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Total Solar Eclipse
The total solar eclipse of 2024 occurred on Monday, April 8. It was visible across North America, including parts of Mexico, the United States, and Canada. This photo was taken by Michelle Tucci at 2:17 pm on April 8, 2024 Jackson, MS.

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MARCH 20-21, 2025

Mississippi Gulf Coast Coliseum and Convention Center, Biloxi, MS

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Journal of the Mississippi Academy of Sciences

Volume 70 January 2025 Number 1

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89th Annual Mississippi Meeting at a Glance

March 19-21, 2025

Gulf Coast Coliseum and Convention Center, Biloxi, MS

Wednesday, March 19, 2025

3:00-5:00	Registration opens—Lobby area in front of Hall D
6:00-9:00	Board Meeting (invites only) Patio 44

Thursday, March 20, 2025

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- Cellular, Molecular, and Developmental Biology Chemistry and Chemical Engineering Ecology, Entomology, Evolutionary Biology, and Zoology Geology and Geography Health Sciences History and Philosophy of Science Mathematics, Computer Science, and Statistics Neuroscience Physics and Engineering Psychology and Social Sciences Science Education	Hall D Room 1 Hall D Room 3 Hall D Room 2 Hall C Room 4 Hall D Room 4 Hall D Room 11 Hall C Room 3 Hall D Room 12 Hall D Room 7 Hall D Room 6 Hall D Room 5 Hall D Room 8
8:00-10:10	Ecology and Evolutionary Biology Symposia (see program)	Hall C Room 4
10:20-12:00	Health Sciences Interactive Workshop (see program)	Hall D Room 7
10:00-11:00	LSMAMP advisory board meeting (College Deans) invitee only	Hall B Room 2-3
11:00-1:00	LSMAMP external advisory board Meeting (invitees only)	Hall B Room 2-3
12:00-1:00	Perkin Elmer Technology Presentation (lunch provided first 50 attendees)	Hall D Room 8
12:00-1:00	2nd Annual Women in Geology	Hall D Room 4
12:00-1:00	'Being a Scientist Panel' -Junior College Outreach	Hall B Room 5-6

89th Annual Mississippi Meeting at a Glance

March 19-21, 2025

Gulf Coast Coliseum and Convention Center, Biloxi, MS

Thursday, March 20, 2025

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- Cellular, Molecular, and Developmental Biology Chemistry and Chemical Engineering Geology and Geography Health Sciences History and Philosophy of Science Marine and Atmospheric Science Mathematics, Computer Science, and Statistics Neurosciences Physics and Engineering Psychology and Social Sciences	 Hall C Poster area Hall D Room 3 Hall D Room 2 Hall D Room 4 Hall D Room 11 Hall C Room 3 Hall C Room 4 Hall D Room 12 Hall D Room 7 Hall D Room 6 Hall D Room 5
1:00-3:00	Health Science Symposium	Hall D Room 11
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

***Odd posters are 5:00-6:00**
***Even posters are 6:00-7:00**
Millsaps Scholar posters are 5:00-7:00

89th Annual Mississippi Meeting at a Glance

March 19-21, 2025

Gulf Coast Coliseum and Convention Center, Biloxi, MS

Friday, March 21, 2025

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 2
	Geology and Geography	Hall D Room 4
	Health Sciences room 1	Hall D Room 5
	Health Sciences room 2	Hall D Room 8
	History and Philosophy of Science	Hall C Room 3
	Mathematics, Computer Science, and Statistics	Hall D Room 12
	Neuroscience	Hall D Room 7
	Physics and Engineering	Hall D Room 6
	Psychology and Social Sciences	Hall D Room 11
10:00-12:00	Ecology and Evolutionary Biology Field Trip	Mississippi Aquarium
8:10-9:50	Health Sciences Debate (See program for details)	Hall D Room 8
9:00-10:30	3 -minute oral competition Mississippi INBRE Scholars	Hall B Room 2-3
11:00-4:00	LSMAMP Symposium	Hall B Room 2-3
10:00-11:00	ASU MJAS High School Poster competition	Hall C
12:00-2:00	MAS Scholars Award Ceremony (lunch provided for attendees first 100)	Hall B Room 5-6
	Divisional Programs	
1:00-3:00	History and Philosophy of Science	Hall D Room 6
1:30-2:00	Geology and Geography	Hall D Room 4
2:00-5:00	Mississippi INBRE sponsored Data Science Workshop	Hall D Room 2

Mississippi Gulf Coast Convention Center
Biloxi, MS 39531

DRIVING DIRECTIONS

If Coming from Jackson, MS –Go South on I-49:

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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Turn left when you see the Mississippi Gulf Coast and Convention Center

If Coming 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
Continue onto MS-67 S (9.1 miles)
Exit onto MS-605 S (11.7 miles)

Turn left onto US-90E/E Beach BLvd (3.2 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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Continue on US 49 South toward Jackson, Hattiesburg, Gulfport

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Exit onto MS-605 S (11.7 miles)

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Take I- 55MS 7 in Grenada County South to Jackson

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The Executive Director's Column

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

This year marks our 89th Annual Meeting, and as I write this, my heart is heavy. For those of you who are regular attendees, you will understand the void I'm feeling. One of my dearest friends and a steadfast supporter of MAS, Ms. Lisa McCammon, unexpectedly passed away in December. Lisa was the first face that anyone attending the MAS would encounter at our registration table, a position she held for over a decade. Her love for people and her positive attitude is irreplaceable, and her absence is deeply felt.

As I reflect on this moment, I realize that the academy has become more than just an annual event for me. I believe that when newcomers attend our meeting, they see a diverse group of individuals coming together to share more than just their research—they see a community they want to be part of. The continued success and growth of our academy are thanks to the collective efforts of every member. We are a volunteer-driven organization, and the work we do is often nothing short of heroic, especially considering the fact that many of us juggle full-time jobs while giving our best to this cause.

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—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 this great state 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), and our exhibitors. Their support has helped make this event both affordable and successful.

Let's show our appreciation by visiting the exhibit booths, and when you return to your institutions, 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 challenges such as obesity, heart disease, and gaps in education, but it's time we strive to change that perception. To do so, we must take pride in the work we do and reach out to share our discoveries and ideas with others.

April 23, 1958-December 22, 2024

Rest in peace, my friend!! You will be deeply missed, and your memory will live on in all of us who were fortunate enough to know you.

88th Annual MAS meeting, USM, Hattiesburg, MS

MISSISSIPPI ACADEMY OF SCIENCES AWARD WINNERS 2025

Contribution to Science Award

Sarah E. Morgan, PhD

Professor and Associate Director
School of Polymer Science and Engineering
The University of Southern Mississippi

Dr. Sarah Morgan is Bennett Distinguished Professor and Associate Director of the School of Polymer Science and Engineering at The University of Southern Mississippi. Her research focuses on polymer behavior at surfaces and interfaces, encompassing bio-inspired polymers and high-performance materials. She is equally passionate about polymer education and development of the next generation of scientists and engineers.

Morgan holds a B.A. from Rice University and a PhD in polymer science from The University of Southern Mississippi. Her doctoral research involved the design of water-soluble polymers to mimic the drag-reducing properties of polysaccharides found in mucins secreted from fish skin cells. Her post-doctoral career started in industry. She spent 14 years in industrial R&D in engineering thermoplastics at GE Plastics, where she held technical and managerial positions at GE locations around the world. At GE she developed materials and formulations for new products, including cell phone and computers housings; sterilizable medical equipment; optical devices; and high temperature automotive applications.

Morgan returned to Southern Miss as a faculty member in 2002, where she has continued research in both bio-inspired and high-performance materials. The research involves multidisciplinary collaborations with academic, national lab, and industrial research partners, which support student training, internships, and employment. Key efforts include determination of peptide assembly mechanisms at interfaces, synthesis of polymeric mimics of naturally occurring antimicrobial peptides, and synthesis of bio-inspired glycopolymers designed to mimic the behavior of natural polysaccharides. Glycopolymer biomaterial application targets include RNA delivery, sensors, drug delivery, water purification membranes, and cell scaffolds. Morgan's research is funded by NSF, NIH, DoD, and industrial partners. She was Science Director of the state-wide *NSF Center for Emergent Molecular Optoelectronics* (sunset in 2024) and PI of the multi-investigator *Multifunctional Materials to Address Military Engineering* U.S. Army Corps of Engineers research collaboration. She is PI of NSF Research Experience for Undergraduates and NSF Research Experience Teachers Sites and has led graduate student training programs. Twenty-two Ph.D. and 10 M.S. students have graduated under her supervision, and she has mentored the research of more than 60 undergraduate students. Morgan holds 9 patents and has over 90 publications.

Morgan is a Fellow of the American Chemical Society and a Fellow of the POLY Division of ACS. She is the recipient of the Conference of Southern Graduate Schools Outstanding Mentor and Society of Plastics Engineers Education Awards. She is lifetime member of MAS, past Chair of the POLY Division of ACS, and Associate Editor for the Journal of Materials Research

Dudley Peeler Award
Contribution to the Mississippi Academy of Sciences

Angie Garner, Ph.D., RDH, FADH

University of Mississippi School of Dentistry
Jackson, MS

Under the guidance of Drs. Benghuzzi and Tucci, Dr. Garner became involved with MAS as a graduate student and has participated in various roles such as presenter, Clinical Health Science Division Chair, Undergraduate and Graduate student poster and presentation judge, Exhibits' Chair, Executive Committee Member, student mentor, and recently elected as President Elect. Dr. Garner has been a practicing Registered Dental Hygienist for over 20 years. Her clinical expertise has been in the dental management of patients with Oral Cancer and the Medically Compromised. Dr. Garner currently is a full-time professor at the University of Mississippi School of Dentistry in the Department of Dental Hygiene. She has been awarded the Dental Hygiene Faculty of the year (2023); and the Nelson Order Teaching Excellence award on two separate occasions (2012 and 2023), which has led to her recent induction into the University of Mississippi Medical Center's Academy for Excellence in Education in December of 2023. Dr. Garner is a member of the American Dental Hygiene Association and has served as the Continuing Education Chair for the Mississippi Dental Hygienists' Association for over a decade. In May of 2024, Dr. Garner was inducted as a Fellow of the American Dental Hygienist Association. Dr. Garner is also the Executive Secretary for Sigma Phi Alpha Dental Hygiene Honor Society, the only national honor society for the Dental Hygiene profession in the US. Dr. Garner has presented and published nationally, which has led to her being a reviewer of numerous journals. Dr. Garner's clinical and research interests involve early detection, patient education, and management of Head and Neck Cancers.

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MAS Early Career Award
Contribution to the Mississippi Academy of Sciences

Haifeng Wang, Ph.D.

Department of Industrial and Systems Engineering
Mississippi State University, Mississippi State, MS

Haifeng Wang, Ph.D., is an Assistant Professor and Co-Graduate Coordinator in the Department of Industrial and Systems Engineering at Mississippi State University. He is the Director of the Systems Intelligence and Optimization Laboratory (SIOL) at MSU and affiliated faculty at UMC Department of Radiation Oncology. He earned his Ph.D. in Industrial and Systems Engineering from Binghamton University and B.S. degree in Industrial Engineering from Southeast University in China. Dr. Wang's research focuses on machine learning and optimization, with applications in medical image analysis, neurological disorder diagnosis, precision agriculture, and smart manufacturing. His work aims to improve the robustness and interpretability of machine learning models for large-scale, complex systems. **Dr. Wang's** work has been supported by different prestigious funding agencies, including NIH and USDA-NIFA. To date,

Dr. Wang has authored over 40 journal articles and 30 conference papers, earning more than 1,500 Google Scholar citations since 2020. Dr. Wang has developed and taught a variety of courses at both undergraduate and graduate levels, including innovative topics such as *Machine Learning with Industrial Engineering Applications* and *Optimization in Deep Learning*. His students and mentees have received numerous awards and recognition, including best paper finalists and competitive fellowships in different international competitions. Dr. Wang actively contributes to his professional community. He serves in leadership roles for various divisions of the Institute of Industrial and Systems Engineers and as an Editorial Board Member and Guest Editor for different journals including *Scientific Data – Nature*.

Mississippi Academy of Sciences Fellows 2025

Shrinidhi Ambinakudige, Ph.D.

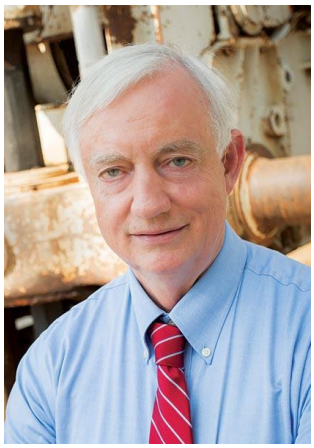
Professor of Geosciences
Mississippi State University, Mississippi State, MS

Dr. Shrinidhi Ambinakudige is a Professor of Geosciences at Mississippi State University, Mississippi State, MS. Hi's academic and professional journey exemplifies a steadfast commitment to environmental and geographical sciences, particularly through his expertise in geospatial science and climate resilience. Holding a Ph.D. in Geography from Florida State University and foundational degrees in Agricultural Sciences from the University of Agricultural Sciences, Dharwad, India, Dr. Ambinakudige brings an interdisciplinary approach to his research and teaching.

Dr. Ambinakudige has authored or co-authored more than 75 peer-reviewed publications and delivered over 90 conference presentations, consistently addressing critical issues such as land cover change, food security, and climate change adaptation. He has also mentored numerous graduate students, fostering research that tackles regional and global environmental challenges.

Dr. Ambinakudige has cultivated an extensive network of collaborators, both nationally and internationally, across disciplines such as climate resilience, food security, human geography, and geospatial science. His research spans diverse environments across multiple continents, addressing pressing issues in both the Global North and South. In the U.S., his work focuses on climate resilience in the Southeastern region. Internationally, he conducts research on land use and food security in South Asia, particularly in Bangladesh, India, and Nepal. In the cryosphere, he employs remote sensing to study glacier changes in North America, the Andes, and the Himalayas. Furthermore, his collaboration with the UN World Food Programme focuses on food security research in the Sahel and Central America. Currently, Dr. Ambinakudige leads a project addressing climate resilience in the Mississippi Delta, integrating geospatial data with human geography to assess climate impacts in vulnerable regions.

Dr. Ambinakudige has demonstrated exceptional leadership across academic, professional, and community spheres. He is an active member of several professional societies, notably the American Association of Geographers (AAG) and the Southeastern Division of the Association of American Geographers (SEDAAG), where he has held various leadership positions. He has also served as Mississippi's representative to SEDAAG and as treasurer for the ASPRS Mid-South Region. Within the Mississippi Academy of Sciences (MAS), Dr. Ambinakudige has contributed as a member of the Effectiveness and Assessment Committee and the Local Arrangement Committee for the 2023 MAS Summer Science & Engineering Symposium. Additionally, he currently serves as an editor for the *Southeastern Geographer* journal.



David T. Dockery III, Ph.D.

Director of MDEQ
Office of Geology and State Geologist, Jackson, MS

Dr. Dockery is the director of MDEQ, Office of Geology and State Geologist, Jackson, MS. He received a B.S in Petroleum Geology from Mississippi State University, M.S. in Geology from University of Mississippi and a Ph.D. in Paleontology from Tulane University.

David was born in Jackson, Mississippi, where his parents were active members of the newly established Broadmoor Baptist Church. His interest in nature began at a young age, starting with collecting rocks at the age of five and later expanding to fossils. David attended Boyd Elementary School, Chastain Middle School, and Murrah High School in Jackson. He married Mary Elizabeth Yonkers (1949-2017), originally from Clinton, Mississippi. In 2020, David married Carolyn Ellis, and together they now reside in the countryside of northwest Clinton, Mississippi. They are members of Pocahontas Baptist Church.

Dr. Dockery held adjunct positions at Millsaps College, Tulane Madison Campus, Hinds Community College, and Mississippi College. He served as Vice President and President of the Mississippi Geological Society and in 2018 became an Honorary Member of the Society. As a member of the Association of American State Geologists, Dr. Dockery represents the Association as a Commissioner on the North American Commission on Stratigraphic Nomenclature. The Commission is responsible for updating the NACSN Code, a guide to the correct use and terminology of stratigraphic nomenclature as used in publications and as a guide to editors.

Dr. Dockery published over 455 publications to his credit, including chapters on the Paleocene-Eocene Boundary and the Eocene-Oligocene Boundary in two volumes published by Columbia University Press in 1998 and 2003, 5 bulletins (Mississippi Geological Survey bulletins 120, 122, 123, 124, and 129) and 3 circulars (circulars 4, 6, and 7). Recent books include a 751-page, 1099-figure (about half-million-word text) book on *The Geology of Mississippi* and a 379-page, 808-figure, book on *Mississippi Environmental Geology*.

Among many accolades and awards, Dr. Dockery is the first recipient of The Gilbert Harri Award in recognition of excellence in systematic paleontology, the Paleontological Research Institution, Ithaca, NY, the Gulf Coast Section of SEPM Distinguished Service Award, finalist (Honorable Mention) in the Division of Novel, Eudora Welty Film and Fiction Festival Award, Honorary Member of the Mississippi Geological Society, and the Dudley Peeler Award for outstanding contribution to the Mississippi Academy of Sciences.

Angie Garner, Ph.D., RDH, FADH

University of Mississippi School of Dentistry, Jackson, MS

Dr. Garner has been a practicing Registered Dental Hygienist for > 20 years. Her clinical expertise has been in the dental management of patients with Oral Cancer and the Medically Compromised. Dr. Garner currently is a full-time professor at the University of Mississippi School of Dentistry in the Department of Dental Hygiene. She has been awarded the Dental Hygiene Faculty of the year (2023); and the Nelson Order Teaching Excellence award on two separate occasions (2012 and 2023), which has led to her recent induction into the University of Mississippi Medical Center's Academy for Excellence in Education in December of 2023. Dr. Garner is a member of the American Dental Hygiene Association and has served as the Continuing Education Chair for the Mississippi Dental Hygienists' Association for over a decade. In May of 2024, Dr. Garner was inducted as a Fellow of the American Dental Hygienist Association. Dr. Garner is also the Executive Secretary for Sigma Phi Alpha Dental Hygiene Honor Society, the only national honor society for the Dental Hygiene profession in the US. Dr. Garner has presented and published nationally, and is a reviewer of numerous journals. Dr. Garner's clinical and research interests involve early detection, patient education, and management of Head and Neck Cancers.

James Starnes, RPG

Research Director. Department of Environmental Quality
Mississippi State Geological Survey
Jackson, MS

James JE. Starnes, RPG, is the Research Director for the Surface Geology and Surface Mapping Division at Mississippi's Department of Environmental Quality's Office of Geology (Mississippi State Geological Survey). He has a Bachelor of Science in Geology from Millsaps College and is a Mississippi board licensed Registered Professional Geologist. His research encompasses over 140 professional publications in a diversity of earth science disciplines including paleontology, stratigraphy, petrology, geoarchaeology, archaeology, geomorphology, and geological mapping. He serves as the Principal Investigator for the United States Geological Survey's cooperative STATEMAP grant geologic mapping grant program for Mississippi. He also serves as the Principal Investigator for geological mapping research for the National Park Service in Mississippi and serves as a research consultant for the NPS's geologic and paleontological resources inventory programs. He serves as an Associate State Geologist to the American Association of State Geologists. He is a research consultant for the Mississippi Museum of Natural Science's paleontology program and conservation biology team. He coordinates and collaborates with geology graduate, undergraduate, and faculty research for institutions working in the state. He is the author of the Survey's Mississippi's Native Lithic Materials database and co-author of the authoritative book, Handbook of Mississippi Prehistoric Indians and Artifacts, a comprehensive archeological resource on the state. He has been a prolific member of the Mississippi Academy of Sciences for over 20 years and has served as both chair and vice chair of the Geology and Geography division. He was appointed by two state governors to serve on the Mississippi State Board of Registered Professionals Geologists and was elected by the board to serve as the board's President for two consecutive terms. He serves on the Mississippi Geological Society's Boland Scholarship committee, has served as chairman of the scholarship, and has served as the Society's President. Additionally, he has over 20 years of experience in archaeological field research and Section 106 cultural resources management working for Archaeology Mississippi, Inc. & Star-Hawk Archaeological Research. He has contributed research to both the Southeastern Archaeological Conference and the Mississippi Archaeological Association. outreach is an important part of his service as a state scientist. He has been the guest lecturer for the Bertolet Seminar series at the University of Mississippi, The USACE's Geo-Institute, the Tellus Museum, Mississippi Museum of Natural Science, Mississippi Geological Society, Shreveport Geological Society, Mississippi Archaeological Association, Mississippi Aquarium, Mississippi Gem & Mineral Society, Union County Heritage Museum as well as for the geological programs at Delta State University, Millsaps College, and USM. He routinely gives talks on geology, geoarchaeology, and paleontology at schools, Rotary Clubs, public library summer reading programs, and museums. He discovered the state's only gemstone deposit while mapping in the field, authored legislation, and successfully worked with both houses in the state legislature and the First Lady to adopt Mississippi Opal as a State Symbol as the Official State Gemstone to promote geoscience education. He has worked with Mississippi Public Television on geoscience education projects including Mississippi Roads, Simply Science (nominated for a southeastern Emmy), and the special 35 million Years Down the Chickasawhay River. He hosts Fossil Roadshow events with our museums and public libraries throughout the state. He hosts an "ask a geologist" portal through his state agency's website. He authored a syllabus for MSU Extension Service creating an earth and historical science education program for 4-H. He has been the guest lecturer for the Bertolet Seminar series at the University of Mississippi, The USACE's Geo-Institute, the Tellus Museum, Mississippi Museum of Natural Science, Mississippi Geological Society, Shreveport Geological Society, Mississippi Archaeological Association, Mississippi Aquarium, Mississippi Gem & Mineral Society, and the Union County Heritage Museum. He also guests lectures and hosts field classes at our college and university's geoscience programs throughout the year.

