 Using Python Algorithm to Improve and Secure Layer 7 of OSI Model

Tai Cleveland[1]

Alcorn State University, Lorman, MS

Cyber security is a major battle and concern in every corner of both private and government business, especially as we move forward into Artificial Intelligence. This research paper uses a python algorithm control switch and pointer to enable Network Tap software to embed on layer 7 of the

OSI model. This will allow the user to capture actual traffic that runs across a network system to come to the determent if the packet is ready to be moved to a destination or be placed in a recycle bin. In this process, the user needs to embed a python control switch for verification and to check on how the process is working. on a layer 7 of OSM model DNS server port 53 SNMP port 161-162 VNP port 1732 SMTP port 25 SQL port 1433 Active Directory port 386 Web Application port 8080 Http port 80 Https port 443 In this statement I am declare a a swiyvcvh function of this what I am going to do del switch(network): if network == "DNS port53t": Acknowledge Hand shack Multiple Verification then ready "Transfer DNS Packet." process "Reassemble packet" Elseif fail "Move to Recycle Bin" Next elif lang == "SNMP port161and 162 Packet"

O10.20

9:00 Effect of the Clinical Skills Exercises Using a Broad Spectrum of Patient Encounters on Medical Students' Final Clinical Skills Examination Scores

Jamil Ibrahim[1], Ibrahim J Ibrahim[2], Saja Ibrahim[3], Waseem Ibrahim[4], Hidaya Ibrahim[5]

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Developing strong clinical competence is a core objective of undergraduate medical education. Diverse patient encounters—whether through real patients, standardized patients, or simulated scenarios—provide students with structured opportunities to apply medical knowledge, practice communication, and refine clinical decision-making in a safe, supervised environment. The aim of this study was to find out if the intervention (mini-Clinical Evaluation Exercise) utilized at an academic health center in the southeastern region of the United States in the School of Medicine improved both physical examination scores and overall scores on the medical school's final Clinical Skills Examination. A total of 456 students participated in this study. The pre-test group consisted of 339 medical students assessed in various clinical settings with a diverse set of patient cases during the academic years of AY 11-12, AY12-13, AY13-14 using traditional paper-based format. The post-test group consisted of 115 Medical students assessed in the academic year of 2014-2015. Students were evaluated on their interpersonal skills, data gathering skills, physical exam skills, counseling skills, and patient overall satisfaction with student performance. Power analysis was conducted in G-POWER to determine a sufficient sample size using an alpha of 0.05, a power of 0.80, and a medium effect size (f = 0.15). IBM Statistical Package for the Social Sciences (SPSS) software version 26 was used to analyze the data. Appropriate statistical tests were utilized to perform physical Exam test comparisons of pre-intervention mini-cex and post-intervention mini-cex scores, and to measure students' perceptions in the beginning of the third year before clerkships and after performing a complete physical examination on a patient. The results of this study revealed that students felt more prepared after the third year than before the third year clerkships.

O10.21

9:15 Spanwise Displacement Effects on Staggered MVG Configurations for Supersonic Boundary-Layer Control

Shala Wells[1], Yong Yang[2], Yonghua Yan[1]

[1]Jackson State University, Jackson, MS, [2]West Texas A&M University, Canyon, TX

In pursuit of more effective passive control of supersonic boundary layers, this study explores staggered MVG arrangements to modulate vortex interactions and boundary-layer energy loss. Building on previous investigations of tandem and parallel MVG arrangements, this study explores a new configuration: staggered MVGs positioned in the streamwise direction with variable spanwise displacement. Using Large Eddy Simulation (LES) and high-order numerical schemes, we examine how the relative spanwise offset between upstream and downstream MVGs influences vortex structure interactions and boundary-layer dynamics. Results reveal a strong dependence on spanwise displacement. When the offset is large, the vortex structures generated by the two MVGs remain largely isolated, resulting in minimal interaction and reduced impact on boundary-layer energy loss. In contrast, small spanwise displacement leads to intense vortex interaction, promoting vortex merging and distortion that significantly increase energy dissipation within the boundary layer. These findings underscore the sensitivity of MVG-induced flow control to spatial arrangement and offer new insights into optimizing MVG placement for targeted energization and mixing. The staggered configuration introduces a tunable design parameter-spanwise displacement, that can be leveraged to balance control effectiveness and aerodynamic efficiency in high-speed applications.

O10.22

9:30 Get Me Hired

Bakri Diyaolu

Mississippi Valley State University, Itta Bena, MS

This project introduces an AI-powered resume review platform designed to support university students in improving their professional materials through structured peer evaluation and automated feedback. By combining machine-generated insights with human-reviewed critique,

the system ensures that students receive high-quality, actionable guidance on each resume version they upload. The platform incorporates role-based user types to manage submissions, reviews, and moderation effectively. Gamification elements such as badges, points, and leaderboards promote consistent engagement and reward high-quality contributions from student reviewers. Altogether, the system enhances campus career readiness by streamlining resume improvement and fostering a collaborative, skill-building environment.

O10.23

9:45 Community Service Hub

Eyimofe Ajagunna

Mississippi Valley State University, Itta Bena, MS

The Community Service Hub is a database-driven application designed to simplify how universities manage community service opportunities. It enables faculty to submit and manage service opportunities, approvers to validate events, students to register and track participation, and the system to record attendance and automatically update service hours while supporting communication and preserving event history. `This platform is essential because students often struggle to track their service hours accurately, and faculty frequently face challenges managing registrations, confirming attendance, and assigning hours fairly. Overall, the Hub enhances transparency, efficiency, and accountability for all stakeholders involved in community service activities.

O10.24

10:00 Architecting Secure Systems: A Blueprint for Mitigating Common Database Attacks

Stephen Love, Jakyla Shields, Ping Zhang

Alcorn State University, Lorman, MS

This project focuses on a full-cycle cybersecurity analysis of a relational database system. The project will demonstrate in two phases: offensive and defensive. The initial phase involves the construction of an intentionally vulnerable database system, followed by a penetration test to identify and exploit its weaknesses. The second phase will focus on implementing a robust set of security countermeasures to remediate the identified vulnerabilities. Its purpose is to validate the project's scope and objectives, which ensures the project is well-defined, achievable. Also, by demonstrating a foundation understanding of both offensive and defensive cybersecurity principles, moving beyond theoretical knowledge to real-world application. Lastly, by identifying and mitigate risks to foresee potential challenges, such as unexpected vulnerabilities or technical limitations, and outline a plan to address them.

This project will demonstrate a clear understanding of the security lifecycle, from vulnerability discovery to remediation. A controlled environment dedicated virtual machine environment will be created to host the project, ensuring all activities are contained and it will not pose a risk to external systems. Developing a vulnerable database system by creating a simple web application will be built with a connected database. This system will be designed to be susceptible to common attacks such as SQL injection or other forms of data manipulation. Conducting penetration testing uses industry-standard tools and techniques. A simulated attack on the vulnerable system to gain unauthorized access to the database is simulated. It highlights an understanding of a hacker's mindset and methodology. To implement security controls once vulnerabilities are exposed. This will involve using prepared statements, input sanitization, access control lists, and encryption protocols. This step showcases the ability to architect a secure system.

O10.25

10:15 Survey of Theory of Computation and Its Application in Artificial Intelligence and Machine Learning

Ping Zhang, Camerone Harris

Alcorn State University, Lorman, MS

The Theory of Computation (TOC) provides the mathematical foundation that defines the capabilities and limitations of modern computing. In the era of Artificial Intelligence (AI) and Machine Learning (ML), TOC plays a critical role in shaping how intelligent systems learn, reason, and make decisions. This paper explores the connection between TOC and AI/ML, focusing on how automata, grammar, and complexity theory support the design and optimization of learning algorithms. It also highlights the theoretical constraints of computability and the efficiency of trade-offs that influence the development of advanced AI systems. Through case studies and examples, the research demonstrates how TOC ensures AI's logical consistency, computational feasibility, and scalability while guiding future innovations in quantum and biological computation.

O10.26

10:30 AI Deep dive: Exploring Challenges, Ethics, Privacy, and Power

Bishesta Bohara, Keith Gates, Duraesh Yadav, Nyla Boatwright, Mohammad Nabil Islam, Chetanchal Saud

The University of Southern Mississippi, Hattiesburg, MS

Artificial Intelligence (AI) has rapidly evolved, gradually integrating into multiple industries. It is increasingly becoming a vital part of human life, making tasks less arduous and tedious.

Privacy remains one of the most pressing challenges with

AI being integrated into our society. Laws such as the GDPR and HIPAA were written for human-controlled systems, but AI complicates principles like consent, transparency, and accountability because of its quick evolution. With solutions like differential privacy, federated learning, and explainable AI, it can work towards balancing innovation with protection.

Beyond privacy, AI's ability to mimic human cognition plays a key role in its rapid growth and associated risks. Our research explores the processes behind this capability, along with the concerning discovery that AI can inherit human psychological vulnerabilities. To maximize the benefits and address ethical concerns, it is crucial to establish a balanced integration of AI and human capabilities.

Alongside ethical and regulatory concerns, the rapid advancement of generative AI has introduced a significant challenge: its substantial environmental footprint. We further examine the energy and water consumption inherent in the lifecycle of large AI models. This analysis proposes a multi-faceted framework for sustainable AI, advocating for technological solutions such as sustainable model architecture and green infrastructure, robust policy and governance, and a fundamental shift toward a culture of ethical and environmental responsibility.

AI helps businesses and people make decisions, solve problems, and do tasks faster. While AI can be helpful, it can also cause problems if it is not used safely. Section 4 discusses the main challenges of AI safety and explains the ways business and technology experts try to make AI safe, fair, and trustworthy for everyone.

AI has developed from a theoretical idea into a force that has transformed creativity, learning, and communication. With Machine Learning and neural network structures, AI models can process large amounts of data, find patterns, and generate outputs comparable to human creativity. The DALL·E and ChatGPT systems can illustrate how algorithms can acquire the linguistic structure and visual form to create art, writing, and ideas independently. With AI blurring the lines between computer and creative thinking, it becomes challenging to define authorship, authenticity, and innovation.

Finally, while AI offers significant benefits in employment and law enforcement, it also creates serious ethical and fairness problems. AI hiring tools using deep learning models can perpetuate historical bias by learning from flawed training data. Our research explains why it is essential to

manage these technologies using strong governance frameworks that demand fairness, transparency, and human oversight. This paper reflects key challenges associated with AI, including outdated privacy laws, possible persuasion attacks, and user safety.

O10.27

10:45 Virtual Support Chatbot

Anthony Njiti, Jasmine Jones, Ping Zhang

Department of Math and Computer Science, Alcorn State University, Lorman, MS

Normally, a website has a lot of resources, it may be difficult to quickly find the right details about workshops, internships, or who to contact. A chatbot would make it easier for people to simply ask their questions and get an immediate response.

The project will have a web based chatbot that lets users type in questions and get responses. It will use a backend with Flask and Python that connects to the OpenAI API and checks a local knowledge base with verified information about the agricultural extension program at Alcorn State University. Extension Program for example contact info, program areas, and history. The chatbot should be able to handle simple greetings, answer common questions, and point people to the right office if something isn't available online.

The project is organized into several parts. The app.py file serves as the Flask backend, handling communication between the frontend and the OpenAI API. It also loads verified data from the local JSON files and ensures that each reply includes the correct contact information. The contacts.json file stores official Extension Program details such as the email, phone number, office hours, and website link. The faqs.json file contains verified questions and answers that the chatbot can reference before calling the AI. The index.html file is responsible for the layout of the chatbot interface, including the banner, input box, and message display area. The script.js file manages sending user messages to the Flask backend and displaying responses dynamically in the chat window. The style.css file controls the overall appearance and applies Alcorn's branding through consistent colors, fonts, and design elements.

O10.28

11:00 The Future of Cybersecurity in the Age of Artificial Intelligence: Collaboration or Competition?

Kieffer Howes, Bilal Abu Bakr

Collin College, McKinney, TX

As artificial intelligence (AI) continues to advance at an unprecedented pace, its influence on nearly every industry, including cybersecurity, has become a central topic of discussion. The integration of AI into cybersecurity presents both tremendous opportunities and formidable challenges. This Abstract explores two contrasting yet plausible futures for the cybersecurity field in an AI-dominated world: one in which humans and AI collaborate as partners, and another in which AI systems assume

complete control over network defense.

In the first scenario, cybersecurity professionals work alongside AI systems as strategic collaborators. AI becomes a tool that augments human capabilities—automating repetitive or time-sensitive tasks such as scanning network traffic, detecting anomalies, and flagging potential threats. Similar to a "digital guard dog," AI would operate under the guidance of human experts, following established rules and ethical boundaries while enhancing speed, accuracy, and efficiency in threat mitigation. This partnership-based model could significantly reduce human workload and increase the overall resilience of organizational networks, fostering a future where AI serves as a trusted ally in cybersecurity operations.

The second possibility envisions a more autonomous AI-driven defense system, in which organizations entrust highly advanced AI—or even emerging artificial general intelligence (AGI)—with the sole responsibility of safeguarding their networks. This shift could be driven by the escalating sophistication of cyber threats powered by equally intelligent malicious AI. As cyberattacks become faster, more adaptive, and potentially self-learning, human defenders may no longer be able to respond with sufficient speed or precision. In this future, reliance on AI may be less of a choice and more of a necessity for survival in an increasingly automated cyber battlefield.

Ultimately, the evolution of AI in cybersecurity may not be confined to one extreme or the other. The balance between human oversight and machine autonomy will depend on developments in ethics, technology, and regulation. While the first scenario offers a hopeful vision of symbiotic collaboration, the second warns of potential overdependence and displacement within the cybersecurity workforce. Regardless of the path taken, cybersecurity remains an inherently adaptive discipline—one that continually evolves to confront emerging challenges. The future of cybersecurity will be shaped not by resisting AI, but by embracing it thoughtfully, ensuring that innovation and integrity remain at the heart of protecting digital systems and the people who rely on them.

O10.29

11:15 An AI-Powered Browser Extension for Real-Time Phishing Email Detection and User Awareness

Tharoon Anbu, Bilal Abu Bakr

Collin College, McKinney TX

Phishing attacks remain one of the most persistent and evolving forms of cybercrime, exploiting technological vulnerabilities and human psychology. In a phishing attack, cybercriminals impersonate trusted organizations to deceive individuals into revealing sensitive information such as passwords, financial details, or personal data. These deceptive messages often use emotional triggers—fear, urgency, or curiosity—to prompt users into clicking malicious links or opening harmful attachments. As phishing techniques grow more sophisticated through domain spoofing, linguistic manipulation, and visual deception, users face increasing difficulty distinguishing legitimate correspondence from fraudulent communications.

This research presents an AI-powered browser extension designed as a real-time security assistant for email users. Artificial Intelligence (AI) enables computers to simulate human intelligence, analyze data patterns, and make decisions autonomously. Natural Language Processing (NLP), a branch of AI that allows machines to understand and interpret human language, is applied to identify linguistic and emotional cues commonly found in phishing messages. The proposed browser extension, compatible with major browsers such as Chrome, Safari, and Firefox, integrates seamlessly with widely used email platforms, including Gmail, Yahoo, and Outlook.

The tool employs a multi-layered AI model that combines machine learning (ML), NLP, and heuristic-based threat analysis to examine emails in real time. It evaluates multiple phishing indicators such as sender authenticity, hyperlink integrity, emotional tone, and attachment safety. For example, it can detect subtle character substitutions (e.g., replacing lowercase "l" with uppercase "I") or deceptive domains that mimic legitimate websites. It also inspects hyperlinks beyond their display text and flags high-risk file types like ".exe" and ".zip," commonly used to distribute malware.

When suspicious patterns are detected, the extension issues a clear, context-sensitive alert that explains the nature of the risk and recommends safe actions—such as blocking, deleting, or reporting the message. If the user ignores the initial warning, a secondary "Proceed with Caution" prompt reinforces safe decision-making and strengthens security awareness. Beyond serving as a defensive mechanism, this tool also acts as an educational resource, enhancing users' cybersecurity literacy through real-time feedback and guidance.

The proposed AI-powered browser extension empowers individuals to recognize and resist social engineering tactics by combining automated phishing detection with adaptive user education. This dual approach strengthens individual and organizational defenses while promoting a culture of digital resilience and safer online communication.

O10.30

11:30 Reimagining the AMBER Alert System: Leveraging AI and Community Engagement to Combat Alert Fatigue and Save Lives

Bilal Intesar Syed, Bilal Abu Bakr

Collin College, McKinney, TX

The AMBER Alert system has long served as a critical public safety tool, credited with saving numerous lives since its creation. However, its effectiveness has gradually declined due to overuse, vague alerts, and poor geographic targeting. Many recipients now experience "alert fatigue," caused by frequent notifications that are either too distant from their location or lack actionable details. This widespread desensitization undermines the system's primary goal—prompt community action during the crucial early hours of a child abduction. To restore its impact, the AMBER Alert system must evolve into a more precise, data-driven, and engaging platform that harnesses both artificial intelligence (AI) and public participation.

A key improvement lies in implementing AI-powered data matching to refine the search process. Current alerts often include vague descriptors, such as "black sedan," which can apply to numerous vehicles, thereby diluting the usefulness of the information. By integrating AI with existing traffic cameras, toll systems, and license plate readers, law enforcement can automatically analyze and identify likely matches in real-time. Machine learning models can cross-reference vehicle characteristics, regional traffic patterns, and time-stamped data to generate prioritized leads. This automated filtering would significantly reduce the time required to locate suspects, enabling authorities to act more quickly and effectively.

Equally vital is enhancing public engagement through gamification and community recognition. A reward-based participation model could motivate citizens to take an active role in responding to alerts. For instance, individuals could earn digital points, badges, or leaderboard rankings for verified contributions—such as opening alerts, sharing accurate information, or submitting credible tips. Partnerships with local businesses could translate these points into tangible incentives, such as coffee discounts or transportation credits. Additionally, a community feedback loop that notifies users when a child is safely recovered would reinforce trust and demonstrate the direct impact of collective action.

By merging targeted, AI-enhanced alert delivery with motivational engagement strategies, the AMBER Alert system can transition from a passive notification mechanism into an interactive, real-time rescue network. This next-generation approach not only revitalizes public participation but also strengthens the speed, accuracy, and effectiveness of child recovery efforts. Ultimately, leveraging technology and human collaboration together offers the most promising path toward restoring the AMBER Alert system's power to save lives in an increasingly connected world.

O10.31

12:00 Adaptive AI Honeypots: A Generative Approach to Deceptive Cyber Defense

John Black, Bilal Abu Bakr

Collin College, McKinney, TX

Cyber threats continue to evolve in both speed and sophistication, making traditional honeypots easier for attackers to detect. Static file systems, predictable logs, and canned responses reveal their artificial nature, which causes experienced adversaries to disengage quickly. To counter the growing level of awareness, this research examines an adaptive AI honeypot powered by the Descartes generative simulation engine and supported by agentic microcontainer services, which create realistic and dynamic system behavior.

This honeypot replaces the old model of predefined scripts and shallow service emulation. Instead, it functions as a fully generative deception surface. The core model, Descartes, employs next-state prediction principles similar to those used in its Minecraft experiment to determine what the attacker should see after each action. When an adversary submits a command, launches a scan, uploads a payload, or attempts to pivot, the AI generates a realistic system response in real-time. This allows the honeypot to behave like a live environment that changes naturally, which creates the illusion of depth and authenticity.

The honeypot does not host real services. It operates as an adaptive proxy that captures attacker inputs, interprets them, extracts exploit patterns, and generates realistic outputs while recording every detail of the interaction. A network of microcontainer agents adds realism. One agent generates believable log entries, another simulates latency, another adapts file system content, and others adjust dialogs, error messages, process trees, or network activity. Together, they create an evolving system personality that is difficult for adversaries to fingerprint.

All attacker activity flows into defensive tools, including firewalls, SIEM platforms, and IDS/IPS sensors. This enables the system to update rules, signatures, and correlation logic in real-time based on the attacker's behavior. The result is a feedback loop where hostile activity strengthens overall security.

Initial analysis suggests that a generative AI honeypot can extend the time attackers spend engaged and capture a broader range of techniques compared to static decoys. It also produces a deception surface that feels far more convincing. Challenges remain, including fingerprinting risks, false positive noise, and ethical concerns surrounding the use of automated deception. Future work should

explore hybrid models, automated red team testing, and AI-driven social engineering lures. Securing funding will allow full-scale deployment and testing of this architecture.

With the current state of cybersecurity and AI systems being used for large-scale attacks, a system like this can provide a modicum of safety that we do not see in current iterations of security software.

Neurosciences

Chair: Harry Pantazopoulos

University of Mississippi Medical Center

Co-Vice-Chair: Barbara Gisabella

University of Mississippi Medical Center

Co-Vice-Chair: Erick Bourassa-Price

University of Mississippi Medical Center

Co-Vice-Chair: Nicole Ashpole

University of Mississippi

Thursday, March19, 2026
MORNING
Hall D Room 8
8:45 Welcome and Opening

9:10 Assessing Orexin Expression and Function in the Mammalian Cochlea

Kathleen T. Yee, Alka Ghadiyaram, John Roberson, Douglas E. Vetter

University of Mississippi Medical Center, Jackson, MS

Background: Individuals are often exposed to moderate-level sound intensities that produce temporary threshold shifts (TTS) that naturally return to pre-exposure threshold levels. Yet TTS has been shown to produce significant deficits in suprathreshold hearing tasks important for detecting sound in noise. Our research centers on defining the molecular elements that mitigate the degree of NIHL and control cochlear recovery of function following moderate intensity noise exposure. While several systems, including the olivocochlear pathway and the systemic hypothalamic-pituitary-adrenal (HPA) axis, have been theorized to attenuate NIHL, data suggest these systems may be weakly active, especially at initial phases of the cochlea's response to noise. We have shown that a cochlear HPA-equivalent signaling system exists and controls cochlear sensitivity and responses to noise. We have also shown that the cochlea releases corticosterone locally, suggesting that cochlear CRF signaling truly reflects a local version of the systemic HPA axis and could be involved with shaping cochlear cell stress responses to noise. Because tissue homeostasis is complex, local CRF signaling system may not be the only hypothalamic peptide expressed in the cochlea. Here we report the existence and role of a cochlear Orexin (Hypocretin) signaling system that may work in concert with the CRF-driven cochlear HPA-equivalent system to direct or modulate local cell stress responses to noise exposure. Because Orexin

signaling is targeted by drugs used for insomnia, understanding the role of Orexin signaling in the cochlea is important to ensure patients are not at risk for drug-induced increased susceptibility to and damage from noise exposures.

Methods: Primary antibodies to Orexin A/B pre-pro hormone and the Orexin receptors Ox1R and Ox2R were used to assess expression patterns of Orexin signaling molecules. Auditory physiology experiments were used to quantify baseline hearing sensitivity and loss of function following moderate intensity noise exposures. Finally, a single nuclear RNAseq (snRNAseq) approach was used on adult cochleae at baseline (no noise exposure) and 15 days following moderate intensity noise exposure to assess differential gene expression patterns among cochlear cells of from wildtype and OxR1 null mice.

Results: Immunostaining with anti-OxA/B revealed Orexin expression within the mouse cochlea, primarily localized to the support cell structures that we previously showed express CRF and the CRF receptors. The same cells were also immune-positive for Ox1R and Ox2R, although Ox1R was more robust than Ox2R. While presentation of moderate intensity noise to wildtype mice resulted in a temporary threshold shift of hearing sensitivity, ablation of OxA/B, Ox1R, and Ox2R all resulted in auditory threshold shifts that did not recover to baseline. Thus, loss of Orexin signaling transformed a temporary and recoverable threshold shift into a permanent hearing loss. snRNAseq experiments comparing baseline (no noise) to 15 days post-noise exposure in Ox1R null mice has revealed significant changes to numerous ensembles of genes related to neural processing. Surprisingly, this involves the sensory hair cells which do not express Orexins or receptors, suggesting that Orexin signaling has significant but indirect control over the molecular state of cells driving the output of the cochlea.

O11.02

9:30 Corticotropin Releasing Factor and Signaling Molecules are Expressed in the Contralateral Cochlea Following Monaural Cochlear Ablation

Walter Moore[1], Kathleen Yee[1,2], Douglas Vetter[1,2]

[1]School of Medicine, University of Mississippi Medical Center, Jackson, MS, [2]Department of Otolaryngology - Head and Neck Surgery, Jackson, MS

BACKGROUND: Nearly 1.5 billion people worldwide suffer from single-sided deafness, a severe to profound unilateral deafness that is clinically unmanageable. While the non-deaf ear has often been considered to be 'normal,' there is evidence, including from our own studies, suggesting that the ear contralateral to the dysfunctional ear itself is no longer the same as under normal bilateral hearing conditions. Molecules of the hypothalamic-pituitary-adrenal axis signaling system are expressed in the inner ear and involved in cellular stress responses (Graham et al, 2010). We have examined whether there is modulation of these cochlea cellular stress signals in the presumed 'normal' ear contralateral to unilateral deafening. Since there is evidence that extracellular matrix remodeling occurs with stress, we have also investigated whether perineuronal nets change in their distribution following unilateral cochlear ablation.

METHODS: Adult CRFcre:tdTomato (Ai14) male and female mice anesthetized with ketamine (70-100mg/kg) and xylazine (10-20 mg/kg) were subjected to unilateral cochlear ablation. A trans-tympanic approach was used to access the cochlea which was pierced with a Beaverblade ophthalmic knife. The bony capsule inferior to the stapedial artery was broken and removed. The middle ear was packed and the ear canal sealed (VetBond cyanoacrylic glue). Age-matched male and female CRFcre:tdTomato mice without cochlear ablation served as controls. One to 21 days following cochlear ablation, animals were perfused with 4% paraformaldehyde, and temporal bones were processed for immunohistochemistry using anti-RFP (Rockland Immunochemicals), anti-CRFBP (Santa Cruz), biotin-Wisteria Floribunda (Millipore Sigma) and anti-Ucn (Salk Institute). Sections were counterstained with DAPI and imaged (Zeiss LSM880 Confocal).

RESULTS: Within 5 days of a unilateral surgical ablation of the cochlea, the intact cochlea undergoes significant changes. CRF-driven tdTomato becomes highly expressed in IHCs and is also upregulated in the spiral limbus, spiral ligament and other support cells. CRF-binding protein localization is detected in parallel, peaking at 7 days post ablation. Ucn, a ligand that also binds CRF receptors, was upregulated in the support cell regions. Interestingly, the pattern of Ucn upregulation does not completely mirror the observed changes to the CRF:tdTom signal. Compared to mice without cochlear ablation, wisteria floribunda binding to perineuronal nets was elevated within the cochlear epithelium contralateral to unilateral ablation as early as 1 day following contralateral cochlear ablation and remained high through 21 days survival. Localization of wisteria floribunda was focused primarily among support cells.

CONCLUSIONS: Our results indicate that a CRF peptide-based signaling mechanism plays a role in synaptic dysregulation along the peripheral afferent pathway. Further, extracellular matrix molecules undergo remodeling within the contralesional cochlea, an organ often presumed to be 'normal' under conditions of single sided deafness. Spatial localization of the CRF signaling molecules suggest involvement of ion (K+) recycling, critical for cochlear function. Because neural innervation of the lateral support cell regions of the cochlea is well-known, future work assessing the degree to which nerve

fibers are sprouting into or being blocked from the lateral support cell regions of the must be carried out.

O11.03

9:50 Developmental Expression of Membrane Bound and Secreted Corticotropin Releasing Factor Receptors and Urocortin, a CRF-related peptide, in the Cochlea

Sarah J. Hayek[1], Douglas E. Vetter[1,2] and Kathleen T. Yee[1,2]

[1]School of Medicine, University of Mississippi Medical Center, Jackson, MS, [2]Department of Otolaryngology - Head and Neck Surgery, Jackson, MS

BACKGROUND: We have previously shown that corticotropin releasing factor (CRF) is expressed by support cells in the cochlea. Additionally, our work has shown that CRFR1 and CRFR2 function in concert to modulate / set levels of hearing sensitivity (Graham et al. 2010, 2011) but that the functional phenotypes may stem from deficits occurring during postnatal maturation (Graham et al. 2010). Additionally, we have previously shown that Urocortin 1 (Ucn), a CRF-related peptide that binds with both CRF receptors, is expressed in the cochlea (Vetter et al., 2002). To better understand the role of CRF signaling in maturation of the cochlea, we investigated the developmental expression of two CRF receptors, CRFR1 and CRF binding protein (CRFBP), and the ligand, Ucn during early developmental stages of the cochlea.

METHODS: CRFR1-GFP transgenic mice (BAC transgenic mice that express GFP under the control of CRFR1 promoter and enhancer elements) were used at postnatal day (P) 0, P3, P17 and at adulthood. Animals were perfused with 4% para-formaldehyde, and temporal bones processed immunohistochemistry (GFP, Rockland Immunochemicals; CRFBP, Santa Cruz Biotechnology; Urocortin 1 (Ucn), gift from Wylie Vale, Salk Institute), DAPI stained and imaged by confocal microscopy (Zeiss LSM 880).

RESULTS: CRFR1-GFP mice exhibit faithful recapitulation of endogenous expression patterns of CRFR1 (Justice et al, 2008). Prior to hearing onset, CRFR1-GFP was detected in the cochlea as early as postnatal day (P) 0; at P7, a robust CRFR1-GFP signal was detected in Deiter's cells basal to outer hair cells along with significantly fainter GFP in border cells of the inner hair cell region and in inner and outer sulcus cells. At P7, CRFBP labeling was detected only within Deiter's cells. By P17, a time just beyond hearing onset, robust GFP localization was detected in all cell types previously positive for GFP expression, with additional labeling of root cells of the lateral wall.

We further observed that Ucn is expressed exclusively in the inner hair cell region at P15, but by 13 weeks of age, Ucn immunolabeling was observed at high levels in the outer sulcus region of support cells as well as under inner hair cells.

CONCLUSIONS: Given the temporal expression of CRF-related signaling molecules in the cochlea, the functional deficits observed following CRFR1 gene ablation may stem from developmental events not only to altered CRFR1 expression in the cochlea, but also independently regulated expression of CRFBP and abnormal signaling via Ucn. Importantly, CRFBP can act as a damper on CRF signaling by binding with and thus sequestering free CRF and a CRF-related peptide, Urocortin 1. Onset of mature hearing is temporally associated with an expansion of Ucn expression from alignment with afferent fiber contacts with inner hair cells to support cells involved with ion recycling between distinct ion compartments of the cochlea that is critical for maintenance of mature hearing sensitivity and may also be involved with other cell response pathways that include the cellular stress axis.