Mississippi Academy of Sciences – Fellows

Year	Names
2021 (Inaugural Fellows)	Ham Benghuzzi Ken Butler Joseph Cameron Zelma Cason Girish Panicker Babu Patlolla K. Raja Reddy Ramata Reddy James Stephens Shelly Tucci Francis Tuluri Md. Zaman
2022	Rob Rockhold David Sason 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

FELLOW MAS (FMAS)

Call for MAS Fellow (FMAS)

Become a Fellow: How to Apply for FMAS

- Are you eligible?
- How to apply and deadline?
- How are applications evaluated?
- How are fellows selected?

Are you Eligible for FMAS?
Call-for-MAS-Fellow-2026

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.

Deadline to apply for 2026 FMAS
November 15, 2025 at 5:00PM CST.

How to Apply
Online application at MAS website (PDF fill-able application form)
MAS Fellow_fillable Application
Please send the completed application to Dr. Raja Reddy, Chair of FMAS Committee (krreddy@pss.msstate.e

2025 Dodgen Lecture

Thursday, March, 20, 2025

(Immediately following the 3:30 awards ceremony)

The Journey to a State Paleontology Program at MDWFP Museum of Natural Science

Given By

George Phillips, MS
Paleontology Curator

MUSEUM OF NATURAL SCIENCE
Jackson, Mississippi 39202-1353

AUTOBIO: Raised in the heart of the Mississippi Black Belt, George grew up and worked on the family farm just outside of Columbus until his mid-20s. Early on, he had befriended a knowledgeable farmhand and a local geologist who, along with his parents' great patience, afforded him a hobby-interest in paleontology that soon became a great passion for the past. Row crops and a family restaurant-catering business kept him occupied until he yearned to return to formal education and turn his passion for paleontology into a career. After completing his BS in Biology & Geology at Mississippi State, he enrolled at North Carolina State for an MS in Geology. While at the North Carolina Museum of Natural Science working part-time and conducting research, he was offered the post of Paleontology Curator at the Mississippi Museum of Natural Science (MMNS) in 2003. Although quickly knee-deep in multiple projects, he soon met the most accommodating woman he would ever know—his wife Nicole—who has given him the same patience, love, and understanding that his parents did so many years ago. George's research interests include a variety of topics—almost as broad as that of the tree of life and landscapes that have ever populated eastern North America (e.g. past MAS abstract topics). Recent years find him occupied with such subjects as interpreting ancient ecosystems in the Southeast, reporting new species occurrences therein, and studying extinction and recovery at the K-Pg boundary—a Cretaceous calamity in the Yucatan and a global catastrophe. You will regularly find George collaborating with the Mississippi Office of Geology on these topics, without whom the MMNS Paleontology Section could not accomplish the volume and quality of research and educational outreach to which the public has grown accustomed.

Public Heath Informatics and Analytics@ Jackson State University
Louis Stokes Mississippi Alliance for Minority Participation (LSMAMP)
Symposium at the Mississippi Academy of Sciences
March 20-21, 2025
Biloxi Mississippi

LSMAMP Symposium Chair(s):

Dr. Glake Hill, Jackson State University
Dr. Martha Tchounwou, Jackson State University
Mr. Brad Franklin, PHIT program at Jackson State University
Ms. Jacqueline Vinson Mississippi State University
Dr. Hattie Spencer Mississippi Vally State University

The Louis Stokes Alliance for Minority Participation (LSAMP) is an alliance-based program. The program's theory is based on the Tinto model for student retention referenced in the 2005 LSAMP program evaluation. The overall goal of the program is to assist universities and colleges in diversifying the nation's Science, Technology, Engineering, and Mathematics (STEM) workforce by increasing the number of STEM baccalaureate and graduate degrees awarded to populations historically underrepresented in these disciplines:
The program also supports knowledge generation, knowledge utilization, assessment, impacts, and dissemination activities.

Public Health Informatics and Technology (PHIT) at Jackson State University aims to expand and enhance informatics and analytics degree and certificate programs to address the rising need for a diverse, skilled workforce in public health informatics and technology. The program is a collaborative effort involving Jackson State University, Alcorn State University, Coahoma College, Consortium, and local stakeholders, focusing on preparing underrepresented minorities for careers in public health informatics and technology. Through shared infrastructure and resources, the consortium will promote, recruit, and train students in certificate and degree programs across fields such as public health informatics and analytics, nursing informatics, health informatics, data analytics, and business analytics.

Thursday, March 20, 2025

10:00am -11:00am (Advisory Board Chair Drs. Glake Hill/ Martha Tchounwou)
Public Health Informatics and Analytics: Advisory Board Meeting (College Deans)
11:00am - 12:15pm

LSMAMP External Advisory Board Meeting (Presidents/Provosts of Alliance Institutions and Program Administrators, ASU, DSU, HCC, CCC, JSU, USM, UM , MSU, MVSU, TC)

Lunch

Preparing for the Future In Health and Taking Advantage of Opportunities.

Friday, March 21, 2025

11:00 - 11:30pm
Moderator: Mr. Brad Franklin (Jackson State University)

Motivational Speaker: Dr. Glake Hill: Jackson State University

Dr. Glake Hill Jr. is a distinguished scientist and the Principal Investigator of the Public Health Informatics and Analytics program at Jackson State University. His research group specializes in developing advanced computational tools to analyze complex systems with high accuracy. Beyond his scientific contributions, Dr. Hill is also a devoted leader(Bishop) in ministry. He entered the Gospel Ministry in 2006 and was ordained as an Elder in the Church of Christ (Holiness) USA in 2008. Since 2010, he has served as the Pastor of Sweet Rest COCHUSA in Pearl, MS, fulfilling his spiritual calling while continuing his impactful work in public health informatics and computational science. In addition to his roles as a scientist and pastor, Dr. Hill is a renowned motivational speaker, inspiring audiences with his profound insights on faith, leadership, and the intersection of science and spirituality. He is the author of 8 books, including Escaping Pharaoh, Victory in the Seed, and Becoming King. He is the founder of Kuumba Academy, an online school to cultivate and unleash creativity of individuals.

11:35 – 12:30 pm:

Guest Speaker: Dr. Sandra Davern: Oak Ridge National Laboratory

Moderator: Dr. Felicite Noubissi (Jackson State University)

Sandra Davern leads the Radioisotope Research and Development Section in the Radioisotope Science and Technology Division at Oak Ridge National Laboratory. She is also the initiative lead for the Accelerating Radiotherapeutics through Advanced Molecular Constructs (ARM) Initiative at ORNL and is the ORNL lead for a University of Tennessee Oak Ridge Innovation Institute, Convergent Research Initiative for the development and advancement of radiotherapies.

In her time at ORNL, she has worked on and led multiple projects, including establishing quality assurance systems for Ac-227 isotope production, microfluidics for separations chemistry and radiobiology, inkjet printing of thin film actinides, and nano constructs for radiotherapeutics. She and her team have recently been granted US Provisional Application Serial No. 63/421,290 for development of biocompatible nanoparticles as radionuclide delivery vehicles for targeted radiotherapy. She was elected as an American Association for the Advancement of Science fellow in 2022.

She has a degree in Biotechnology from Dublin City University and a PhD in Pharmacology from University College Dublin, Ireland. Her post-doc was at ORNL on Targeted Alpha Therapies using phage display for novel targeting vectors.

12:30 – 12:40 pm: Break

Lunch

12:40pm - 1:15pm: The Lasting Effects, and Advantages of Internships

Dr. Sherry Painter

Oak Ridge Institute for Science and Education (ORISE)

Moderators: Mrs. Jacqueline Vison and Dr. Sarah Lee

Dr. Sherry Painter Project Manager, Oak Ridge Institute for Science and Education (ORISE). She received her B.S. in Chemistry from Western Kentucky University and Ph.D. in Biophysical Organic Chemistry from Vanderbilt University. She has been a professor in higher education for over 20 years and during that time, she served in several administrative roles at LeMoyne-Owen College, an HBCU in Memphis, Tennessee. She joined the ORISE team as a Project Manager in August 2022 where she manages research participation programs for the USDA-ARS. Dr. Painter brings with her a wealth of knowledge in guiding students to explore their options and devise a plan to get to where they want to be.

1:15pm-1:45pm:

Dr. Shanah Grant

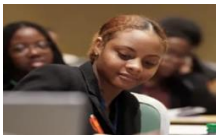
Knowing and Planning for your Financial Future

Moderator: Trinity Starks (Graduate Student JSU)

Dr. Shanah K. Grant is a renowned mathematician, STEM professor, and financial literacy advocate dedicated to empowering students with the knowledge and confidence to thrive academically and financially. With over a decade of collegiate teaching experience, Dr. Grant is committed to bridging the gap in mathematical understanding and financial literacy, empowering students especially those in STEM fields to excel both professionally and financially. Holding a Bachelor of Science in Mathematics from Fort Valley State University, a Master of Science in Mathematics from Jackson State University, and a Ph.D. in Mathematics from Georgia State University with a focus in Collegiate Mathematics Education, Dr. Grant is a powerhouse in her field. She currently serves as an Assistant Professor at Fort Valley State University, where she oversees a $1.4 million scholarship budget, helping students secure financial support in their pursuit of a mathematics degree. Recognizing the gaps in both mathematical understanding and financial preparedness, Dr. Grant founded Sharpe Sessions, an elite education firm dedicated to transforming how students approach math and finance. Through personalized tutoring, research-driven teaching, and immersive financial literacy workshops, she helps students build confidence in their abilities— whether in the classroom or in wealth-building. Dr. Grant is a trailblazer in the world of mathematics and financial literacy, inspiring students to take control of their academic, professional, and financial futures.

2:15pm- 2:45pm

Group Photographs- LSMAMP Pictures Organizers: Dr. Jonathan Towns, Dr. Ouida McAfee, Ms. Sonia Ely



Friday, March 21st, MAS Symposia

MAS Scholar Symposium

Sponsored by:

Mississippi INBRE, Millsaps College and Alcorn State University

Friday, March 21, 2025
12:00 P.M. (Room B5-6)

89th Annual Mississippi Academy of Sciences Meeting

March 20-21, 2025

Mississippi Coast Coliseum and Convention Center
Biloxi, MS

The MAS, in its commitment to recognize and promote 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, Vice President for Research
and Director for Mississippi INBRE
The University of Southern Mississippi, Hattiesburg, MS
Program Coordinator: Dr. K. Raja Reddy, Mississippi State University
Moderators: Dr. Destiny Crockett, Mississippi State University
Dr. Naflath Thenveettil, Mississippi State University

Sponsored by 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 their graduate/post graduate student abstracts to represent their division and present in the sponsored lunch award symposium, on Friday, March 21st 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 21st 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 3/15/2025 at 5 PM to be included in the competition and sent to Judges for initial screening.
4. On Friday 3/21/2025 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 Chairman: Timothy J. Ward | Associate Dean of Research, Millsaps College
Event Coordinator: Mariam 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 as well as to provide a dedicated venue to disseminate and present their research activities. Participation in undergraduate research increases self-confidence, independence, and critical thinking skills. Disseminating one's results by participating in 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 Millsaps College. Candidates in science and engineering research may be selected by their division chairs and approved 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 their 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 21st 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, March 20th around 5-7 PM (see program for more details). Failure to physically present their poster and be present on Thursday 3/21/2025 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 3/21/2025 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.**

ASU MJAS Scholars Symposium

Honoring Excellence in Science in Mississippi Symposium

Chairman: Dr. Babu Patolla, Alcorn StateUniversity

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 14 divisions will s**elect the 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: and overall Saha Award-Certificate plus $250; 2nd Place: Certificate plus $150; 3rd Place: Certificate plus $100; 4th Place: Certificate plus $50 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).

DATA SCIENCE WORKSHOP

FRIDAY, MARCH 21

- 2 - 5 p.m.
- Hosted at Mississippi Academy of Sciences 2025
- Mississippi Coast Convention Center
- Hall D, Room 2

Scan the code to learn more

SCAN ME

MISSISSIPPI INBRE

IDeA Network of Biomedical Research Excellence

January 2025, Vol 70 No 1

Mississippi INBRE Data Science Workshop

Friday, March 21, 2025:

- 2:00pm: Opening Remarks
- 2:10pm: Foundational AI: Achievements, Challenges, and the Role of Quantum Computing in a Sustainable Future
- Somayeh Bakhtiari Ramezani, Ph.D., Assistant Teaching Professor, Data Science Academic Institute, Mississippi State University
- 3:00pm: Advancing Robustness and Generalization in AI Models for Human-Centric Vision Tasks,
- Bo Wang, Ph.D., Assistant Professor, Department of Computer Science, University of Mississippi (Ole Miss)
- 3:50pm: Break
- 4:00pm: Introduction to Large Language Models for Healthcare,
- Keith Dillon, Ph.D., Associate Professor, Department of Data Science, University of Mississippi Medical Center (UMMC)
- 4:50pm: Closing Remarks

Dr. Somayeh Bakhtiari Ramezani is an Assistant Teaching Professor in Data Science at Mississippi State University, specializing in Artificial Intelligence (AI) and quantum computing with a focus on their applications in healthcare. With a strong commitment to advancing AI-driven healthcare solutions, Dr. Ramezani's research explores innovative approaches to automate and improve data processing from sensor-captured temporal data, as well as the development of multimodal models aimed at accelerating diagnosis, reducing error rates, and enhancing healthcare accessibility in rural areas.

An SEC Emerging Scholar of 2023 and ACM SIGHPC Fellow of 2021, Dr. Ramezani has been recognized for her research in data science and high-performance computing. She holds a BSc in Computer Engineering, an MSc in Information Technology, and a PhD in Computer Science with a specialization in AI.

Beyond academia, Dr. Ramezani is actively involved in professional communities, serving as the Vice Chair of the IEEE Women in Engineering (WIE) MS Chapter and Faculty Advisor for the Mississippi State University WIE Chapter, where they advocate for diversity and inclusion in STEM fields.

Bo Wang is an Assistant Professor in Computer Science at Ole Miss. His research interests in computer vision and deep learning focus on enhancing the robustness and generalization of models, with applications to human-centric tasks such as human pose estimation and human-object interaction. He obtained the PhD degree from the School of Computing at the University of Utah in 2015. He also spent nearly a decade in industry research labs at GE Global Research, Tencent US, and CtrsVision. In both industry and academia, he regularly serves as a Program Committee/Area Chair for leading AI and computer vision venues, including CVPR, ICCV, ECCV, and AAAI, among others.

Dr. Keith Dillon is an Associate Professor in the Department of Data Science, John D. Bower School of Population Health. He received a PhD from the University of California San Diego in Photonics, and a Master of Science from Rice University in Electrical Engineering. He also held positions as a postdoctoral research scientist at Columbia University, College of Physicians and Surgeons, in New York; postdoctoral fellow at Tulane University, Department of Biomedical Engineering and Department of Biostatistics, in New Orleans; Senior Staff Engineer at Qualcomm Research in San Diego; and assistant professor of Data Science at the University of New Haven in West Haven, Connecticut. Dr. Dillon is the co-founder of Formulens LLC, the co-holder of three patents, and co-author of more than two dozen research publications. His research focuses on emerging sensors and methods for medical imaging.

DIVISIONAL SYMPOSIA AND WORKSHOPS
Thursday, March 20, 2025
ECOLOGY AND EVOLUTIONARY BIOLOGY
SYMPOSIA
8:00-10:10
Hall L Room 1

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

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

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

Title: *"Palynology of the Booneville Dinosaur Site, Mississippi, U.S.A. – Floristics, biostratigraphy, and Climate"*

A Campanian vertebrate fossil site (The Tolar-Stevens Dinosaur locality) near Booneville, Mississippi contains exceptionally well preserved and diverse assortment of palynomorphs that provide important age and palaeoecological data. Palynomorphs are from interlaminated carbonaceous clays, silts, and fine-grained sands of the lower Coffee Formation. The faunal assemblage includes a partial skeleton of an adult hadrosaur, the most complete dinosaur found in Mississippi to date, along with the dentary of a very young hadrosaur, suggesting that this assemblage may have included a nesting site. Crocodilians, sea turtles, an aulopiform fish, sharks and macroinvertebrates also occur. Palynomorphs include freshwater algal spores, trilete and monolete spores, and gymnosperm and angiosperm pollen. Species of Normapolles (= Fagales) are prominent, making up between 10% and 30% of all angiosperms; their abundance suggests a warm and subhumid or seasonally dry climate. The abundance of bryophytes, lycophytes, pteridophytes and freshwater algal cysts suggest the bone bed is high in the estuary or under strong deltaic distributary influence.

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.

Donald A. Yee, Ph.D., Professor in Medical Entomology, University of Southern Mississippi, Hattiesburg, MS

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

Among the 3,700 species of mosquitoes, less than 10% are actually involved in pathogen transmission, with the other 90% having little contact with humans. From this emerges a staggering fact, most of our knowledge of mosquitoes comes from those few hundred species, and in reality we base most of our ecological, physiological, genetic, and biological knowledge about them on just a small group of medically important species. We often view all mosquitoes as the same: small and dark in color. However, mosquitoes vary in size and come in all different colors and patterns. Herein I will explore several mosquito phenotypes to show the

amazing diversity of mosquito body shapes and forms, and discuss what this may mean for our understanding of their ecology and evolution.

Dr. Donald Yee is a Professor in School of Biological, Environmental, and Earth Sciences, University of Southern Mississippi, Hattiesburg, MS. He is interested in community ecology of aquatic insects, focusing on mosquitoes and predaceous diving beetles. He is a Board Certified Entomologist with Medical Entomology specialization and a subject Editor in Journal of Medical Entomology.

Wei Wu, Ph.D., Professor, University of Southern Mississippi, Ocean Spring, MS

Title: *"The Impact of Soil Porewater Salinity and Fire Management on Salt Marsh to Pine Savanna"*

Coastal marshes are one of the most productive and intensively used ecosystems in the world, providing numerous ecosystem services that are critical to the communities that surround them and beyond. However, they are under threat due to a variety of natural and anthropogenic stressors, such as climate change and sea-level rise (SLR). SLR can cause marshes to drown, converting them to open water. Meanwhile, marshes can respond to SLR through landward migration when suitable geomorphological condition and habitat are available. This research focuses on the mechanisms that drive landward migration of salt marshes including the role of proscribed fire. One objective is to predict how soil porewater salinity and prescribed fire affect productivity of salt marshes, and understory vegetation and pine trees in pine savannas, along the gradient of salt marsh-ecotone-pine savanna in the Grand Bay National Estuarine Research Reserve, MS. Using Bayesian multi-level models, we found that fire management likely helped facilitate landward migration of coastal marshes by increasing productivity of salt marsh vegetation and understory vegetation in ecotone and upland forests as well as decreasing tree height growth through increased salinity stress. The findings provide insights as to how salt marshes respond to SLR and fire management.

Dr. Wei Wu is an Associate Professor in University of Southern Mississippi, located at the Gulf Coast Research Laboratory in Ocean Spring, MS. She earned her PhD in SUNY College of Environmental Science and Forestry, Syracuse, NY. She has been trained as a systems ecologist, and have been working in diverse ecosystems, including upland and coastal forests, coastal wetlands, and open sea. Her research interests have centered on ecological resilience through understanding species' and diverse ecosystems' response to environmental change. Her research tools include cutting-edge model selection and Bayesian statistics, traditionally frequentist statistics, spatial statistics, GIS, remote sensing techniques, computer model simulations, field-based observations/experiments, and controlled experiments.

Michael Goblirsch, Ph.D., Research Entomologist in USDA ARS, The Thad Cochran Southern Horticultural Research Laboratory, Poplarville, MS

Title: *"Direct Effects and Interaction of Certain Fungicides and Viruses on Honey Bee Health: A Novel Cell Culture Approach"*

Historically viewed as safe for insect pollinators, the toxicity of fungicides applied to flowering crops is being reconsidered because accumulating evidence suggests exposure to these agrochemicals can cause negative effects to these beneficial insects when they visit treated crops for food. Insect pollinators like honey bees may be exposed to fungicides while foraging on flowering crops land deposit contaminated food resources in the hive upon their return to the nest. It is likely that fungicide exposure may occur in tandem with other stressors to honey bee health, such as viral infections, yet the effects of

this common interaction is understudied. Here, we wanted to apply a cell-based approach to characterize some of the negative effects of fungicide exposure and viral infections on honey bees. We exposed AmE-711 honey bee cells to relevant concentrations of the widely used fungicide, chlorothalonil, and infected the cells concurrently with the honey bee virus, Acute bee paralysis virus (ABPV). We then established a dose response relationship for cell viability, measured mitochondrial function via mitochondrial membrane potential (MMP) assay, and quantified expression of oxidative stress and immune signaling genes. Preliminary findings demonstrate that changes to cell viability, MMP, and oxidative stress response gene expression occurred mainly in response to individual stressors. However, we did observe an additive effect of fungicide exposure and ABPV infection on expression of the immune peptide gene, hymenoptaecin. Our findings provide motivation for additional research using AmE-711 as a platform for developing models of interacting stressors relevant to honey bee health and to help predict adverse outcomes.

Dr. Mike Goblirsch is a Research Entomologist stationed at the Thad Cochran Southern Horticultural Research Laboratory in Poplarville MS. His current research focuses on the use of a continuous cell line that he established from honey bee embryonic tissues to explore the effects of pathogens, such as viruses, and pesticides on honey bee health at the cellular and molecular levels. He also studies the effects of existing and new pesticides on honey bees at the organismal and colony levels.

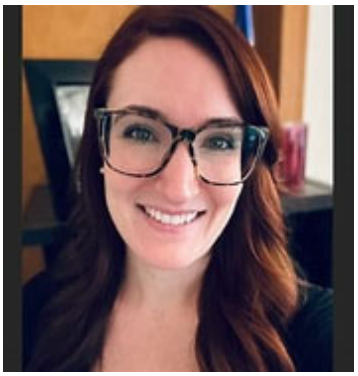
HEALTH SCIENCES INTERACTIVE WORKSHOP

10:20 AM-12:00 PM

Room D11

Moderators: Drs. D. Olga McDaniel and Lance Keller

Title: Leveraging Metabolomics for Bio-Marker Discovery in a Multi--Omics Landscape: "Oncology"



Micaiah Ward, PhD,
Field Metabolomics Scientist, at Metabolon

Dr. Micaiah Ward is a Field Metabolomics Scientist supporting Metabolon's North America East Region and Population Health activities. Prior to joining Metabolon, Micaiah earned her Ph.D. in Cellular and Molecular Biology from Florida State University where her research incorporated genomics, transcriptomics and proteomics to investigate and characterize venoms from snakes, centipedes and scorpions. In addition, she used genome-wide association (GWAS) and evolve and resequencing (E&R) approaches to identify the genetic architecture of evolved venom resistance in fruit flies (Drosophila melanogaster).

Micaiah then served as a Postdoctoral Research Fellow at Regeneron Pharmaceuticals, where she honed experience in immuno-oncology, infectious diseases, and CRISPR technology. Her broad scientific acumen and multi-omics expertise allows Micaiah to highlight the added value of metabolomics in moving the needle of scientific progress across basic and applied research areas in academia and industry.

Currently, as a Field Metabolomics Scientist at Metabolon, she is engaged with researchers across scientific disciplines to achieve meaningful phenotypic results using the power of metabolomics.

Her scientific achievements include authorship of 17 publications (additional in progress), multiple grants and awards, and mentoring 28 undergraduate and high school researchers.

Prior to her PhD, she held positions in both restaurant and mechanical contracting industries where her responsibilities included all aspects of human resources for 50-150 employees, project and budget management, coordination of two new restaurant openings from build-out to staff training.

Dr. Ward is very resourceful and innovative individual. She said "I look forward to opportunities where I can combine my scientific expertise and desire to help others with my ability to plan and execute whatever project comes my way.

HEALTH SCIENCES

HEALTH SCIENCES SYMPOSIUM

1:00 PM -3:00 PM

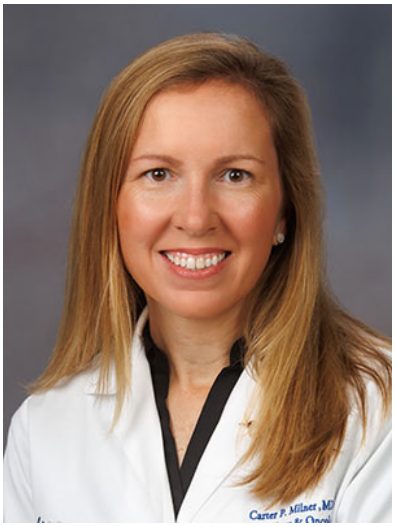
Disease Diagnostics and Thearpies

Room: D11

Moderators: Drs. D. Olga McDaniel and Lance Keller

"The Future is Here"

1:00-1:30 PM "Chimeric Antigen Receptor Therapy: Indications, Management, and Future Directions"



Carter Payne Milner, MD
Associate Professor of Medicine
Division of Hematology and Oncology
Department of Medicine
University of Mississippi Medical Center
Jackson, Mississippi

Dr. Millner will discuss different dual-target **CAR**-T studies conducted on a wide range of tumor models, the selection of target combinations, in clinical settings, and the potential **future directions.**

Carter received her medical degree from the University of Mississippi School of Medicine in Jackson. She completed a residency in internal medicine at the University of Mississippi Medical Center, where she also completed a fellowship in hematology and oncology.

Dr. Milner is a member of the American Society for Blood and Marrow Transplantation, the American Society of Hematology, and the American College of Physicians. Dr. Milner is board certified in hematology and oncology. She cares for both benign and malignant hematology conditions but has an emphasis in bone marrow transplant and cellular therapies. She serves as the Director for Bone Marrow Transplant and Cellular Therapies at UMMC. Dr. Carter, is a former Jackson Futbol Club (JFC), Soccer Star.

1:35-2:10 "Chronic Liver Disease and Advanced Technological Strategies for Diagnosis Across the Disease Spectrum"

Elliot Varney, MD, PhD
Clinical Radiology Resident Diagnostic and Interventional Radiology University of Mississippi Medical Center Jackson, MS

Elliot is a native Mississippian who graduated from Millsaps College in 2013 with a degree in Biochemistry, received his medical degree from University of Mississippi Medical Center (UMMC), in 2019 and his doctorate in Biomedical Sciences from UMMC in 2023.

Dr. Varney has served in multiple leadership roles on the local, national, and international levels including Chief resident of the Diagnostic Radiology residency program, Chairperson of the UMMC Graduate Medical Education Chief Resident Counsel, the American College of Radiology Leadership Summit, American Physician Scientist Association, and currently serves on the international LI-RADS Quantitative Imaging Group.

Dr. Varney is the coauthor of over 100 peer-reviewed scientific publications and has been a recipient of numerous honors and awards for his work in device development, artificial intelligence, biomedical engineering and a broad range of presentations at the Health Sciences Division and Mississippi Academy of Sciences (HSD/MAS) annual meetings. Additionally, he has aided in the development and validation of multiple clinical and imaging technologies including Liver Surface Nodularity, AI Metrics, and ChemoID in his efforts to continue advancing technology and precision medicine at the bedside and radiology workstation.

Dr. Varney has set to do his advanced Interventional Radiology fellowship at Yale University beginning in June 2025.

2:15-2:45 "Cardiac Electrophysiology and Mapping Technology for Ablation and Atrial Fibrillation"

James H. Hamilton IV, MD
Assistant Professor,
Department of Medicine- CARD
University of Mississippi Medical Center

Dr. James Hamilton is board certified in cardiovascular disease and clinical cardiac electrophysiology.

Dr. Hamilton is a native of Long Beach, Mississippi. He was a Carrier Scholar at the University of Mississippi, where he graduated with a degree in chemical engineering before entering medical school at the University of Mississippi Medical School (UMMC). Following an internal medicine residency and a chief resident year at UMMC, he completed a cardiovascular disease fellowship at UMMC.

Jimmy, then moved to Indianapolis, IN, with his wife and three children to complete a 2-year clinical cardiac electrophysiology fellowship (EP) at the Krannert Institute of Cardiology in Indianapolis. He returned to Mississippi following EP fellowship, working in private practice for three years before becoming the chief of the EP section at UMMC.

Dr. Hamilton has special interest in advanced ablation techniques and treatments for atrial and ventricular arrhythmias, Watchman left atrial appendage closure device insertion, and leadless pacemaker insertion.

Dr. Hamilton, has over 15 years of experience in the medical field. He has extensive experience in Congenital Cardiac Conditions, Cardiac Implantable Device Procedures, and Cardiac Electrical System Procedures.

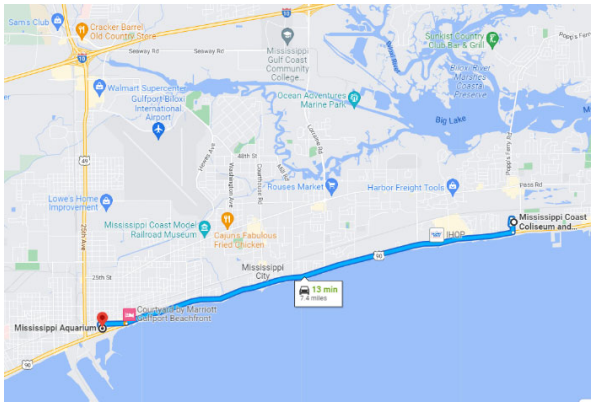
Dr. Hamilton has been a recipient of numerous honors and awards for his work, including Medical Service Resident of the Year Award, GV Sonny Montgomery VA Hospital, 2009, Medtronic Emerging Leaders Program Attendee (by invitation), Medtronic, Inc. 2017, Boston Scientific EP Vision 20/20 Emerging Leaders Program (by Invitation only), 2023.

Outside of the hospital, he enjoys relaxing and travelling with his wife, three children, and two dogs as well as camping and fishing.

DIVISIONAL SYMPOSIA AND WORKSHOPS
Friday, March 21, 2025

ECOLOGY AND EVOLUTIONARY BIOLOGY
FRIDAY 10:00-12:00
FIELD TRIP TO THE MISSISSIPPI AQUARIUM

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



Opened in August 2020, **Mississippi Aquarium** is a premier institution delivering an awe-inspiring entertainment experience which supports animal research and conservation, inspires learning and instills a passion for the aquatic world. The Aquarium tells the incredible story of all of Mississippi's aquatic resources from the Delta to the coastline and the remarkable connection that ties all of the state's natural resources uniquely together. Featuring the warm waters of the Gulf of Mexico and beyond, the roaring waters of the mighty Mississippi River and the wetlands and marshes of the tranquil bayous, the story of Mississippi's natural resources had never been told in this extraordinary way. The Aquarium understands that living in Mississippi is about the outdoor experience and the relationships of its people. Mississippi Aquarium represents education, conservation and community. The Aquarium provides visitors many opportunities to be entertained and fully immersed in the aquatic wonder that Mississippi has to offer. **MAS participants can receive the discount throughout the meeting (Feb. 22-24) by mentioning MAS at the ticketing window. Tickets also can be purchased in advance by calling Sarah Fisher, Biology Specialist, at the aquarium (228-241-1218). Dr. Nina Baghai Riding will join MAS participants from 10 am - 12 pm on Friday, February 24th.**

- **Address:** 2100 E Beach Blvd, Gulfport, MS 39501
- **Hours:** 10 am – 5 pm (Mon – Sun)
- **Parking Garage Rates**: $2.25 for 1 hour, $4.50 for 2 hours, $11 for 2 plus hou

Regular Adult Admission to the Aquarium: $24.95

Discount rate for MAS participants: $19.95 + tax

(Please mention MAS at the ticketing window.)

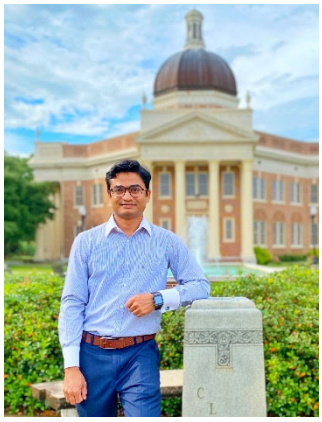
Note: Dr. Baghai-Riding will be at the location at 10:00 am on March 21, 2025 (meet by ticket window)

HEALTH SCIENCES
SYMPOSIUM II- A Changing Landscape
8:10 -9:50 AM
Room: D8

Pros and Cons for Trending Medical Advancement- A Scientific Debate

Speakers: **Shazeed-Ul Karim, Graduate Student (Defender)**
Dr. Poonam Sharma, Assistant Professor-Research (Challenger)
Dr. Lance Keller, Assistant Professor- Microbiology (Ring Master)

8:15-9:00 **Topic I** **Genome Editing**



Shazeed-Ul Karim, Graduate Student (Defender)

Shazeed-Ul Karim, the "**Defender**" of the Genome Editing is a 5th year PhD candidate at the School of Biological, Environmental and Earth Sciences at the University of Southern Mississippi.

His research focuses on developing animal models for Chikungunya Virus infection in the heart and exploring IL-17A based therapeutics. He has also made significant contributions to SARS-CoV-2 research, including developing a novel and potential drug delivery systems for SARS-CoV-2 inhibition and identifying antiviral agents targeting the Omicron variant.

Shazeed-Ul Karim's noticeable achievements during his PhD, include securing 1st place in the Graduate Student Oral Presentation in Health Science Division (HSD) at the 88th Annual MAS meeting in 2024. He was also an Honorable Mention Winner at the Mississippi INBRE Graduate Scholars Symposium at the 88th MAS meeting for 3-Minute Thesis Competition. He also earned 3rd place in the Graduate Poster Competition at the 6th MAS Summer Science and Engineering Symposium in 2024 at the Mississippi State University.

Shazeed has been recognized with multiple competitive travel awards and actively participated in prestigious conferences. His research highlights understanding of viral pathogenesis and antiviral therapeutics. He is also a Teaching Assistant for several labs, including Immunology, Microbial Physiology and General Microbiology.

Shazeed-Ul Karim, during his PhD studies has published five high-impact manuscripts, of which in three he was the first author.

Poonam C. Sharma, Assistant Professor-Research (Challenger)

Poonam C. Sharma, MD, PhD, TS(ABB), SM(ASCP), FACSc, the **"Challenger"** is a board-certified clinical microbiologist with over ten years of experience in research, medical microbiology, and teaching.

Dr. Sharma, an MD graduate from India, received her PhD in Microbiology and Immunology at the University of Mississippi Medical Center (UMMC). She currently serves as an Assistant Professor of Pathology and Medical Director at UMMC's Clinical Microbiology and Serology labs.

Her research focuses on glycosaminoglycan-based inhibitors for respiratory infections. She also teaches multiple courses at UMMC, educating future clinicians in microbiology and pathology.

Dr. Sharna has received multiple honors, including the Certificate of Recognition from UMMC and awards from various prestigious societies, including the American Association of Bioanalysts, American Society for Clinical Pathology, American Society for Virology, Mississippi Academy of Sciences, and the Society of Infectious Diseases Pharmacists. She has published several notable manuscripts in top medical journals.

Lance E. Keller, PhD. Assistant Professor, (Ring Master)

Dr. Lance E. Keller, Assistant Professor, the **"Ring Master"** is at the School of Medicine, Department of Cell & Molecular Biology, Center for Immunology and Microbial Research, University of Mississippi Medical Center.

Lance is Microbiologist and bacterial geneticist by training. He is from Texas, and received his B.S. in Biology, 2009, from Georgetown, Tx. Then he moved to University of Mississippi Medical Center (UMMC), where he got his MS in Biomedical Sciences in 2012, and his PhD. in Microbiology and Immunology, 2015. Then, he travelled with his young family to Europe for additional education and Research opportunities. Dr. Keller stopped in Groningen, Netherlands for a Postdoctoral position. In this position he studied **"Genetic network construction to examine heterogeneity in infection models"** from 2015-2017. Then he moved to Lausanne, Switzerland, where he studied **"Florescent microscopy to develop sequencing technology based on FRET",** 2017-2020.

Dr. Keller joined the faculty at UMMC in 2020. He has exceled in the area of research discoveries very quick. He demonstrated that Pneumococcal Surface Protein K (PspK) is a canonical surface adhesin of non-encapsulated *Streptococcus pneumoniae* (NESp). He demonstrated that PspA allows NESp to colonize the nasopharynx as effectively and encapsulated pneumococci. The prior beliefs indicated that pneumococci had to have a capsule to colonize the nasopharynx. This resulted in an Outstanding Young Researcher Award from UMMC. As well as an American Society for Microbiology (ASM) award to present his research. Dr. Keller's Award are numerous. He received a Defense and Advanced Research Project Agency (DARPA) Cooperative Agreement Award, 2017-2018 for the development of a novel sequencing technology based on FRET microscopy. He also took an active part in a Major International Joint Research Project (2019-2020), from the National Natural Science Foundation of China.

Dr. Keller served on Institutional Review Board (IRB). He is member for Veterans Affairs Hospital, Jackson, MS, Cancer Center and Research Institute (CCRI), UMMC Intramural Research Support reviewer, School of Graduate Studies in Health Sciences, current Vice-Chair and the 2023-2024 Co-Chair of Health Sciences Division of MAS.

He has 14 published research manuscript of which he is a first Author on seven. He has multiple academic memberships including, American Society of Microbiology, American Association for Immunology, Mississippi Academy of Science, etc.

9:05:9:50 AM **Topic II Artificial Intelligence**

Speakers: **Aubrey Smyly, MD, Graduate Student (Defender)**

Dr. Merlin M. Manogaram, Project Manager (Challenger)

Dr. Elliot Varney, Clinical Radiology Resident(Defender)

Aubrey R. Smyly MD, the "**Defender**" is a PhD student in Biomedical Imaging and a resident in diagnostic radiology at the University of Mississippi Medical Center (UMMC).

Aubrey has a strong academic foundation, including dual degrees in Chemistry and Biology from Mississippi College (2018), a medical degree from UMMC (2023), and completion of an internal medicine internship at UMMC (2024).

She has received thirteen awards for research covering topics within the fields of computational chemistry and diagnostic radiology.

In addition, she has earned multiple honors for leadership, academics, mentorship, and community service, including acceptance into the prestigious 2025 "Sparking and Promoting Academic Radiology Careers (SPARC)" workshop through the American Roentgen Ray Society.

Dr. Smyly is an active member of several leading organizations, including the Radiological Society of North America, Mississippi Radiological Society, American College of Radiology, American Roentgen Ray Society, and Society of Interventional Radiology, reflecting her dedication to contributing to advancements in diagnostic and interventional radiology. Dr. Smyly is dedicated to advancing medical imaging research.

Dr. Merlin Margaret Gnanasigamani Manogaram, Project Manager ***(Challenger)***,
Department of Radiology, School of Medicine,
University of Mississippi Medical Center

Dr. MMG Manogaram received her Bachelor in Surgery and in Medicine, 1994, from Kilpauk Medical College, Chennai, India. Then she entered in Medical College of Madras, received her MD in Clinical Pharmacology, 2004, from Madras Medical College, Chennai, India.

From 2005-2007, she was Research Associate and Principal Investigator at Indian Council of Medical Research.

Dr. MMG Manogaram moved to the United States. She received her Master's in Healthcare Administration (MHA) from Minneapolis MN, 2013. She is a certified Clinical Research Coordinator.

Dr. Manogaram holds a position of Postdoctoral Fellow and Project Manager in the Department of Radiology, at the University of Mississippi Medical Center (UMMC), where she studies in particular, imaging biomarkers to unravel phenotypically heterogenous obesity among the UMMC population.

Dr. Manogaram received numerous Honors and Awards for excellence in quality of her work. She received the Ruth L. Kirschstein prestigious National Research Service Award (NRDA) (T32), 2022.

In addition, she has won several research awards including Young Investigator Award, Mississippi Academy of Sciences, February, 2023, Outstanding Medical Research Award, University of Mississippi Medical Center, April, 2023, Press release Scientist Des chercheurs venus d'Inde et du Canada, Le laboratoire méconnu de I'IUT' L'yonne Républicaine, France, January 2009.

Dr. Manogaram is a member of American Roentgen Ray Society (ARRS), Association of Clinical Research Professionals (ACRP), etc. She has numerous presentations and publications in which you may contact her at mmanogaram@umc.edu.

Dr. Elliot Varney, (Ring Master)

Elliot Varney, MD, PhD, the **"Ring Master"** is a Clinical Radiology Resident of Diagnostic and Interventional Radiology, University of Mississippi Medical Center.