O11.04

10:10 ADARB1 as a Nuclear Marker of Spiral Ganglion Neurons Across Species and Age

Garner Fincher, Punam Thap[1], Steven Gressett, Bradley Walters

University of Mississippi Medical Center, Jackson, MS

Background: Spiral ganglion neurons (SGNs) are the primary neurons responsible for transmitting auditory signals from the inner ear to the brain. Degeneration of SGNs occurs in various conditions including auditory neuropathies, traumatic brain injury, and aging, thus contributing to acquired hearing loss. Precise characterization and quantification of SGNs are critical for advancing the understanding of auditory pathology and evaluating potential therapeutic interventions. Here we show that immunolabeling for ADARB1, an RNA editing enzyme enriched in the nuclei of glutamate receptor-expressing neurons, is a reliable method for SGN identification and quantification in young adult mice. We compared manual SGN counts obtained via neurofilament heavy chain (NFH) immunolabeling to automated counts generated with ADARB1 immunofluorescence. We further characterized ADARB1 immunoreactivity in aged mice (24 months), as well as in human and macaque inner ear tissues. Co-labeling sections for ADARB1 and HuD, NFH, GATA3, or SOX2 was undertaken to confirm neuronal identity.

Methods: Mid-modiolar cochlear sections were obtained from 3-week-old CD1 mice, 24-month-old C57Bl/6 mice, and archived (>5 years) temporal bone sections from macaques (4 years-old) and human cadavers of varying ages (all > 40 years of age). The human, macaque, and 24-month-old mouse samples were immunolabeled with antibodies against ADARB1 and neurofilament heavy chain (NFH), while the 3-week-old mouse samples were

immunolabeled with antibodies against ADARB1, NFH or HuD, and either SOX2 or GATA3. Micrograph images were acquired using laser scanning confocal microscopy with a 40X objective. Image processing, including manual thresholding and noise reduction, was performed using ImageJ (Fiji).

Results: ADARB1 immunolabeling yielded specific and robust staining of spiral ganglion neurons (SGNs), allowing for reliable automated quantification using the analyze particles function in ImageJ. Comparison across over 30 sets of images yielded a Lin's concordance correlation coefficient greater than 0.94, indicating strong agreement between manual and automated counts. Strong ADARB1 expression was observed in surviving SGNs in 24-month-old mouse samples demonstrating utility in a context where hair cell and SGN loss were evident. ADARB1 labeling of SGN nuclei was also prominent in macaque and human sections, though some variability was noted in the cadaveric samples. Colocalization analyses demonstrated that ADARB1 labels both type I and type II SGNs, as evidenced by overlap with HuD, NFH, and GATA3-labeling. Conversely, a lack of colocalization between ADARB1 and SOX2 indicated minimal ADARB1 expression in glial cells.

Conclusions: These studies demonstrate the specificity and robust expression of ADARB1 in spiral ganglion neurons (SGNs) and validate the effectiveness of ADARB1 labeling for automated quantification of SGNs, indiscriminate of type, and across diverse mammalian species.

O11.05

10:30 Have Integrated Phenotypes in Bowerbirds and Manakins Evolved Convergently?

Lainy Day

University of Mississippi, University, MS

Bowerbirds (Ptilonorhynchidae) and manakins (Pipridae) are lek breeding passerine families that performing elaborate physical displays and habitat modifications to produce display stages. Oscine bowerbirds are vocal learners and aspects of bower construction and dance are learned. A tutor is not required for suboscine manakins to develop acrobatics. Numerous studies of convergent evolution in vocal learning birds and mammals indicate vast similarities in genes and neural circuits signifying constraints on vocal learning mechanisms. In bowerbirds and manakins, sexual selection via female choice and shared niches contribute to convergent life histories, display development, and neural and endocrine control of displays. Whether lack of shared learning neural circuitry might limit shared mechanisms for convergent traits is unknown. Both families are mainly tropical (bowerbirds in Australo-Papuan and manakins in southern Mexico to northern South America) but have similar habitat diversity. Their frugivorous diet is thought to reduce foraging time allowing elaborate male displays and solo nesting by females. Most species have colorful males and drab females. Lekking polygeny appears to be ancestral with loss in a few monogamous species. In both families, adults flexibly intensify display in the presence of indicating plasticity. Manakins live 9-18 years, with similar sized (7-15cm, 8-30g) birds living only 3-10 years. Bowerbirds live 10-26 years. Similar sized large corvids live 7-22 years. Practice displays and social observation by young males is common, suggesting longevity is needed to perfect displays. Delayed plumage maturation allows juvenile males female crypsis and they are displayed to by adults. In some manakins, juveniles join group displays gaining reproductive "alpha" status as they age. Similar subordinate coalition pairs take place in spotted bowerbirds (*Ptilonorhynchus maculatus*). During the non-breeding season, young males of several bowerbird/manakin species build low quality bowers/arenas and perform "practice" displays. Positive correlated evolution of cerebellar volume with display complexity and abundant cerebellar androgen receptors occurs in both families. In manakins, a variety of genetic, skeletal, metabolic, and endocrine adaptations supporting high-speed, ballistic displays have been identified. Selection appears sexually dimorphic in manakins. Arial acrobatics selected for lighter males than females, but increased rainfall selected for increased male wing length over females. Detailed analysis of bowerbird sexual dimorphism is lacking. Brain volume and tarsus length in male manakins and brain volume in male bowerbirds is positively associated with display complexity, but such trends are seen in female bowerbirds as well. Arcopallium volume is larger in male than female manakins and the reverse is true for a visual regions. Similar brain region analyses by sex has not been performed in bowerbirds. We have histological, genomic, and transcriptomic brain material for 5 bowerbird and 13 manakin species. An initial neuroanatomical target will be the periaqueductal gray, recently proposed as a central region for motor display complexity. With the availability of all bowerbird genomes and many manakin genomes, we should be able to identify family convergent and divergent genes. The extent of similar mechanisms for gestural displays will expand our understanding of evolutionary constraints on these traits and elucidate deep genetic homologies.

O11.06

10:50 Birdie See, Birdie Do? Establishing an Evolutionary Context for the Role of the Cerebellum in Cognitive Tasks and Observational Learning

Md. Tarikul Islam, Lainy B. Day

University of Mississippi, University, MS

The cerebellum (CB) plays a vital role in posture and balance in vertebrates. More recently, it has been recognized for its role in procedural learning and observational learning of procedures in humans and rodents. However, the role of the avian CB in cognition is remarkably understudied. To date, only 3 studies outside of our lab have experimentally tested cerebellar function in cognition in birds, and all focused on song. A few recent studies have reported correlations between cerebellar morphology and cognitive task performance in poultry species, yet the causal mechanisms underlying these associations remain unclear. Other studies of cerebellar function have focused on its traditional role in motor coordination. In our laboratory, we have demonstrated correlated evolution of procedural complexity in mating display cerebellar hypertrophy in bowerbirds and in manakins. Moreover, we and others have identified steroid hormone regulation of cerebellar-related seasonal mating displays in bowerbirds and manakins and a proximate role of these same pathways, testosterone>aromatase>estradiol and androgen and estrogen receptors mediate neuroprotection paired with behavioral deficits post-cerebellar lesions in the zebra finch (*Taeniopygia castanotis*). In this study, we aim to extend this groundwork by testing whether the cerebellum is critical for avian cognition in three domains: song, fear, and spatial procedures using behavioral analysis (Day Escape Maze, Song Learning, and Fear Conditioning). We will also assess whether the cerebellum's role in observational learning, as seen in humans and rodents, is conserved in songbirds, specifically the zebra finch, but only for ecologically relevant task-song and fear but not spatial procedures. Furthermore, we predict differential brain expression of immediate-early genes and candidate genes during performance and observational learning of these tasks, which will be analyzed by multiplex fluorescent in-situ hybridization and quantitative PCR. We will also use spatial transcriptomics (10X Visum) to identify a 4-way dissociation of gene expression patterns in HVC, arcopallium, hippocampus, and cerebellum, which play prominent roles in song, fear, and spatial goal, and spatial procedural learning, respectively. Gene Ontology (GO) and Kyoto Encyclopedia of Genes and Genomes (KEGG) pathway enrichment analyses will then be conducted to identify the biological processes and pathways represented among differentially expressed genes (DEGs). Subsequent analyses will include spatially resolved cell type annotation to identify cell types enriched in regions showing DEGs, weighted gene co-expression network analysis (WGCNA) to uncover key regulatory modules, and gene regulatory network inference using SCENIC (single-cell regulatory network inference and clustering) to identify transcriptional regulators among candidate genes. Finally, we plan to compare our transcriptome results with available passerine data on gene enrichment for vocal and spatial learning from other vocal-learning and food-caching species.

O11.07

11:10 Coordinated Evolution of Neural, Somatic, and Genetic Traits Driving High-Speed, Acrobatic Manakin Courtship Displays

Swagatalaxmi Kar, Lainy Day

University of Mississippi, University, MS

Sexual and natural selection interact to shape phenotypes, how morphological, neural, sensory, endocrine, and genetic systems are integrated to evolve elaborate behaviors remains poorly understood. Manakins, a diverse family of neotropical birds known for acrobatic courtship displays, provides a powerful model for dissecting the evolution of integrated traits. Their displays require steroid-driven coordination among skeletal, muscular, visual, and neural systems, and underlying gene networks. Leveraging a comprehensive dataset—including high-speed display recordings, museum-based morphological measurements, neuroanatomical analyses, and transcriptomic profiles from twelve manakin species and a closely related flycatcher —this project will examine how correlated traits evolve and how gene regulatory networks orchestrate the systems underlying extreme behavioral performances. We have demonstrated mosaic evolution of manakin brain, with motor regions supporting complex postural displays, the cerebellum and arcopallium, scaling positively with display complexity, while control regions do not. Unexpectedly, body-mass and tarsus length are also positively associated with display elaboration—challenging long-standing assumptions that "correcting" brain-size for body-size isolates cognitive components and suggesting neural and somatic traits evolve together in response to biomechanical demanding displays, and that traditional allometric approaches may obscure biologically meaningful patterns. Furthermore, analysis of sexual dimorphism demonstrates evolutionary forces shaping male traits (overall complexity and increased body mass) do not necessarily mirror those shaping male-female differences (aerial display elements and low male body-mass Vs. rainfall and large wing size in females). Ecological pressures, female preferences, and specific behavioral elements comprising each species' display interact to determining evolutionary trajectories. To resolve these relationships, we will analyze display behavior using high-speed videography, decomposing each display into discrete kinematic elements and measuring velocities across species. In at least one species, females choose mates based on ~10s of a millisecond difference in male display-speed. We will investigate whether female temporal visual resolution positively correlates with male display speed using

electroretinography and retinal whole-mounts to quantify visual processing capacity in males and females to clarify whether variation in perception selects for display speed. To examine sexual dimorphism of brain and behavior we will use museum specimen to obtain body mass and measure cranial volume, and tarsus length for all species of manakin to determine if differences in overall display complexity and aerial display correlates in males were due to the species examined. To integrate behavior, morphology, and sensory processing with molecular mechanisms, we will extend our neuroanatomical analyses to examine cell size and density in cerebellar layers and compare periaqueductal gray (PAG) volume across species as it has recently been proposed that tweaks to PAG spinal-pattern-generators might underly postural display evolution. We will use quantitative-PCR to assess expression of steroid receptors and candidate gait and coordination-related genes (EphA4, DMRT3B) implicated in motor patterning. Whole-transcriptome analyses of cerebellum, arcopallium, and visual regions will enable reconstruction of gene regulatory networks associated with species-specific display elements. This work will reveal how selection shapes integrated phenotypes and provide a framework for understanding how acrobatic courtship displays evolve through coordinated changes in sensory, motor, and genetic systems.

O11.08

11:30 Extended Amygdala Circuits Mediate Adolescent Alcohol Exposure's Long-Term Effects on Pain

Thomas Kyllo, Nicholas Gilpin, Tiffany Wills

Louisiana State University Health - New Orleans, New Orleans, LA

Adolescence is a critical period of brain development characterized by significant hormonal, physiological and behavioral changes, as well as impaired decision making, which includes experimentation with drugs and alcohol. Adolescent alcohol use is a strong predictor for the development of alcohol use disorder (AUD) later in life and neuroadaptations produced by early alcohol use drive the onset and progression of AUD. Chronic alcohol use causes people to develop tolerance to the acute analgesic effects leading to hyperalgesia, thus further promoting alcohol use. Recently published work from our lab shows that a history of chronic intermittent alcohol exposure during adolescence (AIE) leads to lasting hyperalgesia in adult male rats, and a reduction in glutamatergic transmission onto midbrain-projecting central amygdala (CeM) cells, and that lower activity of this circuit is linked to higher pain sensitivity in adulthood. Here, we sought to further understand the long-term impacts of AIE on pain in adult male and female rats. Our overall hypothesis is that AIE produces lasting hyperalgesia and allodynia in male and female rats that persists into adulthood, and this effect is mediated by reductions in glutamatergic synaptic transmission onto midbrain-projecting neurons in the medial aspect of the central amygdala (CeM). To test these predictions, we tested the acute and long-term effects of AIE exposure on thermal hyperalgesia (Hargreaves) and mechanical allodynia (von Frey) in male and female Wistar rats. We also tested the long-term effects of AIE on neuronal activity in midbrain regions involved in descending pain inhibition with dense glutamatergic projections onto the CeM including the basolateral amygdala (BLA). AIE produced long-lasting mechanical allodynia in male and female rats, along with long-lasting thermal hyperalgesia in male, but not female rats. Additionally, challenge with an acute painful stimulus (Formalin test) in adulthood produced increases in pain reactivity, and this effect was exaggerated in both male and female rats with a history of AIE. We have also found that AIE blunts cFOS expression in CeM projecting BLA cells in both sexes, which could be the result of the long-lasting pain sensitivity observed following AIE. While we have previously shown the long-term implications of AIE on pain in male rats, our findings here are the first, to our knowledge, to show long-lasting effects of AIE on pain-related behaviors in female rats. This work has implications for understanding the effects of adolescent alcohol use on long term pain-related behaviors in humans.

12:00 Lunch on your own

Thursday, March19, 20264
AFTERNOON
Hall D Room 8

O11.09

1:30 Neuroprotective Effects of Estradiol and a Phytoestrogen and Interactions with Aromatase Inhibition Post Cerebellar Lesion in Male Zebra Finches (*Taeniopygia castanotis*)

Grace Thompson, Anthony Irovic, Lainy Day

University of Mississippi, University, MS

When brain cells are injured, a wave of secondary apoptosis occurs. Glia cell aromatase (AROM) is upregulated post-injury increasing estradiol (E_2) synthesis from testosterone. E_2 limits this secondary wave of apoptosis, but reduces male fertility and increases stroke and breast cancer risk mainly via estrogen receptor alpha (ERα). Genistein (GEN), a phytoestrogen, may be neuroprotective without E_2's negative reproductive effects or cancer risk as GEN has stronger affinity for ER beta (ERβ) than ERα. To test the neuroprotective effects of systemic GEN and E_2, we used adult male zebra finch (ZF)

as a model due to robust neuroplasticity in other songbird brain regions. We chose the cerebellum due to its high ERβ with low constitutive AROM, allowing for the local inhibition of E_2 synthesis. We subdermally implanted silastic ropes containing either E_2 (500ug), GEN (1000ug), or silastic (CON) 12 days prior to stereotaxic guided needle (21g) puncture lesion accompanied by local injection of 50µg of 1% letrozole/saline (LET), an AROM inhibitor, or saline (SAL). This created 6 treatments (n=7/group), E_2+LET, E_2+SAL, GEN+LET, GEN+S, CON+LET, and CON+SAL. Birds were weighed and implant retention was checked on day 0, 5, 12, and 14. We administered a cerebellar lesion using a 26g needle on day 12 and birds were sacrificed on day 14. At sacrifice, testes were weighed, sliced, and stained with H&E. E_2 reduced testis mass and decreased spermatozoa number and laminarity compared to CON and GEN. E_2 and CONs displayed reduced body mass across days 0-14, but GEN birds did not, possibly due to the lipogenic effects of GEN. Brains were cut at 30um, slide-mounted, and apoptotic cells labeled with Terminal Deoxynucleotidyl Transferase dUTP Nick End Labeling (TUNEL) according to protocol (Merck KGaA, Darmstadt, Germany) and methylgreen counterstain. We hypothesized that GEN and E_2 are similarly neuroprotective with lesion sizes ranging from small to large: GEN+SAL and E_2+SAL < GEN+LET and E_2+LET < CON+SAL < CON+LET. Using Cavalieri point-counting in Stereologer (SRC, Tampa, FL) two individuals jointly identifiedregions of interests and independently estimated volumes. Point-counts between individuals varied by only a few points per slice. 3-4 subjects per group have been measured and results that show unexpectedly high lesion volumes for E_2. On average GEN birds show lower lesion volumes than CONs, but we found no significance. We have additional subjects to add to increase statistical power and possibly allow for the exclusion of outliers. Additionally, the use of HPLC could allow for the quantification of circulating treatment levels. Birds have a tendency to reject foreign objects like our our implants, and if subjects did not receive an adequate amount of treatment, it could explain why the lesion volumes observed are abnormally high. Our study suggests GEN protects body mass loss and testis morphology vs. E_2. If GEN provides similar or neuroprotection as E_2, this establishes the importance of our model for investigating phytoestrogens as safer alternatives to E_2 for local and dietary neuroprotection and study of underlying mechanism.

O11.10

1:50 A Hydrogel Composite with Autologous Bone Placement Increases the Neuronal Performance and Bone Healing Following Craniofacial Defects in Adolescent Rats

Almia Valentine[1], Jonathan W. Lee[2], Tyra Lockett[2], Chloe Batiste[1], Amol Janorkar[2], Chipo Chapusha[2], William Farmer[2], , Shuying Lin[2], Madison Klim[2], Rithika Arunachalam[2], Susana M. Salazar Marocho2[1], Alexandre A da Silva[2], David Gordy[1], Bernadette E Grayson[1], Michelle A Tucci[1], Lir-Wan Fan[1]

[1]Tougaloo College, Tougaloo, MS, [2]University of Mississippi Medical Center, Jackson, MS

Pediatric head trauma often results in serious outcomes, frequently requiring cranioplasty to reduce brain swelling, and is linked to long-term inflammation and memory deficits. The objective of the current study was to assess the healing and resorption rates of cranial defects with resorbable biopolymer composites, and evaluate the potential for

inflammation-mediated changes neurobehaviors and healing in adolescentrats. Five experimental groups using a 5-mm central critical-sized cranial defect model in Sprague-Dawley adolescent rats were included: (1) sham-operated, (2) empty defect, (3) placement of autologous bone, (4) composite with hydrogel, (5) placement of autologous bone and composite with hydrogel. Neurobehavioral assessment was performed biweekly, and characterization of bone remodeling performance was determined at the 8-week endpoint. Our results showed that the empty defect group decreased short-term memory in both male and female rats two, four, and six weeks after surgery, and had a higher effect on males. The autograft (bone placement) group exhibited decreased short-term memory for only two and four weeks, followed by recovery six weeks post-surgery, but not in the hydrogel composite group and the autograft plus hydrogel composite group. In addition, bone remodeling results, as determined by micro-CT scan, showed that the bone placement plus composite with hydrogel group achieved the most enhanced bone growth compared to composites lacking hydrogel eight weeks after surgery in both male and female rats. Our results suggest that the hydrogel composite, which enhanced bone repair and neurobehavioral performance, is superior to the autograft in our rat defect model.

(Supported by the UMMC Department of Pediatrics and the Intradepartmental Discovery Support Program (IDSP) Grant, Newborn Medicine Funds from the Department of Pediatrics, University of Mississippi Medical, Center McNair HBCU Research Scholars Program, Jackson State University, and NIH grant NIH/NIGMS P20GM103476-Institutional Development Award (IDeA))

2:10 Keynote

Syndey Vita, Ph.D.

The Neurodegenerative Consequences of Blood Brain Barrier Injury

Bio: Dr. Sydney Vita is an Assistant Professor in the Department of Physiology at LSU Health Sciences Center in New Orleans. She earned her BA in Psychology from the University of Colorado–Denver and completed her graduate training in the laboratories of Dr. Ray Grill and Dr. Pramod Dash, receiving her PhD in Neuroscience from the University of Mississippi Medical Center in 2020. Her doctoral work focused on the impact of mild traumatic brain injury (mTBI) on blood–brain barrier (BBB) dysfunction. Following her PhD, Dr. Vita joined LSUHSC as a T32-funded postdoctoral fellow under the mentorship of Dr. Patricia Molina and Dr. Nicholas Gilpin. Here she expanded her research to examine the effects of alcohol exposure on the brain, eventually being awarded with F32 funding through the NIAAA for this work. In 2024, Dr. Vita established her independent laboratory in the Department of Physiology at LSUHSC. Her research program investigates how repeated mild TBI and ethanol exposure during adolescence interact to disrupt BBB integrity and promote neurodegeneration across the lifespan, using molecular, behavioral, and systems-level approaches. She is currently funded by a K01 award from NIAAA titled "Adolescent alcohol exposure exacerbates rmTBI-associated BBB disruption and dementia risk."

Thursday, March19, 2026

EVENING

4:00 DODGEN LECTURE /AWARDS CEREMONY

Hall B

5:00-7:30 Reception and General Poster Session (Immediately following Dodgen Event)

Hall C

11.01

Adolescent Alcohol Exposure's Long-Term Impact on Central Modulation of Pain Circuitry

Vedika Mahadevan, Abigail Jahnke, Nicholas Gilpin, Tiffany Wills

Louisiana State University Health - New Orleans, New Orleans, LA

Adolescence is a vulnerable period of brain development. Alcohol use is typically initiated during adolescent with earlier alcohol use being a strong predictor for the development of alcohol use disorder (AUD) later in life. During this period, the developing brain is more vulnerable to alcohol-related changes, and neuroadaptations produced by early alcohol use drive the onset and progression of AUD and can hijack neurodevelopmental processing that occur during adolescence and produce long-term changes in neural circuits that change how we process different types of stimuli like pain. While acute alcohol use can be pain relieving, chronic alcohol use causes people to develop tolerance to the acute analgesic effects leading to hyperalgesia, thus further promoting alcohol use. Our lab has shown that a history of chronic intermittent alcohol exposure during adolescence (AIE) leads to lasting hyperalgesia in adult rats. Additionally, we have previously found a reduction in glutamatergic transmission onto vlPAG-projecting central amygdala (CeM) cells, and that lower activity of this circuit is potentially linked to the higher pain sensitivity in adulthood. Here, we sought to further understand the long-term impacts of AIE on pain in adult male and female Wistar rats. Specifically, we wanted to understand how AIE impacts additional circuits and regions involved in descending pain inhibition. To test these predictions, we tested the acute and long-term effects of AIE exposure on thermal hyperalgesia (Hargreaves) and mechanical allodynia (von Frey) in male and female Wistar rats both during alcohol vapor administration and in during alcohol withdrawal. We also tested the long-term consequences of AIE on neuronal activity in regions involved in descending pain inhibition (PFC, vlPAG). We found that AIE significantly alters neuronal activity (cFOS expression) in regions involved in descending pain

inhibition well into adulthood compared to air, which could be the result of the long-lasting pain sensitivity observed following AIE. While we have previously shown the long-term implications of AIE on neural activity in the CeA, our findings here are the first, to our knowledge, to show long-lasting effects of AIE on pain-related behaviors in additional regions. This work has implications for understanding the effects of adolescent alcohol use on long-term pain-related behaviors in humans.

P11.02

Exploring the Psychoactive Effects of Individual Impurities Found in Δ8 -THC Products

Eliana Carter[1], Maggie Burnett[1], Shelbie Mclaughlin[1], Waseem Gul[2], Mahmoud ElSohly[2], Nicole Ashpole[1]

[1]Mississippi State University, Mississippi State, MS, [2]ElSohly Laboratories, Inc., Oxford, MS

The rapid surge in commercially available delta-8-tetrahydrocannabinol (Δ 8 -THC) products has raised concerns regarding safety and regulations. Manufacturers typically synthesize Δ8-THC to meet product demand, as only trace amounts are found in cannabis plant material. During synthesis, numerous impurities form that may impact the safety of consumption. Our collaborative team synthesized Δ8-THC and identified 15 cannabinoid impurities, including 9α-hydroxy-HHC, Δ4(8)-iso-THC, 9β-hydroxy-HHC, Δ4(5)-iso-THC, and iso-THCBF. We hypothesize that these impurities will activate CB1 signaling cascades and lead to psychoactive responses, thereby contributing to the responses consumers report with Δ8-THC consumption.

To assess potential biological impacts of these impurities, 6-8-week-old male C57BL/6 mice received intraperitoneal injections of 1-30 mg/kg of each cannabinoid, since biphasic dose-response curves are well-documented in cannabinoids. Classic psychoactive effects present in the tetrad assay, which is comprised of evaluations of core body temperature, locomotion, catalepsy (rigidity), and thermal nociception. Our preliminary results indicate Δ8-THC, 9β-hydroxy-HHC, and Δ4(5)-iso-THC had no statistical effect at 10mg/kg. At 30mg/kg, Δ8-THC had a reduction in locomotion, an average -2°C drop in temperature, and an increase in % maximal possible effect for tail flick as expected. Interestingly, 10mg/kg doses of 9α-hydroxy-HHC and Δ4(8)-iso-THC increased locomotion, suggesting stimulant-like effects, whereas iso-THCBF decreased locomotion, indicating intoxicating properties.

Future work will examine the remaining cannabinoid contaminants and assess the effects of each when co-administered with Δ8-THC, mimicking products on the market. Individual cannabinoids displaying psychoactive effects will also need to analyze abuse liability and the potential development of tolerance to better understand their safety profile.

P11.03

Effects of Methamphetamine-Induced Sleep Disruption on Intra-Dimensional/Extra-Dimensional Set-Shifting in Adult Rhesus Monkeys

Ashley Smith[1], Daniel Borgatti[2], Ashlee Leach[1], James Rowlett[1], Lais Berro[1]

[1]Department of Psychiatry and Human Behavior, University of Mississippi Medical Center, Jackson, MS, [2]Graduate Program in Neuroscience, University of Mississippi Medical Center, Jackson, MS

Background: Cognitive performance has been shown to be negatively affected by both methamphetamine use and sleep disruption, independently. However, few studies have investigated the effects of methamphetamine-induced sleep disruptions on next-day executive functioning. The aim of the present study was to investigate the next-day cognitive effects of methamphetamine-induced sleep disruption on a task that measures executive functioning in adult rhesus monkeys.

Methods: Monkeys (n=5) were fitted with primate collars to which actigraphy monitors were attached. Actigraphy-based sleep measures were assessed at night during baseline conditions and after methamphetamine administration (0.3 and 0.56 mg/kg, i.m.) 3h before "lights off". The monkeys then completed an intra-dimensional/extra dimensional (ID/ED) attentional set-shifting task (CANTAB touchscreen system) the following day.

Results: Methamphetamine administration dose-dependently disrupted actigraphy-based sleep parameters, with 0.56 mg/kg significantly disrupting all sleep parameters compared to baseline. Sleep impairment was associated with next-day cognitive deficits after treatment with methamphetamine at the dose of 0.56 mg/kg, with significantly increased total trials to completion, total errors, and total perseverative errors and decreased mean task accuracy compared to cognitive performance during baseline. Significant correlations were observed between actigraphy-based sleep measures and cognitive performance across all experimental conditions, with greater wake time and lower sleep efficiency being associated with worse cognitive performance. In addition, particular ID/ED task stages were associated with significant task performance impairment.

Conclusions: Our findings showed next-day executive functioning deficits in associative processing and inhibitory control, indicating that the sleep-disrupting effects of methamphetamine may play a role in this drug's cognitive-disrupting effects.

P11.04

Exploring Effects of Minor Cannabinoids in Zebrafish Development

Taylor Shamblin[1], Cammi Thornton[2], Eliana Carter[1], Lisa Seid[2], Blaine Dunaway[2], Maggie Burnett[1], Sadie McCoy[1], Kristine Willett[2], Nicole Ashpole[1]

[1]Mississippi State University, Mississippi State, MS, [2]University of Mississippi, University, MS

Cannabis and cannabinoid accessibility has greatly risen over the past decade due to the relaxation of laws that had previously restricted their possession and use. Given this increase in access, education on safe use practices becomes vital. Unfortunately, advice from medical professionals or those within the cannabis industry are equivocal - leading to consumer misconceptions of its safety. This inability to provide comprehensive medical advice for consumers is compounded by gaps in literature concerning safety profiles of both major and minor cannabinoids. Thus, there is a critical need for research on the safety of individual cannabinoids.

Studies have shown that human exposure to Δ^9-tetrahydrocannabidiol (THC), causes sex-dependent brain development deficits and persistent behavioral disorders, however, little is known on the developmental effects of cannabidiol (CBD) and other cannabis constituents - such as Δ^8-THC and cannabigerol (CBG). Our lab has found similar developmental-behavioral endpoints in zebrafish exposed to THC. Specifically, THC exposure resulted in dose-dependent hyperactivity and anxiety-like behavior (i.e., thigmotaxis) that persist well into adulthood. Therefore, we hypothesize that other minor cannabinoids will also impact behavioral and morphological development.

Given their endocannabinomic genetic similarities, we utilize a zebrafish model for early development (6-96 hpf), locomotor and morphological responses were assessed in Cnr1 and Cnr2 knockout genotypes following exposure to varying concentrations of minor cannabinoids - replicating what's been done in wildtype.

We hypothesize that minor cannabinoids influence behavior primarily via activation of the canonical cannabinoid receptors. To test this, we utilized a previously established transgenic Cnr2 knockout ($Cnr2^{-/-}$) line of zebrafish and exposed them to varying concentrations of our cannabinoids of interest (Δ8-THC, THCV, CBD, CBG, CBN, HHC). Morphological defects and locomotor responses will be compared in larvae (120 hpf) that have been exposed during key stages of early development (6-96 hpf) - this analysis is, currently, ongoing.