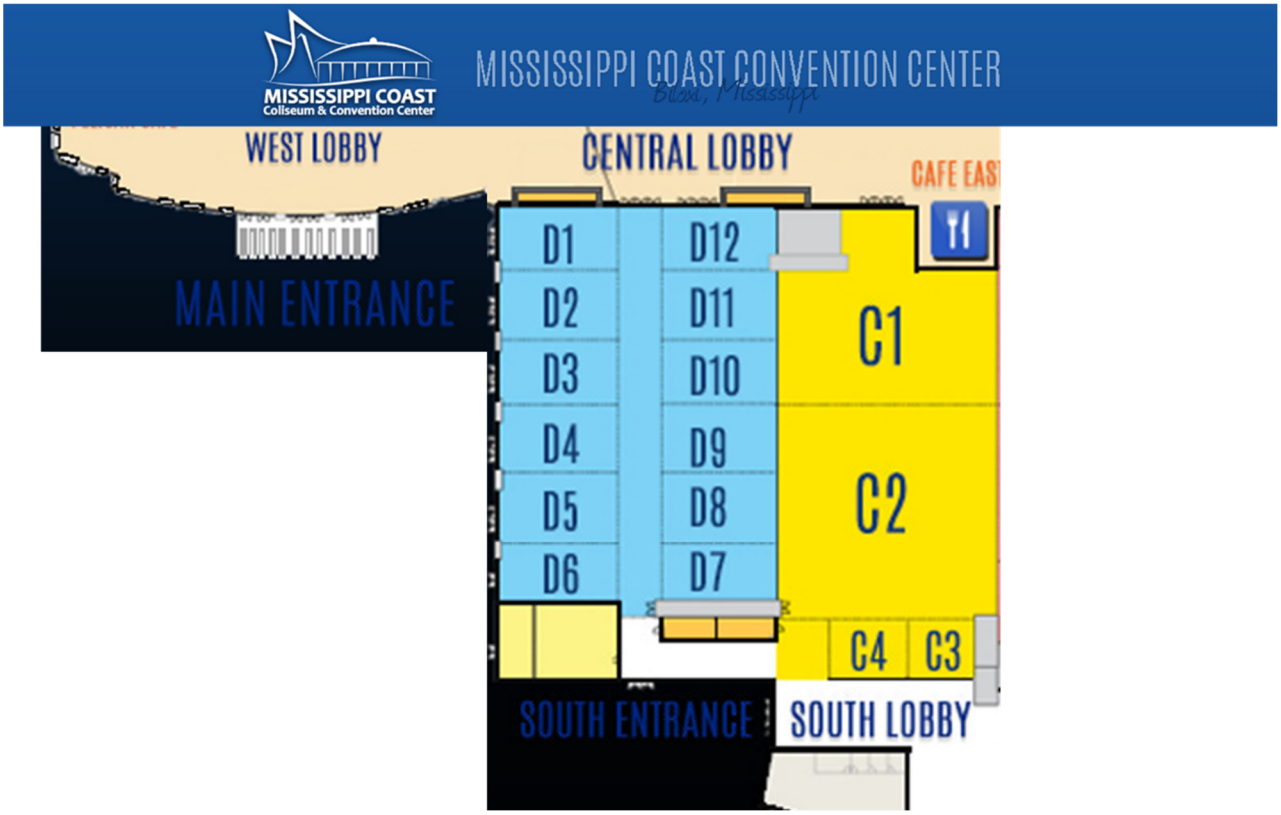
Elliot is a native Mississippian who graduated from Millsaps College in 2013 with a degree in Biochemistry, received his medical degree from University of Mississippi Medical Center (UMMC), in 2019 and his doctorate in Biomedical Sciences from UMMC in 2023.

Dr. Varney has served in multiple leadership roles on the local, national, and international levels including Chief resident of the Diagnostic Radiology residency program, Chairperson of the UMMC Graduate Medical Education Chief Resident Counsel, the American College of Radiology Leadership Summit, American Physician Scientist Association, and currently serves on the international LI-RADS Quantitative Imaging Group.

Dr. Varney is the coauthor of over 100 peer-reviewed scientific publications and has been a recipient of numerous honors and awards for his work in device development, artificial intelligence, biomedical engineering and a broad range of presentations at the Health Sciences Division and Mississippi Academy of Sciences (HSD/MAS) annual meetings. Additionally, he has aided in the development and validation of multiple clinical and imaging technologies including Liver Surface Nodularity, AI Metrics, and ChemoID in his efforts to continue advancing technology and precision medicine at the bedside and radiology workstation.

Dr. Varney has set to do his advanced Interventional Radiology fellowship at Yale University beginning in June 2025.

Mississippi Coast Coliseum and Convention Center Floor Plan



Key to Abbreviations

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

1 Agriculture and Plant Science
2 Animal Sciences, Wildlife, Fisheries, and Veterinary Sciences
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
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2nd number is Abstract Number within oral presentations (O) or poster session (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: Gary Feng

USDA-ARS

Co-Chair: Shankar Ganapathi Shanmugam

Mississippi State University

Co-Chair: Emran Ali

Alcorn State University

Thursday, March 20, 2025
MORNING
Hall D Room 1
8:00 Welcome and Opening

O1.01

8:15 WHOLE CORN EAR PHENOTYPING THROUGH FULL SURFACE HYPERSPECTRAL IMAGING

Haibo Yao[1, 2], Ebrahiem Babiker[2], Yanbo Huang[2], Dan Jeffers[2], John Brooks[2]

[1]USDA-ARS, [2]USDA-ARS, Mississippi State, MS

Corn is the number one crop in the United States. US is also the largest corn producer in the world, representing one-third of world production. In the state of Mississippi, corn is the second largest row crop, accounting for more than $675 Million in 2023. Corn breeding is an important process to develop and identify corn hybrids with important traits such as high yield, drought tolerance, resistance to diseases and insects, etc. One essential task in corn breeding is ear assessment after hand harvest of corn ears. This task involves evaluation of traits such as ear shape and size, kernel row number, kernel number, surface distribution of kernels on the ear, and gene markers. However, traditional ways for measuring and recording corn ear traits are manually based, which is subjective, inconsistent, time consuming, and expensive. In addition, it is difficult for a manual approach to record certain information such as kernel surface distribution on the ear. This research developed a novel hyperspectral imaging system for whole corn ear phenotyping. The hyperspectral imaging system implemented pushbroom line scanning and was able to scan full corn ear surface using a rotational stage. The resulted hyperspectral image of a whole corn ear is a flattened surface image of the ear, which provides a two-dimensional (2-D) digital representation of whole corn ear surface from a three-dimensional (3-D) whole corn ear body. Hyperspectral imaging is a promising research tool for agricultural products, especially when analyzed with artificial intelligence and machine learning algorithms. The resulted 2-D corn ear hyperspectral images can be used for 3-D whole corn ear phenotyping, categorization and quantification of kernels, and identification of the above corn ear phenomics traits. Furthermore, spectral information in the hyperspectral images could be used to identify other pertinent traits such as nutritional and chemical constituents of kernels, disease and fungal infection status, and genotypic expression under fluorescence excitation.

O1.02

8:30 EVALUATION OF SINGLE AND MIXED COVER CROPS SPECIES IN A SANDY LOAM SOIL UNDER CORN PRODUCTION

Partson Mubvumba, Heather L. Tyler

[1]USDA-ARS-CPSRU, Stoneville, MS

Informed selection of cover crop species is critical for optimizing their benefits by considering the costs of adoption and the potential initial negative impact on yields against the proven benefits for sustainable production. The Lower Mississippi Delta region is lagging in cover crop adoption, partly due to a paucity of this information from the area, despite being one of the major row crop-producing regions in the United States. Common cover crop species in the region, cereal rye (CR) (*Secale cereale)*, hairy vetch (HV) (*Vicia villosa*), and crimson clover (CC) (*Trifolium incarnatum*), and their possible two- and three-combination mixes were evaluated for their impact on biomass production, enzyme activities, nutrient cycling, and corn (*Zea mays*) yields. HV + CC + CR and HV + CR produced the highest biomass and lowest yields compared to all treatments. HV and CC produced the least biomass but comparable yields to no cover crop. HV + CC + CR, HV + CR, CR, CC, and HV treatments had comparable total nitrogen, phosphorus, and soil organic carbon levels in the surface 0- to 5-cm depth. Generally, CC alone and the HV + CR mix consistently displayed significantly higher phosphatase, N-acetylglucosaminidase, s-glucosidase, and cellobiohydrolase activities compared to all other treatments, while CR had the lowest. The single species of CC or HV may be the best option in the short-term for initial cover crop implementation, rotating with CR a few years down

the line for optimum long-term benefits under corn production in this region.

O1.03

8:45 MOLECULAR ANALYSIS OF ASPERGILLUS FLAVUS STRAINS AND MICROBIAL COMMUNITY ANALYSIS IN PEANUT SEEDS

Md Mostafa Masud, Sumyya Waliullah, Victor Njiti, Emran Ali, Franklin Chukwuma

Alcorn State University, Lorman, MS

Aspergillus flavus is a prevalent pathogen that poses a serious threat to peanuts, leading to aflatoxin contamination and significant crop losses in storage conditions. Distinguishing toxigenic and non-toxigenic *A. flavus* strains is crucial for effective management, but traditional methods are often slow and time-consuming. To address this challenge, we developed molecular tools to differentiate *A. flavus* isolates. By combining morphological and species-specific PCR sequencing, we

identified A. flavus isolates from peanut seeds collected across the southern USA. To identify aflatoxin and non-aflatoxin producing isolates, we utilized RT-PCR, RT-qPCR with primer optimization focusing on four genes (AflD, AflQ, AflP, AflR) from aflatoxin biosynthesis gene cluster and subsequently, quantified aflatoxin production by ELISA. Our results showed clear differences of gene expression and quantification throughout our isolates. By analyzing gene expression patterns, quantification and AFs production, we characterized toxin and non-toxin producing *A. flavus* isolates. These results revealed the efficacy and specificity of these molecular tools which could be helpful for developing good molecular markers for distinguishing toxigenic and atoxigenic isolates and to manage *A. flavus* contamination in peanut seed lots. In addition, research on the role of seed microbiome in mycotoxin production is limited. We assessed the microbial communities in peanut seeds using ITS gene sequencing over multiple years, revealing a diverse microbiota that includes *A. flavus* and other fungal pathogens. This approach offers novel insights into peanut seed-associated microbiomes, co-infection and aflatoxin production, shedding light on the correlation between the role of microbial communities and aflatoxin contamination.

O1.04

9:00 DEVELOPMENT OF MULTIPLEX PCR ASSAY FOR RAPID DETECTION AND DIFFERENTIATION OF PATHOGENIC RACES OF *Fusarium oxysporum f. sp. niveum* (FON) IN WATERMELON

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

[1]Alcorn State University, Lorman, MS, Lorman, MS

Fusarium wilt, caused by *Fusarium oxysporum f. sp. niveum* (FON), poses a significant threat to global watermelon production. The pathogen is divided into four races, making traditional bioassay identification challenging due to the high genetic variability within and across races. Accurately determining the race of FON is crucial, as resistant watermelon cultivars exhibit race-specific resistance. Existing molecular methods allow identification of races 1 and 2, but race 3 requires multiple PCR assays for confirmation. This study aimed to develop and optimize a multiplex PCR protocol that integrates three previously published singleplex markers into a single assay to differentiate FON races 1, 2, and 3 simultaneously. Isolates of FON and related Fusarium species were collected from key watermelon-producing regions, including Georgia, Florida, and South Carolina, to validate the assay's sensitivity and specificity. The optimized multiplex PCR successfully detected FON DNA at concentrations as low as 0.5 ng/µl, differentiated FON from other Fusarium oxysporum species, and distinguished between races 1, 2, and 3 in a single reaction. This novel assay marks the first successful use of multiplex PCR for race-level identification of FON, providing a critical diagnostic tool for rapid, accurate detection and monitoring of race 1, 2 and race 3 proliferation in the US.

O1.05

9:15 DEVELOPMENT OF A SIMPLE HOMEMADE SPORE TRAP TOOL FOR MONITORING DOWNY MILDEW AND MOLECULAR CHARACTERIZATION OF ITS CAUSAL AGENTS

Mikeria Wallace, Sumyya Waliullah, Victor Njiti, Chunquan Zhang, Franklin Chukwuma, Emran Ali

Alcorn State University, Lorman, MS, Lorman, MS

Airborne sporangia are the primary agents responsible for economically significant vegetable diseases like downy and powdery mildew in Mississippi. These pathogens, biotrophic oomycetes, are dispersed through airborne spores that thrive in the region's warm, humid summer conditions. Over the last two decades, shifts in pathogen populations have reduced fungicide efficacy, creating an urgent need for molecular characterization and epidemiological studies. Timely detection of these phytopathogens is essential for the vegetable industry, where an integrated management approach relies heavily on prompt fungicide applications. Early and sensitive molecular detection methods offer a way to optimize fungicide timing. To address this, we developed a cost-effective, simple spore trap collection method, paired with advanced molecular techniques, including PCR and qPCR, for early detection of key pathogens like *Pseudoperonospora spp*., which causes downy mildew in vegetables. Airborne sporangia were collected from the ASU model farm at Alcorn State University, Lorman, MS, Mississippi, and then amplified using *P. cubensis*-specific molecular markers. We also performed molecular characterization of *P. cubensis* isolates, contributing to the establishment of a bio-surveillance system for this pathogen. Integrated with existing monitoring systems, this approach has the potential to improve management strategies for airborne phytopathogens in vegetable crops greatly.

O1.06

9:30 FROM WASTE TO WEALTH: INVESTIGATING INSECT FRASS AS A BIOFERTILIZER THROUGH SOIL MICROBIAL DYNAMICS

Jasmine Sahota, Shankar Ganapathi Shanmugam, Jagman Dhillon

[1]Mississippi State University, Starkville, MS

The global trend towards using insects for food and feed is gaining momentum due to increasing population, environmental concerns, and the need for sustainable protein sources. Mass rearing of insects produces a high amount of byproduct, known as insect frass. Insect Frass is a mixture of insect excreta, shed exoskeleton and undigested feed. Insect frass has recently gained attention as potential organic amendment to enhance plant growth as it is considered a good source of essential plant macronutrients (N, P, K), micronutrients and a diverse microbial community. However, despite its benefits,

research on frass-associated microbiome is limited. This study particularly investigates the effects of insect frass quality and quantity on soil-plant-microbial dynamics and highlights its potential use as a biofertilizer for enhancing plant growth. Soil microbial communities play a central role in nutrient cycling, decomposition, and soil carbon storage essential functions that contribute to better plant growth. For this study, insect frass samples were procured from different industries, reared on diverse range of diet sources including agriculture waste, food waste, corn and soy. The objective of this study is to investigate how diet sources and insect combination affect frass microbial community composition and how it affects soil-plant health when applied as a soil amendment. We employed 16S rRNA (bacterial) and ITS (fungal) amplicon sequencing to characterize the frass associated microbial community composition. Additionally, we used Biolog EcoPlates to measure the microbial metabolic activity by assessing average well color development (AWCD) across frass samples. Furthermore, based on our initial frass characterization, a greenhouse trial was set up in a completely randomized design to evaluate the effect of insect frass as a soil amendment on corn plant growth. Soil was amended with five treatment rates (0, 50, 100, 200, 250 lb/ac) from four insect species treatment (A_back soldier fly, B_Cricket, A_Cricket, C_Black soldier fly). We measured the plant growth parameters, harvested the corn plant at six leaf (V6) stage, and collected the rhizosphere and bulk soil for further analysis. DNA sequences were analyzed using QIIME (Quantitative insights into microbial ecology). Results showed significant differences in microbial diversity and community structure based on insect species and diet sources. Statistical analysis using R indicated that frass amendment rates significantly affected aboveground biomass ($p < 0.05$), with higher rates correlating with increased biomass. Furthermore, AWCD, an estimation for microbial metabolic activity, varied significantly across treatments, suggesting that insect frass amendments influence soil microbial metabolic activity. Principal Component Analysis (PCA) showed distinct clustering of microbial (fungal and bacterial) communities based on insect species and diet source, indicating that different frass source has distinct microbial composition. These findings showed that insect species and diet sources play a crucial role in shaping frass's microbial composition and metabolic activity, which, in turn, affects soil microbial dynamics and plant growth response in corn production systems.

O1.07

9:45 DROUGHT INDUCED SHIFTS IN RHIZOSPHERE MICROBIAL COMMUNITIES ACROSS DEVELOPMENTAL STAGES OF COWPEA GENOTYPES

Durga Purushotham Mahesh Chinthalapudi[1, 2], Sujan Poudel[1], Raju Bheemanahalli[1], Shankar Ganapathi Shanmugam[1,]

[1]Department of Plant and Soil Sciences, [2]Institute of Genomics, Biocomputing, and Biotechnology, Mississippi State University, Starkville, MS

The increasing global population and climate change pose significant threats to food security, with drought being a critical factor limiting crop productivity. Understanding the interactions between plants and their associated microbiota under drought stress is crucial for developing resilient agricultural practices. This study investigates the impact of drought on the rhizoplane microbial communities of two cowpea (Vigna unguiculata L. Walp.) genotypes, UCR369 and ES4, across different developmental stages. A greenhouse experiment was conducted where both cowpea genotypes were subjected to drought stress at four growth stages: V2 (trifoliate leaf), V4 (branching), R1 (early bloom), and R4 (mid-pod set). Root-associated microbial communities were analyzed using amplicon metagenomics, and functional predictions were made using PICRUSt2. Additionally, community-level physiological profiling (CLPP) was performed using Biolog EcoPlates to assess microbial metabolic activity. Our results revealed that both genotype and drought significantly influenced the composition of root-associated bacterial communities. Proteobacteria, Actinobacteria, Firmicutes, and Chloroflexi were the dominant phyla, with UCR369 exhibiting a higher abundance of Actinobacteria and Firmicutes under drought conditions compared to ES4. Drought significantly reduced bacterial richness in both genotypes, particularly at the R4 stage in ES4. However, Shannon diversity was not consistently affected by drought. Metabolic activity, measured by average well color development (AWCD), was higher in control plants than in drought-treated plants across all growth stages for both genotypes. These findings highlight the dynamic nature of root-associated microbial communities under drought stress and their dependence on plant genotype and developmental stage. The study provides insights into how microbial communities adapt to environmental stressors and suggests that enhancing plant-microbe interactions could be a promising strategy for improving crop resilience to drought.

10:00 BREAK

O1.08

10:15 EFFECT OF MICRONUTRIENTS APPLICATION ON SOYBEAN YIELD AND QUALITY IN RAINFED PRODUCTION SYSTEM

Ammar Bhandari, Tulsi Kharel, Nacer Bellaloui

USDA-ARS, Stoneville, MS

Modern high-yielding crop cultivars often require more nutrients, prompting producers to focus on maximizing yield through high-input management practices, including micronutrients application. Adequate uptake of these micronutrients can improve the nutritional quality of edible crops. However, more information is needed on the micronutrient requirements and recommendations in

soybean in the lower Mississippi Delta region. The study aimed to determine the effect of micronutrients application on soybean yield and quality in rainfed production systems. The experiment design was a split-plot design with four replications, where irrigation was the main plot and fertilizer treatment was the subplot. Each plot was 25.35 ft wide (8 rows) x 200 ft long. The treatments were either the full or a half rate of (i) zinc, Zn (microLink Zn 4%), (ii) iron, Fe (microLink Fe 4%), (iii) Zn + Fe, and (iv) control -no micronutrient application (C). The full rate of Zn was applied at 10 lbs. ac^{-1}, and the half rate was 5 lbs. ac^{-1}. The Fe was applied at 5 lbs. ac^{-1}, and 2.5 lbs. ac^{-1} as full and half rate, respectively. Soybean variety 48XFO of maturity group was planted on April 18, 2023, and April 25, 2024. The micronutrients (Zn and Fe) were split into two applications. The first foliar application was ~50 days after planting (DAP), and the second was ~70 DAP. The full rate received both applications, and the half rate received only the first application. The center four rows were harvested using 8XP two row combine for soybean yield. The soybean seed sub-samples were collected, ground, and analyzed for protein, oil, fatty acid, and sugars using a Foss NIR (NIRS™ DS3 F). The yield and quality data for rainfed environments in 2023 and 2024 will be presented and discussed.

O1.09

10:30 USING HOST RESISTANCE TO CONTROL COTTON PARASITIC RENIFORM NEMATODE

Chunda Feng and Salliana Stetina

USDA, Agricultural Research Service, Crop Genetics Research Unit, Stoneville, MS 38776

Cotton is the primary source of natural fiber for the textile industry worldwide. The US is a leading cotton producer and the largest exporter in the international cotton market, representing about seven billion dollars total value annually. 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 disease for cotton production; the yield loss caused by this parasite is about 5% in these states and could be up to 50% in some heavily infested fields. Several approaches are applied to manage this important disease. Nematicides could provide protection to cotton seedlings for a short period, but the nematode populations increase dramatically during the cotton growing season. Rotation with non-host crops may reduce the populations of RN but is often not a choice due to some technical and economic constraints. Growing resistant (R) cultivars would be 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 found in a few genotypes of tetraploid Sea Island cotton (*G. barbadense*) and some diploid *Gossypium* species. Therefore, the objectives of our research included identification of genetic resource of resistance to RN in diploid species and introgression of resistance from diploid to tetraploid upland cotton. Genetic and genomic approaches have been employed to characterize the RN resistance in this diploid *Gossypium* species. Using a genome-wide association study, we were able to identify some single nucleotide polymorphisms (SNPs) associated with resistance in *G. herbaceum*. Transcriptome analysis revealed differentially expressed genes (DEGs) in response to the RN. Some of these DEGs may play important roles in RN defense mechanism. Quantitative trait loci (QTLs) have been detected from two *G. arboreum* accessions, and candidate R genes were identified. Crossing tetraploid and diploid cotton usually results 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. The chromosome numbers of several *G. arboreum* R genotypes might be doubled using colchicine treatment, which was evidenced by the produce of seed when pollinated with tetraploid upland cotton. Triploid plants of (*G. hirsutum* x *G. arboreum*) and (*G. histutum* x *G. raimondii*) were treated with colchicine, the treated plants produced seed and crossed with diploid species. The ploidy levels of the colchicine treated plants need to be determined. Overall, our efforts in characterization of the genetic basis of resistance in diploid *Gossypium* species and the development of intermediate breeding lines (potential artificial tetraploid *G. arboreum* and interspecific hexaploid) will be useful for developing resistant upland cotton cultivars by introgression of resistance from diploid species, and eventually using host resistance to control cotton parasitic RN.

O1.10

10:45 ELEVATED CARBON DIOXIDE ALLEVIATES THE DROUGHT STRESS EFFECTS ON COTTON

Naflath Thenveettil[1], Manoj Kumar Reddy Allam[1], Krishna N. Reddy[2], Kambam Raja Reddy[1]

[1]Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS, [2]USDA-ARS, Crop Production Systems Research Unit, 141 Experimental Station Road, P.O. Box 350, Stoneville, MS

Drought stress disrupts the water balance in the plant system, impairing normal physiological functions and leading to reduced yield in many crops, including cotton. This study aimed to explore the effects of drought during reproductive and boll development stages under ambient and elevated CO_2 conditions. A pot culture study was conducted in a Soil-Plant-Atmospheric-Research facility, where an upland cotton cultivar was grown under well-watered (100% evapotranspiration, ET) and drought (50% ET) conditions at ambient (425 ppm, aCO_2) and elevated (725 ppm, eCO_2) CO_2 concentrations. Drought conditions notably impacted most of the physiology, seed yield, and fiber quality traits, while CO_2 influenced physiology, seed cotton, and lint weight. Under aCO_2, the photosynthesis and stomatal conductance decreased by 35 and 63%,

respectively, while the reductions under eCO_2 were less pronounced, at 20 and 36%, respectively. The photosystem-II efficiency and electron transport rate increased under eCO_2 by 19% each under well-watered conditions and by 21 and 25%, respectively, under drought. The seed cotton and lint weights were reduced under drought, with reductions of 19 and 15% under aCO_2 and 17 and 19% under eCO_2. However, plants grown under eCO_2 had attained more than 20% higher seed cotton and lint weight compared to those under aCO_2 in both well-watered and drought conditions. Cotton fiber qualities were significantly altered by the drought conditions under both CO_2 levels. The micronaire increased by 21 and 32% under aCO_2 and eCO_2, respectively, while the fiber length decreased by 4 and 3%, respectively. This study highlights the significant impacts of drought stress on cotton physiology, seed yield, and fiber quality, with elevated CO_2 mitigating some of the adverse effects, particularly in terms of seed cotton and lint weight.

O1.11

11:00 EPIDEMIOLOGICAL INSIGHTS INTO SEED TRANSMISSION OF PHYTOPLASMAS IN SOLANACEOUS CROPS

Sritej Mateeti[1], Assunta Bertaccini[2], Victor Njiti[1], Emran Ali[1]

[1]Alcorn State University, Lorman, MS, Lorman, MS, [2]University of Bologna, Italy

Phytoplasmas, plant-pathogenic bacteria lacking cell walls, pose a critical threat to global crop productivity by causing various diseases. One lesser-explored aspect of their epidemiology is seed transmission, which contributes to the persistence and spread of these pathogens worldwide. Therefore, this study focuses on phytoplasma transmission via seeds of solanaceous crops such as tomato, eggplant providing new insights into their epidemiological significance and the need for quarantine and control measures. In tomatoes, seed transmission was first confirmed under greenhouse conditions in Italy, with recent investigations extending this phenomenon to open-field seeds from Southern Italy. Molecular analyses using nested PCR, RFLP, and sequencing revealed infection with phytoplasma subgroups 16SrX-B, 16SrV-A, 16SrI-B, and 16SrXII-A in mother plants, while seedlings grown under insect-proof conditions tested positive for 16SrI-B and 16SrXII-A. Similarly, the eggplant seeds were sourced from mother plants showing little leaf disease symptoms. Molecular analysis revealed phytoplasma infections (16SrI, 16SrII, 16SrIII, 16SrV, 16SrVI, and 16SrXII) in seedlings at different time intervals after transplantation in insect-proof greenhouse. Notably, internal germination observed in first-generation eggplant fruits produced from asymptomatic seedlings capable of perpetuating disease cycles. This study underscores the critical role of seed transmission in the survival and dispersal of phytoplasmas, highlighting its potential as a global threat to agriculture. These findings emphasize the need to study the seed transmission of phytoplasmas to acquire proper knowledge. Thus, better mitigating strategies can be planned to control the spread of these pathogen through seeds, enhancing crop health and safeguarding the global agricultural productivity.

O1.12

11:15 RESILIENCE OF FINGER MILLET TO DROUGHT STRESS AT VARIOUS GROWTH PHASES

Mohan Kumar Bista, Nisarga K Narayana, Alekhya Chakravaram, Raju Bheemanahalli

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

Finger millet (*Eleusine coracana L.)* is a self-pollinated, C4 annual coarse cereal from the grass family. It is characterized as a short-day, warm-season crop. Despite gaining global recognition for its nutraceutical benefits and climate resilience, finger millet remains relatively underutilized in several regions, including the United States. This crop presents a promising alternative to conventional cereals, especially on marginal soils prone to environmental stressors. However, research on finger millet's performance in hot and arid conditions is notably sparse. In this study, we phenotyped a diverse collection of 498 finger millet accessions for key agronomic and yield-related traits in the challenging marginal soils of Mississippi under high temperature and low rainfall conditions. Remarkably, over 71% of the accessions reached flowering, yet only 61% of those produced viable seeds. Our analysis revealed significant genetic variation among the USDA GRIN finger millet germplasm collection. To further elucidate the physiological responses of finger millet to drought stress (DS), we subjected four selected genotypes to drought conditions for ten days across three critical reproductive stages: panicle development (DS1), flowering (DS2), and grain filling (DS3). The morpho-physiological traits of these genotypes displayed varying degrees of recovery post-stress, contingent on the specific trait and the timing of drought exposure. Notably, the chlorophyll index was adversely affected by drought across all developmental stages and demonstrated complete recovery after a 10-day rewatering. In contrast, stomatal conductance exhibited full recovery following drought stress during panicle development, whereas only partial recovery was observed during flowering and grain-filling stages. The impact of drought stress on grain yield was significant, with reductions following the sequence: DS3 (35%) > DS2 (33%) > DS1 (12%), indicating the necessity of strategic irrigation timing. These findings advocate for the potential of finger millet as a viable alternative to traditional cereals in rainfed agricultural systems. Integrating tolerance and resilience mechanisms with adaptive plasticity may be pivotal for developing drought-tolerant cultivars in this promising crop.

O1.13

11:30 CHARACTERIZATION OF NATIVE MYCORRHIZAL FUNGI DIVERSITY IN TWO NATIVE GRASSES AND EIGHT WATERMELON CULTIVARS IN SOUTHWEST MISSISSIPPI

Jean Louis Cyubahiro Cyuma, Frank Mrema, Bed Prakash Bhatta, Yan Meng, Victor Njiti

Alcorn State University, Lorman, MS

Cover cropping is a promising strategy for sustainable agriculture with the potential to modify soil microbiome and enhance soil quality. This study was conducted to characterize the abundance and diversity of native arbuscular mycorrhizal fungi (AMF) in the roots of two native grasses and eight cultivars of watermelons by histopathological and molecular methods. A simple ink and vinegar staining technique for identifying AMF structures was used to stain the roots and observe them under a light microscope. Genomic DNA was isolated using the DNeasy Plant Kit protocol. The first polymerase chain reaction (PCR) was conducted using universal primers to amplify internal transcribed spacers (ITS-5 and ITS-4) and 18S rRNA gene fragments from colonized root samples of grasses and watermelon cultivars. The second PCR was conducted using specific primers AML1 and AML2 targeting the small sub-unit (SSU) ribosomal RNA (rRNA) gene of many arbuscular mycorrhizal fungi (AMF). The results showed the presence of arbuscules, vesicles, and hyphae within the root cortical cells of native grasses and watermelon cultivars, indicating AMF colonization. Interestingly, in one of the cultivar's roots, a septate fungal hypha with clamp connection was observed in healthy tissues, indicating a typical characteristic feature of Basidiomycota fungi but did not show any necrotic root cortical cells. The results of the first PCR showed a clear band in all ten samples suggesting the presence of unidentified fungi. The results of the second PCR showed 80% of the samples were positive suggesting the presence of AMF fungi colonization. The histopathological and molecular results confirm the presence of arbuscular mycorrhizal fungi and Basidiomycota fungi of unknown role in the watermelon roots. Ongoing studies include the isolation of AMF from the rhizosphere, purification of the nested PCR products, sequencing, and conducting basic local alignment in the GenBank to identify the characterized endophytic microbiome.

O1.14

11:45 SOYBEAN ROOT ARCHITECTURE AND NODULATION UNDER DROUGHT STRESS

Bala Subramanyam Sivarathri, Mohan K Bista, Nisarga Kodadinne Narayana, Raju Bheemanahalli

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

Soybean (*Glycine max L.*) is an important leguminous crop that supplies essential protein and oil for human and animal nutrition. The rise in frequency and severity of drought episodes during critical growing periods has significantly strained sustainable soybean cultivation. Roots, as the foremost structures to detect signals of water scarcity, play a vital role in communicating these stress cues to aerial plant parts for appropriate physiological adjustments. To advance the breeding of climate-smart soybean genotypes, it is essential to investigate and select donor genotypes/varieties based on their root architecture. A major challenge in this effort has been the accurate and rapid phenotyping of root systems, hindering our understanding of root structure, functionality, and adaptive responses to environmental stressors. In our study, we conducted an initial field assessment to evaluate biomass and yield traits. Based on these traits, a diverse panel of 227 soybean genotypes were selected, and phenotypes root traits utilizing custom-designed root beds. Our analysis revealed significant genetic variability ($p<0.001$) across all evaluated root growth and developmental characteristics. We then selected sixteen soybean genotypes, distinguished by their root traits, specifically root length and biomass, for evaluation under two distinct soil moisture regimes during the early vegetative stage (V3) for 14 days. The findings demonstrated notable variability in root architecture, nodulation, and biomass traits under drought conditions. Specifically, drought stress significantly reduced nodule count, total root length, and biomass compared to control. Moreover, a substantial decrease of 28% was observed in the root-to-shoot ratio in drought-stressed plants relative to their well-watered counterparts. Our study identified promising root donor genotypes that can be exploited in breeding programs to develop superior trait-pyramided cultivars suitable for rainfed environments.

O1.15

12:00 INVESTIGATING SOIL MICROBIAL DYNAMICS: THE SYNERGISTIC EFFECTS OF COVER CROPS AND NITROGEN IN SWEET POTATO SYSTEMS

Lahari Nekkalapudi, Lorin Harvey, Michael Cox, Joshua White, Shankar Ganapathi Shanmugam

Mississippi State University, Starkville, MS

Mississippi is the third-largest sweet potato producer in the United States. Sweet Potato requires adequate nitrogen (N) and soil health to improve yields. Microorganisms, including bacteria and fungi, play a crucial role in regulating N availability from applied N, soil organic matter, and crop residues. However, limited research exists on studying the role of soil microorganisms in improving soil health with cover crops in the sweet potato production system. Therefore, a field study was conducted at Pontotoc Ridge-Flatwoods Branch Experiment Station in Pontotoc, Mississippi to assess the effects of cover crops and N application on soil microbial diversity and nutrient availability in sweet potato. This study was conducted using a randomized block design with a split-block arrangement, replicated four times, and included three N treatments (0, 50, and 100 lb^{-1}) and three cover crop treatments (no cover crop, winter wheat, and clover). Cover crops planted in fall and terminated in spring before planting sweet potato. Soil samples were collected at planting, after harvesting sweet potato and after

termination of cover crops and analyzed for physical, chemical and biological properties. Amplicons targeting the bacteria (16s) and fungal (ITS) were sequenced for soil microbiome characterization. DNA sequence data was analyzed using QIIME (Quantitative insights into microbial ecology). R statistical software was used for analyzing the data. Cover crop treatments showed significant difference in measured soil permanganate-oxidizable carbon (PoXC). Specifically, clover cover crop treatment showed significantly higher soil PoXC levels than the control (fallow) treatment. Sequencing data revealed significant differences in microbial diversity among N treatments, with notable effects on Shannon diversity ($p = 0.0326$) and Chao1 richness ($p = 0.0080$) at the preplant stage. ITS data also showed significant N-related differences in Shannon diversity ($p = 0.0224$). Cover crop treatments significantly influenced microbial diversity, with changes in Shannon diversity ($p = 0.0035$) and Chao1 richness ($p = 0.0197$) at the preplant stage, and further significant impacts on Chao1 richness at post-termination ($p = 0.0033$) and harvest ($p = 0.0006$). Beta diversity analysis revealed significant effects of nitrogen and cover crop treatments. Pre-planting 2023 nitrogen treatments showed a significant difference ($p = 0.001$). Cover crop treatments significantly impacted beta diversity at preplant ($p = 0.002$), ITS preplant ($p = 0.001$), post-termination ($p = 0.013$), and harvest ($p = 0.001$). In conclusion, both nitrogen and cover crop treatments significantly influenced soil microbial diversity and soil health, with cover crops, particularly clover, enhancing soil permanganate-oxidizable carbon levels and driving notable shifts in microbial community structure across different growth stages of sweet potato production.

O1.16

12:15 IMPROVED FERTILITY MANAGEMENT REDUCES GREENHOUSE GAS EMISSIONS IN CORN

Pankaj Prashad Joshi, Madhav Dhakal

Mississippi State University, Mississippi State, MS

Use of nitrogen fertilizers exacerbates greenhouse gas (GHG) emissions in row crop production. Practices that improve crop utilization of applied N can minimize GHG emissions. A field experiment was initiated in May 2024 to evaluate nitrogen application rates (Low: 246 kg N ha^{-1} and High: 297kg N ha^{-1}), fertilizer placement depths (0 and 10 cm) and soil surface management (close and open) on seasonal GHG emission and yield scaled emissions (YSE) in corn (Zea mays). Treatments were arranged in a randomized complete block design replicated four times. Weekly to biweekly soil N_2O, CH_4 and CO_2 fluxes were measured using LICOR trace gas analyzers and smart flux chambers. Preliminary results indicated that the N_2O flux was greater (0.993 nmol m^{-2} s^{-1}) at the low N rate than the high rate at 2 weeks after planting (WAP) and the effect reversed at 13 and 15 WAP. The CH_4 flux was negative and was smaller at the high N rate than the low N rate at 2 and 4 WAP. The CO_2 flux was greater at the high N rate at 2 and 11 WAP. Fertilizer placement at 10 cm depth had greater N_2O flux at 4 and 7 WAP, and at harvest than surface application (0 cm). Subsurface application had smaller (-0.0.067 nmol m^{-2} s^{-1}) CH_4 flux at the knee-high stage (4 WAP) and greater (-0.014 nmol m^{-2} s^{-1}) at the tasseling stage (11 WAP) than surface application. Subsurface placement had greater CO_2 flux at 6 and 13 WAP than surface placement. Soil surface management by closing packer wheel trenches had greater (2.243 µmol m^{-2} s^{-1}) CO_2 flux at 4 WAP than in respective counterparts. The high N rate increased the cumulative CO_2 emission over the season. Seasonal N_2O and seasonal CH_4 were not impacted by treatments ($P>0.005$). The interaction between fertilizer placement depth and surface management showed lower seasonal N_2O emissions when fertilizer was applied on the surface without closing packer wheel trenches than at the opposite treatments. Carbon dioxide equivalent (CO_2e) (2595.904 ± 58.045 t ha^{-1}) and YSE (0.257 ± 0.009 kg CO_2e kg^{-1} corn) were greater in high N rate than in low N. Overall, optimizing nitrogen application holds the potential to minimize GHG emissions in corn without compromising yield.

12:30 LUNCH

Thursday, March 20, 2025

AFTERNOON

DIVISION POSTER SESSION 1:30-3:30 PM

Hall C

Posters will be judged in the division and will also be presented in the General Poster Session following the Award Ceremony and Dodgen Lecture

P1.01

STUDENT'S RESEARCH AND EXTENSION EXPERIENTIAL LEARNING IN CLIMATE SMART INTEGRATED PEST MANAGEMENT FOR UNDERSERVED COMMUNITIES

Raven Butler[1], Daniel Collins[1], Tahir Rashid[1], Muhammad Haseeb[2]

[1]Alcorn State University, Lorman, MS, [2]Floridia A & M University

Small farmers in the southern region of the U.S. face challenges in managing plant diseases, weeds, and insects in crops and forest ecosystems. Yield losses due to sub-tropical climate conditions, weather extremes (e.g., hurricanes, drought, tornados), and pest outbreaks have been substantial pests. As climate change continues to intensify and create new pest threats, it is critical that we train the next generation of plant health management scientist and professionals in how to respond and develop new farm and forest ecosystems management practices to mitigate the impacts of climate change on crop production.

Underserved farmers and communities are especially vulnerable due to limited resources and lack of integrated pest management training in climate smart agriculture. To maintain our nation's global competitiveness in sustainable agriculture we need a diverse well-trained workforce. The overall objective of this project is to provide students with research and extension experiential learning opportunities in climate smart IPM practices. The small farm IPM interns engaged in firsthand research in the use of cover crops for carbon sequestration and soil health. Students planted and maintained research and extension demonstrations field plots in the use of flowering plants for pollinator health and biodiversity in crop production. Additionally, the small farm IPM interns conducted a plant pest survey of plant diseases and insect pests impacting small farms in Mississippi and Louisiana.

P1. 02

RAPID ON-SITE SOIL TESTING: A NEW ERA FOR BOOSTING SOIL HEALTH AND CROP PRODUCTIVITY

Jontayvious Thomas, Aleeiah Alexander, Sritej Mateeti, Sumyya Waliullah, Franklin Chukwuma, Emran Ali

Alcorn State University, Lorman, MS

Rapid on-site soil testing is a modern way for farmers to manage soil health, particularly benefiting minority and resource-limited communities in Mississippi. This innovative approach allows farmers to assess key soil health parameters directly in the field, providing immediate insights without the need for complex laboratory procedures. By using portable soil testing kits, farmers and agricultural extension agents can quickly determine soil pH, nutrient levels, and organic matter content, making it easier to make informed decisions on soil amendments and crop management practices. In Southern Mississippi, where minority farmers often face barriers to resources and support, rapid soil testing plays a critical role in promoting equitable agricultural success. This technology offers a cost-effective, accessible solution, empowering farmers with the knowledge they need to optimize soil health and boost crop productivity. With rapid test results, farmers can promptly apply appropriate amendments, such as lime or fertilizers, to correct nutrient imbalances, improve soil structure, and enhance crop resilience. Here we optimized a rapid onsite soil helth testing method that offers soil health testing (soil PH, N, P, and K) within an hour. Our study demonstrates the effectiveness of on-site soil testing in addressing soil health issues across diverse vegetable farms in Mississippi's underserved areas. By bringing soil testing directly to the farm, this test reduces dependency on distant laboratories and enables minority farmers to make real-time, data-driven decisions that strengthen their crop outcomes and profitability. Ultimately, rapid on-site soil testing fosters sustainable agricutural practices that contribute to long-term soil health, environmental stewardship, and community resilience.

P1.03

EFFECT OF COVER CROPS AND ORGANIC AMENDMENTS ON SOIL STRUCTURAL STABILITY AND FRAGMENTATION CHARACTERISTICS RELEVANT TO CIVIL ENGINEERING APPLICATIONS

Lucy Kent[1], Wei Dai[2], Gary Feng[3]

[1]Mississippi State University, Mississippi State, MS, [2]Louisiana State University - Agricultural Center, [3]USDA-ARS, Genetics and Sustainable Agricultural Research Unit, Starkville, MS

This study evaluates how cover crops and poultry litter influence soil structural stability and fragmentation characteristics, which are essential for soil strength, load-bearing capacity, and erosion resistance in civil engineering applications. The research utilizes data from a 5-year field experiment conducted at the Pontotoc Ridge-Flatwoods Branch Experiment Station in Pontotoc County, MS. A split-plot design was employed with different cover crop types—native vegetation (control; NV), cereal rye (*Secale cereale;* R), winter wheat (*Triticum aestivum;* W), hairy vetch (*Vicia villosa*; V), and a mustard (*Brassica rapa*; M) plus cereal rye mixture (M+R)—and soil amendment treatments: no amendment (control), inorganic amendment (phosphorus, potassium, sulfur; Fert), and poultry litter (PL). During the field experiment, soil samples were collected for structural testing, with a focus on fragmentation and aggregate stability under varying load conditions. Soil was fractionated by wet-sieving into aggregates of five size classes (> 2 mm, 2-1 mm, 1-0.5 mm, 0.5-0.25 mm, and < 0.25 mm). Results showed the smallest fraction (<0.25 mm) dominated aggregate size distribution, indicating potential challenges for soil compaction and stability in construction. The M+R cover crop treatment increased the proportion of > 2 mm aggregates by 166% and 294% compared to native vegetation (NV) and vetch (V), respectively, highlighting its potential to enhance soil strength and structural integrity in engineered soils. Conversely, vetch increased the proportions of 1-0.5 mm and 0.5-0.25 mm aggregates by 55% and 45% over M+R, suggesting variability in how different cover crops contribute to soil fragmentation properties. No significant effects of cover crop or fertilization treatments were observed in water-stable aggregates, mean weight diameter (MWD), or fractal dimension (FD), parameters crucial for assessing soil's response to external stresses. However, FD correlated positively ($p < 0.05$) with several aggregate size fractions, while MWD showed positive correlation with the > 2 mm fraction and soil organic carbon—an important factor in soil cohesion and stability—and negative correlations with smaller fractions. These insights underline the potential role of organic amendments and cover crop types in modifying soil properties, which may influence soil suitability in foundations, embankments, and erosion control projects. This study emphasizes the need for long-term evaluations to fully assess the impacts of soil amendments on geotechnical properties critical to civil engineering applications.