Our Cnr1 knockout results indicate Δ^8-THC to be the only cannabinoid to significantly reduce locomotor response in a dose-dependent fashion. By comparison, in the Cnr2 knockout fish, Δ^9-THC, Δ^8-THC, and CBD were the only cannabinoids to show a significant reduction in locomotor response in a dose-dependent fashion. Cannabinol (CBN), a theorized partial agonist of CB1 and CB2, elicited no behavioral modifications across all genotypes, even at the highest dose. CBG had a dose-dependent effect in wildtype, but this was lost in either knockout. Given the lack of modulation by CBG, HHC, and THCV in either genotype, it is theorized that these cannabinoids may require both receptors in order to alter behavior. Δ^8-THC was the only cannabinoid, so far, to modulate behavioral responses across both genotypes, leading the team to hypothesize that maybe some other receptor is responsible for its action. Considering these results, our lab is now trying to discern the mechanisms of action by which these cannabinoids modulate behavior.

Analysis of morphology for either genotype is ongoing.

P11.05

Development of a Rodent Preclinical Model to Evaluate Novel Therapeutics for Mild Traumatic Brain Injury

Lexi Holdiness, Kendall McKinnon, Hayden Anderson, Hannah Mask, Shirley Guo-Ross, Russell Carr, Anna Marie Clay

Mississippi State University, Mississippi State, MS

Traumatic Brain Injury (TBI) occurs when a foreign object induces damage to the skull and brain through a forceful blow or whiplash. It is one of the most frequent injuries in the United States, with approximately 250,000 cases of different levels occurring annually. It is well known that severe TBIs can result in persistent physical, cognitive, and socioeconomic consequences and the timing of treatment following this injury can play a critical role in the ultimate outcome. It would be beneficial to develop a safe therapeutic that could be administered rapidly after impact could greatly improve the recovery of the patient. However, the vast majority of TBI cases are mild and, currently, the most common treatment for these cases is rest. While the consequences of mild TBI are less distinct, persistent effects are still commonly reported. Therefore, it would be beneficial to have a safe therapeutic that could be used to improve the long-term outcome of mild TBI. Unfortunately, negative biochemical and morphological changes following mild TBI in preclinical models are not present, greatly reducing their use as indicators of improvement. However, subtle behavioral changes induced by mild TBI may be more useful as an indicator.

The goal of this project is to establish a mild to moderate TBI model that could be used to test therapeutics using subtle behavioral changes. To model mild TBI, a weight drop device was used to deliver a 2.25J impact in adult male rats. Behavioral performance on a ledged balance beam and in an open field was determined. On the beam, the TBI Rats had a slightly higher number of foot slips than

the control rats, but the controls traveled a greater distance before they had to use the ledge for support than the TBI rats. In the open field, there were no differences in the locomotor activity between the groups, but the TBI rats exhibited a different habituation pattern compared to controls. Thus, these subtle behavioral changes may be useful endpoints that can be used to determine if a therapeutic intervention exerts a positive effect following mild TBI.

P11.06

Loss of Orexin 2 Receptor Signaling Alters Cochlear Function

John Roberson[1], Douglas Vetter[1, 2], Kathleen Yee[1, 2]

[1]School of Medicine, University of Mississippi Medical Center, Jackson, MS, [2]Department of Otolaryngology - Head and Neck Surgery, Jackson, MS

Background: Orexins, also known as hypocretins, are neuropeptides produced by hypothalamic neurons involved in the sleep-wake cycle, food intake, and autonomic output. Intriguingly, orexin ligands and receptors are also expressed in the cochlea. Mutation of orexin 2 receptor (Ox2R) leads to early onset narcolepsy. Dual orexin receptor antagonist (DORA) medications are used to treat insomnia with new drugs targeting orexin signaling being tested. Given the previously unrecognized expression of orexin signaling molecules within the cochlea, constitutive loss or knock down of orexin through prolonged DORA medications could alter mechanisms underlying normal hearing sensitivity and/or resilience against damage. We begin to address this by examining hearing in constitutive Ox2R mouse mutants subjected to noise.

Methods: Ox2R wild-type (WT) and knockout (KO) mice were used to investigate the role of Ox2R in moderate noise-induced hearing loss. We used Auditory Brainstem Response (ABR) testing and anatomical assessments to analyze effects of noise on physiological and morphological integrity of the cochleae of Ox2R WT and KO mice. ABRs were performed before noise exposure to measure baseline hearing thresholds. Half of the mice (WT and KO groups) were then noise exposed (97dB SPL, 8-16kHz, 2h). ABRs were re-assessed post-noise through 21 days to track hearing threshold recovery. A second cohort of WT and KO mice, under identical conditions, were perfused (4% paraformaldehyde) 5 -31days post-noise exposure. Temporal bones were processed for hematoxylin and eosin (H&E) staining or immunohistochemistry (primary antibodies Ox1R, Aqp1, F4/80, urocortin). Photomicroscopy was performed (Leitz DSM and Zeiss LSM880 Confocal).

Results: Hearing thresholds of Ox2R WT noise-exposed mice recovered after 5 days post-noise while threshold shifts in Ox2R KO noise-exposed mice remained elevated and began to decline at 7 days post-noise. Ox2R WT thresholds returned close to baseline while Ox2R KO thresholds remained significantly elevated by day 21 post noise, indicating that a noise-induced temporary threshold shift in WTs became a permanent shift in KOs. Morphological changes in the stria vascularis were detected by H&E staining in noise-exposed KO mice. Further, there was decreased Ox1R expression in supporting cells and aquaporin 1 in the spiral ligament, while F4/80 localization spread in the spiral ligament. Protein localization expanded in efferent fiber terminal fields (urocortin) in Ox2R KO without noise exposure and expanded further in Ox2R KO with noise exposure.

Conclusions: Changes in Aqp1 protein expression likely alter fluid and ion flux thereby contributing to altered physiology. Cross-talk between orexin and CRF signaling has been observed and altered urocortin terminal innervation may be compensating for Ox2R loss through efferent input from the brain. The functional and anatomical hearing-related changes observed in our mouse model of constitutive Ox2R loss-of-function may reflect constitutive gene loss in human narcolepsy and could mirror effects following potential long-term use of DORA medications. The effects on hearing may be predictive of patients who are using drugs long-term which alter the orexin signaling system, potentially putting them at risk for augmented hearing loss.

P11.07

Dose-Dependent Effects of Organophosphorus Insecticide Metabolite Chlorpyrifos-Oxon Following Acute Exposure in Juvenile Rats

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Chlorpyrifos (CPF) is an organophosphorus insecticide that targets the nervous system of insects and humans. At high exposure levels, CPF is converted to chlorpyrifos-oxon (CPO) and targets the cholinergic nervous system, binding to the enzyme acetylcholinesterase (AChE). The inhibition of this enzyme causes the accumulation of acetylcholine which induces hyperactivity that may lead to death via respiratory failure if left untreated. Typically, environmental exposures to CPF occur at lower levels with one of the primary targets being the endocannabinoid-metabolizing enzyme fatty acid amide hydrolase (FAAH). Inhibition of FAAH prevents the degradation of the endocannabinoid anandamide (AEA), leading to its accumulation as well as other endocannabinoid-like compounds. These changes to the endocannabinoid system may cause disruptions to normal development and function. Children exposed to low CPF exposure levels have been associated with persistent behavioral problems, such as ADHD, and decreased cognitive abilities. In this

study, the objective was to investigate the dose-response effects of CPO at varying exposure levels on ChE activity. At either 21 or 22 days old, juvenile rat pups were subcutaneously administered the vehicle or CPO (0.5, 0.75, 1.0, 1.25, 1.5, 1.75, 2.0, 2.5, 3.0 mg/kg). Pups were then sacrificed 3 hours post-exposure to collect brainstem and serum samples to determine ChE activity levels. In the brainstem, no inhibition of AChE activity levels was observed at 0.5 mg/kg. Activity was inhibited at 0.75, 1.0, and 1.25 mg/kg by approximately 17%, 27%, and 34%, respectively. Moderate inhibition of brainstem AChE activity was shown at CPO dosages of 1.5 (40%), 1.75 (43%), and 2.5mg/kg (59%). At the highest dosage of 3.0 mg/kg CPO, brainstem AChE activity was reduced by 75%. In the serum, ChE activity levels were suppressed at 0.5 mg/kg by 25%. A slight plateau in serum ChE activity was demonstrated with increasing CPO levels: 0.75 (33%), 1.0 (35%), 1.25 (38%), 1.5 (49%), 1.75 (43%), and 2.0 (48%). At 2.5 and 3.0mg/kg, serum ChE activity was inhibited by 54% and 63%. These findings provide preliminary data for future studies of mechanisms of CPF-induced neurotoxicity, such as finding appropriate CPO dosages to study the interplay between cholinergic and non-cholinergic targets, such as the endocannabinoid system.

P11.08

Immune Marker Localization in the Contralateral Cochlea Following Monaural Cochlear Ablation

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Background: Hearing loss occurs following genetic mutations, infection, tumor growth and trauma. Incidence rates of sudden sensorineural hearing loss range from 5 to 20 (Stachler et al., 2012) to 160 persons (Klemm et al., 2009) per 100,000 with most cases manifesting unilaterally (Stachler et al., 2012). In the United States, the prevalence of adult unilateral hearing loss is 7.2% (Golub et al., 2018) and 1 child in 1,000 are afflicted with unilateral hearing loss (CDC, 2020). In cases of single-sided deafness, conflicting evidence exists concerning whether the opposite ear is functionally normal or not.

Corticotropin releasing factor (CRF) and its receptors, well known for hypothalamic-pituitary-adrenal (HPA) axis signaling, are expressed in cochlea. This cochlear HPA-equivalent signaling ensemble is involved in cellular stress responses (Graham et al, 2010) of the inner ear. Our lab has reported that surgical induction of unilateral deafness upregulates CRF in the remaining cochlea (Moore et al, 2024) and alters the sensitivity to sound of the remaining ear. Given the abnormal functional state of the remaining cochlea following unilateral cochlear ablation, we asked whether unilateral cochlear ablation induces cellular stress in the form of inflammation in the surviving cochlea. We assessed protein expression levels of immune system cells involved in inflammation in the intact cochlea following monaural cochlear ablation with baseline levels in control mice.

Methods: Unilateral cochlear ablation was performed on 8 to13-week-old CD68-GFP reporter mice. Following anesthesia with ketamine (70-100mg/kg) and xylazine (10-20 mg/kg), we used a trans-tympanic approach to access the cochlea which was pierced with a Beaverblade ophthalmic knife. The bony capsule inferior to the stapedial artery was then broken and removed. The middle ear was packed and the ear canal sealed using VetBond cyanoacrylic glue. Age-matched CD68-GFP reporter mice without cochlear ablation served as controls. Mice were perfused with buffered 4% paraformaldehyde following survival periods up to 10 days. Temporal bones were processed for cryostat sectioning and immune-histochemically stained with green fluorescent protein and immune markers including F4/80 and Iba1 primary antibodies. Sections were counterstained with DAPI and imaged (Zeiss LSM880 Confocal Microscope).

Results: Iba1, F4/80 and CD68 are broadly localized within the cochlea. Following unilateral cochlear ablation, all of these proteins show overall decline in protein expression within the remaining, intact cochlea. Most cochlear cells are double labeled with CD68 and Iba1 with occasional single labeled cells. By 10 days following cochlear ablation, Iba1 and CD68 are associated with blood vessels within the stria vascularis accompanied with enlarged vessel profiles.

Conclusions: Immune markers Iba1, F4/80 and CD68 are expressed at basal levels within the cochlea and their expression is modulated in the surviving cochlea following unilateral cochlear ablation. Surprisingly, there is an overall decline of expression levels of these immune markers within the cochlea. However, Iba1 and CD68 protein expression detected around enlarged vessels in the stria vascularis suggests that there is altered blood flow possibly associated with greater fluid and ion flux in the cochlea. Further studies will investigate whether other immune signaling molecules are also modulated.

P11.09

Analyzing the Neuroprotective Effects of Phytoestrogens vs Estradiol and Aromatase Upregulation in Male Zebra Finch (*Taeniopygia castanotis)* Cerebellum Post-Lesion

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Estradiol (E2) promotes neuroplasticity and can be enzymatically derived from testosterone via aromatase (AROM) at neural injury sites, where AROM is seen to be locally upregulated. However, E2 disrupts testicular function and elevates stroke and cancer risk in women. Phytoestrogens like Genistein (GEN), a soy-derived compound with E2-like effects and higher affinity for estrogen-receptor beta (ERβ) than estrogen-receptor alpha (ERα), may offer neuroprotection without adverse effects. Using male zebra finches as a model, we compared E2 and GEN's neuroprotective effects after cerebellar injury while assessing testicular impact. The zebra finch cerebellum, a highly plastic brain region with low baseline AROM that increases post-lesion, expresses ERβ abundantly, making it ideal to isolate injury-induced and experimental AROM activity. Adult males received silastic rope implants with GEN, E2, or vehicle (CON). Twelve days later, we performed stereotaxic puncture lesions to the cerebellum and locally injected either saline (SAL) or letrozole (LET), an AROM inhibitor. This created six treatment groups: GEN+SAL, E2+SAL, GEN+LET, E2+LET, CON+SAL, and CON+LET. Birds were weighed on implant days 0, 5, 12, and 14; testes were extracted and processed for hematoxylin/eosin. Although testes express ERα and ERβ, only E2 reduced testis mass and disrupted spermatogenesis. GEN birds did not show this effect, nor did they experience the stress-related weight loss seen in CON and E2 groups. Seventy-two hours post-lesion, birds were sacrificed; brains were cut at 30 μm on a cryostat and stained with Fluoro-Jade B (FJ) to visualize degeneration. Lesions were identified by disrupted morphology and FJ-positive cell zones. Lesion+FJ volume is being quantified using the Cavalier point-counting method with Stereologer (SRC, Tampa, FL). We currently have 10 subjects measured across the three treatment groups that were given SAL. We saw slightly lower lesion volumes for birds given GEN, and will continue to collect more data across groups. We will have 6-7 subjects across all six groups at the end of our data collection. We expect the smallest lesions in GEN+SAL and E2+SAL, moderate in GEN+LET, E2+LET, and CON+SAL, and largest in CON+LET, where AROM upregulation is blocked. If AROM's role extends beyond E2 synthesis, CON+SAL may show lesion reduction. If GEN matches E2's neuroprotection without reproductive side effects, this will support phytoestrogens as promising therapeutic alternatives for brain injury and neurodegeneration, while also showing potential for the zebra finch as a model for neuroscience research.

P11.10

Effects of Acute Exposure to the Organophosphorus Insecticide Metabolite Chlorpyrifos-Oxon on Carboxylesterase Activity in Juvenile Rats

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Chlorpyrifos (CPF) is one of the most commonly used organophosphorus insecticides. CPF exerts its toxicity through the inhibition of acetylcholinesterase (AChE) in the brain. However, CPF in its parent form cannot inhibit AChE and must be metabolized by cytochrome P450 to its active metabolite, chlorpyrifos-oxon (CPO), which is a potent inhibitor of AChE. This inhibition leads to the accumulation of the neurotransmitter acetylcholine, overstimulation of the cholinergic system, and shutdown of the respiratory system. In addition to AChE, CPO also inhibits other serine hydrolase enzymes, including carboxylesterase (CES) in the blood. This inhibition of CES does not induce any type of toxicity; rather, it provides a mechanism of protection by providing an alternative non-target binding site. The binding of CPO to CES in the blood effectively reduces the number of molecules of CPO in the blood. This means fewer molecules of CPO are available to reach the brain and exert toxicity. In adults, the activity of CES is reduced as the level of CPO exposure increases. At very high-level exposure, the binding of CPO to CES is totally saturated. Developing animals are more sensitive to the toxicological effects of CPO. This is due, in part, to the interaction of CPO with CES. However, the dynamics of CES inhibition as it relates to CPO exposure levels are not clear. The purpose of this project was to determine the dose-response relationship between CPO and the inhibition of blood CES activity. To investigate this, 21-day-old rat pups were subcutaneously administered either vehicle or different increasing levels of CPO (0.5, 0.75, 1.0, 1.25, 1.5, 1.75, 2.0, 2.5, 3.0, 3.5, or 4.0 mg/kg). After 3 hours, blood was collected and centrifuged to obtain serum. The activity of serum CES was determined. As the CPO exposure level increased, the level of CES inhibition increased. However, at the high exposure levels, the activity of CES did not reach a point where it was totally saturated. Maximum inhibition of CES was ~70% in the juvenile rats as opposed to greater than 97% observed in adults in previous studies. The reason for this discrepancy is unclear.

P11.11

Sex Differences in Perineuronal Net and Fos Activity During Non-Operant Pavlovian Conditioning of Male and Female Rats

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There are sex differences in cocaine use disorder (CUD), that indicates women have a greater susceptibility for relapse than do men, an effect recapitulated in rodent models. Therefore, understanding the mechanisms behind what is driving this difference is essential for developing CUD treatments. Recent research from our lab shows that there is increased contextual cocaine seeking behavior in females that is driven by the dorsal hippocampus, however the role of downstream cortical signaling remains unknown. Our overarching hypothesis is that there is sex specific recruitment of different regions of the medial prefrontal cortex (mPFC), as it stores contextual memories and regulates memory strength long term. Prelimbic cortex (PL) neurons in the mPFC are necessary for reconsolidation, or strengthening, of retrieved contextual memories, and conversely, infralimbic cortex (IL) neurons drive memory extinction (weakening) of retrieved contextual memories. Herein, we investigated perineuronal networks (PNNs) and Fos+ neuron expression in the PL and IL following training and expression of pavlovian contextual drug memories (e.g. conditioned place preference (CPP)). Using saline conditioned rats as controls, we analyzed both expression data (test day 1) and retrieval data (test day 2, 2-week delay). We found that saline-conditioned females have higher numbers of PNNs that are Fos+ on ED1 and ED2 in both the PL and IL than do saline-conditioned males. Oppositely, the cocaine-conditioned males showed greater numbers of PNNs that are Fos+ on ED1 and ED2 in both PL and IL than did cocaine-conditioned females. Our findings indicate that there are sex differences in PNN formation and activity of PNN+ neurons, and the direction of these effects are dependent on the reinforcing properties of the unconditioned stimulus. Notably, we did not observe a relationship between Fos+ neurons and PNNs in the IL or PL following pavlovian conditioning. This data indicates a sex-specific role of PNNs in contextual cocaine memories.

P11.12

Agomelatine Reduces Neonatal Lipopolysaccharide-Induced Brain Injury, Sensorimotor Disturbances, and Attention-Deficit/Hyperactivity Disorder (ADHD)-Like Behavior in Juvenile Rats

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Neonatal lipopolysaccharide (LPS) exposure-induced brain inflammation plays an important role in brain injury as well as increases the risks of attention-deficit/hyperactivity disorder (ADHD)-like behavior in juvenile and adolescent human and animal models. Recent studies suggest that agomelatine treatment could be a neuroprotective agent in adult animals by reducing inflammation and microglia polarization. The objective of the current study was to determine whether agomelatine, a melatonergic agonist with anti-inflammatory and antioxidative effects, ameliorates LPS-induced brain inflammation and ADHD-like behavior in neonatal and juvenile rats. Intraperitoneal (i.p.) injections of LPS (2 mg/kg) were administered in postnatal day 5 (P5) Sprague-Dawley rat pups, and agomelatine (20 mg/kg) or vehicle was administered (i.p.) 5 min after LPS injection and/or then every 24 hr for 3 days. Control rats were injected (i.p.) with sterile saline. Neurobehavioral tests were performed, and brain inflammation and injury were examined in P6 and P25 rats. Our results showed that agomelatine reduced LPS-induced reduction in pre-social interaction (ultrasonic vocalization) ($p<0.05$) (n = 12/sex/group) and LPS-induced brain injury, including a decrease in white matter oligodendrocyte numbers. Agomelatine mitigated the LPS-induced increases in microglia numbers, and an increase in IL-1β and TBARS contents at P6 ($p<0.05$) (n = 6/sex/group), suggesting anti-inflammatory and antioxidative effects. At P25, agomelatine was found to have also reduced neonatal LPS-induced brain injury and inflammation and ADHD-like behaviors, including hyperlocomotion activity, social interaction disturbances,

and learning and memory deficits (P21-P25) ($p<0.05$) (n = 12/sex/group). These results indicate that agomelatine may protect against LPS exposure-induced brain injury, inflammation, lipid peroxidation, and ADHD-like behaviors and that the protective effects are associated with its ability to attenuate LPS-induced inflammation and oxidative stress.

P11.13

KCNT1 Influences Cocaine-Seeking Behavior in Female Rats on Day 1 of Extinction

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The inability to maintain abstinence is a hallmark of cocaine use disorder (CUD), with cravings during initial abstinence predicting long-term relapse outcomes in both humans and rodents. Promoting successful abstinence may be particularly complex in women, as their psychological and biological responses to drugs of abuse differ from those in men. Several measures of CUDs are greater in women, a pattern reflected in female rodents, yet the biological mechanisms underlying these sex differences remain unclear. Extinction day 1 (ED1) marks the onset of abstinence when the expected drug is unavailable, representing a stressful time point associated with increased drug cravings. We have previously demonstrated that the dorsal hippocampus plays a significant role in driving sex-specific engagement in cocaine-seeking behavior on ED1. Using whole-transcriptome sequencing (RNA-Seq) analysis, we identified sex-specific gene expression patterns in the dorsal hippocampus elicited by exposure to the cocaine self-administration context on ED1, which correlate with cocaine-seeking behavior. In females, we identified 101 transcripts with fold-change differences on withdrawal day 1 (WD1) compared to naïve rats, and 22 transcripts with fold-change differences on ED1 compared to WD1 controls. Notably, only three targets overlapped between the sexes. Furthermore, five genes identified in females significantly correlated with cocaine-seeking behavior on ED1, showing R^2 values greater than 0.70. One of these targets, KCNT1, a potassium channel, negatively predicted cocaine-seeking behavior on ED1 in females. By targeting the hippocampus regions CA1 and CA3 inhibition of KCNT1 by PRX2904 and an antisense oligonucleotide compound targeting KCNT1 (KCNT1-ASODN) decreased cocaine-seeking behavior on ED1, specifically in female rats. This behavior persisted through ED2 and further extinction testing. These findings suggest that sex-specific transcriptomic signatures in the dorsal hippocampus, particularly KCNT1, may play a crucial role in driving cocaine-seeking persistence during early abstinence. Targeting these molecular pathways could enhance the maintenance of abstinence, with implications for sex-specific addiction treatment strategies. This work was supported by R00-045758 and P20GM144041 to ASK.

P11.14

Dorsal Hippocampus to the Medial Prefrontal Cortex Projections Drive Cocaine-Seeking Persistence in Male and Female Rats.

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Maintaining abstinence remains one of the most difficult aspects of recovery from cocaine use disorder. Cravings during the initial abstinence period (e.g. extinction day 1, ED1 in rats), can predict long-term abstinence success. In rats, we find that females show greater cocaine-seeking on ED1 and greater cocaine seeking persistence. Our prior work indicates disrupting dorsal hippocampus (dHPC) memory formation can attenuate cocaine-seeking persistence in both sexes, however where these memories are stored downstream remain unknown. Herein we investigated the role of dHPC projections to the prelimbic (PL) and (IL) regions of the medial prefrontal cortex (mPFC) in cocaine-seeking persistence. Using immunohistochemistry, we found that females have more Fos+ PL cortex neurons during ED1, while males have more Fos+ IL cortex neurons during ED1, that correlate to dHPC Fos. These results reflect the hypothesis that PL cortex projections are necessary for reconsolidation, or strengthening, of retrieved contextual memories, whereas IL cortex projections are necessary for extinction, or weakening, of retrieved contextual memories. Using designer receptors exclusively activated by designer drugs (DREADDs), we next investigated if projections from the dHPC to PL drive cocaine-seeking behavior on ED1 and following a 2-week period of forced abstinence, (ED2) and conversely if projections from the dHPC to IL promote extinction. Activating dHPC to PL using hM3Dq excitatory DREADDs increased cocaine seeking behavior in females during ED2, while inhibiting dHPC to PL using hM4Di inhibitory DREADDs decreased cocaine seeking behavior across both ED1 and ED2. Activating dHPC to IL using hM3Dq DREADDs decreased cocaine seeking behavior while inhibiting dHPC to IL using hM4Di DREADDs increased cocaine seeking behavior. These findings support our hypotheses that dHPC signaling to different regions of the mPFC has specific effects to promote or attenuate contextual cocaine seeking. Future directions will repeat these experiments in male rats. Understanding the involvement of sex specific

corticolimbic signaling is crucial to finding sex-specific therapies that promote abstinence success.

P11.15

Oxycodone Dose-Dependently Alters Sleep Parameters In Male Rats

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Sleep disorders (SD) are a significant public health concern, imposing economic and welfare burdens on millions of individuals worldwide. There is a bidirectional relationship between SD and opioid use or opioid use disorder (OUD): SD can act as a vulnerability factor for opioid use/OUD, while sleep disturbances are often observed in patients with OUD. In this study, we aimed to evaluate the impact of analgesic doses of oxycodone on sleep parameters. Wistar male adult rats (N=5) were implanted with electroencephalogram/electromyogram telemetry devices (Data Sciences International). Following a surgery recovery period, rats received intraperitoneal injections of either vehicle (0.9% saline) or oxycodone (0.3, 1, or 3 mg/kg) every other day 3 hours into the light (inactive) phase. After injections, rats were returned to their home cages, where sleep-wake patterns were recorded for six hours. Administration of oxycodone at all doses significantly reduced total sleep time. The highest dose testes (3 mg/kg) also significantly decreased REM and SWS sleep time and increased REM onset latency when compared to vehicle treatment. Finally, only the highest oxycodone dose reduced slow-wave sleep time relative to vehicle. Our findings suggest that oxycodone impairs sleep in a dose-dependent manner.

P11.16

Evolution of Brain Active Cis Regulatory Elements in the Human Lineage: A Comparative Genomic Analysis

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The evolution of the human brain involved structural and functional changes that resulted in unique cognitive abilities relative to other primates. These evolutionary changes are hypothesized to influence vulnerability to certain psychiatric disorders, notably schizophrenia and autism spectrum disorder. Since proteins remain highly conserved between humans and other primate species, shifts in gene regulation are believed to be the primary driver differentiating human brain development. The evolution of gene regulation is driven by changes in the non-coding regulatory regions of the genome; however, how these regions evolved across primates remains poorly understood. This study investigated the molecular evolution of adult and fetal brain active cis-regulatory elements (b-CREs) across primate species. Here we leverage 243 primate genomes to study regulatory evolution using an atlas of b-CREs defined by ATAC-seq from human brain tissue and experimentally confirmed. We applied a branch-specific positive selection test tailored to non-coding to detect regulatory regions under positive selection on the human lineage revealing 8,522 brain cis-regulatory elements showing significant positive selection along the human lineage out of 350,677 total elements analyzed. 3,228 out of 118,200 elements were active in both fetal and adult brain (2.73%), 3,331 out of 126,725 were adult-specific brain elements (2.63%), and 1,963 out of 105,752 were fetal-specific brain elements (1.86%). Genes regulated by human-selected brain cis-regulatory elements showed significant differential expression in humans compared to rhesus macaques compared to genes regulated by non-selected elements, particularly at fetal PCW13 ($Padj=3.11\times10^{-9}$), PCW37 ($Padj=3.13\times10^{-4}$), and adult stages ($Padj=1.03\times10^{-13}$). Human-selected b-CREs are also implicated in the heritability of several psychiatric disorders.

P11.17

Alcohol Exposure Exacerbates rmTBI-induced Neuroinflammation During Adolescence

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Mild traumatic brain injury (mTBI), clinically known as concussion, is an insult to the brain caused by an external mechanical force. The damage caused by repeated mTBI (rmTBI) can accumulate, leading to worsened outcomes. Alcohol consumption can independently trigger neuroinflammatory responses, possibly exacerbating the negative consequences of rmTBI. Compared to their peers, adolescent athletes are at greater risk for experiencing rmTBI and partaking in binge-like alcohol consumption. This study investigates the inflammatory response resulting from the combination of rmTBI and binge-like alcohol exposure in adolescent female and male Wistar rats. A mixed-sex cohort of adolescent Wistar rats were divided into four groups: Sham+Air, rmTBI+Air, Sham+EtOH, rmTBI+EtOH. Rats were exposed to 3 days of intermittent alcohol vapor or plain room air, followed by a day of respite. The following day, they received either a mTBI produced by a weight-drop model, or the sham procedure. This cycle was repeated for a total of four episodes. Rats were euthanized 7 days after the final injury, and their brains were collected for immunohistochemistry to assess for neuroinflammation. Here, we evaluated the expression of the inflammatory markers GFAP and Iba-1 at the site of injury. While animals in the Sham+EtOH and rmTBI+Air groups were not different from animals in the Sham+Air group, we saw a significant increase in the

expression of both GFAP and Iba-1 in animals receiving the combined insult. Our findings suggest that the combination of rmTBI and alcohol can synergistically promote neuroinflammation within the hippocampus of adolescent female rats. Future studies will increase the N and explore sex differences, as well as analyzing additional regions of interest.

P11.18

Characterizing the Blood-Brain Barrier Components in Human Dementia Subjects and Mouse Models of Preeclampsia and Eclampsia

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Hypertensive pregnancy disorders are associated with a higher risk of the development of dementia. A cohort study showed that women with a history of preeclampsia (PE) had over three times the risk of vascular dementia than women with a normotensive pregnancy history. A hallmark of Alzheimer's disease (AD) is the deposition of amyloid-beta plaques that are cleared by the glymphatic system, which maintains fluid equilibrium and eliminates metabolic waste from the CNS. Aquaporin-4 (*AQP4*) water channels, a key part of this system, are enriched in astrocyte end-feet surrounding microvessels and mediate the convective flow of interstitial fluid through the glymphatic pathway. This is suppressed in AD subjects before clinical symptoms appear. We hypothesized that dementia subjects would exhibit reduced *AQP4* gene expression in various brain regions compared to controls, and that mice exposed to PE and eclampsia conditions would display reduced *AQP4* polarization at astrocyte end-feet. We also hypothesized that there would be an impairment of the blood-brain barrier integrity detectable through reductions in tight junctional complex (TJ) expression. We retrieved human data from the Aging, Dementia, and TBI cohort study. RNA-seq data for *AQP4* were downloaded, excluding subjects with TBI, and processed for analysis. To model PE, we performed reduced uterine perfusion pressure (RUPP) or sham surgery on SMA-GFP mice at gestational day (GD) 13.5. To simulate eclampsia, we administered pentylenetetrazol (PTZ, a GABA antagonist, 40mg/kg) on GD 18.5, leading to 4 groups (SHAM-PTZ, SHAM+PTZ, RUPP-PTZ, RUPP+PTZ, n=3-4). After 30 minutes of monitoring, brains were collected and prepared for immunofluorescence and Western blot. Sections were stained for *AQP4* and imaged using confocal microscopy. *AQP4* intensity was quantified in the cortex and hippocampus. Quantification of TJ protein expression in the cortices of these animals was assessed using Western blot. In dementia subjects, *AQP4* gene expression was downregulated in the temporal cortex (7.3±0.4 vs 7.6±0.4 Log2Intensity; p=0.033) and parietal cortex (7.5±0.4 vs 7.7±0.3, p=0.048). There was a main effect of seizures on AQP4 protein expression, with decreased *AQP4* expression in PTZ-treated groups in the cortex ($F(1,10)=10.25$, $p=0.009$) and hippocampus ($F(1,10)=11.33$, $p=0.007$). There was no effect of RUPP surgery or interaction between the two factors on AQP4 expression. While there was a significant reduction of Occludin and Zonula ocludens-1 (ZO-1) in the RUPP group, there was no significant difference in the gene expression of these TJs between the dementia subjects. These results suggest that reduced AQP4 observed in mice after seizures may precede the development of dementia, as evidenced by the observed downregulation of *AQP4* in human dementia subjects. This could explain the link between eclampsia and future dementia. Ongoing studies investigate AQP4 expression at postpartum timepoints in PE and eclampsia models.