P1.04

DELTA AGRICULTURE

JoDarylrius Blake

Coahoma Community College, Clarksdale, MS

The Mississippi delta describes a region of Mississippi that encompasses areas that lay between the Mississippi and Yazoo river. It is mostly characterized by its physical attributes that mostly includes areas that have unsupervised plots of land. This makes the prime for farming and maintaining crops. The types of crops grown and maintained are usually affected by different types of climates. Some of the crops that usually yield the best outcomes in the Mississippi Delta are cotton, wheat, and corn. These crops are extremely successful due the type of soil they are grown in and the time of year in which they are grown. These crops are normally planted in the delta's richest soil, alluvial. The soil is extremely rich in nutrients because it typically contains sediments and deposits from surrounding bodies of water (Rivers, streams, lakes, floodplains). In addition to the soil, the crops are normally planted in the middle to end of spring. During these times, the crops receive between 51-64 inches of rainfall to help them grow for their eventual harvest during the fall. However, the delta is also prone to harsh winters and other extreme, colder climates. Depending on when a certain crop was planted, this would have a profound effect on the growth potential of the crops by stifling its progress. Since crops are thought to do better in climates that are wet and warm, rather cold and dry, looking at past data of how crops grew in certain climates in the Mississippi Delta should provide more insight into the impact climate change has on them.

P1.05

CLIMATE CHANGE AND ITS IMPACT ON DELTA AGRICULTURE

DeAnte Brown

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Climate change is significantly altering agricultural systems globally, with particularly pronounced effects on delta regions due to their unique environmental and geographical characteristics. These areas, often located at the confluence of rivers and seas, are highly vulnerable to shifts in temperature, precipitation patterns, sea-level rise, and increased frequency of extreme weather events. This paper explores the multifaceted impacts of climate change on delta agriculture, focusing on changes in crop productivity, soil salinity, water availability, and

Pest dynamics. Rising sea levels and increased flooding exacerbate the salinization of soil, affecting both crop yields and the suitability of land for traditional farming practices. Altered precipitation patterns, including droughts and unpredictable rainfall, complicate irrigation practices and water management, further challenging food security in these regions. Additionally, climate change is driving shifts in the prevalence of pests and diseases, threatening both the quality and quantity of agricultural production. Through a review of case studies from various delta regions, this study emphasizes the need for adaptive strategies, including the development of climate-resilient crop varieties, sustainable water management practices, and policy interventions that integrate environmental, economic, and social dimensions of climate resilience. Addressing these challenges is critical to ensuring the continued viability of agriculture in delta regions, which play a crucial role in global food systems.

P1.06

COFFEE, MORE THAN AN ECONOMICALLY IMPORTANT BEVERAGE

Molly Mellen, Luke Cardin, Kacy Carson, Amelia Anding

Delta State University, Cleveland, MS

Coffee is one of the most commonly consumed beverages globally, making its production economically significant. Coffee is one of the most traded commodities in the world, making it a considerable economic driver, especially in developing nations. While Coffea arabica (Arabica coffee), is the most commonly known species, other species include Coffea canephora (robusta coffee), Coffea liberica var. dewevrei, (Excelsa coffee), and Coffea liberica Bull ex Hiern, (liberica coffee). The coffee industry creates around 2 million jobs in the United States, producing billions of dollars in wages. The foremost coffee-producing areas are Latin America, Africa, and Southeast Asia. The largest producer, Brazil, dedicates over 2 million hectares to growing coffee plants. Of the 43 million bags of coffee Brazil produces annually, about 70% is Arabica, and the remaining percentage is robusta. Around 125 million people worldwide are involved in coffee production. Occupations in the coffee industry can include working in retail, being part of a supply chain, and farming. Coffee farming can transform the economy of rural areas and contribute to infrastructure development. In 2023, the global coffee market was estimated to be worth $127 billion, $26 billion of which was contributed by the United States market; by 2030, the worldwide value is expected to grow to around $180 billion. In 2023, people in the United States consumed over 3 billion pounds of coffee. The United States has the highest coffee market revenue, with Asia following as the second-largest market. Europe has the most substantial coffee consumption in the world, with approximately 5.6 billion pounds consumed in 2022. Deforestation is a primary method of creating coffee plantations, yet it contributes to biodiversity loss. To maintain biodiversity, coffee plantations are incorporating agroforestry practices like planting coffee among shade trees. As soil degradation is another issue due to repeated planting, agroforestry can also be enforced to preserve soil nutrients. A positive trend in coffee production is an increasing interest in sustainably generated and ethically obtained coffee. The versatile uses of the coffee plant, such as for tenderizing meat, repelling insects, making natural dye, and exfoliating skin, can potentially raise coffee's economic value. In the coming years, the coffee industry will likely have several areas of growth as specialty

products such as coffee concentrates and premium coffee beans increase in demand.

P1.07

IMPACTS OF BIODIVERSITY OF SHORT-ROTATION WOODY CROPS ON WATER QUALITY

Nyla Jones, Courtney Siegert, Brooke Dominici, Waqar Shafqat, Cade Booth, Sarah Havens, Austin Himes, Heidi Renninger

Department of Forestry at Mississippi State University, Mississippi State, MS

Mitigating agricultural nutrient runoff and improving water quality is a key challenge in meeting food and energy demands. To address this challenge, short-rotation woody bioenergy crops, specifically *Populus deltoides* (eastern cottonwood) and its hybrids, can be planted at the interface of riparian areas and agricultural production fields to alleviate fertilizer runoff into adjacent bodies of water. This research employed an experimental design to evaluate the effects of *P. deltoides* diversity on tree productivity and nutrient uptake and how it mitigates agricultural runoff. We deployed ion exchange resins 0.5 meters below the soil surface at four different sites in Mississippi that contained either monoculture plantings of a single *P. deltoides* genotype or a mixture of two genotypes for the entire growing season. Across two years and all sites, nitrate concentrations were reduced by 23%, and ammonia concentrations were reduced by 51% relative to concentrations in agricultural soils. In both years, multi-genotype plots reduced soil ammonia concentrations more than single-genotype plots, while the opposite trend was observed for soil nitrogen. The results of this study display the efficiency of the short-rotation woody crops in reducing water quality degradation that may have positive downstream impacts. This study can be used as an example of mitigation techniques for fertilizer runoff in agricultural fields to limit such degradation of water quality and prevent monetary/economic loss for agricultural producers. All four years of data are still being analyzed and will be presented.

P1.08

EFFECT OF TEMPERATURE ON LABOR PRODUCTIVITY: EVIDENCE FROM SOCIOECONOMICALLY VULNERABLE COMMUNITIES IN THE US

Jingfang Zhang, Kevin May

Alcorn State University, Lorman, MS

This paper estimates the effects of the increasing incidence of heat on labor productivity, with a particular focus on socioeconomically underserved vulnerable communities. Extensive literature has already linked climate change to many economic outcomes, including industrial and national output, agricultural yield, total factor productivity, worker productivity, to name a few. However, little is known about the effects of how temperature affects economic outcomes in socioeconomically vulnerable communities. socioeconomically vulnerable communities often lack the necessary resources, technological advancements, infrastructure, and support systems to withstand and recover from the adverse effects of extreme weather events. Consequently, the impacts on economic outcomes in these areas may be significantly different from those observed in more developed regions. We utilize annual county-level labor productivity proxied by average employee compensation, historical weather, and social vulnerability index data, along with the panel fixed effects estimation framework, to identify the sensitivity of labor productivity to rising temperatures. We performed our analysis for the contiguous United States from 2001-2019. We find that labor productivity is largely insensitive to changes in the frequency of cool-to-moderate maximum daily temperatures. However, as temperatures shift above 18 Celsius, the effects on productivity turn increasingly negative, particularly affecting socioeconomically vulnerable communities to a greater extent. Given existing climate forecasts, we predict that future extreme temperatures further deepen worker productivity inequality among socioeconomically vulnerable communities and more developed regions.

P1.09

THE RELATIONSHIP BETWEEN BAKER'S YEAST (*Saccharomyces cerevisiae*) FERMENTATION RATES, GROWTH, AND RESPIRATION

Ismael Mayo, Debarshi Roy, Jon I. Moreno, Marta Piva

Alcorn State University, Lorman, MS

Due to the challenges of climate change and environmental pollution, there is an ongoing global effort to replace fossil fuels with renewable ones. Since the literature is unclear on whether mitochondrial function improves fermentation rates, we screened baker's yeast (*Saccharomyces cerevisiae*) strains to find the factors that produce strong fermenters. Therefore, we crossed a wild-type strain with a petite mutant without mitochondrial function. On glucose culture medium, the resultant meiotic segregants formed colonies of roughly four sizes: large, medium, small, and tiny. We determined whether they were wild-type or mutant by assessing their growth on a medium with glycerol (non-fermentable) and one with glucose and geneticin (fermentable and selective for mutants). After incubating the strains in a glucose medium for 15 hours, their growth was measured by absorbance at 600 nm. For all the strains, the fermentation rate was determined by measuring the CO_2 released for ten minutes after adding the inoculum to the culture medium. The respiration rate for the wild types was determined after washing the cells, incubating them in a non-fermentable substrate for three hours, and measuring the CO_2 as previously indicated. The mutants showed a significant negative correlation between the fermentation rate and the growth in the glucose medium ($p < 0.05$). Additionally, the mutants that grew poorly in the glucose medium had a significantly higher fermentation rate than those that showed better growth, suggesting that the fast accumulation of ethanol limits their

growth. Interestingly, the wild-type strains' fermentation rate had a strong linear relationship with their respiration capacity ($p < 0.01$), suggesting that, when active, mitochondria improve fermentation, probably by taking up and metabolizing the ethanol. Future studies will confirm the ethanol effect on cell growth and elucidate what genes are responsible for the increase in fermentation rate. 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 and the US Department of Education under Title III-grant number P382G23011.

P1.10

ACCURATE PREDICTION OF SOIL PROPERTIES USING FOURIER TRANSFORM MID-INFRARED SPECTROMETERS WITH SPECTRAL PRE-PROCESSING

Yasas Gamagedara[1], Dr. Gary Feng[2], Dr. Mary Love Tagert[1], Dr. Vitor S. Martins[1], Dr. Nuwan K. Wijewardane[1]

[1]Department of Agricultural & Biological Engineering, Mississippi State University, Starkville, MS, [2]Genetics & Sustainable Agriculture Research Unit, Crop Science Research Laboratory, USDA-Agricultural Research Service, Starkville, MS

Mid-infrared spectroscopy enables rapid and precise prediction of soil properties. Utilizing the USDA-Kellogg Soil Survey Laboratory's spectral library (national dataset) of over 72,000 samples which were scanned using a Bruker Vertex 70 (VT) spectrometer, has the potential to enhance the efficiency and cost-effectiveness of soil analysis. This study evaluated the predictive capabilities of various local spectrometers, including a portable ARCoptix (AR) and Bruker Alpha II equipped with DRIFT (DR) and Front Reflection (FR) modules, emphasizing their versatility and cost-saving potential. In this study, the objectives were to: (i) use models calibrated on spectra from the national spectrometer (VT) to predict for spectra from local spectrometers (DR, FR, and AR), (ii) use models calibrated on spectra from local spectrometers to predict for spectra from local spectrometers, and (iii) test the ability of different pre-processing techniques to improve the model performances in predicting different soil properties: total carbon (TC), calcium (Ca), and pH. A subset of 2,500 soil samples representing Mississippi and Texas was selected from the national dataset for model training. The local dataset was randomly divided into 70% for training (1,027 samples) and 30% for testing (440 samples). Both training and testing datasets underwent multiple pre-processing techniques, including first derivative with Savitzky-Golay filter (FD), baseline correction (BC), and standard normal variate (SNV). Principal component analysis revealed significant spectral variations among the spectrometers. TC and Ca achieved $R^2 > 0.70$ when models were calibrated on pre-processed spectra from VT to predict for pre-processed spectra from any of the local spectrometers (with at least one pre-processing technique contributing to this R^2 value). Additionally, pH also yielded $R^2 > 0.70$ when models were calibrated on pre-processed spectra from VT to predict for pre-processed spectra from both DR and FR, and $R^2 > 0.50$ when predict for pre-processed spectra from AR. TC showed $R^2 > 0.70$ even without the application of any pre-processing techniques, when models were calibrated on spectra from DR or FR to predict for spectra from alternative spectrometers. However, TC attained $R^2 > 0.70$ only when models were calibrated on pre-processed spectra from DR or FR to predict for pre-processed spectra from AR. Ca and pH also achieved $R^2 > 0.70$ when models were calibrated on pre-processed spectra from DR to predict for pre-processed spectra from either FR or AR. A similar pattern was observed for Ca and pH when models were calibrated on pre-processed spectra from FR to predict for pre-processed spectra from either DR or AR. Overall, the combination of FD and SNV provided the best and consistent prediction performances across all the spectrometers and soil properties examined in this study, with the exception of TC when using models calibrated on spectra from VT to predict for spectra from AR. This study demonstrated the effectiveness of spectral pre-processing techniques in enhancing prediction accuracy across different spectrometers. Future research will explore calibration transfer techniques to further optimize the use of affordable portable spectrometers like AR, reducing the costs and time associated with soil property analysis.

P1.11

ROW CLEANER CONFIGURATIONS TO FACILITATE HIGH-SPEED SOYBEAN PLANTING INTO RESIDUE

Oluwaseyi Olomitutu, Michael Mulvaney, Wes Lowe, John Wallace, Jagmandeep Dhillon

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Inadequate residue management in conservation tillage can impede planting, thereby affecting the consistency of seed placement and potentially compromising seed-soil contact. Impaired seed-soil contact can result in poor germination, seedling emergence, crop establishment, and yield. To avoid poor seed-soil contact, various row cleaners have been developed as planter attachments. The objective of this study was to determine the field efficacy of different row cleaner configurations at different planter speeds in rye residue. The trial was conducted during the 2024 cropping season at Brooksville, Mississippi. A precision planter (John Deere® toolbar with MaxEmerge 2 row units retrofitted with AgLeader® SureSpeed and SureForce) was fit with Martin-Till 1345 narrow row cleaners with razor wheels. Planting was conducted into 7,753 kg ha^{-1} standing rye residue. The experimental design was a 2×8 factorial laid out in a randomized complete block design, replicated four times. Planting was accomplished at two planting speed (8.1 and 16.1 km h^{-1}) and eight row cleaner configurations (row cleaner alone, row cleaner plus side treader wheels, wheel weights, and coulter attachments in

all possible combinations). Plots were 4.1 m (four rows) × 300 m long. Soybean variety Revere 4526XFS was planted at 345,800 seeds ha^{-1}. Actual plant population and plant spacing data were recorded in two 5 m rows. Surface and subsurface residue was collected at two random locations on border rows immediately after planting. Mean plant spacing, spacing variability (standard deviation) and grain yield were estimated. Preliminary results will be presented.

P1.12

INTERCROPPING FLOWERING PLANTS WITH WATERMELONS AS A HABITAT FOR POLLINATORS FOR SUSTAINABLE CROP PRODUTION.

TreDarious Clifton, Daniel Collins, Tahir Rashid, Raven Butler, De Shawn Moody, Ariel Fritzgerald, John Goins III, Jaylan Scott

Alcorn State University, Lorman, MS

Watermelons (*Citrullus lanatus*) are an important fresh market crop worldwide. In 2023 the US watermelon market was valued at approximately $748 million. Pollinators are essential for our environment and crop production systems. Over seventy percent of the world's flowering plants, including two-thirds of the world's crop species such as watermelons, depend on pollinators to reproduce. Loss of habitats for pollinators is a threat to the sustainability of farming and global food security. Pollinator health is a national research priority. More research on managing floral resources that provide nectar and pollen to support the pollinator populations is needed. The objective of our research is to evaluate the diversity of flowering plants intercropped with watermelons to attract a variety of pollinators including honeybees and native bees to enhance pollination and fruit development and quality of watermelons. On June 12, 2024 on the Alcorn State University, Lorman, MS Model Farm Lorman, MS we set-up bee vane traps and intercropped three flowering plants species Zinnia (*Zinnia elegans*), Sunflowe rs (*Helianthus annuus*) and Okra (*Abelmoschus esculentus)* with four watermelon cultivars (C. lanatus) Sugar Baby, Charleston Gray, Jubilee, and Tender Sweet. We also setup a watermelon variety trial on the Alcorn State University, Lorman, MS Agricultural Experiment Station using the bee vane traps. We monitored both locations every forty-eight hours over four weeks to quantify the number and diversity of bee species visiting the watermelons plots. Preliminary results have shown a wide variety of bees, mostly bumble bees (*Bombus spp.),* visited the plots. We documented exceptionally good watermelon pollination and fruit set.

P1.13

THE RHIZOSPHERE MICROBIOME OF *Nerium oleander*

Ramiyah Thompson, Naira Ibrahim, Brent Thoma, Mohadetheh Moulana

Jackson State University, Jackson, MS

Phytoremediation is a promising strategy for removing heavy metals (HMs) from contaminated soils. However, the role of soil microbes in facilitating or inhibiting this process still needs to be better understood. Nerium oleander, a common ornamental plant, shows promise in remediating HMs. The main objective of this study is to evaluate the potential role of the root-associated microbiome of Nerium oleander in enhancing the efficiency of remediating HMs from the soil. Samples were collected from four plants and surrounding soil sections across Mississippi, preserved to ensure microbial stability, and processed with DNA extraction, quantification, and PCR amplification for sequencing.16S rRNA metagenomic sequencing was used to characterize the microbial diversity and composition in the rhizosphere of Nerium oleander compared to adjacent unplanted soils. Preliminary findings indicate that the microbiome differs form the surrounding microbiome in the rhizosphere, which plays an important role in enriched Nerium oleander. Thus, the plant's root microbiome may play a significant role in HM remediation. We may conclude that Nerium oleander's phytoremediation potential will be enhanced by introducing beneficial microbes and analyzing gene expression under HM stress. In addition, Nerium oleander will be considered a phytoremediator through microbiome manipulation, supporting resilient remediation systems in polluted environments.

P1.14

FROM WASTE TO WEALTH: INVESTIGATING INSECT FRASS AS A BIOFERTILIZER THROUGH SOIL MICROBIAL DYNAMICS

Jasmine Sahota, Shankar Ganapathi Shanmugam, Jagman Dhillon

[1]Mississippi State University, Starkville, MS

The global trend towards using insects for food and feed is gaining momentum due to increasing population, environmental concerns, and the need for sustainable protein sources. Mass rearing of insects produces a high amount of byproduct, known as insect frass. Insect Frass is a mixture of insect excreta, shed exoskeleton and undigested feed. Insect frass has recently gained attention as potential organic amendment to enhance plant growth as it is considered a good source of essential plant macronutrients (N, P, K), micronutrients and a diverse microbial community. However, despite its benefits, research on frass-associated microbiome is limited. This study particularly investigates the effects of insect frass quality and quantity on soil-plant-microbial dynamics and highlights its potential use as a biofertilizer for enhancing plant growth. Soil microbial communities play a central role in nutrient cycling, decomposition, and soil carbon storage essential functions that contribute to better plant growth. For this study, insect frass samples were procured from different industries, reared on diverse range of diet sources including agriculture waste, food waste, corn and soy. The objective of this study is to investigate how diet sources and insect combination affect frass microbial community composition and how it affects soil-plant health when applied as a soil amendment. We employed

16S rRNA (bacterial) and ITS (fungal) amplicon sequencing to characterize the frass associated microbial community composition. Additionally, we used Biolog EcoPlates to measure the microbial metabolic activity by assessing average well color development (AWCD) across frass samples. Furthermore, based on our initial frass characterization, a greenhouse trial was set up in a completely randomized design to evaluate the effect of insect frass as a soil amendment on corn plant growth. Soil was amended with five treatment rates (0, 50, 100, 200, 250 lb/ac) from four insect species treatment (A_back soldier fly, B_Cricket, A_Cricket, C_Black soldier fly). We measured the plant growth parameters, harvested the corn plant at six leaf (V6) stage, and collected the rhizosphere and bulk soil for further analysis. DNA sequences were analyzed using QIIME (Quantitative insights into microbial ecology). Results showed significant differences in microbial diversity and community structure based on insect species and diet sources. Statistical analysis using R indicated that frass amendment rates significantly affected aboveground biomass ($p < 0.05$), with higher rates correlating with increased biomass. Furthermore, AWCD, an estimation for microbial metabolic activity, varied significantly across treatments, suggesting that insect frass amendments influence soil microbial metabolic activity. Principal Component Analysis (PCA) showed distinct clustering of microbial (fungal and bacterial) communities based on insect species and diet source, indicating that different frass source has distinct microbial composition. These findings showed that insect species and diet sources play a crucial role in shaping frass's microbial composition and metabolic activity, which, in turn, affects soil microbial dynamics and plant growth response.