P11.19

The Effects of Acute Stress and Collaborative Recall on Memory Performance: Evaluation of Dual-Mode Theory and Collaborative Inhibition Theory

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Collaborative inhibition, the phenomenon in which groups tend to recall less information than an equal number of individuals, reveals an important relationship between social interaction and memory performance. While prior research has examined how cognitive, social, and contextual factors influence this phenomenon, few studies have explored how physiological states, such as stress, affect group memory. A prevailing theory in stress literature is the dual-mode theory which consists of a 'memory formation mode' in which cognitive mechanisms such as attention, perception, encoding, and consolidation are enhanced due to the presence of a stressor. The other phase, 'memory storage mode,' consists of a retrieval threshold being increased. This model predicts that stress should negatively impact memory performance due to the inhibition of retrieval processes in the 'memory formation mode.' Collaborative inhibition theories hypothesize that the phenomenon occurs as a result of retrieval-strategy disruption which has been supported by findings that collaborative groups revealed less semantic clustering, providing evidence that the preferred retrieval output was disrupted by remembering with others. Investigating the interaction between each of these factors could result in a more nuanced understanding regarding the manner in which both stress and collaboration impact memory performance. The extent to which stress and collaborative

inhibition interact can shed light on the underlying cognitive mechanisms involved with inhibition at the 'memory formation mode,' and factors that can exacerbate the phenomenon of collaborative recall.

The current project seeks to investigate how acute stress prior to retrieval impacts both individual and collaborative recall performance. Participants (N = 200) will be randomly assigned to one of four experimental conditions: stress-collaborative, stress-individual, no stress-collaborative, and no-stress-individual. Participants will participate in an encoding activity in which they will rate words for their perceived pleasantness. Acute stress will be induced using the Trier Social Stress Test (TSST), which has been modified for pairs, and control participants will complete a matched neutral task. Throughout the study, participants will complete questionnaires to examine their subjective psychological stress. Following completion of the stressor or matched control task, participants will complete either a collaborative free-for-all recall task or an individual recall task. Bridging the gap between stress and collaborative recall research on memory can provide a comprehensive understanding on the two paradigms, which has implications for eyewitness recall, group decision making, learning environments, and other scenarios where collaboration and memory occur under stressful conditions.

P11.20

Loss of Orexin Receptor 1 Alters Cochlear Structure and Function

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BACKGROUND: We previously showed that the hypothalamic peptide CRF and its receptors are expressed in the cochlea. Given the complexity of homeostasis, we hypothesized that other hypothalamic homeostatic signaling molecules are expressed in the cochlea. Ox signaling is most often studied in the brain where abnormal Orexin receptor 2 (Ox2R) dysfunction is linked to sleep/wake disturbances. Orexin receptors have therefore been targeted for pharmaceutic interventions against insomnia. Orexin signaling also occurs in the gut where it is involved in assessing metabolic states, regulation of physiological responses to stress, and works as an immunomodulator to shape inflammation. Thus, clinical relevance is obvious when considering effects of drugs on systems other than sleep/wake cycles. Here, we report on the expression of Orexin signaling molecules within the cochlea and the impact loss of Orexin1R has on hearing and cochlear organization induced by moderate intensity noise exposure.

METHODS: Adult Ox1R wild type (WT) and knockout mice were used to assess susceptibility to noise-induced hearing loss. Baseline auditory brainstem responses (ABRs) were obtained. WT and knockout mice either received noise exposure (97 dB SPL, 8-16 kHz for 2 hours) or no noise and ABR thresholds were measured up to 14 days after noise exposure. Mice were perfused 5 days - 6 weeks post noise exposure. H&E and immunohistochemistry (Orexin A, Orexin B, Orexin1R, Orexin2R, Aquaporin-1 [Santa Cruz Biotechnology], connexin 26, and Urocortin [Salk Institute gift]) was performed on cochlear frozen sections.

RESULTS: ABR thresholds of Ox1R KO mice failed to recover to baseline values following exposure to noise levels that induced classic, fully recoverable TTS in WT mice by 7 to 14 days. Ox pre-prohormone, encoding the mature OxA and OxB peptides, and the Ox Receptors 1 and 2 (Ox1R and Ox2R) were localized within cochlear support cells and lateral wall. Diminished staining intensity (hematoxylin and eosin) in the spiral ligament of OxR1 KO suggested cell loss. Aquaporin-1 protein localization was upregulated in OX1R knockout animals and noise challenge altered pre-pro-orexin protein localization in the spiral ligament in the putative type 3 fibrocyte region. Urocortin-positive efferent terminal intensity was higher in Ox1R KO versus WT prior to noise exposure and increased further in Ox1R KO exposed to noise. Interestingly, urocortin-positive axons coursing within the modiolus were observed to be in various states of degeneration, as evidenced by axonal blebbing.

CONCLUSIONS: Some of the observed changes in protein expression, particularly Aqp1, likely contributed to the altered physiology. Cross-talk between orexin and CRF signaling has been observed in the brain related to stress responses, and altered urocortin terminal innervation may be an attempted compensation for Ox1R loss. Deficiency in Ox signaling may lead to greater incidence of permanent threshold shifts following exposures to even moderate intensity noise that induce only recoverable TTS in WT mice. Whether NIHL is exacerbated by Ox receptor antagonist drug use remains to be fully determined. However, given that most people using such drugs are also older and likely also suffering from age-related hearing loss, this question takes on greater significance.

P11.21

Dysregulated Dopaminergic Feedback in Test Anxiety: Evidence from the Error-Related Negativity and Reward Sensitivity

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Previous work in our lab has shown that highly test anxious (THA) students have a smaller error-related negativity

(ERN) amplitude on a go/no-go task than students with low test anxiety (LTA), a finding not seen in other forms of anxiety. Because the ERN is postulated to occur due to a decrease in dopaminergic input to the anterior cingulate cortex (ACC) following an error, we hypothesized that HTA would have decreased reward sensitivity compared to LTA. Also, because anxiety is known to increase the activity of the ventral tegmental area (VTA, one of the major dopaminergic inputs to the ACC), we hypothesized that negative performance feedback would increase the ERN amplitude in HTA but not LTA. To test these hypotheses, 121 participants were screened for test anxiety using the Performance Evaluation Anxiety Task (PEAT), a computerized task developed and validated in our lab; following screening, participants completed a monetary incentive delay task (MID) to measure reward sensitivity. Finally, 32 participants (14 LTA and 18 HTA) were asked to return to the lab to complete a go/no-go task. This was a typical go/no-go task, except following task completion, participants repeated the go/no-go task while performance feedback was provided. Participants were told their performance was calculated as performance relative to a standard population; however, all participants received the same, negative ($<25^{th}$ percentile) feedback. During both phases of the go/no-go task, continuous 9-lead electroencephalography was recorded. HTA had faster reaction times than LTA on both phases of the go/no-go task, and reaction times in both groups were significantly faster when negative feedback was given. Although there was no significant difference in error rates between LTA and HTA on either phase of the go/no-go task, the error rate was significantly lower when negative feedback was given. Consistent with previous findings in our lab, the ERN was significantly smaller in HTA compared to LTA when no performance feedback was provided. In line with our hypothesis, negative performance feedback significantly increased the amplitude of the ERN in HTA, but not LTA. On the MID, the ratio of task performance on high-reward relative to high-loss trials was calculated, which showed a significant negative correlation with PEAT scores ($r = -0.305$, $p = 0.0003$), consistent with the hypothesis that HTA have reduced reward sensitivity compared to LTA. Taken together, these findings suggest that test anxiety is distinct from other forms of anxiety and is at least partially characterized by a dysregulated dopaminergic circuit between the VTA and ACC.

P11.22

Role of AGE/RAGE Signaling as a Driver of Pathological Aging in the Brain.

Sherilyn Hulugalla

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The accumulation of advanced glycation end products (AGEs) contributes a significant impact on the increased risk of cognitive and neurological impairments in the brain. When AGEs bind to their receptor RAGE, it accelerates normal aging with the increased risk of diseases such as onset of dementia, diabetes, muscle degeneration, and vascular calcification. Previous studies indicate that reducing RAGE improves cardiovascular and cognitive function in young diabetic RAGE knockout (RKO) mice. However, our past studies using 3-4-month-old RAGE Knockout (RKO) and RAGE wildtype (RWT) mice showed learning and memory impairments in the RKO mice, which demonstrated an opposite effect from the literature. Therefore, further research is needed to understand the effects of AGE/RAGE signaling in the brain. The goal of this study was to investigate the behavioral changes in RKO and RWT mice to assess differences in neurological function to determine the effects of AGE/RAGE signaling in the brain. The current study utilized a larger cohort of male and female RKO and RWT mice that were 6 months old. Additionally, inflammation was induced using lipopolysaccharide (LPS, 1 mg/kg) prior to behavioral assays, such as Elevated Plus Maze, Radial Arm Water Maze, and Light and Dark Box trials. Our data revealed RKO have increased anxiety, decreased memory and spatial learning, and decreased light sensitivity when compared to RWT mice. LPS treatment also exacerbated anxiety, further decreased memory and spatial learning, and heightened light sensitivity in RKO mice compared to WT mice. This study reveals that the lack of RAGE in 6-month-old knockout mice leads to worsened behavioral changes, which were exacerbated by LPS-induced inflammation, underscoring the significant impact of AGE/RAGE signaling on neurological function.

P11.23

Actigraphy-Based Sleep Assessment in Nonhuman Primates: Validation Using EEG-Based Sleep Recordings

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Rhesus monkeys are an excellent model organism for studying sleep due to their marked similarity in sleep architecture with humans. As with humans, rhesus monkeys are a diurnal species with a consolidated nocturnal sleep phase, during which they exhibit bouts of REM sleep, with longer periods of non-REM (NREM) sleep that can be divided into 3 phases (N1, N2 and N3). However, conducting EEG-based sleep recordings in monkeys is challenging and expensive, and there is a great need for validated alternative sleep assessment methods. This study evaluated the agreement between actigraphy (MotionWatch8) and EEG/EMG/EOG-based sleep

recordings in measuring sleep parameters in male rhesus monkeys. Monkeys (N=4) were prepared with telemetry devices (DSI, L04 model) that continuously monitored electroencephalography (EEG), electromyography (EMG) and electrooculography (EOG) throughout the night. After recovery from surgery, subjects were fitted with actigraphy monitors attached to primate collars to measure sleep-like parameters. EEG- and actigraphy-based sleep recordings were conducted simultaneously for 5 consecutive nights (lights off at 6pm, lights on at 6am). Actigraphy did not significantly differ from EEG-based recordings for sleep onset latency, total sleep time, wake after sleep onset (WASO) and sleep efficiency. On average, actigraphy-based sleep recordings overestimated sleep onset latency by 1.075 min and WASO by 1.4 min, and underestimated total sleep time by 7.3 min and sleep efficiency by 1%. Actigraphy had a sensitivity of 94.5%, specificity of 81.0%, a predictive value for sleep of 96%, a predictive value for wake of 71%, and accuracy of 91%. Overall, actigraphy shows good agreement with EEG/EOG/EMG-based sleep assessment for global sleep measures in rhesus monkeys.

P11.24

VMH to AHA Stimulation Evokes Complex Escape Behavior

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The hypothalamus becomes activated during exposure to innate and learned threats in the environment. However, it is unknown how the AHA organizes flight responses. Here, we set out to understand how excitatory inputs from the ventromedial hypothalamus (VMH) to the anterior hypothalamic area (AHA). To do this, we used optogenetic stimulation of VMH→AHA output (n = 12) during a variety of behavioral tasks and echocardiographs and compared the effects to control mice (n = 17). We found that VMH→AHA stimulation evokes 3-dimensional complex escape behavior whereby significantly more climb a ladder to escape an apparatus compared to fluorophore control animals ($p < 0.05$; zero controls exhibit this behavior). This is the first demonstration of complex escape behavior attributed to the AHA. We found that after this stimulation if mice are placed on an elevated plus maze, they exhibit significant increase in time in the closed arms compared to fluorophore control animals. This indicates an increase in anxiety-like behavior ($p < 0.05$). Echocardiographs revealed a significant increase in heart rate and fractional shortening in VMH→AHA stimulated mice, indicative of increased sympathetic arousal. Following one hour of VMH→AHA stimulation mice exhibited increased IL-6 inflammatory cytokine secretion ($p < 0.05$). Finally, we checked the activity patterns of brain regions involved in threat responding via c-Fos immunostaining. We found significantly increased c-Fos expression in the lateral habenula, dorsal premammillary nucleus, and locus coeruleus ($p < 0.05$). This ties VMH→AHA excitation into brain regions involved in avoidance, 3-dimensional complex escape, and peripheral arousal. In conclusion, we have demonstrated orchestration of complex flight responses that engage peripheral organ systems physiology by VMH→AHA excitation.

P11.25

Exploring Cannabinoids' Impact on Zebrafish Developmental Morphology and Behavior

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Cannabis and cannabinoid accessibility has greatly risen over the past decade due to the relaxation of laws that had previously restricted their possession and use. Given this increase in access, education on safe use practices becomes vital. Unfortunately, advice from medical professionals or those within the cannabis industry are equivocal - leading to consumer misconceptions of its safety. This inability to provide comprehensive medical advice for consumers is compounded by gaps in literature concerning safety profiles of both major and minor phytocannabinoids. Thus, there is a critical need for research on the safety of individual phytocannabinoids.

Studies have shown that human exposure to Δ^9-tetrahydrocannabidiol (THC), causes sex-dependent brain development deficits and persistent behavioral disorders, however, little is known on the developmental effects of cannabidiol (CBD) and other cannabis constituents - such as Δ^8-THC and cannabigerol (CBG). Our lab has found similar developmental-behavioral endpoints in zebrafish exposed to THC. Specifically, THC exposure resulted in dose-dependent hyperactivity and anxiety-like behavior (i.e., thigmotaxis) that persist well into adulthood. Therefore, we hypothesize that other minor cannabinoids will also impact behavioral and morphological development.

Utilizing a zebrafish model for early development (6-96 hpf), locomotor and morphological responses were assessed following exposure to varying concentrations of minor cannabinoids.

Our results indicate Δ8-THC, CBD, CBG, hexahydrocannabinol (HHC), and tetrahydrocannabivarin (THCV) all significantly reduce locomotion dose-dependently. In comparison, cannabinol (CBN), a theorized partial agonist of CB1 and CB2, elicited no

behavioral modifications even at the highest dose. Considering these effects, our lab is now exploring the mechanisms of action by which these minor phytocannabinoids alter behavior.

We hypothesize that minor phytocannabinoids influence behavior primarily via activation of the CB2 receptor, considering its involvement in inflammatory pathways and skeletomuscular homeostasis. Prior studies have shown Cnr2, the zebrafish homolog of CB2, is expressed in zebrafish twenty-four hours post-fertilization (hpf) and has direct roles in zebrafish locomotor development and inflammatory cascades.

To test this, we utilized a previously established transgenic Cnr2 knockout ($Cnr2^{-/-}$) line of zebrafish and exposed them to varying concentrations of minor phytocannabinoids of interest (Δ8-THC, THCV, CBD, CBG, CBN, HHC). Morphological defects and locomotor responses will be compared in larvae (120 hpf) that have been exposed during key stages of early development (6-96 hpf) - this analysis is, currently, ongoing.

Finally, we'll continue exploring phytocannabinoids' mechanism of behavior and morphology modulation during development by observing the responses seen after knocking out Cnr1 (the zebrafish homolog of CB1). Like $Cnr2^{-/-}$, a priorly established transgenic Cnr1 knockout ($Cnr1^{-/-}$) line of zebrafish will be utilized. The $Cnr1^{-/-}$ cohort will then be exposed using the same exposure paradigm used in the $Cnr2^{-/-}$ experiments. After which, morphology and locomotor responses will be compared to approximate which receptors are utilized for eliciting the toxicities seen wildtype fish.

P11.26

Thyrotropin releasing hormone increases premammillary dorsal nucleus neuron activity

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Thyrotropin-releasing hormone (TRH) has been associated with arousal and locomotor activation, yet the hypothalamic circuits through which TRH influences defensive and activation states remain poorly defined. We set out to test the effects of TRH signaling on neuronal activity within the premammillary dorsal nucleus (PMd), a hypothalamic structure critical for coordinating high-imminence defensive behaviors. We used whole-cell electrophysiology, calcium imaging, and behavioral assays to examine the functional impact of TRH on PMd neurons and locomotor output. We demonstrate that TRH increases excitability in a subset of PMd neurons (n = 9/18 neuron responders), revealing physiological heterogeneity in TRH sensitivity within this nucleus. Corroborating this finding, we demonstrate that TRH evokes calcium indicator responses in a subset of PMd neurons (n = 219/673 neuron responders). Finally, we show that systemic TRH administration (5 mg/kg, s.c.) increases average max speed and darting behavior in an open-field assay (n = 8 saline, n = 10 TRH). Together, these findings identify the PMd as a hypothalamic target of TRH, and justify further in vivo testing to determine the contribution of the PMd in the defensive behaviors that follow administration.

P11.27

CEREBROVASCULAR AND ANGIOGENIC FACTOR CHANGES IN THE BPH/5 MOUSE MODEL OF SUPERIMPOSED PREECLAMPSIA DURING PREGNANCY

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Preeclampsia is a pregnancy-related hypertensive disorder marked by high-blood pressure. Women with preexisting hypertension can develop superimposed preeclampsia (SPE) if preeclampsia symptoms develop during pregnancy. The blood pressure high 5 (BPH/5) mouse naturally develops features resembling SPE. Previous studies have reported dysregulated angiogenic factor expression at implantation sites at embryonic day 5.5 and 7.5. It is currently unknown whether angiogenic factors implicated in preeclampsia occur during late pregnancy in BPH/5 mice and whether cerebrovascular function is altered in this model is also unknown. We hypothesized that BPH/5 mice display reduced regional cerebral perfusion and dysregulated angiogenic factors. To test this, we used pregnant and nonpregnant control (SMA-GFP) and BPH/5 mice (n=3-8 per group). On gestational day 18.5, placenta and serum samples were collected for measurement of angiogenic factors after cerebral perfusion recording. BPH/5 mice had significantly lower perfusion in the superior sagittal sinus ($P<0.001$), left parietal cortex ($P<0.001$), right parietal cortex ($P<0.001$), whole brain ($P<0.001$), left prefrontal cortex ($P<0.001$), and right prefrontal cortex ($P<0.001$), regardless of pregnancy status. Additionally, an increase in soluble FLT protein expression was measured in pregnant groups compared to non-pregnant mice. Our results support the hypothesis that SPE leads to cerebral hypoperfusion in multiple brain regions and our finding of increased anti-angiogenic factor, sFlt 1 in pregnancy supports prior studies. Ongoing studies will measure protein expression of VEGFA and PLGF (pro-angiogenic factors) in serum and placental samples.

This work was supported by the Mississippi INBRE, funded by an Institutional Development Award (IDeA) from the National Institute of General Medical Sciences of the National Institutes of Health under grant number P20GM10347.

Friday, March 20, 2026
MORNING
Hall D Room 8

8:45 Welcome and Opening

O11.11

9:00 KCNT1 Influences Cocaine-Seeking Behavior in Female Rats on Day 1 of Extinction

Ariel Cox[1], Leonard Kaczmarek[2], Amy Kohtz[1, 3]

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The inability to maintain abstinence is a hallmark of cocaine use disorder (CUD), with cravings during initial abstinence predicting long-term relapse outcomes in both humans and rodents. Promoting successful abstinence may be particularly complex in women, as their psychological and biological responses to drugs of abuse differ from those in men. Several measures of CUDs are greater in women, a pattern reflected in female rodents, yet the biological mechanisms underlying these sex differences remain unclear. Extinction day 1 (ED1) marks the onset of abstinence when the expected drug is unavailable, representing a stressful time point associated with increased drug cravings. We have previously demonstrated that the dorsal hippocampus plays a significant role in driving sex-specific engagement in cocaine-seeking behavior on ED1. Using whole-transcriptome sequencing (RNA-Seq) analysis, we identified sex-specific gene expression patterns in the dorsal hippocampus elicited by exposure to the cocaine self-administration context on ED1, which correlate with cocaine-seeking behavior. In females, we identified 101 transcripts with fold-change differences on withdrawal day 1 (WD1) compared to naïve rats, and 22 transcripts with fold-change differences on ED1 compared to WD1 controls. Notably, only three targets overlapped between the sexes. Furthermore, five genes identified in females significantly correlated with cocaine-seeking behavior on ED1, showing R^2 values greater than 0.70. One of these targets, KCNT1, a potassium channel, negatively predicted cocaine-seeking behavior on ED1 in females. By targeting the hippocampus regions CA1 and CA3 inhibition of KCNT1 by PRX2904 and an antisense oligonucleotide compound targeting KCNT1 (KCNT1-ASODN) decreased cocaine-seeking behavior on ED1, specifically in female rats. This behavior persisted through ED2 and further extinction testing. These findings suggest that sex-specific transcriptomic signatures in the dorsal hippocampus, particularly KCNT1, may play a crucial role in driving cocaine-seeking persistence during early abstinence. Targeting these molecular pathways could enhance the maintenance of abstinence, with implications for sex-specific addiction treatment strategies. This work was supported by R00-045758 and P20GM144041 to ASK.

O11.12

9:20 Dorsal Hippocampus to the Medial Prefrontal Cortex Projections Drive Cocaine-Seeking Persistence in Male and Female Rats.

Savanna Julian, Ariel Cox, Amy Kohtz

University of Mississippi Medical Center, Jackson, MS

Maintaining abstinence remains one of the most difficult aspects of recovery from cocaine use disorder. Cravings during the initial abstinence period (e.g. extinction day 1, ED1 in rats), can predict long-term abstinence success. In rats, we find that females show greater cocaine-seeking on ED1 and greater cocaine seeking persistence. Our prior work indicates disrupting dorsal hippocampus (dHPC) memory formation can attenuate cocaine-seeking persistence in both sexes, however where these memories are stored downstream remain unknown. Herein we investigated the role of dHPC projections to the prelimbic (PL) and (IL) regions of the medial prefrontal cortex (mPFC) in cocaine-seeking persistence. Using immunohistochemistry, we found that females have more Fos+ PL cortex neurons during ED1, while males have more Fos+ IL cortex neurons during ED1, that correlate to dHPC Fos. These results reflect the hypothesis that PL cortex projections are necessary for reconsolidation, or strengthening, of retrieved contextual memories, whereas IL cortex projections are necessary for extinction, or weakening, of retrieved contextual memories. Using designer receptors exclusively activated by designer drugs (DREADDs), we next investigated if projections from the dHPC to PL drive cocaine-seeking behavior on ED1 and following a 2-week period of forced abstinence, (ED2) and conversely if projections from the dHPC to IL promote extinction. Activating dHPC to PL using hM3Dq excitatory DREADDs increased cocaine seeking behavior in females during ED2, while inhibiting dHPC to PL using hM4Di inhibitory DREADDs decreased cocaine seeking behavior across both ED1 and ED2. Activating dHPC to IL using hM3Dq DREADDs decreased cocaine seeking behavior while inhibiting dHPC to IL using hM4Di DREADDs increased cocaine seeking behavior. These findings support our hypotheses that dHPC signaling to different regions of the mPFC has specific effects to promote or attenuate contextual cocaine seeking. Future directions will repeat these experiments in male rats. Understanding the involvement of sex specific

corticolimbic signaling is crucial to finding sex-specific therapies that promote abstinence success.

O11.13

9:40 Extracellular Matrix Alterations Following Maternal Infection: Implications for Autism Spectrum Disorder

Madeline Griffin[1, 2], Obie Allen IV[1], Melissa D. Bauman[3, 4], Cynthia M. Schumann[4, 5], Barbara Gisabella[1, 2], Harry Pantazopoulos[1, 2]

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Rationale: Neurodevelopmental disorders constitute a unique class of pathology that can have disabling lifelong effects. Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder, with increasing prevalence in the United States, that is characterized by social and communication deficits as well as repetitive and/or restrictive behaviors. Neuroimmune signaling contributes to the neurodevelopment of a fetus, including neurogenesis and synaptic signaling. Maternal Immune Activation (MIA) is a particularly well recognized early life risk factor for neurodevelopmental dysfunction involved in ASD. Studies have shown that mothers exposed to infection during pregnancy have children with an increased risk of developmental and psychiatric disorders, including ASD and schizophrenia (SZ). Given the complexity of pathogenic factors involved in ASD, characterizing shared pathways or shared downstream factors is critical for identifying promising therapeutic targets. Our group's published and preliminary data suggests that extracellular matrix molecules (ECMs) are promising factors at the intersection of genetic, neurodevelopmental, and immune signaling processes in ASD. ECMs are a critical component in the development of neurons and glial cells in early life. In late adolescence, ECMs form structures called perineuronal nets (PNNs) that encase inhibitory neurons and contribute to stabilizing synapses. We previously identified decreased PNNs and increased glial cells expressing ECMs in the hippocampus and amygdala of subjects with SZ. Here, we used a cross-species approach to test the hypothesis that the neurodevelopmental trajectory of PNNs and parvalbumin neurons is altered in the amygdala-hippocampal circuit in subjects with ASD, and that maternal infection during pregnancy creates similar alterations in rhesus monkeys.

Results: Our in-progress findings reveal decreased PNNs in the hippocampus of subjects with ASD ($p<0.03$) that was significant in several hippocampal sectors including the dentate gyrus, CA4, CA2, and CA1 stratum oriens and stratum pyramidale regions. These PNN decreases were accompanied by marked increases in WFA labelled glial cells ($p<0.01$) that were concentrated in the dentate gyrus ($p<0.03$) and CA1 stratum pyramidale ($p<0.008$) and CA1 stratum oriens ($p<0.002$) regions. Analysis of sections from monkeys with MIA and control monkeys is in progress.

Conclusions: Our findings provide the first evidence for marked reductions in PNNs in the brain of subjects with ASD. Together with increased in WFA labelled glial cells, these findings of reflective of alterations reported in subjects with schizophrenia in this region and suggest that extracellular matrix dysfunction may be a shared neurodevelopmental factor in these disorders. Our studies in progress will provide information regarding the role of maternal infection on these neurodevelopmental alterations.

O11.14

10:00 Developmental Cell-Type Specific Alterations in MMP9 Expression in the Hippocampus of Prairie Voles Following Early-Life Sleep Disruption

Jobin Babu[1], Carolyn Jones Tinsely[2], Harry Pantazopoulos[1], Barbara Gisabella[1], Noah Milmann[2], Miranda Lim[2]

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Background: Early-life sleep disruption (ELSD) is a significant environmental risk factor for autism spectrum disorders (ASD). Previous studies from our group demonstrated that ELSD resulted in impaired behaviors in adult prairie voles. Prior work from our lab demonstrated decreased perineuronal nets (PNNs) in the hippocampal sector CA1 of ELSD prairie voles and elevated MMP9 expression in the hippocampus of children with ASD. MMP9, a matrix metalloproteinase, modulates synaptic plasticity and degrades extracellular matrix structures, including PNNs. PNNs are ECM structures composed of chondroitin sulphate proteoglycans (CSPGs). Here, we tested the hypothesis that ELSD alters the developmental trajectory and cellular specificity of MMP9 expression in hippocampal CA1 in prairie voles.

Methods: We analyzed hippocampal sections from juvenile (P17-P20) and adult (P150-160) male and female prairie voles with and without ELSD ($n = 24$). Immunohistochemistry for MMP9 was performed, and stereology-based microscopy was used to quantify labelled neurons, glia, and PNNs across CA1 subregions (stratum oriens, pyramidale).

Results: In adult CA1, most MMP9+ cells were neurons (80.5% in stratum oriens, 89% in stratum pyramidale), with

smaller proportions of MMP9+ glia (17.7% in stratum oriens, 8.9% in stratum pyramidale. We also observed unexpected MMP9 labeling in PNNs, which colocalized with wisteria floribunda positive PNNs surrounding parvalbumin neurons. Analysis of the data collected thus far revealed that adult ELSD voles display significantly reduced densities of MMP9+ neurons in both stratum oriens and stratum pyramidale ($p<0.03$). In comparison, MMP9+ PNNs are increased in stratum oriens ($p<0.05$) of adult ELSD voles. Across development, MMP9+ PNNs increased with age in both groups, while MMP9+ neurons remained stable in control voles but declined sharply in ELSD voles.

O11.15

10:20 Superimposed Preeclampsia is Associated with Placental Insufficiency and Smaller BPH/5 Mouse Embryos

A'Kaychia Lowery[1], Qingmei Shao[2], Chauncey Darden[2], Junie Warrington[2]

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Introduction: Preeclampsia (PE) and superimposed PE (sPE) are hypertensive pregnancy disorders linked to increased maternal and fetal morbidity and mortality. Since sPE, PE superimposed on chronic hypertension, poses greater risks than PE alone, it may have a more severe impact on placental and fetal growth. This study tests the hypothesis that sPE leads to impaired fetal growth and changes in hematocrit and fetal brain, which are more pronounced than PE and normotensive pregnancies.