P1.15

THE ROLE OF NITROGEN AND SULFUR FERTILIZATION IN SHAPING SOYBEAN ROOT ASSOCIATED MICROBIAL DIVERSITY AND ENZYME ACTIVITY IN SOYBEAN

Durga Purushotham Mahesh Chinthalapudi[1, 2], Nisarga Kodadinne Narayana[1], Jagmandeep Singh Dhillon[1], Raju Bheemanahalli[1], Shankar Ganapathi Shanmugam[1, 2]

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Fertile soils typically sustain a diverse assemblage of microorganisms, including bacteria, fungi, archaea, and other microbial taxa. Soil microorganisms including bacteria, archaea and fungi play a diverse and often decisive role towards the functioning of ecosystem such as driving the cycling of major elements (e.g., N, C, and S). Understanding microbial dynamics, metabolic and functional activity in both fertile and infertile soybean rhizosphere soils allows for targeted soil management practices. This study aimed to evaluate how different rates of N and S application affect microbial metabolic diversity and enzyme activity in the soybean rhizosphere. We used Biolog Ecoplates to assess microbial metabolic activity, measuring Average Well Color Development (AWCD) as an indicator of overall metabolic function. Treatments included a range of N and S doses, and enzyme assays were conducted to assess the activities of β-glucosidase (BG), N-acetyl-β-D-glucosaminidase (NAG), and arylsulfatase (ARS), enzymes linked to carbon, nitrogen, and sulfur cycling. Principal component analysis (PCA) of carbon source utilization showed distinct microbial metabolic shifts under N treatment (PERMANOVA, $p = 0.001$), with S showing no significant effect on AWCD ($p = 0.321$). Results indicated that high N fertilization (200 lb./ac) significantly increased AWCD (1.83 ± 0.17) and Shannon Diversity Index (SDI: 3.69 ± 0.14) compared to controls (AWCD: 1.47 ± 0.21). Enzyme activity for BG and NAG, linked to carbon and nitrogen metabolism, also peaked at 200 lb./ac N (BG: 2.25 ± 0.24; NAG: 1.69 ± 0.14). In contrast, ARS activity, related to sulfur cycling, responded to S fertilization alone. These findings underscore that N fertilization can significantly enhance rhizosphere microbial diversity and metabolic activity, especially in terms of carbon and nitrogen cycling, while S specifically boosts sulfur cycling enzymes. This research suggests that optimized N application could promote beneficial microbial functions, supporting sustainable soybean production.

P1.16

COVER CROP AND NITROGEN SYNERGIES: ENHANCING SOIL MICROBIAL DIVERSITY AND NITROGEN CYCLING IN MISSISSIPPI CORN FIELDS

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Soil microbial communities play a crucial role in sustaining soil ecosystems, influencing soil physical and chemical properties and driving essential nutrient cycles. These communities are impacted by factors such as plant diversity and fertilization, which can collectively shape soil functional diversity and carbon (C) and nitrogen (N) cycling. Despite extensive research, the combined effects of cover crops (CCs) and nitrogen application on microbial functional diversity and nutrient cycling remain underexplored. Additionally, agricultural practices, especially different CC species, may induce variability in microbial diversity and ecosystem functions, emphasizing the need to better understand the interactions between CCs and soil microbial ecology. Our three-year study aimed to address this knowledge gap using a strip plot design across two locations, Starkville and Newton, to evaluate the effects of various CCs (ryegrass, balansa, CC-mix [ryegrass + radish + red clover], and control) and N levels (0 lb. and 100 lb.) on soil microbial communities and C/N cycling in corn production systems. Soil bacterial and fungal communities were characterized using amplicon

sequencing of genomic DNA extracted from soil samples. Results from the two-year study (2022-23) indicated distinct microbial community structures between locations. The Chao1 diversity index showed higher bacterial ASV richness in 2022 compared to 2023. While alpha diversity indices did not reveal significant CC treatment effects in Newton, Starkville exhibited significant differences. Plots with 100 lbs. N had greater Shannon diversity compared to 0 lbs. N plots, indicating a positive correlation between N application and microbial diversity. Enzymatic assays (β-glucosidase and β-glucosaminidase) and active carbon analyses demonstrated higher activity in ryegrass and CC-mix plots. Additionally, the abundance of N-cycling genes (amoA and nifH) varied significantly across CC treatments, underscoring the role of CCs in modulating soil N-cycling potential. Overall, our findings reveal that ryegrass and CC-mix enhance bacterial richness, active carbon levels, soil enzymatic activity, and the abundance of N-cycling microbial taxa, highlighting their potential to improve soil health in corn production systems.

P1.17

THE POTENTIAL OF *Pennisetum purpureum* AS A PROMISING CROP IN SOIL REMEDIATION, ENVIRONMENTAL STRESS AND BIOENERGY PROSPECTS

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This study emphasizes the potential of *Pennisetum purpureum* (elephant grass) as an effective solution for addressing the dual challenges of heavy metal (HM) contamination in soil and environmental stressors, while also exploring its potential as a bioenergy crop. The research demonstrates that *P. purpureum* not only accumulates significant levels of heavy metals, such as zinc (Zn) and nickel (Ni) but also shows resilience to drought conditions. Chosen for its rapid growth, high biomass production, and adaptability to a variety of environmental conditions, *P. purpureum* is a promising candidate for sustainable remediation strategies. Additionally, its ability to sequester carbon through soil enhancement positions it as a valuable bioenergy resource, offering an integrated solution for environmental restoration and sustainable energy production. In this study, plants were exposed to three different concentrations of Zn (1 ppm, 50 ppm, and 160 ppm) and Ni (0.1 ppm, 3.7 ppm, and 5 ppm), alongside drought treatments for 14 weeks. The carbon content in the biomass will also be analyzed. Preliminary results suggest *P. purpureum* shows significant tolerance to and accumulation of HMs, with Zn primarily accumulating in the shoots and Ni in the roots. Furthermore, the species demonstrates resilience under drought stress, reinforcing its potential as a dual-purpose crop for both bioenergy production and phytoremediation. In conclusion, the study highlights *P. purpureum* as a promising candidate for mitigating soil contamination and contributing to ecosystem health. Continued research will provide further insights into its role in sustainable agricultural and environmental management practices.

P1.18

EVALUATION OF MULTI-SPECIES WATERMELON GENOTYPES IN SOUTHWEST MISSISSIPPI

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Watermelon (*Citrullus sp*.) is a popular, nutritious summertime fruit in the United States. Mississippi has a rich history of growing watermelons, and its southeastern region is a major producer of watermelons. Evaluating *Citrullus* genotypes allows researchers to identify traits that can guide breeding programs, improve stress tolerance, and ensure sustainable cultivation. In this research study conducted during the summer of 2024 at the Alcorn Experiment Station, Lorman, Mississippi, we evaluated 14 different seeded watermelon genotypes and a check seedless watermelon variety (treatments). A pollenizer variety 'Sugar Baby' was planted in each plot of the check variety to ensure successful pollination. The study was done in a randomized complete block design with two replications (blocks). The 14 genotypes were obtained from the United States Department of Agriculture germplasm repository (Griffin, Georgia) and represented three species of watermelon: *Citrullus lanatus, Citrullus mucosospermus, and Citrullus amarus*. A soil test was conducted prior to the direct seeding of watermelons in the research plots. A black plastic mulch was laid out on the rows of the research plots prior to seeding. Four 87-feet long rows with minimum of 8 feet row to row distance were used. The rows were raised 4 inches and plant to plant spacing was maintained at 1.5 feet. Standard agronomic practices including watering, weeding, and fertilizer application were carried out. No pesticide was applied during this trial to observe the natural disease and pest pressure. Several data were collected from the standing crop as well as post-harvest. These included days to germination, cotyledon length and width, days to first female flower, vegetative cover, number of vines, leaf size, vine length, internode distance, thickness of plant base, disease incidence, number of marketable and cull fruits, fruit shape, fruit weight, rind thickness, fruit polar and equatorial diameter, stripe pattern, flesh color, flesh firmness, sweetness (degree Brix), seed color, seed size, and presence of internal defects such as hollow heart or explosive rind. Maturity indices such as browning of the tendril nearest to the fruit, fading of the outer fruit color, and formation of the pale-yellow base (field spot) were utilized to make harvest decisions. The harvesting of the fruits ranged from 75 to 80 days after seeding. All the fruits were first weighed in the field and three representative fruits per plot were brought indoors to further evaluate watermelon fruit quantity and quality traits. The analysis of variance on the yield data showed that significant differences in yield existed among the 14 genotypes (F-value for cultivar = 4.27; P-value = 0.00516). However, blocking did not significantly impact the yield of the cultivars (F-value = 2.369; P-value = 0.146). The mean

yield comparison using the least significant difference method showed that the 14 genotypes fall into three distinct groups. Genotype PI 438677 (Jubilee) had the highest yield among all and was grouped separately. Eleven other genotypes were grouped together, and the remaining three genotypes had a separate grouping. Further statistical analyses are underway to gain insights into diverse traits of watermelon.

P1.19

IDENTIFYING HEAT-TOLERANT COTTON CULTIVARS DURING FLOWERING AND BOLL DEVELOPMENT

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Heat stress during the reproductive phase has significantly challenged agricultural productivity, particularly in cotton-growing regions. This period is critical for plant reproduction. Various physiological and reproductive processes, such as flowering, pollination, fertilization, and boll development, occur during this stage. Coincidence of heat stress during this stage adversely affects yield and fiber quality. This study assessed the impact of heat stress on the physiological responses and yield traits of diverse cotton cultivars under field conditions. Sixteen genetically and agronomically diverse cotton cultivars were subjected to approximately 6°C above ambient temperatures during the reproductive phase. The results indicated that the cultivars exhibited rapid physiological adjustments in response to heat stress. Notable increases were recorded in key parameters such as stomatal conductance and transpiration rates, particularly when compared to control plants. Leaf temperatures in heat-stressed plants increased significantly, averaging 4°C higher than the control. Heat-stressed plants showed a 17% increase in total leaf area, whereas leaf dry weight remained consistent across both the heat-stressed and control groups, suggesting a complex interplay between growth responses and stress impacts. The analysis further revealed that heat stress disproportionately affected reproductive structures relative to vegetative ones, evidenced by a striking 58% decrease in the total dry weight of squares, flowers, and bolls, contrasted with a mere 7% reduction in stem dry weight. We also assessed the impact of heat stress on pollen germination and their relationship with yield and quality parameters. Among the cultivars phenotyped, PHY443 and AMX12507 exhibited the least and greatest reductions in reproductive biomass, respectively, indicating potential as candidates for heat stress tolerance breeding.

P1.20

ISOLATION AND CHARACTERIZATION OF FUNGAL PATHOGENS OF WATERMELON IN SOUTHWEST MISSISSIPPI

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Watermelon is an important vegetable crop in the United States and is a promising crop for rural farmers. However, watermelon production and productivity are significantly affected by several fungal, bacterial, and viral diseases. Our research study aimed at understanding the fungal diseases of watermelon in southwest Mississippi. Initial scouting of a watermelon field at Alcorn State University, Lorman, MS, resulted in the collection of leaf samples from eight plots (102-1, 108-1, 203-1, 206-1, 208-1, 303-1, 402-1, and 405-1). Additionally, one symptomatic fruit sample was obtained from plot 204-1. Each sample was carefully collected using sterilized scissors, stored in Ziploc bags, and transported in a cooler with ice to preserve integrity. In the laboratory, small sections from symptomatic tissues were excised under a biosafety cabinet, ensuring samples were taken from the interface of healthy and symptomatic tissue to avoid fully necrotic regions. Surface sterilization of samples was performed with 1% sodium hypochlorite, followed by two sterile water rinses and subsequent drying on sterile filter paper. Sterilized samples were cultured on potato dextrose agar (PDA) plates, with four tissue sections per plate, and incubated at room temperature (24°C). Fungal growth was observed within two days. For samples exhibiting similar fungal morphologies, only one representative morphotype was selected for further culturing to reduce redundancy. Sections from these mother plates were transferred to fresh PDA plates, resulting in nine distinct PDA cultures representing fungal isolates from plots 108-1 (2 plates), 203-1 (1 plate), 204-1 (2 plates), 206-1 (1 plate), 208-1 (1 plate), and 303-1 (2 plates). The watermelon genotypes associated with those plot names were PI 560013 (Citrullus mucosospermus type), Ultra Cool Hybrid (Citrullus lanatus type), PI 255136 (Citrullus amarus type), and PI 688009 (Citrullus amarus type). DNA extraction was performed on fungal isolates using a commercial kit and quantified using a spectrophotometer. A polymerase chain reaction (PCR) amplification of fungal DNA was conducted using internal transcribed spacer (ITS) primers: ITS-5 (forward primer) and ITS-4 (reverse primer). The gel electrophoresis of the PCR product revealed clear bands at the expected ~600 base-pairs length for all samples, confirming the successful amplification of fungal ITS region. These results validated the presence of fungi in the symptomatic tissues collected from the field. Further analysis through Sanger sequencing will be carried out to determine the fungal genera present. Basic local alignment will be done, and phylogenic maps will be prepared to determine the evolutionary lineage of each fungus. Several pathogenicity assays will also be conducted to prove Koch's postulates. Overall, the findings contribute to our understanding of the fungal pathogens associated with watermelon crops in southwest Mississippi and lay the groundwork for future studies on disease management and mitigation strategies.

P1.21

THE CAPABILITY OF *Nerium oleander* TO UPTAKE HEAVY METALS FROM CONTAMINATED SOIL

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Soil contamination by Heavy Metals (HMs) occurs due to various modern human activities, including the use of pesticides, fuel spills, and agrochemical applications. Phytoremediation has emerged as a promising solution for the removal of HMs from soil. Among various plant species, *Nerium oleander*, an ornamental plant, has shown significant ability to absorb HMs and sequester them in its system. The overall objectives of our research were to study the capability of *Nerium oleander* to remediate the soil from Heavy Metals (Zinc (Zn), Cadmium (Cd), and Arsenic (As)), and to understand the biochemical and genetic changes that occur when these plants are treated under different levels of Zn, Cd, and As and their transcriptional changes during the growth period. Our first step was to sequence the whole genome of *N. oleander*. The next step will be the treatment of the plants with (Zn, Cd, and As) under different concentrations (10 ppm, 50 ppm, and 100 ppm) to investigate the transcriptomic analysis. We employed Next Generation Sequencing (NGS) technology, including Hi-C sequencing, for whole genome sequencing. Preliminary findings for whole genome sequencing identified genes that play a vital role in the metal transporter such proline synthetase. Also, the results showed the ability of *N. oleander* to uptake Zn and Cd more in leaves rather than roots, while As accumulated more in the roots. We believe, the transcriptomic analysis for the treating plants will show additional transporters for Zn, Cd, and As.

P1.22

PRIMING SOYBEAN SEEDS WITH BIOSTIMULANTS AND GIBBERELLIC ACID: A STRATEGY TO ENHANCE COLD TOLERANCE

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In the context of climate change, the challenges posed by rising temperatures and drought during critical growth stages can significantly impact soybean development. Thus, early planting has become a simple management strategy to mitigate damage from late-season stress. However, early planted seeds are often exposed to lower soil temperatures that affect the emergence and seedling establishment, significantly impacting soybean growth and development. This study investigated how priming seeds with biostimulants, and gibberellic acid (GA3) might boost soybean resilience against low-temperature stress, particularly during the emergence and seedling establishment phases. We evaluated the effects of seed priming using biostimulants and GA3 on the performance of soybeans under controlled environmental conditions, focusing on three temperature treatments: optimal (30/20°C), low (20/10°C), and low-temperature induction and recovery. Our findings indicate that low-temperature stress significantly impairs root development and leaf pigment content, irrespective of the use of biostimulants. Priming with biostimulants resulted in a 17% increase in shoot biomass and a 14% increase in root biomass compared to those treated with GA3 under low-temperature conditions. Conversely, the root-to-shoot ratio increased with GA3, showing a 19% increase when compared to biostimulants. Specific biostimulants like HM-2163, BioWake, and B-Sure notably enhanced shoot biomass by 15% and total root length by 7% compared to hydropriming at low temperatures. Our research highlights that low temperatures can significantly hinder soybean vigor, particularly affecting both shoot and root biomass. The effectiveness of biostimulant and GA treatments in alleviating low-temperature impacts varies, suggesting that the specific active ingredients and concentrations play a crucial role in soybean growth under stress conditions.

P1.23

INVESTIGATING SOIL MICROBIAL DYNAMICS: THE SYNERGISTIC EFFECTS OF COVER CROPS AND NITROGEN IN SWEET POTATO SYSTEMS

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Mississippi is the third-largest sweet potato producer in the United States. Sweet Potato requires adequate nitrogen (N) and soil health to improve yields. Microorganisms, including bacteria and fungi, play a crucial role in regulating N availability from applied N, soil organic matter, and crop residues. However, limited research exists on studying the role of soil microorganisms in improving soil health with cover crops in the sweet potato production system. Therefore, a field study was conducted at Pontotoc Ridge-Flatwoods Branch Experiment Station in Pontotoc, Mississippi to assess the effects of cover crops and N application on soil microbial diversity and nutrient availability in sweet potato. This study was conducted using a randomized block design with a split-block arrangement, replicated four times, and included three N treatments (0, 50, and 100 lb^{-1}) and three cover crop treatments (no cover crop, winter wheat, and clover). Cover crops planted in fall and terminated in spring before planting sweet potato. Soil samples were collected at planting, after harvesting sweet potato and after termination of cover crops and analyzed for physical, chemical and biological properties. Amplicons targeting the bacteria (16s) and fungal (ITS) were sequenced for soil microbiome characterization. DNA sequence data was analyzed using QIIME (Quantitative insights into microbial ecology). R statistical software was used for analyzing the data. Cover crop treatments showed significant difference in measured soil permanganate-oxidizable carbon (PoXC). Specifically, clover cover crop

treatment showed significantly higher soil PoXC levels than the control (fallow) treatment. Sequencing data revealed significant differences in microbial diversity among N treatments, with notable effects on Shannon diversity ($p = 0.0326$) and Chao1 richness ($p = 0.0080$) at the preplant stage. ITS data also showed significant N-related differences in Shannon diversity ($p = 0.0224$). Cover crop treatments significantly influenced microbial diversity, with changes in Shannon diversity ($p = 0.0035$) and Chao1 richness ($p = 0.0197$) at the preplant stage, and further significant impacts on Chao1 richness at post-termination ($p = 0.0033$) and harvest ($p = 0.0006$). Beta diversity analysis revealed significant effects of nitrogen and cover crop treatments. Pre-planting 2023 nitrogen treatments showed a significant difference ($p = 0.001$). Cover crop treatments significantly impacted beta diversity at preplant ($p = 0.002$), ITS preplant ($p = 0.001$), post-termination ($p = 0.013$), and harvest ($p = 0.001$). In conclusion, both nitrogen and cover crop treatments significantly influenced soil microbial diversity and soil health, with cover crops, particularly clover, enhancing soil permanganate-oxidizable carbon levels and driving notable shifts in microbial community structure across different growth stages of sweet potato production.