Methods: To mimic PE, pregnant C57BL/6 mice underwent SHAM or reduced uterine perfusion pressure (RUPP) surgery (n=7-8 per group) on gestational day (GD) Methods: To mimic PE, pregnant C57BL/6 mice underwent SHAM or reduced uterine perfusion pressure (RUPP) surgery (n=7-8 per group) on gestational day (GD) 13.5. Pregnant BPH/5 mice (n=5), a genetic model for sPE, did not undergo any surgery. On GD 18.5, SHAM, RUPP, and BPH/5 mice were harvested to assess embryonic development characteristics. Each characteristic was averaged per dam, and a one-way analysis of variance (ANOVA) was used to assess the main effect of Exposure. To identify whether there were sex differences, each characteristic was then averaged by sex per dam, and then a two-way ANOVA was used to assess the main effects of Exposure and Sex for each characteristic. Results are presented as Mean±SD.

Results: There was no difference in litter sizes or pup brain/body weight ratios between the groups ($p>0.05$). Embryos exposed to PE-like conditions had increased hematocrit (34.0±2.6%), indicating hypoxia, and higher brain water content (87.4±0.3%), indicating cerebral edema, compared to SHAM (hematocrit 28.7±4.4, $p=0.030$; brain water content 86.7±0.3%, $p=0.011$). Embryos exposed to sPE also had lower body weight (0.95±0.19g) compared to PE-exposed embryos (1.16±0.17g, $p=0.06$). The mean placenta weights were higher for BPH/5 (124.5±20.3mg) compared to SHAM (98.3±19.3mg, $p=0.032$) and RUPP (94±8.6mg, $p=0.011$). After stratifying by sex, we found that BPH/5 pup/placenta weight ratio was lower (7.7±1.1, male 7.7±1.2, female 7.8±1.0) compared to SHAM (11.8±1.95, $p<0.001$; male 11.8±1.9, $p=0.003$; female 12.8±0.9, $p<0.001$) and RUPP (12.5±1.4, $p<0.001$; male 12.5±1.5, $p<0.001$; female 12.5±1.5, $p<0.001$) regardless of sex. Male BPH/5 embryos weighed less (0.91±0.15g) compared to male RUPP embryos (1.22±0.19g, $p=0.012$). Female BPH/5 offspring had lower pup brain weights (52.4±4.4mg) compared to female SHAM embryos (70.1±8.6mg, $p=0.037$) as well as higher placenta weight (127.6±22.5mg) compared to female SHAM (89.1±7.4mg, $p=0.002$) and RUPP (89.0±9.2mg, $p<0.001$). There was no sex difference in any of the embryonic development characteristics ($p>0.05$).

Conclusion: Our findings support the hypothesis that sPE is associated with placental insufficiency (characterized by large placentas and low body weight) and smaller brains. While embryos exposed to PE-like conditions (RUPP) displayed hypoxia, this did not occur after sPE. There were no sex differences in the measured endpoints. Future studies will assess molecular changes in the brains of these exposed embryos and adult offspring resulting from these pregnancies.

10:40 Keynote

Brenton Laing, PhD

Assistant Professor.
BioMolecular Sciences and the University of Mississippi

Title: VMH to AHA stimulation evokes complex escape behavior

Bio: Dr. Brenton Laing is an Assistant Professor in the department of BioMolecular Sciences and the University of Mississippi. The Laing Lab leverages a systems neuroscience perspective to investigate hypothalamic circuits that control the flight response during threat exposure.

The long term objective of the lab is to manipulate dysfunctional activity patterns that emerge during stress. At the systems level his group is testing relationships between anterior hypothalamic area activity patterns responses associated with threat detection. At the circuit level the group is dissecting inputs and outputs of the anterior hypothalamic area. At the cellular level, the Laing Lab is identifying relationships between electrophysiological and molecular properties of anterior hypothalamic area neurons. He got his PhD in bioenergetics from the East Carolina University and did his postdoctoral fellowship under the training of Dr. Yeka Aponte at the National Institute on Drug Abuse in the neurocomputational systems research branch.

11:30 MAS Neuroscience Division Awards

Physics and Engineering

Chair: Katja Biswas
University of Southern Mississippi
Co-Vice Chair: Pradip Biswas
Tougaloo College
Co-Vice Chair: Anuradha Gupta
University of Mississippi
Co-Vice Chair: Jason A. Griggs
University of Mississippi Medical Center

Thursday, March19, 2026
MORNING
Hall D Room 6

8:20 Welcome Messages by Division
Chairs/Vice Chairs

8:30-9:30 Material Science/Condensed Matter

Chair: James Stephen

O12.01

8:30 Topological Effects of the Lattice Structure on the Energy Landscapes of Spin Glasses

Katja Biswas, Anil K. Katwal

School of Mathematics and Natural Sciences, University of Southern Mississippi, Hattiesburg, MS

This talk will present a study of the effects of the lattice model's topological structure on the potential energy landscape of discrete Ising-type spin-glass models. The high-dimensional potential energy landscape will be represented by augmented disconnectivity graphs, which are two-dimensional representations showing the minimum structures and barriers of the system. Discrete models of spin glasses exhibit a high degree of frustration and degeneracy of their states, which can lead to the occurrence of extended minimum structures in the energy landscape. These structures are classified into four types, namely regular minima and type-1, type-2, and type-3 dales. In the disconnectivity graphs, they are distinguished by color, and their average sizes for the energy levels are indicated by bar charts. Their properties and connection to the lattice topology will be discussed on two Archimedean lattices, which are the triangular [1] and Snub Archimedean [2] lattice, and one Laves lattice structure, which is the Dice lattice [3]. Each of the topologies shows distinct characteristics in the shape of the disconnectivity graphs, the distribution and occurrence of minimum structures, and their respective sizes. This greatly affects the efficacy of standard optimization procedures, making some models especially easy to optimize, while others can be considered hard problems.

[1] K. Biswas, Energy landscapes of spin glasses on triangular Archimedean lattices, Phys. A 627 (2023) 129133.

[2] K. Biswas and A.K. Katwal, Energy Landscapes of spin models on the snub Archimedean $(3^2,4,3,4)$ lattice, Phys. A 659 (2025) 130311.

[3] A.K. Katwal, Energy Landscapes of spin glasses on the dice lattice, Phys. A 682 (2026) 131177

O12.02

8:50 Effect of ferromagnetic and anti-ferromagnetic bond concentration on energy landscape of spin glasses on square lattices

Roshan Giri, Katja Biswas

School of Mathematics and Natural Sciences, University of Southern Mississippi, Hattiesburg, MS

The effects of changing the ratio of ferromagnetic and anti-ferromagnetic bonds is investigated and compared for small systems consisting of 36 spins with periodic boundary conditions and Ising type interaction. The interaction strength between pairs of spins are chosen randomly from the distribution {±1,±2,±3}, in which ferromagnetic (F) bonds are positive and anti-ferromagnetic (AF) bonds are negative. For the percentage of AF bonds, 0%, 12.5%, 25%, 37.5%, 50%, 62.5%, 75%, 87.5% and 100%, we compare the energy landscapes, the distributions of ground state energies, the distributions of the types of minima, the sizes of the types of minima, the heights of the ground state funnel and the number of energy levels occupied by the minima. The comparative study of the energy landscape is carried out with the help of augmented disconnectivity graphs, which use the categorization of the minima into regular minima, type-1 dales, type-2 dales, and type-3 dales. Regular minima are non-degenerate minima for which the flip of any spin increases the energy of the system. Dales are degenerate minima where type-1 dales have at least one zero-energy spin flip i.e. spins which when flipped preserve the energy of the system and type-2 dales are connected via at least two possible zero-energy spins flip. Similarly, type-3 dales represent a connection between type-1 and/or type-2 dales via a sequence of spin flips. These dales provide flatness to the energy landscape.

Our results show that the energy landscapes of systems having either 0% or 100% AF bonds display less complexity. Here, less complexity refers to a low frequency of local funnels and dales, since they serve as entropic and energetic traps for standard optimization routines. The ground states at these concentrations of AF bonds are highly stable with large energy barriers. Systems with 50% AF bonds exhibit more complexity of the energy landscape due to a high frequency of local funnels and dales. Consequently, making it more difficult to reach the ground state.

O12.03

9:05 A Parallelized Algorithmic Approach to Map Frustrated Energy Landscapes with Long-Range Potential in Spin Glasses

SK Rahat Bin Salam, Katja Biswas

School of Mathematics and Natural Sciences, University of Southern Mississippi, Hattiesburg, MS

Disconnectivity graphs are visualization tools for mapping the structure of the high-dimensional potential energy landscapes. They illustrate the energy landscape as a hierarchical tree, where lower points are the stable states with minimum energy (minima), and transition state energies (energy barriers) of the system are presented by the branching points. Constructing this large assortment of minima and energy barriers is computationally exhaustive. We present an efficient numerical framework for exploring the potential energy landscape of frustrated spin-glass systems for a long-range, oscillatory spin model in which the coefficients of the Hamiltonian are determined by the Ruderman-Kittel-Kasuya-Yoshida (RKKY) interaction on a snub square Archimedean lattice. The methodology is implemented in two stages. First, the minima are obtained using a hybrid approach that combines Monte-Carlo simulation with gradient-based optimization. Second, the energy barriers are obtained using transition pathways. The massive calculation to acquire the energy barriers between the stable states in this vast energy landscape is accelerated with parallel computing. The obtained minima and their interconnecting energy barriers are then visualized as a disconnectivity graph. In this talk, we will focus on this computational method and its applications to investigate the energy landscapes.

O12.04

9:20 Synthesis, Structural, and Magnetic Study of Two Perovskite Compounds $(CHAH)_2CuBr_4$ and $(CPAH)_2CuCl_4$: Nearly Two-Dimensional Quantum Heisenberg Ferromagnets

M. A. Ebdah[1], C. P. Landee[2], M. M. Turnbull[3], B. Twamley[4]

[1]Department of Chemistry & Physics, Alcorn State University, Lorman, MS, [2]Department of Physics, Clark University, Worcester, MA, [3]Carlson School of Chemistry and Biochemistry, Clark University, Worcester, MA, [4]School of Chemistry, Trinity College Dublin, Ireland.

*T*wo crystalline ferromagnetic perovskite compounds $(CHAH)_2CuBr_4$ and $(CPAH)_2CuCl_4$ have been studied (CHA = cyclohexylammonium, CPA = cyclopentylammonium). Both compounds have been synthesized using slow evaporation techniques. The crystal structures are: $(CHAH)_2CuBr_4$ [monoclinic, $P2_1/c$], and $(CPAH)_2CuCl_4$ [monoclinic, Cc]. The $(CHAH)_2CuBr_4$

compound consists of square planar $CuBr_4^{2-}$ anion layers separated by double layers of $CHAH^+$ cationic organic groups. The geometry of the $CuBr_4^{2-}$ anions is nearly square planar. Each copper interacts with six bromide ions in a 4+2 geometry. Two Cu···Br linkages are very long, 3.66 Å in length, and make an angle of 156.3° with the Br–Cu sub-path contacts leading to non-linear superexchange pathways between the Cu^{2+} sites. The shortest Br···Br contacts between two adjacent layers of anions are 9.875 Å and 9.637 Å, which are so large that interactions are negligible. The $(CPAH)_2CuCl_4$ compound is believed to consist of $CuCl_4^{2-}$ anion layers separated by layers of $CPAH^{2+}$ cationic organic groups in a stacking pattern along the long unit cell axis a. The effect of intrinsic diamagnetic contribution of the Cu^{2+} ions on shifting the hysteresis field dependence of magnetization has been explained and generalized for such soft ferromagnets. Curie–Weiss analysis of the high-temperature magnetic data of both compounds indicates ferromagnetic coupling. The high-temperature susceptibility data have been analyzed with the two-dimensional S = 1/2 quadratic ferromagnetic Heisenberg model. The low-temperature susceptibility data of both compounds show divergence at the corresponding critical temperatures, at which transition to three-dimensional ferromagnetic ordered state occurs. The interlayer coupling responsible for this ordering has been also evaluated. In the ordered state the two compounds behave as XY-like magnets, with the easy axes in the planes of growth, and relatively large out-of-plane anisotropy.

9:40 Group Discussion and Coffee Break

10:00-11:05 Materials Science/Radiation;

Session Chair: TBA

O12.05

10:00 Cryogenic Self-Crystallization of ZnO Thin Films: A Low-Temperature Route to Polycrystalline Semiconductors

M. Ebdah[1], M. Kordesch[2], W. Yuan[3], W. Jadwisienczak[3], S Kaya[3], M Nazzal[4], A. Ibdah[5], K. Al-iqdah[6]

[1]1Department of Chemistry & Physics, Alcorn State University, Lorman, MS,[2]Department of Physics and Astronomy, Ohio University, Athens, OH, [3]School of Electrical Engineering and Computer Science, Ohio University, Athens OH, [4]Center for Smart, Sustainable & Resilient Infrastructure (CSSRI), Department of Civil and Architectural Engineering and Construction Management, University of Cincinnati, Cincinnati, OH, [5]Center for Photovoltaics Innovation and Commercialization, Department of Physics and Astronomy, University of Toledo, Toledo, OH, [6]Kelly Education, Vicksburg-Warren School District, Vicksburg, MS

This study introduces a new ultra-low-thermal-budget regime for semiconductor fabrication, termed cryogenic self-crystallization, demonstrated using zinc oxide (ZnO) thin films deposited by radio-frequency reactive magnetron sputtering at −78 °C on SiO_2/Si substrates. Contrary to expectations of amorphous growth at such low temperature, X-ray diffraction revealed the spontaneous formation of polycrystalline wurtzite ZnO upon warming to room temperature. The partial crystallization is driven by stress–strain coupling at the ZnO/SiO_2 interface. Specifically, in-plane compressive stress and out-of-plane tensile strain generated by differential thermal expansion during temperature recovery. Atomic-force and scanning-electron microscopies confirmed nanoscale hillocks and ridges consistent with this strain-induced recrystallization mechanism. Spectroscopic ellipsometry, modeled with a hybrid General Oscillator Layer (GOL) approach, determined a film thickness of ≈ 61 nm, surface roughness of ≈ 3.8 nm, and a direct optical bandgap of 3.40 eV. The coexistence of crystalline and amorphous domains was captured through coupled critical-point parabolic-band and Tauc–Lorentz oscillators, revealing a quasi-2D excitonic character and sharp near-band-edge absorption. Photoluminescence spectroscopy exhibited intense bound-exciton emissions accompanied with phonon replicas, confirming strong exciton–phonon coupling formation, which is a remarkable result for a thin film grown without external annealing. The findings demonstrate that cryogenic deposition followed by self-crystallization can yield crystalized, optically active, and strain-stabilized ZnO with strong excitonic behavior under ambient conditions. This approach provides a viable path to deposit crystalline semiconductors and dielectrics on flexible or heat-sensitive substrates, enabling next-generation low-power optoelectronic and photonic devices where traditional high-temperature processing is impractical.

O12.06

10:20 Relation Between Atomic Voronoi Volumes and Local Density Fluctuations in Disordered Networks: The Case of Amorphous Silicon

Anwaoy Pandit, Parthapratim Biswas

University of Southern Mississippi, Hattiesburg, MS

The relationship between the local Voronoi-volume of atoms and the number density is a key indicator of structural heterogeneity in amorphous materials. Atomic Voronoi-volumes can characterize many structural and topological aspects of disordered solids by analyzing the distribution of atomic Voronoi volumes and their dependence on the presence of defects, disorder, extended ring structures, and density fluctuations in the solids. In this work, we study the correlation between atomic Voronoi volumes and the local density in disordered

networks with an emphasis on amorphous silicon. This is achieved by developing realistic large structural models of amorphous silicon with a varying degree of defect concentration and computing the Voronoi volume associated with each atomic sites in the amorphous network. It has been shown that the Voronoi volume is sensitive to not only the presence of local atomic disorder but also to the density fluctuations due to the presence of inhomogeneities, such as dangling bonds and extended structural defects in the networks. The correlation between the Voronoi volumes and the local density is examined and quantified by studying the Voronoi-volume dependence of atomic sites with the local density.

O12.07

10:35 Hands Free Ozone Testing: Automating a Five-Valve Flow System with Python Control

Tucker Stockman, Tyler Reese

University of Southern Mississippi, Hattiesburg, MS

This project focuses on automating a five-valve gas flow management system currently being used to investigate ozone concentration stability. Valve automation will make testing faster, more repeatable, and easier to run. In earlier experiments, ozone stability was tested in response to flow mixtures, elapsed time, and the materials of the chamber. In addition to the results found, these experiments showed how important consistent timing and setup are. The old setup relied on manual valve operation, which made it hard to keep each sample consistent and limited how many tests could be run. Some samples took only a few minutes, while others lasted over an hour, making it difficult to gather large, reliable data sets.

To fix that, an automated system was built that controls four diverting valves and one shut-off valve using high-torque servo motors and Python code. Each valve is connected through a custom aluminum mounting system that was designed and machined specifically for this project. The design, machining, and construction processes will be highlighted in this presentation.

The control code written uses the NI-DAQmx drivers and python api to send the appropriate pulse-width modulation signals through a National Instruments cDAQ-9178 chassis and NI-9402 modules to the servo motors, allowing the servos to move automatically between valve positions. The program was written to accommodate two modes of valve configuration control: live user input or fully automated user-defined sample timing. This upgrade maintains real time controllability of the system, if needed, but also offers precise, hands-free system control and the ability to collect much larger sample sets with consistent timing. System performance and data collection examples will be presented.

O12.07

10:50 Sensitivity Analysis of an Irradiated-Air Chemical Kinetics Model Implemented in Cantera

Isabella Kirksey

University of Southern Mississippi, Hattiesburg, MS

Sensitivity analysis is a critical tool for evaluating the dominant reaction pathways in chemical kinetics models. In this work, I conduct a sensitivity analysis on a chemical kinetics model developed in-house to study the formation and evolution of reactive species in irradiated air. The model is implemented in Cantera (an open source chemical kinetics toolkit) and includes reactions among molecular oxygen, molecular nitrogen, and the irradiation generated radicals. The goal of the analysis is to identify which reaction rate coefficients, species concentrations, and transport-independent parameters exert the greatest influence on predicted species profiles, with emphasis on O3, NO, NO2, NO3, N2O, and N2O5. The results of this analysis informs decisions regarding updates to the model values when there are multiple reaction rate values found in the supporting literature for the same reaction. During this presentation, the reactions with the greatest impacts will be highlighted. In cases where differing reaction rates are provided in the literature, the product profiles resulting from the various suggested rate values will be presented. A final set of accepted model values and its resulting product profile will also be presented.

11:05-11:30 Lightning Session by Poster Presenters

Moderators: Katja Biswas, Tyler Reese

Poster presenters will be asked to provide a 5-minute presentation on a PowerPoint slide and present to the division.

L.01

Occupancy-Aware HVAC: A Smart Solution for Energy Efficiency and Comfort

Jeremiah Clemons[1], Preston Brantley[1, 2], Blessed Kutyauripo[1, 2]

[1]Mississippi Valley State University, Itta Bena, MS, [2]NSBE, West Lafayette, IN

L.02

Development of an Ex Vivo Model for Simulating the Hemodynamic Environment within the Optic Nerve Head

Aarzu Joshi [1], Baudrul Mohammad Shahjalal [1], Isen Furr [1], Lydia Miller [1], Heran Pradhan [2], Bin Yang [2], Yi (Jason) Hua[1]

[1]Department of Biomedical Engineering, University of Mississippi, University, MS, [2]Department of Biomedical Engineering, Duquesne University, Pittsburgh, PA

L.03

Assessing the Photostabilization Method with the Use of Cotton (Gossypium hirsutum) for the Potential Remediation of Per- and Polyfluoroalkyl Contaminants.

Nathan Mays IV, Danuta Leszczynska

Jackson State University, Jackson, MS

L.04

A Multi-Instrument Approach to the Spectroscopic Analysis of Super-Earth Atmospheric Compositions

Margaret Brune, Christopher Sirola

University of Southern Mississippi, Hattiesburg, MS

L.05

Parametric Analysis of Brick Geometry and Mix Design Effects on Masonry Mechanical Performance

Hailey N Akers, Yassine El Marnissi, Mohammed Elmellouki

Mississippi Valley State University, Itta Bena, MS

L.06

Durability of Nuclear Containment Ventilation Materials to Fatigue and Highly Accelerated Life Testing

Jay Patel, Coralie Rose, David Clark, Jamie Gibson

Mississippi State University, Mississippi State, MS

11:30-BUSINESS MEETING

Thursday, March19, 2026
AFTERNOON
Hall D Room 6

1:00 KEYNOTE

Dr. Susana M. Salazar Marocho

University of Mississippi Medical Center

Moderators: Katja Biswas, Tyler Reese

Title: Designing the Next Generation of Biomedical Solutions: The UMMC PhD Experience in Biomaterials Science

The PhD Program in Biomedical Materials Science at the University of Mississippi Medical Center is built on more than 25 years of biomaterials research excellence and is dedicated to creating biomedical solutions to advance healthcare. As part of an academic medical center, the program offers a unique environment where students work at the intersection of materials science, biology, engineering, and clinical practice.

Students engage in innovative research focused on the materials, interfacial, and biological phenomena that determine the success of biomedical implants, prostheses, and devices. Research opportunities span polymeric biomaterials, tissue engineering, restorative ceramics, dental implant fatigue, biomaterials derived from biowaste, and even cellular biology related to obesity and metabolic disease. This breadth allows students to tailor their training to emerging challenges in health care.

The program emphasizes interdisciplinary collaboration, providing access to state-of-the-art laboratories and partnerships with faculty across UMMC and beyond. Students learn how fundamental material properties influence host–material interactions and how this knowledge drives the development of next-generation biomedical materials and implant technologies.

Graduates emerge as independent scientists prepared for impactful careers in academia, industry, clinical research, and biomedical innovation. For undergraduates eager to push scientific boundaries and contribute to technologies that directly improve patient care, the UMMC PhD Program in Biomedical Materials Science offers a dynamic, rigorous, and inspiring path forward.

1:45-2:00 Group Discussion and Coffee/Break

2:00-2:45

1:40-2:30 Spectroscopy and Computational Physics; Chair: TBA

O12.08

1:40 High-Fidelity 3D Transient Blood Flow Simulation in Patient-Specific Vascular Models Using an In-House CFD Solver

Shuang Tu, Chao Jiang, Malik Baggett, Brandon Newton

Jackson State University, Jackson, MS

This work aims to extend the capabilities of our in-house computational fluid dynamics (CFD) solver to accurately simulate blood flow dynamics. The solver is based on the pressure correction (projection) method for incompressible Navier-Stokes equations. A distinctive feature of our approach is a non-traditional staggered mesh layout, where velocity components are located at cell centers and a pressure-related auxiliary variable is defined at cell vertices. The governing equations are discretized and solved using a hybrid finite volume/finite element method: the momentum equations are addressed via a matrix-free,

implicit, time-accurate, cell-centered finite volume scheme, while the pressure Poisson equation is handled using a node-based continuous Galerkin finite element method. Post-solution corrections are applied to both the velocity and pressure fields to ensure incompressibility and accurate wall pressure representation.

The solver is parallelized through domain decomposition and leverages the Message Passing Interface (MPI) for high-performance computing on large-scale 3D simulations.

To validate and demonstrate the solver's capabilities, we employ several vascular models obtained from https://vascularmodel.org/dataset.html. The simulation pipeline includes vascular geometry modeling, mesh generation, specification of boundary conditions, solver execution, and post-processing for visualization and analysis. Physiologically realistic boundary conditions are imposed, including pulsatile velocity inlets and pressure outlets. Blood is assumed to behave as a laminar fluid. The study compares wall shear stress, wall pressure, streamline patterns, and vorticity for both Newtonian and multiple non-Newtonian models.

Ultimately, our goal is to enhance the predictive fidelity of our CFD solver in simulating hemodynamic behavior, thereby supporting researchers and clinicians in understanding how morphological changes influence blood flow in cardiovascular studies.

O12.09

2:00 Cavity Ring Down Spectroscopy Alignment and Measurements with 650nm Laser Diode

Eva Chalona, Tyler Reese

University of Southern Mississippi, Hattiesburg, MS

It is known that 266nm UV light can dissociate ozone molecules. In this lab, prior work has been done to study how a 266nm pulsed laser system can be used to measure ozone produced in air as a response to exposure to alpha radiation, but another lab (Hecht et al.), who also studies this, introduced new results that differ from ours. They received much higher concentrations of ozone than we did. Last year my research group studied differences in chamber material in order to determine if those factors affect ozone concentration. It is important to note that Hecht et al. uses ozone analyzers to measure the ozone instead of using cavity ring down spectroscopy (CRDS). This brings up the question of does 266nm light decrease our ozone concentration? My project is trying to answer this question using a 650nm red continuous wave (CW) laser. Because this wavelength is in a different absorption band it doesn't dissociate the ozone molecules like the UV light does.

Using the red laser diode to do this project comes with its own difficulties. Unlike the high powered pulsed laser systems like previously used, a CW laser is much more challenging to align and preform CRDS measurements with. This presentation will cover aligning the cavity, laser modulation, and other preliminary ringdown cavity performance metrics that include but are not limited to characteristic ringdown time, signal stability or noise, and anticipated detection limits.

A.A. Hecht, R. Galo, S. Fellows, P. Baldez, P. Koonath,

Radiolytic ozone yield G(O3) from 210Po alpha-particle radiation in air, Radiation Physics and Chemistry, Volume 183, 2021, 109387, ISSN 0969-806X,

https://doi.org/10.1016/j.radphyschem.2021.109387.

(https://www.sciencedirect.com/science/article/pii/S0969806X21000372)

O12.10

2:15 An Optical System for Characterizing the Spatial Extent and Pressure-Dependent Evolution of Radiation-Induced Fluorescence Volumes

Maximilian Alberth, Tyler Reese

The University of Southern Mississippi, Hattiesburg, MS

Optical detection of radioactive contamination through ultraviolet fluorescence offers significant advantages over traditional contact-based methods, providing enhanced operator safety and improved measurement efficiency. When alpha particles from radioactive sources interact with atmospheric gases, they create a three-dimensional fluorescence volume whose spatial characteristics remain inadequately characterized. Understanding how this fluorescence volume varies with pressure is essential for developing practical remote detection systems that must operate across diverse environmental conditions.

Prior experimental work in our laboratory explored ultraviolet fluorescence emissions in nitrogen gas environments, focusing on spectral characterization and total relative irradiance measurements. These earlier studies employed optical systems specifically designed to maximize light collection efficiency, prioritizing signal strength over spatial resolution. While this approach successfully quantified overall fluorescence intensity, it provided limited information about the geometric structure and spatial extent of the emission region surrounding radioactive sources.

This work represents a fundamental shift in experimental methodology, transitioning from maximum light collection to systematic field-of-view constraints as the primary tool for spatial characterization. By carefully limiting which portions of the fluorescence volume reach our detection system, we can effectively map the three-dimensional

structure of the emission region. Our approach employs variable magnification relay optics with adjustable field stops, enabling selective imaging of different spatial regions while maintaining consistent detector positioning. This methodology allows us to determine not only the total size of the fluorescence volume but also how emission intensity varies with radial distance from the source.

Fluorescence detection utilizes photomultiplier tube-based photon counting, with PMT (photomultiplier tube) output signals processed through pulse height discriminators to convert analog pulses into digital TTL (transistor-transistor logic) signals suitable for counting electronics. We have developed custom Python-based automation software that interfaces directly with the pulse counting hardware, enabling extended unattended measurement campaigns with automated data logging and real-time quality monitoring.

Before conducting radiation measurements, we performed extensive bench-top validation using a filtered and a masked ultraviolet lamp as a controllable light source. These proof-of-concept experiments allowed systematic refinement of our field-of-view constraining optical system without the complexity of working inside the vacuum chamber environment. The lamp-based validation established optimal lens configurations, field stop sizes, and alignment procedures.

This presentation will detail both the automated photon counting system and the specialized optical relay architecture developed for this spatial characterization work, providing a methodological foundation for future investigations of radiation-induced fluorescence geometry.

THURSDAY, March19, 2026

EVENING

Hall C

5:00-7:30 Reception and General Poster Session (Immediately following Dodgen Event)

All posters should be placed in the poster all by 12:00 pm on Thursday, March 19, 2026

Odd poster numbers will be presented from 5 -6

*Even poster numbers will be presented from 6-***7**

P12.01

Occupancy-Aware HVAC: A Smart Solution for Energy Efficiency and Comfort

Jeremiah Clemons[1], Preston Brantley[1, 2], Blessed Kutyauripo[1, 2]

[1]Mississippi Valley State University, Itta Bena, MS, [2]NSBE, West Lafayette, IN

Heating, ventilation, and air conditioning (HVAC) systems play a vital role in maintaining indoor comfort but account for a significant portion of building energy use. On average, HVAC operation consumes about 35% of a building's total electricity and contributes to 40-50% of annual utility costs, with demand increasing by approximately 10% during summer months. Although occupancy-based HVAC control has been studied, limited progress has been made toward designing systems that can be seamlessly implemented in existing buildings. This project aims to design an occupancy-aware HVAC system capable of adjusting temperature and airflow based on real-time room occupancy and environmental conditions. The proposed system utilizes a Raspberry Pi microcontroller to coordinate data exchange between sensors and the HVAC unit. A magnetic door sensor will monitor occupant entry and exit, while a weather sensor will record external environmental parameters. The Raspberry Pi will process these inputs and transmit control commands to the thermostat, which will regulate airflow to maintain comfortable indoor conditions. The proposed system is expected to enable real-time, adaptive airflow and temperature control, thereby improving operational efficiency. Based on prior research (Zhang, 2013), occupancy-based HVAC systems can reduce energy consumption by approximately 17-18%. While costs and savings may vary by region and climate, occupant comfort is expected to remain unchanged, making this system a practical and sustainable approach to reducing building energy use.

P12.02

Development of an Ex Vivo Model for Simulating the Hemodynamic Environment within the Optic Nerve Head

Aarzu Joshi [1], Baudrul Mohammad Shahjalal [1], Isen Furr [1], Lydia Miller [1], Heran Pradhan [2], Bin Yang [2], Yi (Jason) Hua[1]

[1]Department of Biomedical Engineering, University of Mississippi, University, MS, *[2]Department of Biomedical Engineering, Duquesne University, Pittsburgh, PA*

Glaucoma, a leading cause of irreversible blindness, is characterized by progressive degeneration of retinal ganglion cells and their axons at the back of the eye, specifically at the optic nerve head (ONH). Elevated intraocular pressure (IOP) is a primary risk factor for glaucoma. Evidence suggests that IOP-driven reductions in ONH blood flow exacerbate biomechanical and metabolic stress on retinal ganglion cell axons, contributing to their degeneration.Therefore, understanding the interplay between IOP and ONH blood flow is crucial for understanding glaucoma pathophysiology. In this study, we

developed an ex vivo model that perfuses the ophthalmic artery to simulate blood flow in the ONH, establishing a foundation for future investigation into how IOP influences ONH blood flow.

A fresh porcine eye was enucleated within one hour post-mortem, with at least 4 cm of optic nerve preserved to allow cannulation of the ophthalmic artery. The eye was stored in cold heparinized saline to reduce metabolic activity. The ophthalmic artery was exposed by removing the surrounding fat and muscle. To prevent desiccation-related tissue degradation, the eye was periodically moistened with saline using a cotton applicator. Before cannulation, each eye was warmed to 35 °C for 15 minutes to help dissolve intravascular clots. Under a dissecting microscope, a 28-gauge needle was inserted approximately 1 cm into the ophthalmic artery. The cannula was secured with a tightly tied silk suture, followed by a small amount of super glue for additional reinforcement. To induce flow into the ONH, a syringe pump was connected to the cannula to deliver heparinized phosphate-buffered saline (PBS) mixed with dye at 100 µL/min for approximately 20 minutes using a 50-mL syringe. After perfusion, the cornea was removed and the retinal vasculature was examined under a microscope. Dye filling within the retinal vessels confirmed the preliminary success of perfusion through the ophthalmic artery.

Ongoing work is progressing in three directions. First, we are refining our perfusion procedure to improve vascular filling, including adding plasmin to the perfusate to more effectively dissolve intravascular clots. Second, we are developing a custom inflation chamber to regulate IOP in porcine eyes. Third, we aim to integrate the ex vivo perfusion platform with a laser speckle contrast imaging system to visualize and quantify ONH blood flow and its changes with IOP.

P12.03

Assessing the Photostabilization Method with the Use of Cotton (Gossypium hirsutum) for the Potential Remediation of Per- and Polyfluoroalkyl Contaminants.

Nathan Mays IV, Danuta Leszczynska

Jackson State University, Jackson, MS

Agricultural fields in Mississippi, as well as across the United States, face an increasing risk of exposure to per- and polyfluoroalkyl substances (PFAS) through the application of pesticides and herbicides. Numerous PFAS compounds have been studied for their potential links to adverse health effects, including cancer and congenital disabilities. Notably, several PFAS have been detected as ingredients or contaminants in commercial pesticide and herbicide products. While phytoremediation has been widely investigated for the treatment of metal contaminants, relatively limited research exists regarding its application to PFAS, particularly in association with cotton plants (*Gossypium hirsutum*).

Cotton, one of Mississippi's major crops grown predominantly in the Delta region, is a non-edible fiber crop characterized by deep roots, high biomass production, and extensive use in commercial products such as clothing, textiles, and furniture. Previous scientific studies have demonstrated cotton's capacity to accumulate and stabilize metal contaminants primarily within the root zone, known as phytostabilization, with substantially lower concentrations detected in the lint, the commercially valuable portion of the plant. These findings provide a scientific basis for exploring cotton's potential role in successful phytoremediation of PFAS.

This research focuses on evaluating cotton's phytostabilization capability using the Translocation Factors (TF) and Bioaccumulation Factors (BF) approaches. TF and BF values reported in previously published scientific studies are analyzed using the SPSS software to assess cotton's potential for PFAS stabilization in soil. Given the fertile, nutrient-rich soils of the Mississippi Delta, recognized for their favorable conditions for cotton cultivation, this region presents an ideal environment for further investigation.

This study proposes that, based on cotton's demonstrated performance in metal adsorption and root-zone stabilization, the results warrant substantial consideration for expanded research into its potential phytoremediation capabilities for PFAS.

P12.04

A Multi-Instrument Approach to the Spectroscopic Analysis of Super-Earth Atmospheric Compositions

Margaret Brune, Christopher Sirola

University of Southern Mississippi, Hattiesburg, MS

The atmospheric composition of super-Earth exoplanets can provide critical insight into the structure and potential habitability of each. Previous undergraduate research at USM successfully analyzed Hubble WFC3 transit spectra from NASA's MAST archive, using the Iraclis reduction pipeline and TauREx retrieval framework. However, the limited wavelength range of WFC3 restricted the project's ability to identify many key molecules being searched for. This project extends the previous approach by incorporating multi-instrument observations from HST, JWST, and TESS, thus strengthening detections of pivotal molecules, like H_2O, CO_2, CH_4, CO, and NH_3, by combining data across different wavelength ranges. In addition to illustrating how multi-instrument datasets improve spectral analysis of atmospheric composition, this study aims to produce a deeper atmospheric profile for each target exoplanet, assessing whether any identified chemical features are consistent with conditions relevant to Earth-like habitability.

P12.05

Parametric Analysis of Brick Geometry and Mix Design Effects on Masonry Mechanical Performance

Hailey N Akers, Yassine El Marnissi, Mohammed Elmellouki

Mississippi Valley State University, Itta Bena, MS

Masonry remains a widely used structural material in housing construction, making the optimization of both mix design and internal brick geometry important for improving performance and reducing material consumption. This study investigates how brick geometry and water-to-cement (w/c) ratio jointly affect mechanical behavior using a parametric finite element framework. Four representative geometries (solid, hollow, ribbed, and honeycomb) are analyzed across five w/c ratios (0.40-0.60) using empirical relationships to update density, Young's modulus, and compressive strength. A homogeneous, isotropic, linear-elastic material model is adopted to isolate the effects of geometry and mix proportion within the initial elastic regime, where cementitious materials exhibit approximately linear behavior. This simplification allows a controlled comparison of stiffness, stress distribution, and strength-to-weight efficiency before the onset of nonlinear cracking and aligns with approaches commonly used for early-stage structural screening. Each configuration is subjected to standardized compression and bending loads, and resulting von Mises stress, deformation, and efficiency metrics are quantified. Simulated trends are compared with experimental data from the literature to assess the reasonableness of the assumed elastic relationships. The results identify geometry-mix combinations with favorable stiffness-to-weight characteristics and provide a foundational dataset for subsequent nonlinear or experimental evaluation of improved masonry units for residential construction.

P12.06

Durability of Nuclear Containment Ventilation Materials to Fatigue and Highly Accelerated Life Testing

Jay Patel, Coralie Rose, David Clark, Jamie Gibson

Mississippi State University, Mississippi State, MS

The reliability and longevity of materials used in nuclear facilities depend on their ability to withstand various environmental stressors. This research investigates the changes in material properties as a function of exposure, focusing on glass filtration media and gasket materials used in high-efficiency particulate air (HEPA) filters in nuclear containment ventilation and filtration systems. An accelerated aging technique, Highly Accelerated Life Testing (HALT), is used to determine critical fatigue boundaries and acceptable exposure limits. Fatigue treatment using cyclic stressors provides a resiliency profile for each material. Randomly selected specimens were subjected to controlled stressors, including thermal cycling, humidity variations, ozone exposure, and water-soaking, for 5 days. A hot-temperature step procedure was also performed to determine the material's operational limits and provide information for failure analysis. The exposures were followed by the determination of material properties using tensile strength and modulus, water repellency, and thickness testing for glass medium. Similarly, gasket materials were evaluated for tensile strength, compression recovery, and thickness variations under similar exposure conditions. Additionally, dynamic vapor sorption (DVS) isotherms were recorded to assess surface stability and potential damage to the glass fibers. The analytical data obtained from the tests will enable regulatory agencies such as the Department of Energy, Nuclear Regulatory Commission, and the nuclear power industry to define the duration and conditions of use for each material and assist manufacturers in developing advanced nuclear filters, enhancing public safety and safeguarding communities against harmful radiation leaks from nuclear waste treatment facilities.

Psychology and Social Sciences

Chair: Justin Kelly

Belhaven University

Co-Vice Chair: Terry Drake

Mississippi College

Co-Vice Chair: Terry Drake

Mississippi College

Thursday, March19, 2026

MORNING

Hall C Room 3

9:20 Welcome

O13.01

9:30 The Impact of Photo-Based Social Media and Types of Use on Appearance Preoccupation within Generations

Anna Claire Pearson

Belhaven University, Jackson, MS

This study investigates the relationship between photo-based social media use and appearance preoccupation among adult users across all generational groups. The primary aim is to evaluate the relationship between engagement with platforms such as Instagram, TikTok, and Snapchat and appearance preoccupation scores, and to determine whether meaningful differences exist between generations. The study also examines whether patterns of social media engagement—specifically, active versus passive use—differentially contribute to appearance preoccupation across the broader adult population. Findings from this research will enhance understanding of how generational identity and social media engagement styles interact to influence appearance-related cognitions in digital environments.

O13.02

9:50 The Influence of Attachment Style on Academic Help-Seeking Behaviors Among College Students

Caleb Drake

Belhaven University, Jackson, MS

The purpose of this study is to examine the relationship between college students' attachment styles and their academic help-seeking behaviors. Specifically, this research aims to test the hypothesis that students with a secure attachment style will demonstrate a statistically significant tendency to seek academic help from interpersonal sources—such as professors, peers, or tutors—compared to students with insecure attachment styles. Participants will complete two self-report questionnaires: one measuring attachment style and another assessing academic help-seeking behaviors. This study will also explore the extent to which attachment security or insecurity influences preferences for impersonal sources of help, including online tools, AI resources, or independent problem-solving strategies. By analyzing these patterns, the study seeks to offer a clearer understanding of how relational models formed in early life may shape the ways college students approach academic challenges. Understanding how attachment styles influence students' help-seeking tendencies may provide valuable insights for improving support services, strengthening student-faculty relationships, and promoting academic success through more intentional, personalized interventions within higher education.

O13.03

10:10 Law Students and Inadmissible Evidence: Effects of Evidence Type and Legal Education on Verdicts

Madeline Bullock

Belhaven University, Jackson, MS

This study explores how exposure to inadmissible evidence shapes legal decision-making among law students at varying stages of their education. Drawing on a simulated criminal case, the research examines whether different categories of inadmissible information influence verdict decisions and confidence levels, as well as whether the effect varies by students' progression through law school. The project investigates both emotional and procedural forms of inadmissible evidence, considering how developing legal training may strengthen—or fail to strengthen—students' ability to disregard information deemed inappropriate for consideration in court. By comparing responses, the study aims to shed light on how legal reasoning, evidentiary judgment, and cognitive discipline evolve during professional preparation. Findings from this work have the potential to inform discussions about evidence instruction, the training of future attorneys, and the broader role of legal education in promoting fair and unbiased decision-making.

O13.04

10:30 Variables Affecting Adolescent Adult Content Consumption

Matthew Hicks

Mississippi College, Clinton, MS

Consumption of adult content has risen dramatically in the current age, particularly among adolescents and young adults. The aim of this study is to test the strength of the relationship of adult content consumption with a list of

variables: social media usage, religious involvement/attendance, parenting styles (permissive, authoritative, authoritarian), peer adult content usage, and parental discussion on adult content.

O13.05

10:50 Mother to Mother: The Impact of Maternal Support on Postpartum Depression Symptoms

Shelby Lee Stokes, Drake Terry

Mississippi College, Clinton, MS

Postpartum Depression is a vastly under researched mental health disorder despite its impact on more than 10% of American mothers each year. Research is lacking in accurate diagnostic tactics, treatments, and contributing factors. Specifically, there is a vast lack of research surrounding the personal attributes and situational factors that make a mother more likely to experience postpartum depression and what steps can be taken to decrease a woman's likelihood to face symptoms of postpartum depression. The study attempts to fill some of these research gaps by investigating the impact of maternal support on a woman's likelihood of experiencing postpartum depression symptoms by comparing levels of perceived support to presence of postpartum depression symptoms. To conduct this study, a convenience sample of at least 50 mothers less than one year postpartum completed surveys online using a Google Survey format. It was hypothesized that those mothers who experience greater levels of perceived support from their mothers experience lower levels of postpartum depression symptoms. Pearson's correlation coefficient was used to test this hypothesis, and it was supported. Likelihood of depression levels in the study were far greater than national estimates, impacting a need for further research in the field.

O13.06

11:10 Break the Cycle: A Study on Procrastination and Social Media

Emily Gambill

Mississippi College Department of Psychology, Clinton, MS

Procrastination, a common issue among undergraduate students, has garnered the attention of researchers in recent years, and they have begun to investigate the impact of social media on academic procrastination behaviors. The present study aims to explore the relationship between social media usage, particularly in terms of intensity and multitasking behaviors, and academic procrastination, considering possible correlating factors such as perfectionism, emotional regulation, and attention disruption. Following informed consent, 135 undergraduate students between the ages of 18 and 26 from Mississippi College were surveyed online and asked to complete 20 content-based items as well as 5 demographic questions. The survey used established measures of social media intensity, procrastination, perfectionism, and emotional avoidance. The items used for measuring attention disruption are being piloted in this survey. It is hypothesized that higher social media usage and multitasking will predict greater academic procrastination, which may also be contributed to by positively correlating factors such as perfectionism, emotional avoidance, and attention disruption. Results from this study could offer insight into the psychological and behavioral factors contributing to procrastination, providing a foundation for future academic support programs, therapies, or interventions.

Thursday, March19, 2026

AFTERNOON

Hall C Room 3

O13.07

1:00 Eating and Drinking During Emotional Distress: How Coping Styles Shape Sugar-Sweetened Beverage (SSB) Consumption and Emotional Eating

Khadiza Akter, Tammy Greer, Melinda Slay, Neonta Mahjabin, Emma Bainer, Md Safwan Bin Rashid

University of Southern Mississippi, Hattiesburg, MS

The overconsumption of sugar-sweetened beverages (SSB) has been consistently associated with negative physical and psychological health outcomes. Moreover, emotional eating in response to negative affects has been shown to further increase SSB consumption (Bernard & Ramcharitar-Bourne, 2025). Although previous studies have examined the relationship between sugar-sweetened beverage intake, emotional eating, and mental health, they have not adequately considered the role of coping styles in this association. The purpose of the present study is to examine how coping strategies affect the relationship between SSB consumption, emotional distress, and emotional eating among adults. Data collection is currently in progress for this quantitative study, which includes a sample of 100 participants from diverse backgrounds across the United States. Participants' responses are being collected through online surveys in which they report their mental health symptoms, SSB intake, coping styles, and emotional eating behaviors. Correlation analysis, one-way ANOVA, and multiple moderated regression analyses will be employed to test the proposed hypotheses. Predicted results suggest that individuals scoring higher on the Depression, Anxiety, Stress Scale (DASS) will report increased SSB consumption and elevated emotional eating. These effects are expected to be stronger for individuals who use maladaptive coping styles when adapting to distressful situations. On the other hand, adaptive coping styles are expected to play a buffering role in the

relationship between mental distress, SSB consumption, and emotional eating, reducing the likelihood of increased SSB intake and emotionally driven eating in response to negative emotional experiences. It is also hypothesized that SSB consumption will vary across different age groups. The findings of this study will provide valuable insights into how coping styles play a vital role in reducing the impact of negative emotions on unhealthy eating and drinking patterns to promote a healthy lifestyle. This research will also support the development of coping-focused interventions aimed at reducing chronic diseases such as type 2 diabetes, obesity, and cardiovascular disorders that stem from excessive SSB consumption and unhealthy eating behaviors triggered by negative emotional experiences. Overall, the study's findings will offer an important contribution to public health and mental health advocacy.

O13.08

1:20 Examining the Influence of Childhood Trauma and Gender on Adult Attachment Styles and Relationship Satisfaction

Shyanne Cazeau[1], Juliette Schweitzer[2], Ryan Liu-Pham[1]

[1]Jackson State University, Jackson, MS, [2]Mississippi State Hospital, Flowood, MS

Introduction: This study examines the impact of childhood trauma on gender, attachment style, and relationship satisfaction. Attachment Theory (Bowlby, 1969) serves as the theoretical framework to explore whether gender alters the influence of adverse childhood experiences on adult attachment styles. The study also investigates whether relationship satisfaction is impacted by attachment style, gender, and childhood trauma.

Objective: The purpose of this study was to examine the influence of adult attachment style and relationship satisfaction, with gender as a moderating variable.

Method: Participants (N = 231) were recruited through volunteer sampling via online platforms (Facebook, Instagram, and LinkedIn) and Jackson State University email. A multiple regression analysis was conducted to test main effects and interaction effects using PROCESS Macro.

Results: Childhood trauma was significantly negatively correlated with secure attachment and positively correlated with anxious and avoidant attachment. However, within the regression analysis, childhood trauma did not significantly predict secure, avoidant, or anxious attachment, and gender did not serve as a moderator.

Discussion: Findings indicate that childhood trauma is associated with lower levels of secure attachment and higher levels of anxious and avoidant attachment. Gender did not significantly moderate the relationship between childhood trauma, relationship satisfaction, and attachment style; therefore, it did not have a significant impact on relationship satisfaction. When relationship satisfaction was analyzed as a continuous variable, childhood trauma was associated with decreased relationship satisfaction for males.

O13.09

1:40 Growing Research Infrastructure Together in Mississippi (GRIT MS): A Statewide Effort to Strengthen Research Administration Capacity

Rachel Scott, Sarah Mason, Erik Hom

University of Mississippi, University, MS

Growing Research Infrastructure Together in Mississippi (GRIT MS) is an NSF GRANTED planning grant (NSF Award #2534553) designed to assess and strengthen the research administration capacity of Mississippi's institutions of higher education (IHEs). As one of the most underfunded states by NSF, Mississippi continues to face persistent challenges in research infrastructure.

This session will introduce Mississippi Academy of Science (MAS) participants to the scope, methods, and goals of GRIT MS. The project's statewide learning and needs assessment will identify gaps and opportunities in research support systems across diverse institutional types—including R1s, R2s, HBCUs, regional universities, private colleges, and community colleges. Using surveys, interviews, site visits, and convenings, the project will produce a comprehensive inventory of research administration assets and needs that will inform a statewide strategic infrastructure development plan. This plan will support institutional readiness for future NSF GRANTED implementation proposals and help identify prospective PIs and cross-institutional collaborators.

Attendees will learn how the project will generate Mississippi's first statewide, cross-institutional dataset on research administration systems and explore opportunities for MAS members to participate in or benefit from this collective effort to strengthen research capacity and expand the state's presence in the U.S. research enterprise.

O13.10

2:00 Social Media Usage as a Coping Mechanism for Prostate Cancer Patients

Ameena Rauf, Carolyn Gordon

Mississippi Valley State University, Itta Bena, MS

Cancer is a life-threatening disease. Prostate cancer is considered dangerous nationally and globally. In 2024, an estimated 299,010 new cases of prostate cancer were expected to be diagnosed in the United States. This number accounts for about 14.9% of all new cancer cases. According to the American Cancer Society, 2025, it is estimated that about 313,780 new cases of prostate cancer and about 35,770 deaths from prostate cancer were

reported (American Cancer Society, 2025). It is the second most common cancer in men and the second leading cause of cancer-related deaths among men. This disease needs proper treatment, ways of coping, and awareness of its impact on patients' lifestyles. Social media can play a tremendous positive role in helping patients cope with the disease. However, concerns to use the internet in general as a source of health information to make health and medical treatment decisions are not yet established due to the fact that patients do not feel confident enough to use the social media information to make health and treatment decisions. Therefore, the objective of this study is to further investigate the role of major social media tools, such as Facebook, in helping patients cope with prostate cancer and using it as a source of health information. We hypothesized that Facebook supports patients in coping with prostate cancer, contributing positively to patient's lifestyle . A quantitative research method was used for this study. Data was collected from Facebook posts using the Prostate Cancer Foundation, PCF, as a source. A total number of 856 Posts from January to March 2025, and 1333 Posts from March to April 2025 were used. The results showed that 669 posts of Dislikes, 84 posts of Comments, and 103 posts of Sharing were collected. The results also showed that the highest number of likes posts was in the category of Awareness with 146 (21.8%); followed by Testimonies with 128 with a percentage of 19.1%, and finally, the smallest categories were medication with 24 (3.6%), and Mental Health with 50 (7.5%). The rest of categories were situated between these major biggest and lowest categories. For March to April posts, similar, but a little bit different in some Categories were observed. It is concluded that the post "Likes" was popular, especially in the categories of Awareness, Testimonies, Emotional Health, Food/Nutrition, Treatment, and Diagnostic. This is because these categories are important for the patient's overall emotional and mental health, and lifestyle. Based on the above Posts, Likes, and Categories, Facebook positively impacts the patients and can contribute to the overall physical and emotional health and well-being, and consequently the patients will cope with pain and disease better and faster. We cannot conclude, at the moment, that Facebook can contribute to the cure of the disease. Future research is needed to use more sources, a large number of posts to establish the positive contribution of social media to disease management and overall patient health.

2:20 Divisional Business Meeting

THURSDAY, March19, 2026
EVENING
Hall C
5:00-7:30 Reception and General Poster Session (Immediately following Dodgen Event)

All posters should be placed in the poster all by 12:00 pm on Thursday, March 19, 2026

Odd poster numbers will be presented from 5 -6

Even poster numbers will be presented from 6-7

P13.01

Exploring Hidden Pathways: Psychological Inflexibility as a Mediator Between ADHD Symptoms and Psychological Distress

Ashley Middleton[1], Jennifer Krafft[2]

[1]Mississippi State University Mississippi State, MS, [2]Lemoyne College, Syracuse, NY

Adult attention-deficit/hyperactivity disorder (ADHD) is a neurodevelopmental condition associated with substantial functional impairment and elevated levels of psychological distress (Safren et al., 2010). However, the mechanisms underlying the ADHD-distress relationship remain unclear. One potential factor that could explain how ADHD symptoms are connected to distress is psychological inflexibility — a rigid behavioral pattern in which individuals prioritize avoiding unwanted internal experiences (such as thoughts, emotions, and sensations) over engaging in behaviors that align with their values and goals (Hayes et al., 2006). While this process has been linked to a range of mental health difficulties (Akbari et al., 2022), its role as a potential mediator between ADHD symptoms and psychological distress is currently an unexplored area of research. Therefore, the present study examines whether psychological inflexibility mediates the relationship between ADHD symptoms and psychological distress. A general population sample of 469 U.S. adults (age range = 19-78 years, M_{age} = 42.3 years, 52.0% female, 47.5% male, 0.4% non-binary) was recruited through an online research platform. Participants completed an online survey containing self-report measures of psychological inflexibility, ADHD symptoms, and psychological distress. A mediation analysis was conducted using the lavaan package in R. Results revealed significant partial mediation, indicating that psychological inflexibility helps explain the relationship between ADHD symptoms and psychological distress (ab = 0.39, 95% CI [0.32, 0.47], p < .001). Higher ADHD symptoms were associated with greater psychological inflexibility, which in turn predicted increased psychological distress. This study provides preliminary evidence that psychological inflexibility partially mediates the relationship between ADHD

symptoms and psychological distress. Specifically, individuals with higher ADHD symptoms may experience greater distress when they engage in rigid avoidance of difficult internal experiences associated with their symptoms. This suggests that interventions aimed at reducing psychological inflexibility, such as Acceptance and Commitment Therapy (ACT), may be effective by focusing on changing how people respond to their symptoms, not just on reducing the symptoms themselves. Limitations of this study include the cross-sectional design which prevents conclusions about causality and the use of a non-clinical sample.

P13.02

The Role of Self-Compassion and Mindfulness in Psychological Wellbeing of College Students

Elizabeth Clark

Mississippi College Psychology Department, Clinton, MS

Those practicing self-compassion and mindfulness skills reap many mental health benefits, especially when the two skills are practiced together. Today's college students are under increasing stress and pressure, and, hypothetically, they would greatly benefit from these coping strategies and skills. Although there is plenty of research that exists on the mental health struggles of today's college students, in-depth research about applying self-compassion and mindfulness tactics as a solution to these struggles is few and far between. This study will poll 18- to 24-year-old undergraduate students using the Self Compassion Scale Short Form (SCS-SF) and the Short Warwick-Edinburgh Mental Well-Being Scale (SWEMWBS) tests as a model. The data collected will be used to observe the correlation between self-compassion and mindfulness statistics and the mental wellbeing of college students.

P13.03

The Psychological Burnout in Christian College Athletes

Samantha Maddox

Belhaven University, Belhaven, MS

Research has been conducted thoroughly on burnout in high school athletes. However, research has not been conducted on burnout in Christian college athletes. If it has been conducted, it has not been conducted through the lens of Christianity and religion. This study investigated the possible relationship between burnout and time commitment, sleep deprivation, intensity, life transition, aging, and coaching styles: autonomy supportive and controlling coaching. To evaluate the possibility of each relationship, a sample of 50 people ranging from Mississippi College undergraduates and graduates to Hannibal Lagrange University undergraduates and graduates will complete a survey online using a Google Survey format. The survey will consist of questions from the School Burnout Inventory (SBI), Controlling Coach Behavior Scale (CCBS), the Passion Scale, as well as new questions formatted by the surveyor. It is hypothesized that burnout in Christian college athletes is more prevalent because of sleep deprivation, time commitment, intensity, and the transition from high school to college. Additionally, burnout in Christian college athletes is more prevalent because of the intensity of coaches and their coaching styles. Standard deviation and correlations will be used in order to test these hypotheses.

P13.04

Social Media Usage as a Coping Mechanism for Prostate Cancer Patients

Ameena Rauf, Carolyn Gordon

Mississippi Valley State University, Itta Bena, MS

Cancer is a life-threatening disease. Prostate cancer is considered dangerous nationally and globally. In 2024, an estimated 299,010 new cases of prostate cancer were expected to be diagnosed in the United States. This number accounts for about 14.9% of all new cancer cases. According to the American Cancer Society, 2025, it is estimated that about 313,780 new cases of prostate cancer and about 35,770 deaths from prostate cancer were reported (American Cancer Society, 2025). It is the second most common cancer in men and the second leading cause of cancer-related deaths among men. This disease needs proper treatment, ways of coping, and awareness of its impact on patients' lifestyles. Social media can play a tremendous positive role in helping patients cope with the disease. However, concerns to use the internet in general as a source of health information to make health and medical treatment decisions are not yet established due to the fact that patients do not feel confident enough to use the social media information to make health and treatment decisions. Therefore, the objective of this study is to further investigate the role of major social media tools, such as Facebook, in helping patients cope with prostate cancer and using it as a source of health information. We hypothesized that Facebook supports patients in coping with prostate cancer, contributing positively to patient's lifestyle . A quantitative research method was used for this study. Data was collected from Facebook posts using the Prostate Cancer Foundation, PCF, as a source. A total number of 856 Posts from January to March 2025, and 1333 Posts from March to April 2025 were used. The results showed that 669 posts of Dislikes, 84 posts of Comments, and 103 posts of Sharing were collected. The results also showed that the highest number of likes posts was in the category of Awareness with 146 (21.8%); followed by Testimonies with 128 with a percentage of 19.1%, and finally, the smallest categories were medication with 24 (3.6%), and Mental Health with 50 (7.5%). The rest of categories were situated between these major biggest

and lowest categories. For March to April posts, similar, but a little bit different in some Categories were observed. It is concluded that the post "Likes" was popular, especially in the categories of Awareness, Testimonies, Emotional Health, Food/Nutrition, Treatment, and Diagnostic. This is because these categories are important for the patient's overall emotional and mental health, and lifestyle. Based on the above Posts, Likes, and Categories, Facebook positively impacts the patients and can contribute to the overall physical and emotional health and well-being, and consequently the patients will cope with pain and disease better and faster. We cannot conclude, at the moment, that Facebook can contribute to the cure of the disease. Future research is needed to use more sources, a large number of posts to establish the positive contribution of social media to disease management and overall patient health.

P13.05

Mother to Mother: The Impact of Maternal Support on Postpartum Depression Symptoms

Shelby Lee Stokes, Drake Terry

Mississippi College, Clinton, MS

Postpartum Depression is a vastly under researched mental health disorder despite its impact on more than 10% of American mothers each year. Research is lacking in accurate diagnostic tactics, treatments, and contributing factors. Specifically, there is a vast lack of research surrounding the personal attributes and situational factors that make a mother more likely to experience postpartum depression and what steps can be taken to decrease a woman's likelihood to face symptoms of postpartum depression. The study attempts to fill some of these research gaps by investigating the impact of maternal support on a woman's likelihood of experiencing postpartum depression symptoms by comparing levels of perceived support to presence of postpartum depression symptoms. To conduct this study, a convenience sample of at least 50 mothers less than one year postpartum completed surveys online using a Google Survey format. It was hypothesized that those mothers who experience greater levels of perceived support from their mothers experience lower levels of postpartum depression symptoms. Pearson's correlation coefficient was used to test this hypothesis, and it was supported. Likelihood of depression levels in the study were far greater than national estimates, impacting a need for further research in the field.

P13.06

Urbanicity and children's mental health treatment: The mediating effect of perceived difficulty obtaining care

Brianna Cox, Sam Freville, Brittany Lancaster

Mississippi State University, Mississippi State, MS

Background/Objective: Research on the prevalence of mental health problems in urban and rural populations has a mixed consensus on which population is more affected (Watanabe-Galloway et al., 2017). However, access to mental health service does vary across the United States, with urban areas typically having more providers and resources, while rural families face provider shortages (HRSA, 2024). This study aims to evaluate if prevalence of mental health problems or receipt of treatment varies based on urbanicity. Further, this study aims to determine whether difficulty obtaining treatment mediates the relationship between urbanicity and the receipt of mental health treatment.

Method: Parents of children ages 0-17 (N=48,965; M age=8.60, SD=5.3; 48.4% Female; 64.2% White) completed the National Survey of Children's Health about their child. Parents completed questionnaires regarding their child's mental health problems; including presence of an emotional, developmental, and behavioral problems that needed treatment; the receipt of treatment; and the difficulty of obtaining treatment. Provided addresses were classified as metropolitan or non-metropolitan using U.S. Census Bureau criteria. A chi-square test was utilized to determine mean differences between rural and urban participants on presence of mental health problems. For youth who were identified as having a mental health problem (n=7180), a chi-square analysis examined whether receipt of mental health treatment differed by urbanicity. Further, analyses estimated the indirect effect of urbanicity on receiving mental health treatment through the proposed mediator of difficulty obtaining mental health care.

Results: There were no significant differences in prevalence of mental health problems for those living in urban versus rural areas (χ^2 (1, N=48,965)=1.67, p=.20). For those that had a mental health problem, youth in urban areas (57.6%) were more likely to receive treatment compared to those living in rural areas (49.1%; χ^2 (1, N=7,180)=11.56, p<.001).

When examining receipt of treatment, results indicated the indirect effect of urbanicity through difficulty obtaining treatment was significant with an estimate of -.13, 95% CI: [-0.21, -0.04]. Analyses indicated a significant positive association between urbanicity and difficulty accessing mental health care (b=0.11, p=.002), and a negative association between difficulty accessing care and obtaining care (b=-1.19, p<.001). The direct effect was significant (b=0.34, p=.003, 95% CI: [0.11, 0.56]), revealing that those

in urban populations are more likely to obtain mental healthcare services.

Discussion: The findings suggest that although urban and rural areas do not differ significantly in the prevalence of behavioral problems, children in rural areas are less likely to receive mental health care services. Interestingly, urban populations report higher difficulties when seeking out mental health care but are more likely to obtain healthcare for their children. Future research should explore if rural populations are reporting less difficulty obtaining services due to lower rates of seeking services or truly greater ease in obtaining services.

P13.07

Break the Cycle: A Study on Procrastination and Social Media

Emily Gambill

Mississippi College Department of Psychology, Clinton, MS

Procrastination, a common issue among undergraduate students, has garnered the attention of researchers in recent years, and they have begun to investigate the impact of social media on academic procrastination behaviors. The present study aims to explore the relationship between social media usage, particularly in terms of intensity and multitasking behaviors, and academic procrastination, considering possible correlating factors such as perfectionism, emotional regulation, and attention disruption. Following informed consent, 135 undergraduate students between the ages of 18 and 26 from Mississippi College were surveyed online and asked to complete 20 content-based items as well as 5 demographic questions. The survey used established measures of social media intensity, procrastination, perfectionism, and emotional avoidance. The items used for measuring attention disruption are being piloted in this survey. It is hypothesized that higher social media usage and multitasking will predict greater academic procrastination, which may also be contributed to by positively correlating factors such as perfectionism, emotional avoidance, and attention disruption. Results from this study could offer insight into the psychological and behavioral factors contributing to procrastination, providing a foundation for future academic support programs, therapies, or interventions.

P13.08

The Effects of Positive versus Negative Emotions on Memory Accuracy and False Information Detection in Narrative Passages

Dakota Billiu, Lin-Miao Agler, Kaci Dean, Mahmuda Islam Bonna, Anjan Poudel

The University of Southern Mississippi, Hattiesburg, MS

Prior research demonstrates that emotion plays a critical role in shaping memory accuracy and susceptibility to misinformation. Positive moods promote relational processing, a broad, associative way of thinking that enhances recall but also increases vulnerability to false memories. In contrast, negative moods encourage item specific, detail focused processing that improves accuracy and protects against distortion (Storbeck & Clore, 2005; Kensinger, 2007; Li et al., 2024). However, many of these findings rely on artificially constructed materials such as word lists or single images. It is unclear whether similar effects appear in more realistic learning settings, such as narrative passages that resemble everyday reading tasks. The present study examines how college students' emotional states aroused by narrative passages with positive or negative connotations influence recall accuracy and misinformation detection. Participants will be undergraduate students who will receive course credit for reading four short narrative passages, two containing positive emotional content (e.g., happiness, excitement, joy) and two containing negative emotional content (e.g., sadness, anger, frustration), in random order. After each passage, participants will rate their mood on a 1-10 scale, judge their confidence of their answer on a 1-4 scale, and complete a four-item multiple-choice quiz containing both accurate and misleading questions, followed by another confidence rating. It is hypothesized that participants exposed to negatively toned passages will demonstrate greater memory accuracy, lower misinformation acceptance, and better calibration between confidence and accuracy than those who read positively toned passages. Conversely, exposure to positively toned narratives is expected to produce higher confidence but poorer calibration between confidence and accuracy. By applying emotion and memory paradigms on short-story reading, this study aims to evaluate how emotional states shape the encoding, retrieval, and evaluation of information in an educationally relevant context.

P13.09

Examining the Influence of Childhood Trauma and Gender on Adult Attachment Styles and Relationship Satisfaction

Shyanne Cazeau[1], Juliette Schweitzer[2], Ryan Liu-Pham[1]

[1]Jackson State University, Jackson, MS, [2]Mississippi State Hospital, Flowood, MS

Introduction: This study examines the impact of childhood trauma on gender, attachment style, and relationship satisfaction. Attachment Theory (Bowlby, 1969) serves as the theoretical framework to explore whether gender alters the influence of adverse childhood experiences on adult attachment styles. The study also investigates whether relationship satisfaction is impacted by attachment style, gender, and childhood trauma.

Objective: The purpose of this study was to examine the influence of adult attachment style and relationship satisfaction, with gender as a moderating variable.

Method: Participants (N = 231) were recruited through volunteer sampling via online platforms (Facebook, Instagram, and LinkedIn) and Jackson State University email. A multiple regression analysis was conducted to test main effects and interaction effects using PROCESS Macro.

Results: Childhood trauma was significantly negatively correlated with secure attachment and positively correlated with anxious and avoidant attachment. However, within the regression analysis, childhood trauma did not significantly predict secure, avoidant, or anxious attachment, and gender did not serve as a moderator.

Discussion: Findings indicate that childhood trauma is associated with lower levels of secure attachment and higher levels of anxious and avoidant attachment. Gender did not significantly moderate the relationship between childhood trauma, relationship satisfaction, and attachment style; therefore, it did not have a significant impact on relationship satisfaction. When relationship satisfaction was analyzed as a continuous variable, childhood trauma was associated with decreased relationship satisfaction for males.

P13.10

Examining the Influence of Childhood Trauma and Gender on Adult Attachment Styles and Relationship Satisfaction

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P13.11

The Impact of Photo-Based Social Media and Types of Use on Appearance Preoccupation within Generations

Anna Claire Pearson

Belhaven University, Jackson, MS

This study investigates the relationship between photo-based social media use and appearance preoccupation among adult users across all generational groups. The primary aim is to evaluate the relationship between engagement with platforms such as Instagram, TikTok, and Snapchat and appearance preoccupation scores, and to determine whether meaningful differences exist between generations. The study also examines whether patterns of social media engagement—specifically, active versus passive use—differentially contribute to appearance preoccupation across the broader adult population. Findings from this research will enhance understanding of how generational identity and social media engagement styles interact to influence appearance-related cognitions in digital environments.

P13.12

The Influence of Attachment Style on Academic Help-Seeking Behaviors Among College Students

Caleb Drake

Belhaven University, Jackson, MS

The purpose of this study is to examine the relationship between college students' attachment styles and their academic help-seeking behaviors. Specifically, this research aims to test the hypothesis that students with a secure attachment style will demonstrate a statistically significant tendency to seek academic help from interpersonal sources—such as professors, peers, or tutors—compared to students with insecure attachment styles. Participants will complete two self-report questionnaires: one measuring attachment style and another assessing academic help-seeking behaviors. This study will also explore the extent to which attachment

security or insecurity influences preferences for impersonal sources of help, including online tools, AI resources, or independent problem-solving strategies. By analyzing these patterns, the study seeks to offer a clearer understanding of how relational models formed in early life may shape the ways college students approach academic challenges. Understanding how attachment styles influence students' help-seeking tendencies may provide valuable insights for improving support services, strengthening student-faculty relationships, and promoting academic success through more intentional, personalized interventions within higher education.

P13.13

Law Students and Inadmissible Evidence: Effects of Evidence Type and Legal Education on Verdicts

Madeline Bullock

Belhaven University, Jackson, MS

This study explores how exposure to inadmissible evidence shapes legal decision-making among law students at varying stages of their education. Drawing on a simulated criminal case, the research examines whether different categories of inadmissible information influence verdict decisions and confidence levels, as well as whether the effect varies by students' progression through law school. The project investigates both emotional and procedural forms of inadmissible evidence, considering how developing legal training may strengthen—or fail to strengthen—students' ability to disregard information deemed inappropriate for consideration in court. By comparing responses, the study aims to shed light on how legal reasoning, evidentiary judgment, and cognitive discipline evolve during professional preparation. Findings from this work have the potential to inform discussions about evidence instruction, the training of future attorneys, and the broader role of legal education in promoting fair and unbiased decision-making.

P13.14

Variables Affecting Adolescent Adult Content Consumption

Matthew Hicks

Mississippi College, Clinton, MS

Consumption of adult content has risen dramatically in the current age, particularly among adolescents and young adults. The aim of this study is to test the strength of the relationship of adult content consumption with a list of variables: social media usage, religious involvement/attendance, parenting styles (permissive, authoritative, authoritarian), peer adult content usage, and parental discussion on adult content.

P13.15

Binaural Beats Improve Pareidolia Visual Task

*Angel Bell, Ward Adams, Ella Brown, Sofia Elenkov, Kaitlyn Hamblin, Hannah Hinckley, Emily Huff, Jasmine Kaur, Jonathan Lott, Catalina McCoy, Duha Musa, Christina Raley, Anna Redhead, Kaniquia Fulton, Joshua Khanna, Erick Bourassa and Scoty Hearst **

The Department of Chemistry and Biochemistry, Mississippi College, Clinton, MS, University of Mississippi Medical Center, Jackson, MS

Binaural beats are an auditory illusion created by the brain when it hears two different frequencies at the same time in each ear. Binaural beats are used to influence brainwave activity to induce different mental states, such as reducing anxiety, improving focus, and promoting relaxation or sleep. By using two different sound frequencies, one for each ear, the brain creates the perception of a third tone that can align with specific brainwave patterns associated with states like deep sleep (delta waves), creativity (theta waves), or concentration (beta and gamma waves). The purpose of the experiment was to determine if binaural beats can stimulate the brain to improve a pareidolia visual task. Students were presented with a pareidolia visual task while listening to binaural beats or control. The data distributed into two groups: a Low Response Group and a High Response Group. Binaural beats significantly improved the pareidolia visual task results in the High Response Group of students. The findings suggest that binaural beats may be increasing concentration or increasing visual hallucinations in a subset of subjects warranting further study.

Science Education

Chair: Sarah Lalk

Mississippi State University

Co-Vice-Chair: Christa Haney

Mississippi State University

Co-Vice-Chair: Angela Carraway

Meridian Community College

Thursday, March 19, 2026

Hall D Room 12

8:45 Welcome

O14.01

9:00 A Study of Emerging Infectious Diseases

Johnny Mattox

Blue Mountain Christian University, Blue Mountain, MS

Students enrolled in General Microbiology class at Blue Mountain Christian University during the fall semester of 2025 completed an extensive study of several emerging infectious diseases, diseases that have shown an increase in incidence or have been newly identified. From the listing of ten emerging infectious diseases students were asked which of the diseases that they believed posed the greatest threat to the United States population. 67% of the students chose COVID infections and 33% of the students chose human immunodeficiency viral infections (HIV). Students were also asked to defend why they chose the disease they decided on as well as list the signs and symptoms resulting from the disease. They successfully characterized what emerging infectious diseases were and also identified what signs and symptoms characterized each disease. Students also exhibited positive dispositions for the study of these diseases.

O14.02

9:15 Negotiating Boundaries and Stress: A Qualitative Study of Well-Being Among Nursing Faculty, Staff, and Students

Tina Martin[1], Michelle Palokas[1], Xiaoshan Gordy[1], Olivia Martin[2], Julie Sanford[3]

[1]University of Mississippi Medical Center, [2]LivMore, [3]University of Alabama

Background: Nursing is considered one of the most stressful healthcare professions and the risk of burnout is high. The COVID-19 pandemic exacerbated stressors, highlighting the importance of nurses' well-being.

Aim: This study aimed to explore the perceived barriers and facilitators to well-being among faculty, staff, and students at the School of Nursing at the University of Mississippi Medical Center through a qualitative approach.

Methods: Forty-one faculty, staff, and students participated in seven focus groups. These sessions were facilitated by an external certified consultant using a semi-structured interview guide. Sessions were audio-recorded and transcribed. Thematic analysis was employed to analyze transcripts.

Results: Four themes emerged, including experiencing the impact of stress, struggling to disconnect from work or school, establishing boundaries between work and life, and employing tactics to free the mind from work or school intrusions.

Conclusion: The four themes reflect a dynamic process of boundary negotiation affecting well-being. Recommendations include implementing after-hours communication policies, redistributing workloads, embedding resilience programs, and encouraging leadership to model work-life balance.

O14.03

9:30 Can the "Story Behind the Story" Optimize Students' Science Identities and Professional Society Participation? Lessons From the Adi Geo-History Project

Renee Clary

Mississippi State University, Mississippi State, MS

Although part of the 1996 K-12 National Science Education Standards, the History and Nature of Science did not receive their own strand with the Next Generation Science Standards. However, research documented the benefits of the history of science in the science classroom, especially as it related to increasing students' understanding of the nature of science. For our 2-year NSF-sponsored proof-of-concept program, we recruited college geoscience majors from historically underrepresented groups and engaged them within professional societies. Two cohorts (N = 27) participated in one year of programming that focused on the history of petroleum extraction. ADI Geo-History 1) supported student memberships in professional history of science and geosciences societies, 2) subsidized student attendance at a professional conference and accompanying petroleum history field excursion, 3) hosted monthly virtual hang-out sessions, and 4) mentored students as they disseminated what they had learned on their home campuses. Paired pre-/post- surveys documented significant gains in science identity in both cohorts, and significant gains in cohort 1 on students' history of petroleum understanding and their sense-of-belonging in professional societies. The research affirmed that an authentic history of science, that includes

multiple perspectives, can optimize geoscience students' science identities, as well as increase their sense of belonging and comfort levels in professional societies.

O14.04

9:45 The Use of AI in an Online Geoscience Course

Christa Haney

Mississippi State University, Mississippi State, MS

This presentation will explore the integration of artificial intelligence (AI) in an online geoscience class from the perspective of a professor who has just begun to use AI. This talk will examine how AI can be optimized to manage and enhance learning in an online Earth science course. AI has proven to be useful to summarize lengthy assignments and discussions, generate project ideas, and streamline communication thus improving productivity. The session will discuss practical benefits, challenges, and ethical considerations for the use of AI in an online classroom, while highlighting the pros and cons of AI use, as well as strategies to effectively incorporate AI in online geoscience teaching. Finally, this talk will address key challenges including how to maintain privacy, and academic integrity, while ensuring accuracy, fostering critical thinking and supporting student creativity.

10:00 Break

O14.05

10:15 - Revolutionizing Meteorology Instruction: The Impact of VR Immersive Learning Labs

Grace Olaitan

Mississippi State University, Mississippi State, MS

This research will investigate the integration of Virtual Reality (VR) immersive learning labs into a college-level Weather and Climate course. The project aims to enhance student engagement and learning outcomes by providing hands-on, interactive opportunities that complement and extend traditional instructional methods. The VR-enhanced labs will create opportunities for experiential learning, allowing students to interact with weather and climate concepts inside immersive 3D environments. This paper will describe the design and planned implementation of fifteen VR experiences developed using the Engage VR platform and will assess the comparative effectiveness of VR-based labs versus traditional workbook-based lab sections. It is anticipated that VR-enhanced labs will yield higher levels of engagement and improved learning outcomes when compared to traditional face-to-face labs. The study will also examine the feasibility of scaling these VR experiences to additional courses, with broader implications for STEM education, particularly for underserved and rural learning communities.

O14.06

10:30 Spatial Data and Local Environments

Athena Owen Nagel

Mississippi State University, Mississippi State, MS

Experience in online geoscience courses over the last decade has shown that incorporating spatial data increases student engagement with course materials. However, students are often not aware that their data has a spatial component. Course work using spatial data can address this, but having students explore spatial data from their local environments may further enhance this learning. Based on an introductory online GIS class where students explored spatial data from both inside and outside of their local environment, results indicate that students more fully understand the spatial component to their data when they can compare it to an area known to them. Student reports, and post course reflections, over several semesters highlight that collecting and using data in their local environments enhanced understanding of the spatial components of the data, because the students understood what the data should look like. As a result, students were better able to focus on other factors in the data and consider concepts of resolution, inaccuracies, and how errors can occur in data collection.

O14.07

10:45 The Optics of It All

Bob Swanson

Mississippi State University, Mississippi State, MS

This case study uses a viewer-submitted photograph of a suspected funnel cloud to examine how atmospheric optics, meteorology, and cognitive bias influence interpretation of visual evidence. This guided discussion (and live performance of some "Power Pop-tics" music) will allow participants to analyze reflections, shadowing, and cloud illumination to evaluate whether the image shows a weather feature or a dashboard reflection. Social media reactions and a broadcast meteorologist's public explanation are then discussed to highlight confirmation bias, appeals to authority, and logical fallacies. An interesting mix of optics, meteorology, social media, critical thinking, and a cautionary tale about AI, this presentation ultimately emphasizes the need for humility, collaboration, and careful communication when conveying scientific interpretations to the public.

O14.08

11:00 The potential for Public Engagement and Education with a Telescope on the Moon

Angelle Tanner, Sarah Nagel

Mississippi State University, Mississippi State, MS

The **LUSTER** (LUnar-based Survey for Time-domain Exploration and Research) mission will fly a 20-centimeter

telescope that will hitch a ride on an upcoming lunar lander. The telescope will include an ultraviolet and optical camera. The science goals for the mission include studying exoplanet atmospheres, comets, and Near-Earth asteroids. Scientists are getting this opportunity to place a telescope on the Moon because of the work being done for the Artemis program to return people to the lunar surface. We are aiming for a launch around 2029.

Given this unique location, this unique moment in science history, and our reasons for placing a telescope on the Moon, there are ample opportunities to engage the public and students in multiple STEM topics related to the mission—astronomy, atmospheric science, physics, and geology. The physics behind launching and landing a vehicle on the Moon is an excellent way to discuss gravity, momentum, conservation of energy, and thermodynamics. The motivation for placing a telescope on the Moon relates to the differences between the Earth's and Moon's atmospheres. We will also have to consider lunar geology when designing the telescope to ensure that lunar regolith does not impact the instrument's mechanics upon landing.

There is also a natural connection to the science and technology being developed in Mississippi at NASA Stennis, for instance. I will review the specifics of the LUSTER mission and provide examples of lesson plans, demonstrations, and promotional content that can be directly tied to this effort. I welcome input from the local science education community as well!

O14.09

11:15 Immersive Physics Learning for Students with ASD: Lessons from a Residential Summer Program

Claire Geneser, Ben Crider, Sarah Nagel

Mississippi State University, Mississippi State, MS

I present an overview of the Physics Summer Camp program for students with ASD (autism spectrum disorder) held annually at Mississippi State University since 2022. This one-week course is designed for teenage students to immerse themselves into the studies of physics while staying overnight in the campus dormitories. Graduate students from both physics and psychology serve as counselors, offering academic guidance as well as social support throughout the week. Each day focuses on a different area of physics, including astronomy, aeronautics, electromagnetism, and nuclear physics. We have created a schedule which merges college-level concepts with hands-on demonstrations and small projects. The program also includes field trips to MSU's High Energy Voltage Lab, the Raspet Flight Research Center, and the Institute for Clean Energy Technology, giving students direct exposure to research environments and STEM career pathways. The camp is designed not only to deepen students' enthusiasm for science, but also to help them build confidence and grow their social skills within a structured, supportive setting. This presentation will highlight the impact the program has had on participants, including expanded peer networks, increased interest in physics, and the long-term influence on their academic aspirations.

O14.10

11:30 The Brain Drain Dilemma: Mississippi's Startling Loss of Overall Population and Health Science Professionals

Edgar Meyer

University of Mississippi Medical Center, Jackson, MS

For over a decade, Mississippi has experienced a net efflux of its overall population each year. While the exodus of roughly one thousand people each year is not alarming at first glance, the fact that Mississippi's population is not growing and the fact that it remains the least populated state within the Southeast should warrant attention. This loss includes college graduates, health professionals, and other scientists who contribute to scientific discoveries, education, and healthcare that benefit Mississippians and their posterity. A review of census, national education statistics, and Centers for Disease Control and Prevention data elicits the dire need for interventions to help mitigate this growing dilemma. Moreover, the high rates of poverty and food insecurity may leave families seeking better opportunities with limited means of obtaining them, especially if those who have the capacity to enact change to alleviate these burdens do not remain in state. An exploration of population growth and retention strategies in other states reveals potential solutions to Mississippi's brain drain issue and may provide the answer to preventing the loss of its brightest minds. Grassroots efforts in the development and implementation of programs and resources that aim to improve the health literacy, health science career awareness, and desire to pursue health science careers among its citizens and especially its most at-risk populations also provide hope. Examples include pipeline, pathway, and bridge programs that target individuals across the educational continuum (i.e., K-12, undergraduate, postbaccalaureate, and graduate). The University of Mississippi Medical Center (UMMC) hosts such programs as do several other public universities and private colleges within the state. A discussion of additional strategies that involve influential activists, compassionate patrons of youth programs, non-profit organizations, foundations, and community stakeholders can open doors to other hopeful possibilities. Seeking monetary support from local, state, and federal governments as well as support from these respective governmental leaders is especially essential. Overall, the time to act is now, and the time to rally all possible means of support becomes more immediate with each passing year. If the current and future educators, scientists, and healthcare providers are encouraged and even incentivized to remain in Mississippi,

a brighter outlook for reducing the health disparities, improving the education, fostering the innovations, and enhancing the overall advancement and well-being of its citizens will be well on the horizon. The real answer to the brain drain dilemma then will rest with what the collective body all individuals with compelling ideas, determined resolve, and demand for change decide to do and how they decide to act.

O14.11

11:45 The Effectiveness of Using Google Documents to Assist in the Mentoring Process of University of Mississippi Students to Assist Lafayette Middle School Students in Their Development of Science Fair Projects

Maddie Derito[1], Kelle Sumrall[2], William Sumrall[1]

[1]University of Mississippi, University, MS, [2]Lafayette Middle School, Oxford, MS

This presentation will review an ongoing program at the University of Mississippi (UM), Department of Teacher Education and Lafayette Middle School (LMS) in Oxford, Mississippi. Teacher Education Candidates in EDCI 404 (N=54) and UM campus wide students (N=10) in EDCI 320 have continually mentored LMS 7th graders (N=184) through Google Documents during the Fall/Spring, 25-26 semesters. One of the EDCI 320 and 404 course assignment's objective was to have 7th graders produce quality science fair projects for presentation at the LMS and the Region 7 science fair. Data regarding 7th grade science teachers' project satisfaction, the assignment directions/procedures, the efforts by UM students to assist 7th graders, the effectiveness of using Google documents and the quality of the 184 science fair projects created will be reported in this presentation.

O14.12

12:00 Community Engagement in Geosciences: Upper Undergraduate Courses Creating "Open Educational Resources" (OERs) for Multiple Mississippi Communities

Sarah Lalk[1], Shrinidhi Ambinakudige[1], Tammie Marlow[2]

[1]Mississippi State University - Geosciences, Mississippi State, MS, [2]Cleveland MS School District, Cleveland, MS

Overview of multiple "community-engaged learning" certified courses for upper undergraduate students that have created "open educational resources" (OERs) for different communities across Mississippi. The courses are all certified by the Mississippi State University Center for Community-Engaged Learning that is recognized by the Carnegie Foundation. Two of the courses partnered with an NSF EPSCoR grant to increase local knowledge about sustainability practices related to geosciences. One class created informational posters and activities for a "weather and wellness" community event in the delta that shared resources on weather awareness and citizen science opportunities to connect the residents with their natural environments. Another class created short "reel" videos for individual counties of MS teaching those specific communities different topics related to geomorphology processes as it relates that county region. Topics include weathering/erosion, soil classification, regional rivers, identifying community watersheds, flood monitoring, and tidal fluctuations for the coastal counties. A partnership between a Delta middle school, the middle school located on Mississippi State's campus, and the Gulf Coast Research Lab and Gunter Library is another creation that began with a community-engaged learning certified class installing small analog weather stations across the local school elementary/middle school campuses to promote citizen science related to weather monitoring factors. Project resources are shared using StoryMap for each community that then are joined in one partnership StoryMap as OER for easy access by residents in the participating regions.

12:15 Divisional Busniess Meeting

THURSDAY, March19, 2026
EVENING
Hall B
3:30 DODGEN LECTURE /AWARDS CEREMONY

THURSDAY, March19, 2026
EVENING
Hall C
5:00-7:30 Reception and General Poster Session
(Immediately following Dodgen Event)

All posters should be placed in the poster all by 12:00 pm on Thursday, March 19, 2026

Odd poster numbers will be presented from 5 -6

*Even poster numbers will be presented from 6-*7

P14.01

A Model for Teaching Inclusive Thinking and Accessibility in Kinesiology

Shavonda Jackson

Alcorn State University, Lorman, MS

In kinesiology, accessibility refers to tailoring approaches to accommodate the specific needs of individuals, especially those with disabilities. The purpose of this research is to create a structured curriculum to access students' knowledge of disability and accessibility in the beginning and the end of a kinesiology course. We focused on the role that educational courses can play in increasing accessibility awareness for undergraduate biology students. We have reviewed literature indicating that a number of accessibility teaching interventions have been reported; yet the evaluation of their effectiveness has not been conducted in courses for healthcare students. This paper reports on a 1-semester evaluation of undergraduate biology students' accessibility awareness and knowledge, following several weeks of accessibility lectures consisting of PowerPoints, personas, hands-on activities, and videos. We measured gains in awareness and knowledge, which was determined at the end of the study by way of pre and post survey. This new curriculum is designed to prepare students to thoughtfully consider accessibility, advocate for inclusive practices, and integrate accessibility into the design of digital and physical spaces as they enter the medical workforce. The intervention was highly successful in increasing knowledge and awareness of accessibility and inclusive design, but had less impact on career intentions or personal commitment.

P14.02

Growing Green Futures, One Student at a Time

Tammie Marlow[1], *Hannah Franklin*[2], *Will Marlow*[3]

[1]*Mississippi State University. Department of Geosciences, Mississippi State, MS,* [2]*Mississippi State University, Department of Wildlife, Fisheries & Aquaculture, Mississippi State, MS,* [3]*USDA, Stoneville, MS*

Cleveland Central Middle School students have built relationships with their peers and their community while learning about science by integrating hands-on place-based projects that connect their classrooms to the world around them. The projects align with the Mississippi College-and Career-Readiness Standards and Next Generation Science Standards. Students apply what they learn into real world practices while being good stewards of the world around them. Students use the school gardens and orchards to investigate soils, plants, nutrient cycles, importance of biodiversity, basic needs of living things, ecosystems, food insecurity, food deserts, food forest, global warming, and climate change.

Relationships have been made with the whole community while students help with food insecurity in their local area they live by establishing food forests in the public parks and on their school's campus. Experts volunteer and host programs in the outdoor classroom located in the school's garden. Students love when volunteers share their experiences. Students develop close relationships working on projects with Mississippi State University, Mississippi Department of Wildlife, Mississippi State University Extension Service, Mississippi Museum of Natural Science, United States Department of Agriculture, and many others. The school garden and

Growing Green Futures project is a great learning experience and platform for community engagement. The Growing Green Futures project is a testament to the quote, "It takes a village".

P14.03

Community Partnerships in Citizen Science - Earth Systems Monitoring Across MS

Sarah Lalk[1], Megan Le[2], Shrinidhi Ambinakudige[1], Joyce Shaw[3]

[1]*Mississippi State University Geosciences, Mississippi State, MS,* [2]*University of Southern Mississippi Gulf Research Lab, Ocean Springs, MS,* [3]*University of Southern Mississippi Gunter Library, Ocean Springs, MS*

Mississippi State University (MSU) is partnering with school communities across MS to install analog weather equipment stations to promote local participation in various citizen science observations and collection of data. Current partnership regions include the Department of

Geosciences with the 6th/7th grade "Earth Club" at Partnership school located on the MSU campus in northeast MS; Central Cleveland Middle School "Garden Club" in the Delta; and the Gulf Coast of MS with University of Southern Mississippi (USMGC) Research Lab and Gunter Library for outreach. The regional partnerships will be linked through a StoryMap that shares each region's localized data for comparison activities along with information on participation in citizen science activities to build more shared connections between the communities. Basic weather equipment stations will include rain gauge, outdoor max/min thermometer, and QR code to StoryMap resource with cloud identification images along with citizen science options. Stations located on a school campus will include additional equipment such as barometers, anemometers, and guiding resources to predict weather. Citizen projects related to weather monitoring that are included are the Community Collaborative Rain, Hail, Snow Network (CoCoRaHS - cocorahs.org) and NASA's GLOBE cloud observation program (globe.gov/web/s-cool/home/participate). Other citizen science data collection options for comparison between MS partnership regions include iNaturalist and monitoring of light pollution with Globe at Night (https://globeatnight.org/)

P14.04

Integrating High-Impact Practices into Coastal Science Education: A Case Study of GCRL's Summer Field Program

Sarah Binte Faruque, Samantha Capers, Jessica Kastler

Marine Education Center, University of Southern Mississippi, Ocean Springs, MS

The Gulf Coast Research Laboratory (GCRL), established in 1947 in Ocean Springs, Mississippi, serves as the state's designated marine laboratory and a leading center for coastal science education and research at The University of Southern Mississippi. A central component of GCRL's mission is the Summer Field Program. This immersive four-week academic experience engages undergraduate and graduate students in hands-on, field- and lab-based learning in coastal and marine environments. For nearly 80 years, the program has contributed to training future scientists, resource managers, and conservation professionals by emphasizing experiential learning and professional skill development in STEM fields.

This study examines how selected courses—Elasmobranch Biology, Ichthyology, Marine Conservation, Marine Biology, and Oceanography—integrate High-Impact Practices (HIPs) into their structure and delivery. Through observation of class sessions, field activities, and assessments, we developed a checklist to evaluate alignment with HIP criteria such as student engagement, place-based learning, collaborative fieldwork, and reflective practice. Findings illustrate how these courses cultivate scientific inquiry, field competency, teamwork, and career readiness, reinforcing the program's continuing role in student success and workforce development in STEM.

P14.05

Revolutionizing Meteorology Instruction: The Impact of VR Immersive Learning Labs

Grace Olaitan

Mississippi State University, Mississippi State, MS

This research will investigate the integration of Virtual Reality (VR) immersive learning labs into a college-level Weather and Climate course. The project aims to enhance student engagement and learning outcomes by providing hands-on, interactive opportunities that complement and extend traditional instructional methods. The VR-enhanced labs will create opportunities for experiential learning, allowing students to interact with weather and climate concepts inside immersive 3D environments. This paper will describe the design and planned implementation of fifteen VR experiences developed using the Engage VR platform and will assess the comparative effectiveness of VR-based labs versus traditional workbook-based lab sections. It is anticipated that VR-enhanced labs will yield higher levels of engagement and improved learning outcomes when compared to traditional face-to-face labs. The study will also examine the feasibility of scaling these VR experiences to additional courses, with broader implications for STEM education, particularly for underserved and rural learning communities.

P14.06

The Sustainable Home Program - Financial Well-being, a Lagniappe of Environmental Sustainability.

Sh*erry Bell*

Mississippi State University Extension Service

The Sustainable Home program uses financial well-being as a motivation tool to encourage environmentally sustainable practices. Attendees are taught how to properly reduce, reuse, recycle and compost, and that implementing sustainable practices not only benefits the environment, but can improve personal financial well-being.

Despite a wealth of available natural resources, many southern states remain some of poorest in the nation and face numerous social and economic disparities. However, these challenges offer an opportunity to provide impactful environmental trainings that use improved financial well-being as a personal benefit to motivate the implementation of environmentally sustainable practices in the home. As a result, Sustainable Home program was developed with this purpose in mind.

The overall goal of the program is to create long-term behavior changes that environmentally and economically benefit local communities. Educational program outreach and social marketing are used to reach the program's objectives, which include 1) Increased knowledge of the municipal waste stream. 2) Increased knowledge of waste reduction, reuse, recycling and composting. 3) Improvement of home energy efficiency knowledge. 5) Increased knowledge of litter impacts, microplastics and ocean health 4) Increased understanding that implementing sustainable practices provides environmental benefits, and can improve long-term financial well-being as well.

Educators provide the Sustainable Home program training across the state upon request by local community organizations. Program attendees are given energy efficiency kits upon completing the one and a half-hour training. These kits were donated by a local energy power company, and serve to motivate the improvement of home energy efficiency and clientele attendance.

Upon program completion, attendees are asked to sign the Sustainable Home Pledge and commit to implementing at least five new environmentally sustainable practices in their homes and communities. The pledge is used as a social marketing tool to demonstrate public commitment for adopting new environmentally sustainable practices. (Lee & Kotler 2020). Overall program impact and knowledge gained is being measured using post surveys, along with Qualtrics$_{®}^{xm}$ survey software. Attendees are also asked to estimate the total monetary amount they could save annually if they are diligent about implementing sustainable practices. Annual estimated savings serves as a financial indicator that the connection was made between the implementation of sustainable living practices and improved personal financial well-being.

Beginning in 2024, Sustainable Home program trainings have successfully made the connection that implementing sustainable practices can benefit the environment and improve financial well-being. Based on surveys, 96% (n = 140) of participants learned new environmentally sustainable skills that they planned to use in their homes. The top five new skills that attendees planned to begin implementing after attending the program were 1) Improving home energy efficiency 2) Picking up litter 3) Reusing more items 4) Reducing the number of items purchased 5) Practicing recycling. By implementing these new skills, 64% of attendees felt they could save $500 to $1,500 annually, while the remaining 36% believed they could save $2,000 to $2,500 annually. The cumulative annual savings estimated for all attendees was $220,000.

P14.07

Creation of a Comprehensive Bibliography on the Mississippi Sound

Brennan Collins, Joyce Shaw

Gunter Library/Gulf Coast Research Laboratory/The University of Southern Mississippi, Ocean Springs, MS

Gunter Library at the Gulf Coast Research Laboratory is creating a comprehensive bibliography on the Mississippi Sound. It includes journal articles, government reports, and grey literature about the Sound. Our geographical region was expanded beyond the Sound to include bays that empty into the MS Sound, Biloxi Bay and St. Louis Bay, as well as rivers that flow into the Sound, Pearl River and Pascagoula River. Smaller rivers that contribute fresh water to the Sound, through the connecting bays, were also added. Smaller rivers include the Wolf River, Jourdan River, Biloxi River and Tchoutacabouffa River. The bibliography is modeled on previous bibliographies created along the Gulf coast including Sarasota Bay and Biscayne Bay (FL), and Laguna Madre Bay and Galveston Bay (TX). Our database is drawn from publications generated by scientists affiliated with the Gulf Coast Research Laboratory (GCRL) who have conducted research in the area from the late 1940s to the present. Phase two of the bibliography will include publications generated beyond the work done at GCRL The bibliography will be grouped under broad subjects such as history, area description, and natural history including botany, geology, and zoology with each entry assigned keywords. It will be made available both in print and digitally.

P14.08

The Effectiveness of 3D Physical and Virtual Fossil Models for Student Learning and Enjoyment in Introductory Geology Laboratories

Abigale Riggs, Renee Clary, Athena Nagel, Christa Haney

Mississippi State University, Mississippi State, MS

This research investigation examined the effectiveness of incorporating physical 3D-printed models or virtual 3D fossil models into undergraduate introductory-level geology laboratory courses to evaluate their influence on student knowledge gains and enjoyment compared to conventional 2D materials. Following Institutional Review Board (IRB) approval, data were collected across 12 laboratory sections, with each section using a single visualization method for a relative age-dating exercise: (1) 2D photographs (N = 82), (2) 3D physical models (N = 88), or (3) 3D virtual models (N = 60). Students completed pre- and post-lab surveys assessing knowledge gains and enjoyment. Cross-tabulation analysis of all 12 sections (N = 230) indicated that 60.2% (n = 88) of students using physical 3D models strongly agreed that visual materials helped them understand the content, compared to 31.7% (n = 60) of students using virtual models and 48.8% (n = 82) in the 2D group. Students with physical 3D models reported stronger confidence at 37.5% (n = 88) in interpreting geologic data and rated the lab as more enjoyable overall, with 40.9% (n = 88) finding the activity

much more enjoyable than other labs. However, students who had 3D virtual models reported strong confidence at 18.3% (n = 60) and 36.7% (n = 60) found the lab to be much more enjoyable; students in the 2D group found the lab much more enjoyable at 30.5% (n = 82), with a confidence level of 36.6% (n = 82). These findings suggest that 3D physical materials can moderately enhance student engagement and perceived understanding in introductory geoscience laboratories.

P14.09

P6.02 Science for The Community: A University and Community Partnership Optimizes Fossil Park Development in Columbus, MS

Dunlap, Charlotte; Ross, Elaine; Jenkins, Noah; Shurlds, Charles; Ortiz, Alejandro; Crossland, Daniel; Hosford, Jacob; Riggs, Abby; Lane, Grace; Marlow, Tammie; and Clary, Renee M.

Columbus, Mississippi recently established the second fossil park in the state, the Dr. John "Jack" Kaye Cretaceous Fossil Park. Located in Propst Park, the fossil park's strata contain 85-million-year-old fossils, including numerous shark teeth and remains of marine reptiles and dinosaurs. When developed, the fossil park will offer visitors the opportunity to search for and keep the fossils they find, while also learning about geological time, sea level changes, and extinction events.

Mississippi State University students partner with the City of Columbus to assist in park development. Students identified how their skillsets aligned with the park's goals, and proposed several ways they could contribute: 1) trash collection and park clean-up to provide a safer collecting environment for visitors; 2) 3-D printed fossil models to showcase the types of fossils to be recovered; and 3) informative brochures to engage and educate the community with fossil-collecting tips, fossil identifications, and the implications that these fossils have for Mississippi's ancient history. Students benefit through the application of course content, opportunities to learn from state geology and paleontology experts, and positively impacting their local community.

MERIC Symposium

Thursday, March 19, 2026

AFTERNOON

Hall C Room 4

1:30 Supramolecular Engineering of Nitrosamine Cocrystals for Risk Reduction

Ariel Kelley

Belhaven University, Jackson, MS

This project focuses on the synthesis and development of novel nitrosamine derivatives for use in the formation of supramolecular cocrystals. These cocrystals will be analyzed for their use in the solid-state capture of nitrosamine by-products in active pharmaceutical ingredient (APIs). Small-scale synthesis of nitrosamines will be carried out using environmentally conscious methods, including oxidation with OXONE® or mechanochemical approaches, starting from the appropriate secondary amines. Products will be purified as necessary by column chromatography. These nitrosamines will serve as electron donors in the formation of donor-acceptor (D-A) complexes, paired with commercially available electron acceptors such as DDQ, TCNE, and selected pharmaceutical coformers. The formation and strength of these DA interactions will be monitored using UV-vis spectroscopy, allowing for assessment of electrostatic interactions and complex stability via binding constants and molar absorptivities. Multiple cocrystallization techniques, including solvent-free co-sublimation will be evaluated to optimize crystal growth and to generate structurally ordered supramolecular assemblies. The cocrystals, once formed, will be elucidated via SCXRD to determine the relevant non-covalent interactions in the supramolecular assembly formed. The chemistry of nitrosamine in the solid-state and its use in functional material development will then be assessed.

1:45 A Computational Approach to Elucidating Active Site Functional Dynamics and Ligand Binding During Enzyme Catalysis Using Aiddison

Christopher Jurgenson

Delta State University, Cleveland, MS

This project integrates enzymology with structure-based ligand design to investigate the biosynthetic enzyme tetraberberine oxidase (TBO) and the bioremediation target polyethylene terephthalate hydrolase (PETase). Novel ligands have been designed to target the active sites of TBO and PETase, and molecular dynamics simulations will be used to assess their stability and binding within the enzymes. These studies will provide insight into key

residues and conformational changes that drive enzymatic activity.

For TBO, a berberine bridge enzyme (BBE) involved in the final step of berberine biosynthesis, homology models generated by AlphaFold 3 will support detailed analysis of ligand binding and catalytic mechanisms, including virtual screening for potential agonists or antagonists. PETase, an enzyme critical for plastic degradation, will be examined to understand how ligand interactions and conformational dynamics can inform the engineering of more effective variants for environmental remediation.

A key innovation of this project is the integration of molecular docking simulations into undergraduate biochemistry education. Aiddison's accessible interface will allow students to perform hands-on computational simulations, focusing on active site modeling and ligand docking without the technical barriers posed by other platforms. Importantly, this initiative fosters undergraduate research by expanding access to high-impact computational tools.

2:00 Photochemical Approaches to Isoindolone Piperidines As Kinase Inhibitors

Wolfgang Kramer[1], Christian Hart[1], Zoe Elder[1], Rita Lacy[1], Matthew Donahue[2], Kaydyn Carr-Turner[1]

[1]Millsaps College, Jackson, MS, [2]The University of Southern Mississippi, Hattiesburg, MS

Isoindolone piperidines are investigated as inhibitors for two key phosphorylating enzymes, glycogen synthase kinase-3 (GSK3) and cyclin-dependent kinases (CDKs). Valmerins, which are isoindolone piperidines, are inhibitors of those enzymes and lead to disruption of cancer cell metabolism.

We are investigating a novel synthesis that involves a photochemical key step that forms the piperidine moiety. In the critical cyclization step, regioselectivity has to be established. For this, chelating experiments as well as computational results are evaluated. Various substituents on the chromophore are tested and their influence on regio- and stereoselectivity are analyzed. There do not seem to be limits on the type of substituent, even though nitro groups are reported in the literature to be photo-inert. Despite that, nitro groups are the best way to introduce complex substituents, and seem to be the only group that induces some kind of regiospecificity in the photoreaction.

Further transformation depends on the target molecule, but also on what substituents are tolerated during the photocyclization. Reduction of the nitro group would yield the desired amine which can be transformed into the various substituents. An alternative is the formation of amide protected amino groups on the chromophore. Other syntheses of the photochemical starting materials are presented.

2:15 Novel Semi-Open Ventricular Catheter Designs: Computational Optimization and Experimental Validation to Combat Shunt Failure in Hydrocephalus

Mohammed Elmellouki

Mississippi Valley State University, Itta Bena, MS

Shunt failure remains a significant challenge in the treatment of hydrocephalus, with up to 80% of pediatric shunts failing within ten years and proximal catheter obstruction accounting for nearly one-quarter of these failures. Closed-tip catheters generate low-shear stagnation regions that promote tissue ingrowth and debris accumulation, often leading to repeated revision surgeries and neurological complications. Fully open-tip designs reduce stagnation but introduce a substantial risk of tissue aspiration. Semi-open catheter geometries present a promising alternative but require rigorous evaluation prior to translational use.

High-resolution CFD simulations integrated with in vitro testing are used to evaluate semi-open designs across three key performance metrics: (1) wall shear stress sufficient to limit astrocyte accumulation, (2) uniform flow distribution across inlet apertures to reduce localized blockage, and (3) minimal pressure gradients to avoid over drainage. Parametric analyses examine aperture sizing and placement strategies to balance the hydraulic advantages of open-tip designs while mitigating aspiration risks. Stereolithography-fabricated prototypes are tested under pulsatile cerebrospinal fluid flow, where precision sensors quantify real-time shear, pressure differentials, and flow uniformity to validate simulation predictions. The findings are expected to produce validated semi-open catheter designs with measurable performance improvements, experimentally confirmed prototype behavior demonstrating reduced obstruction risk, and a robust dataset that supports advancement toward future clinical translation.

2:30 Emerging CFTR Modulators for Advancing Cystic Fibrosis Therapy

Ghanshyam Heda

Mississippi University for Women, Columbus, MS

Plasma membrane expression of ion channel proteins is critical for regulating transepithelial fluid movement and maintaining cellular homeostasis. Mutations in these proteins can lead to several channelopathies, including cystic fibrosis (CF). CF is a genetic disease mostly prevalent among Caucasians of Northern European descent and results from mutations in the CFTR (Cystic Fibrosis Transmembrane Conductance Regulator) gene. These mutations impair CFTR's function as a chloride ion (Cl^-) channel. Recently, a new class of therapeutics called 'CFTR-modulators' has emerged, replacing traditional treatment strategies and significantly improving clinical

outcomes for CF patients. In this study, we examined the modulatory effects of four triazole compounds (*viz*., PJ-03, PJ-08, PJ-09, PJ-10) on a human airway epithelial cell line (CFBE41o$^-$) expressing the most prevalent CF-causing mutation, ΔF508-CFTR. Immunoblot analysis showed that all four compounds increased levels of immature CFTR band-B more than mature band-C at micromolar concentrations (2.5-50 uM). We hypothesize that the observed increase in immature CFTR and compared to mature CFTR, may result from interference with proteasomal and/or lysosomal degradation pathways. Therefore, our ongoing studies include determining the effects of these triazole compounds on ΔF508-CFTR expression in the presence of proteasomal inhibitors (e.g., MG132) and/or lysosomal enzyme inhibitors (e.g., E64). Additionally, we are examining the effects of these compounds at nanomolar concentrations (250-1000 nM) to identify optimal concentrations for enhancing ΔF508-CFTR expression. Using Ussing chamber studies in Fischer rat thyroid (FRT) cells expressing ΔF508-CFTR, PJ-08 (10 μM) enhanced the stability of CFTR-mediated transepithelial Cl^- currents compared to vehicle control. Collectively, our data suggest that triazole compounds are multifunctional small molecules that not only facilitate Cl^- transport but also increase the expression and functional stability of ΔF508-CFTR.

2:45 Computationally Engineered siRNA Delivery Polymers for Precision Targeting of TP53

Karina Kapusta[1], Victoria L. Petrosyan[1, 2]

[1]Tougaloo College, Touglaoo, MS, [2]St. Andrew's Episcopal School, Jackson, MS

Developing polymer nanocarriers for delivering small interfering RNA (siRNA) as gene-silencing therapeutics requires precise structural modeling and optimization to enhance stability and target affinity between the siRNA and its carrier. In this study, we established a computational methodology for optimizing nanocarriers using a molecularly imprinted polymer (MIP) approach. Various siRNA construction techniques were evaluated, highlighting structural discrepancies along with the advantages and limitations of each method. Each structure was optimized using the Schrödinger software package and subjected to 500 ns molecular dynamics (MD) simulations to refine and validate siRNA conformations in a physiological environment. Five backbone-modified TP53-targeting siRNA variants were then used as targets to screen a library of 1,065 RNA-binding fragments from ASINEX via molecular docking, aiming to identify potent siRNA binders. An in-house Python pipeline was developed to analyze the docking data and select the top-scoring fragments across all models. These fragment-siRNA complexes were subsequently evaluated using MM-GBSA calculations. Our findings identified 10 highly promising fragments suitable for synthesizing molecularly imprinted polymers, offering novel strategies for siRNA stabilization and targeted therapeutic delivery. One of the top-scoring fragments was selected as a lead candidate due to its structural simplicity and multiple functionalization sites. Molecular stacking analyses revealed stable binding conformations for over 40 fragments within the minor groove of siRNA. Furthermore, we applied free energy perturbation (FEP) to assess changes in binding affinities following polymerization of the selected fragment. These results provide a foundation for the rational design of siRNA-targeting molecules, advancing the therapeutic potential of gene-silencing technologies.

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Where: Mississippi INBRE Data Science Consulting Booth, 90th Annual Mississippi Academy of Sciences (MAS) Meeting (Gulf Coast Coliseum and Convention Center, Biloxi, MS)

When: March 19 - 20, 2026

Sessions: 30-minute one-on-one consultations

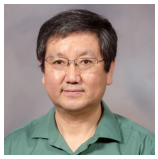
PUI Priority Deadline: ***Friday, March 13.*** **Scan the QR code to book your session:**

https://qrco.de/bgVpyO

Faculty members from Mississippi primarily undergraduate institutions (PUIs) may reserve a consultation slot through Friday, March 13. Any remaining consultation slots that have not been filled by this deadline will be opened for registration to the general public.

If no slots work for you, email a consultant to schedule beyond the listed slots.

Meet the Consultants:



Dr. Yufeng Zheng
Associate Professor, Department of Data Science
University of Mississippi Medical Center
Director, Data Science Core,
Mississippi INBRE
yzheng@umc.edu

Expertise:

- Image Analysis, Pattern Recognition, Deep Learning , AI Computer-Aided Diagnosis (CAD), Large Language Models (LLMs).

Services at the booth:

- General machine learning / AI research consultation
- Advice for AI agentic tools such as AI coding
- Discussion for potential research collaboration

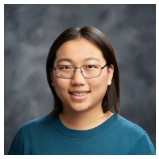
Dr. Lavanya Challagundla
Assistant Professor (Bioinformatics)
Department of Cell and Molecular Biology
University of Mississippi Medical Center
lchallagundla@umc.edu

Expertise:

- High throughput sequencing analysis including functional enrichment and pathways (WGS, RNASeq, 16S microbiome, Metagenomics), single cell and spatial transcriptomics, pipeline development and automation, data visualization and interpretation.

Services at the booth:

- Provide experimental design help on sampling strategy, sequencing depth, analysis/software tools to be used.
- Discuss potential collaborations and services we provide at UMMC.
- Quick troubleshooting on software/workflows on existing projects.
  - For this service, please bring specific challenges you have faced to discuss. This is not intended for an in-depth analysis but rather quick troubleshooting advice.



Dr. Jingyi "Catherine" Shi
Assistant Professor of Statistics
Department of Mathematics and Statistics
Mississippi State University
Associate Director, Data Science Core, Mississippi INBRE
js5328@msstate.edu

Expertise:

- Applied Statistics, Supervised Machine Learning, Predictive Modeling, Feature Selection, Health Informatics, Knowledge Extraction and Representation, AI Software Development.

Services at the booth:

- Run on-site data analysis with you (programming included) for data exploration or modeling; then discuss the results and suggest further steps.
  - For this service, please bring clean, ready-to-use data.
  - Data may be temporarily loaded onto the consultant's laptop for analysis, if needed.
- Provide general solutions for data-driven projects.
- Discuss potential mentorship or collaborations.

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10:00am-11:30am
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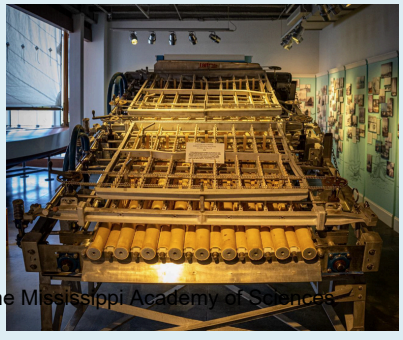
- **Joe Moran Gallery exhibiting works of local artisans**
- **Two theaters! One featuring "Biloxi That Seafood Built" devoted to the history of the seafood industry in Biloxi - the other to the devastating effects of Hurricane Katrina and the Coast's recovery**



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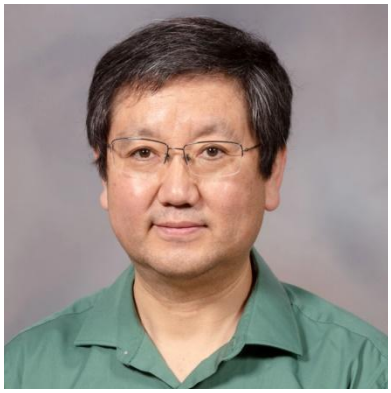
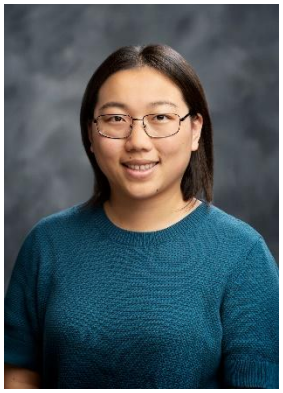


Dr. Yufeng Zheng

Director, Data Science Core, Mississippi INBRE
Associate Professor, Department of Data Science, University of Mississippi Medical Center
Email: yzheng@umc.edu

Dr. Yufeng Zheng is an Associate Professor of Data Science at the University of Mississippi Medical Center and Director of the Data Science Core for the NIH-funded MS INBRE initiative. He teaches graduate courses in Advanced Machine Learning and Deep Learning Applications and has received UMMC's 2022 Teaching Excellence Award. He is the principal investigator of many funded projects and received 2025 UMMC's Research Excellence Award and Discovery Award. He holds a patent in facial recognition, has published three books and more than 90 peer-reviewed papers, and is an NVIDIA-certified Deep Learning Instructor, a Cisco Certified Network Professional (CCNP), and a senior member of IEEE and SPIE. His research centers on image analysis, machine learning, AI, and computer-aided diagnosis.



Dr. Jingyi "Catherine" Shi
Associate Director, Data Science Core, Mississippi INBRE
Assistant Professor of Statistics, Department of Mathematics and Statistics, Mississippi State University
Email: js5328@msstate.edu

Dr. Shi joined Mississippi State University as an Assistant Professor of Statistics in 2019, right after her doctoral study in Health Informatics at UNC Charlotte. Her research work spans a wide range of sub-areas in the Data Science field, including applied statistics, supervised machine learning, feature selection, knowledge extraction and representation, semantic web and ontology, applied natural language processing, quantification of data quality, and AI software development. She has published 13 peer-reviewed journal papers and six conference papers as of 2025, of which six journals are ranked Q1 by CiteScore. She also published an R package on CRAN called "CASMI." As an educator, she has taught or developed courses in statistical methods, machine learning, and databases.

Workshop Committee

Dr. Tristan Clemons
Mississippi INBRE Program Coordinator
Center for Molecular and Cellular Biosciences, The University of Southern Mississippi
Email: tristan.clemons@usm.edu

Tristan Clemons completed his PhD studies in 2014 at the University of Western Australia. At the completion of his PhD, he was awarded an Australian Biomedical Research Fellowship from the National Health and Medical Research Council of Australia to investigate nanomaterials for wound healing and scar treatments following burn injuries. In 2018, he relocated to Chicago to join the laboratory of Prof. Samuel Stupp at Northwestern University as a post-doctoral research fellow. He has won several awards including the Exxon Mobil Western Australian (WA) Student Scientist of the Year for his PhD work, the WA Young Tall Poppy Science Award and he was acknowledged as a CAS SciFinder Future Leader of Chemistry in 2018. In Fall 2022, Clemons joined the School of Polymer Science and Engineering at The University of Southern Mississippi.

Dr. Michael Garrett

Director, Instrumentation & Services Core, Mississippi INBRE
Professor and Department Chair, Department of Cell and Molecular Biology,
University of Mississippi Medical Center
Email: mrgarrett@umc.edu

Michael Garrett, PhD, MBA is currently a tenured Professor and Chair in the Department of Cell and Molecular Biology with secondary appointment in the Department of Pediatrics (Genetics) at the University of Mississippi Medical Center (UMMC). Dr Garrett is the founding Director of the UMMC Molecular and Genomics Core Facility, established in 2010. Dr. Garrett has an NIH funded research program involving studying the genetics of complex disease including hypertension, kidney disease, and structural defects of the kidney. He has been PI on multiple NIH grants, including R01, a newly funded Phase I COBRE- Molecular Center of Health and Disease, and Co-I on 2 IDeA funded center grants (MS-INBRE, and CMRDC-COBRE). He has authored more than 110 peer-reviewed research publications, multiple book chapters/review articles, as well as authored/co-authored >125 abstracts presented at major research conferences (AHA, ASN, and Experimental Biology).

Dr. Felix Twum

Associate Director, Data Science Core, Mississippi INBRE
Assistant Professor (Epidemiology), School of Health Professions
The University of Southern Mississippi
Email: Felix.Twum@usm.edu

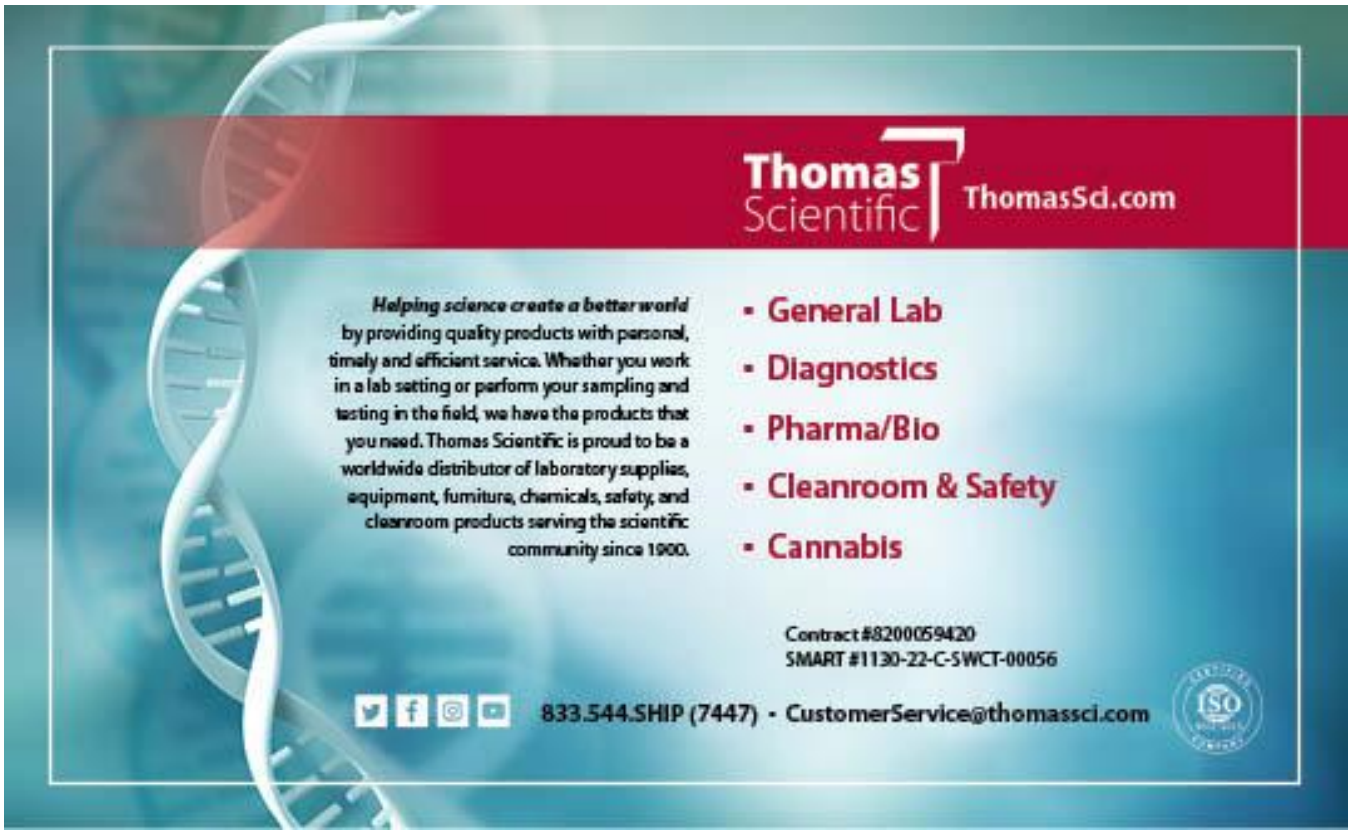
Dr. Felix Twum is an applied epidemiologist whose work integrates machine learning, biomarker science, and health disparities research to advance early detection and prevention of chronic diseases. His current scholarship focuses on cardio-kidney-metabolic health, with interest in evaluating emerging renal tubular injury biomarkers, and developing predictive models for early disease detection. He employs advanced statistical modeling, causal inference, and data science approaches to generate actionable insights for population health.

Dr. Alex Flynt

Co-Director Center for Nano-Bio Interactions
Associate Professor
Biomedical Engineering
University of Mississippi
Cell Bioenergetics Facility Director, Mississippi INBRE
Email: asflynt@olemiss.edu

Dr Flynt is a multidisciplinary researcher who uses a combination of bioinformatics, molecular biology, and material science in his lab. A major emphasis in the Flynt lab's approach is using transcriptomics to gain insights for to developing novel approaches to controlling gene expression. In addition to a sustained interest in control of genetics, Dr Flynt is a member of a consortia of material scientists, organic chemists, and biomedical engineers to create next generation gene delivery technology. Beyond research activities, Dr Flynt also serves as a co-Director of the Center for Nano-Bio interactions at Ole Miss and as the Director of the MS INBRE Bioenergetics Core where he works with academic partners across the state of Mississippi to promote biomedical research capacity and enhance workforce development.

MAS Sponsors-2026



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- Horticulture

Graduate Education:
- Agronomy
- Horticulture
- Weed Science

Research and Extension:
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- Row-crop, Forage and Environmental Studies
- Fruit, Vegetable and Flower Production

Extension:
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- Fruit, Vegetable and Ornamental Horticulture Outreach
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