P1.24

COWPEA REPRODUCTIVE STAGE: IMPACT OF DROUGHT AND HIGH NIGHT TEMPERATURE

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Cowpea (*Vigna unguiculata*) is a key legume crop valued for its nutrition and adaptability to various soils and environments. Recent studies have highlighted a negative correlation between low rainfall and cowpea yield during the reproductive stages. Drought stress (DS) during this phase markedly impacts seed yield by reducing the number of flowers, pods, and seeds produced per plant. In addition, historical climatic data reveal an alarming trend of high night temperatures (HNT) relative to daytime temperatures during the growing season, with research suggesting that such high night temperatures negatively influence seed size and overall seed quality. In this study, we assessed the interactive effects of HNT and DS on the physiological and yield parameters of diverse cowpea genotypes during the reproductive phase. Three diverse cowpea genotypes were grown under optimum conditions until flowering. Subsequently, they were subjected to four treatments: the CNT group at 22°C with full irrigation, the DS at 22°C with a 50% reduction in irrigation, the HNT at 28°C, and the DS+HNT group at 28°C with reduced irrigation. Our results demonstrated that a 4.8°C increase in nighttime temperature and a 50% decrease in soil moisture led to dramatic reductions in stomatal conductance (91%) and transpiration (79%). This decline resulted in a notable rise in leaf temperature (12ºC) and a significant reduction in pod weight (65%) under DS+HNT. The stresses had a differential effect on seed weight, with reductions of 63% under DS+HNT, 31% for DS, and 22% for HNT compared to the control. Moreover, seed protein content dropped by 25% under DS+HNT, while starch content exhibited an increase of 11% relative to the control. Among the tested genotypes, "UCR 369" displayed superior tolerance to the stress conditions compared to the control. These findings emphasize vulnerability to combined stress, underscoring the need to develop genotypes with improved resilience to combined HNT and drought stress. These findings provide the foundation for exploring breeding strategies to sustain cowpea production under uncertain growing conditions

P1.25

GENOTYPIC VARIABILITY IN MORPHO-PHYSIOLOGICAL TRAITS RESPONSES TO DROUGHT STRESS IN RICE

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Rice (*Oryza sativa L.)* is a staple for over 3.5 billion people worldwide, but drought significantly impacts growth and development. Moreover, rice is highly sensitive to drought, particularly during early development and reproductive stages. In this study, we quantified the impact of drought stress on morphological, physiological, and biomass traits using 192 diverse japonica accessions during the vegetative stage using mini-hoop houses. At the two-leaf stage, plants grown under non-stress conditions were subjected to two different soil moisture levels, such as control (100% irrigation) and drought (50% irrigation of control), from 21 to 45 days after sowing. After 25 days of drought stress, there was a greater reduction in stomatal conductance (95%) and transpiration when compared to the control. Drought-induced significant reduction in tiller number (33%), leaf area (64%), shoot dry weight (55%), and root dry weight (29%) in comparison to control. Furthermore, the calculated drought stress tolerance index for physiology and biomass traits showed substantial genetic variability in tolerance during the vegetative stage. Based on the initial analysis, genotype 'Sweet92' outperformed the other genotypes based on growth and physiological vigor indices, scoring 5.6 and 5.4, respectively. The lowest score was observed for S201 (2.8 and 3.9). Under drought, genotype 'Tacauri' had the highest growth and physiological vigor index, while 'INA22' exhibited the least vigor index. The identified genotypes can be used as a genetic source for breeding new drought-tolerant cultivars.

P1.26

DROUGHT STRESS EFFECTS ON QUINOA: PHYSIOLOGY, LEAF BIOPHYSICAL AND YIELD TRAITS

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Quinoa (Chenopodium quinoa Willd.), a highly nutritious member of the Amaranthaceae native to the Andean region, exhibits significant agronomic potential due to its

complete protein profile, containing all nine essential amino acids. This study investigates the physiological responses of two quinoa genotypes subjected to contrasting soil moisture conditions (full irrigation vs. low irrigation) during the critical flowering stage for 14 days. The objective was to evaluate the effects of moisture stress on gas exchange, leaf biophysical, reproductive fitness, and yield components. Results revealed distinct physiological and pigment alterations between irrigation treatments. Notably, the 14-day water deficit exposure substantially reduced stomatal conductance (77%) and transpiration (62%) and increased leaf temperature by 2°C in drought-stressed plants. Furthermore, the greenness index demonstrated an 18% decrease, while the Modified Chlorophyll Absorption in Reflectance Index (MCARI) significantly reduced by 41% under drought conditions. Likewise, the Zarco-Tejada & Miller Index (ZMI) indicated a notable increase ($p<0.01$) of 16% in drought-affected plants. Our initial findings also elucidate the impact of short-term drought stress on flowering, maturation traits, branching, and overall yield components. These findings shed light on the variability in quinoa responses to drought stress, offering valuable insights for trait selection and crop improvement during the reproductive stage.

P1.27

IMPROVED FERTILITY MANAGEMENT REDUCES GREENHOUSE GAS EMISSIONS IN CORN

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Use of nitrogen fertilizers exacerbates greenhouse gas (GHG) emissions in row crop production. Practices that improve crop utilization of applied N can minimize GHG emissions. A field experiment was initiated in May 2024 to evaluate nitrogen application rates (Low: 246 kg N ha^{-1} and High: 297kg N ha^{-1}), fertilizer placement depths (0 and 10 cm) and soil surface management (close and open) on seasonal GHG emission and yield scaled emissions (YSE) in corn (Zea mays). Treatments were arranged in a randomized complete block design replicated four times. Weekly to biweekly soil N_2O, CH_4 and CO_2 fluxes were measured using LICOR trace gas analyzers and smart flux chambers. Preliminary results indicated that the N_2O flux was greater (0.993 nmol m^{-2} s^{-1}) at the low N rate than the high rate at 2 weeks after planting (WAP) and the effect reversed at 13 and 15 WAP. The CH_4 flux was negative and was smaller at the high N rate than the low N rate at 2 and 4 WAP. The CO_2 flux was greater at the high N rate at 2 and 11 WAP. Fertilizer placement at 10 cm depth had greater N_2O flux at 4 and 7 WAP, and at harvest than surface application (0 cm). Subsurface application had smaller (-0.0.067 nmol m^{-2} s^{-1}) CH_4 flux at the knee-high stage (4 WAP) and greater (-0.014 nmol m^{-2} s^{-1}) at the tasseling stage (11 WAP) than surface application. Subsurface placement had greater CO_2 flux at 6 and 13 WAP than surface placement. Soil surface management by closing packer wheel trenches had greater (2.243 µmol m^{-2} s^{-1}) CO_2 flux at 4 WAP than in respective counterparts. The high N rate increased the cumulative CO_2 emission over the season. Seasonal N_2O and seasonal CH_4 were not impacted by treatments ($P>0.005$). The interaction between fertilizer placement depth and surface management showed lower seasonal N_2O emissions when fertilizer was applied on the surface without closing packer wheel trenches than at the opposite treatments. Carbon dioxide equivalent (CO_2e) (2595.904 ± 58.045 t ha^{-1}) and YSE (0.257 ± 0.009 kg CO_2e kg^{-1} corn) were greater in high N rate than in low N. Overall, optimizing nitrogen application holds the potential to minimize GHG emissions in corn without compromising yield.

P1.28

HISTORICAL EXTREME RAINFALL AND TRENDS DURING OFF-GROWING SEASONS IN EAST CENTRAL MISSISSIPPI

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This study evaluates historical (1925–2024) climate extremes during the off-growing season in Noxubee County, Mississippi. The off-growing season, from November to April, falls outside the main crop season and plays a crucial role in supporting spring field operations and conserving soil nutrients. Rainfall extremes during this period critically regulate the soil hydrology, as excessive moisture not only hinders the operation of agricultural machinery but also accelerates the leaching of soil nutrients. The objective of this study is to identify extreme rainfall events and dry spells during the off-growing season. We hypothesize that high-frequency intensive precipitation may present multiple agronomic challenges for farmers, including restricted field operation windows, soil erosion, and nutrient leaching. Conversely, prolonged dry spells could impede the accumulation of plant-available moisture, which is crucial for the success of cover crops and subsequent main crop growth. Through a comparative analysis of historical rainfall patterns, this research will provide essential insights for developing adaptive soil and water management strategies to mitigate risks of extreme rainfall conditions.

P1.29

MODELING RUNOFF,SEEPAGE, AND SOIL WORKABILITY IN OFF-GROWING SEASONS ACROSS MISSISSIPPI

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Mississippi's distinct precipitation pattern, characterized by 65% of annual precipitation occurring in the off-growing season (November-April), creates various challenges for agricultural productions. This precipitation pattern is crucial for spring field operations, precision nutrient management, and soil conservation practices. This study aims to evaluate the impact of historical weather data

on key water losses (evaporation, runoff and seepage) and soil moisture dynamics for dominant soil types in Mississippi. Specifically, DRAINMOD will be utilized to simulate all water balance components and soil (0-10 cm) moisture using 100-years daily precipitation records. The simulation results will quantify the impacts of extreme rainfall events on surface runoff and seepage dynamics by categorizing the non-growing season into dry, normal, and wet periods. Furthermore, the study will assess the number of available work days in spring. This study will provide valuable insights for managing the risks of waterlogging and runoff, improving water-nutrient use efficiency, developing resilient agricultural management strategies across diverse spring weather patterns.

P1.30

EFFECT OF SEED PRIMING WITH ACETIC ACID ON GROWTH AND YIELD OF SOYBEAN GROWN ON NONIRRIGATED 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 recent 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 rain yield of soybeans grown on nonirrigated sites.

P1.31

SOIL AGGREGATE DYNAMICS AND ORGANIC CARBON SEQUESTRATION I IN CORN PRODUCTION SYSTEMS WITH COVER CROPPING AND AMENDMENT PRACTICES

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Soil aggregates play a significant role in reducing soil erosion and improving carbon sequestration. A four-field experiment was conducted on Falkner silt loam near Pontotoc, Mississippi, to explore the effects of winter cover crop and soil amendments, including poultry litter (PL), flue gas desulfurization (FGD) gypsum and lignite, on the size distribution and stability of soil aggregates and associated organic carbon content at 0-30 cm depth in a no-till rainfed corn system. Treatments of winter cover crop and no cover crop were applied to the main plots, while soil amendments with fertilization treatments included PL and inorganic fertilizer N alone and in combination with FGD gypsum and lignite, and an unfertilized control were allocated to the sub-plots. Results indicated 0.25-0.053 mm aggregates was dominant across all treatments, contributing significantly to the bulk soil organic carbon (SOC) content and exhibiting the highest carbon preservation capacity due to their high content, while > 2 mm aggregates had the highest SOC content. The aggregate stability index, mean weight diameter, geometric mean diameter, SOC content in bulk soil and all aggregates, and carbon preservation capacity in all aggregates were highest under winter cover crop. The utilization of PL further improved aggregate stability index and decreased fractal dimension. Combining PL with FGD gypsum and lignite enhanced SOC content in bulk soil and in > 2 mm and 1-0.5 mm aggregates, as well as the carbon preservation capacity of the > 2 mm aggregates. The key factor driving changes in aggregate stability was the > 2 mm aggregates. Moreover, soils with a higher proportion of > 2 mm aggregates have greater potential for improved aggregate stability. These findings suggested that integrating winter cover crop with PL, FGD gypsum and lignite enhances soil aggregate stability and carbon sequestration, particularly through improvements in > 2 mm aggregates.

P1.32

DROUGHT STRESS EFFECTS ON SOYBEAN SEED YIELD AND QUALITY UNDER CURRENT AND FUTURE CO_2 ENVIRONMENTS

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The increasing prevalence of abiotic stresses has heightened the risk to global crop production. Drought stress during the reproductive stage significantly compromises the seed yield and quality in soybean. Additionally, the influence of rising atmospheric CO_2 levels must be considered when preparing for climate change. In this study, two soybean cultivars, DS25-1 and DS31-243, were grown under well-watered (100% evapotranspiration, ET) and drought (50% ET) conditions at ambient (425 ppm, aCO_2) and elevated (725 ppm, eCO_2) CO_2 concentrations in sunlit plant growth chambers during the flowering and pod development stages. The physiology and seed yield of the cultivars were significantly affected by the drought conditions with differential responses. DS25-1 was more susceptible to drought, showing reductions of 35%, 17%, and 49% in photosynthesis (A), Ci/Ca ratio, and stomatal conductance (gsw), respectively, under aCO_2. In contrast, DS31-243 exhibited no significant changes in A and gsw under drought. In DS25-1, the pods (no. plant^{-1}) decreased by 32 and 53% under drought at aCO_2 and eCO_2, respectively, leading to seeds (no. plant^{-1}) reductions of 33% and 54% and yield declines of 61% and 65%, respectively. For DS31-243, seed yield decreased by 56% under aCO_2 but only 29% under eCO_2. The 100-seed weight of DS25-1 declined by 15% and 21% under drought at aCO_2 and eCO_2, respectively, while DS31-243 exhibited smaller reductions of 6% and 7%, respectively, under the same conditions. Drought increased saturated fatty acids (palmitic and stearic) in DS25-1 by 3% and 9% under aCO_2 and by 6% and 16% under eCO_2. For DS31-243, palmitic acid decreased by 2% under aCO_2 and 3% under eCO_2, while stearic acid increased slightly by 2% and 1% under aCO_2 and eCO_2, respectively. Polyunsaturated fatty acids (linoleic and linolenic) remained essentially unchanged in both cultivars. Further studies are needed to screen a large number of cultivars to understand genetic variability and help identify climate-resilient soybean lines.

P1.33

SMART INACTIVATION OF FOODBORNE PATHOGENS IN FRESH PRODUCE USING GREEN WATER ACTIVATION TREATMENT WITH COLD PLASMA TECHNOLOGY

Abdus Sobhan, *Earnest Coleman*

Alcorn State University, Lorman, MS

Cold plasma is an emerging non-thermal pathogens deactivation and surface modification technology, which is chemical free, ecofriendly, and convenient. Plasma treated water, termed as plasma activated water (PAW), generates an acidic or basic environment in resulting of the redox potential, conductivity and in the formation of reactive oxygen (ROS) and nitrogen species (RNS). The aim of this study is to investigate the physical properties of plasma activated water (PAW) which is treated with combined mixture of O_2 and N_2 and employ the PAW for direct microbial deactivation of strawberries produce. The results obtained from this study revealed that the temperature gradient, pH, and electrical conductivity of the PAW as plasma treatments with the activation time and discharge frequency of the plasma leap reactor systems increased simultaneously. pH values of cold plasma treated sample decreased significantly from pH 7.4 to 3.4, while the electrical conductivity increased from 78 to 162 mS/cm. The substantial reduction in E. coli TOP 10 bacterial cells increased from 1.6 to 8 log at a frequency of 2000 Hz. Application of PAW was also tested with strawberries and observed their deactivation impact on fruits. It was found that strawberries treated with PAW significantly reduced bacterial load and extended the shelf life of the strawberries up to 30 days without compromising their quality compared to untreated control sample.

P1.34

DETERMINING CLIMATE EFFECTS ON US TOTAL AGRICULTURAL PRODUCTIVITY

Wei Gao

Colorado State University, Fort Collins, CO

The sensitivity of agricultural productivity to climate has not been sufficiently quantified. The total factor productivity (TFP) of the US agricultural economy has grown continuously for over half a century, with most of the growth typically attributed to technical change. Many studies have examined the effects of local climate on partial productivity measures such as crop yields and economic returns, but these measures cannot account for national-level impacts. Quantifying the relationships between TFP and climate is critical to understanding whether current US agricultural productivity growth will continue into the future. We analyze correlations between regional climate variations and national TFP changes, identify key climate indices, and build a multivariate regression model predicting the growth of agricultural TFP based on a physical understanding of its historical relationship with climate. We show that temperature and precipitation in distinct agricultural regions and seasons explain ~70% of variations in TFP growth during 1981-2010. To date, the aggregate effects of these regional climate trends on TFP have been outweighed by improvements in technology. Should these relationships continue, however, the projected climate changes could cause TFP to drop by an average 2.84 to 4.34% per year under medium to high emissions scenarios. As a result, TFP could fall to pre-1980 levels by 2050 even when accounting for present rates of innovation. Our analysis provides an empirical foundation for integrated assessment by linking regional climate effects to national economic outcomes, offering a more objective resource for policy making.

P1.35

SOYBEAN SEED COMPOSITION AS INFLUENCED BY PLANT ARCHITECTURE GENES IN THE EARLY SOYBEAN PRODUCTION SYSTEM IN MISSISSIPPI

Nacer Bellaloui, James Smith, Rama Gadi

USDA-ARS, Stoneville, MS

Soybean plant architecture determines growth habit and development, thereby impacting seed yield and quality. Therefore, optimizing plant architecture for seed yield and composition is essential. Many previous studies conducted on plant architecture (growth habit and development) confounded genotypic background with plant architecture. Therefore, the objective of this research was to investigate the effects of plant architecture (stem termination and related traits) on seed composition (seed protein, oil, oleic acid, and sugars) using a set of near-isogenic soybean lines that have the same genotypic background (MG V line DS-880), but differ in specific plant architecture (stem termination) genes at two loci. One set of four near-isogenic lines of maturity group V was developed for the midsouth production system. Their specific gene combinations and stem termination types are: indeterminate (Dt1, dt2); semi-determinate (Dt1, Dt2); tall-determinate (dt1-t, dt2); and determinate (dt1, dt2). A three-year experiment was conducted under irrigated conditions in Stoneville, MS, USA. Two non-isoline MG V lines, including one cultivar, were used as checks. The ANOVA results showed that line, year, and their interactions all significantly ($p \leq 0.05$) affected seed composition components. For example, both line ($p \leq 0.0001$) and the year x line interaction ($p \leq 0.004$) significantly affected seed protein. Line significantly ($p \leq 0.0001$) affected seed oil. Both seed oleic acid and sucrose were significantly ($p \leq 0.001$) affected by line, year, and their interactions. The mean value of seed protein, oil, oleic acid, and sugars (sucrose, raffinose, and stachyose) showed different levels, depending on the line architecture. These results suggest that both plant architecture and environmental factors, especially temperature, may have significant effects on seed composition components. These findings advance our knowledge of the relationship between plant architecture and seed composition, and may be beneficial in helping soybean breeders and producers determine the best plant architecture for optimal seed composition. Although the sink-source relationships of these nutrients, and C and N metabolism, may be determined differently among the isolines, the real nature of these changes in seed composition is still yet to be understood, requiring further investigations.

P1.36

WHOLE CORN EAR PHENOTYPING THROUGH FULL SURFACE HYPERSPECTRAL IMAGING

Haibo Yao[1, 2], Ebrahiem Babiker[2], Yanbo Huang[2], Dan Jeffers[2], John Brooks[2]

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Corn is the number one crop in the United States. US is also the largest corn producer in the world, representing one-third of world production. In the state of Mississippi, corn is the second largest row crop, accounting for more than $675 Million in 2023. Corn breeding is an important process to develop and identify corn hybrids with important traits such as high yield, drought tolerance, resistance to diseases and insects, etc. One essential task in corn breeding is ear assessment after hand harvest of corn ears. This task involves evaluation of traits such as ear shape and size, kernel row number, kernel number, surface distribution of kernels on the ear, and gene markers. However, traditional ways for measuring and recording corn ear traits are manually based, which is subjective, inconsistent, time consuming, and expensive. In addition, it is difficult for a manual approach to record certain information such as kernel surface distribution on the ear. This research developed a novel hyperspectral imaging system for whole corn ear phenotyping. The hyperspectral imaging system implemented pushbroom line scanning and was able to scan full corn ear surface using a rotational stage. The resulted hyperspectral image of a whole corn ear is a flattened surface image of the ear, which provides a two-dimensional (2-D) digital representation of whole corn ear surface from a three-dimensional (3-D) whole corn ear body. Hyperspectral imaging is a promising research tool for agricultural products, especially when analyzed with artificial intelligence and machine learning algorithms. The resulted 2-D corn ear hyperspectral images can be used for 3-D whole corn ear phenotyping, categorization and quantification of kernels, and identification of the above corn ear phenomics traits. Furthermore, spectral information in the hyperspectral images could be used to identify other pertinent traits such as nutritional and chemical constituents of kernels, disease and fungal infection status, and genotypic expression under fluorescence excitation.

P1.37

OXFORD NANOPORE TECHNOLOGY: GAME-CHANGING ONSITE DIAGNOSIS FOR *Phytophthora capsici*

Kumudini Talari, Sumyya Waliullah, Carson Posey, Charlicia Meeks[1], Emran Ali

Alcorn State University, Lorman, MS

Detecting *Phytophthora capsici* (*P. capsici*) based solely on visual symptoms is challenging and leads to misdiagnosis. Farmers frequently harvest seemingly healthy fruits, only for fruit rot to develop after shipping. Furthermore, pathogens can mimic *P. capsici* symptoms on cucurbits and peppers, and plants may even suffer simultaneous attacks by multiple pathogens, complicating identification. Without timely and accurate diagnosis, *P. capsici* can spread rapidly, causing significant crop losses. Current diagnostic methods, including traditional microscopy-based culture techniques and polymerase chain reaction (PCR), are time-intensive and lack sensitivity for early-stage infections. This study introduces

an optimized Oxford Nanopore Technology (ONT) genomic approach for rapid and precise detection of *P. capsici* in plant samples. Designed for portability and capable of sequencing reads up to 100 kb, the ONT MinION device—smaller than a smartphone—provides a promising solution for in-field diagnostics. Plant tissue samples, symptomatic and non-symptomatic, were collected from cucurbit and pepper fields during late summer and early fall. Total DNA was extracted using a magnetic bead-based kit (Primerdesign, Southampton, UK). Sequencing libraries were prepared using ONT's 1D-cDNA sequencing kit, loaded onto a MinION 107 v9.5 Flow Cell, and analyzed using the Mk1B MinION device. Raw sequence reads in fast5 format were converted to fastq or fasta, with high-quality reads subjected to BLAST searches against the NCBI database for *P. capsici* identification. The deployment of ONT enables the generation of actionable genomic data in real-time, enhancing our understanding of *P. capsici* and its role in Phytophthora blight disease development in cucurbits. This technology represents a breakthrough in the rapid, field-based diagnosis of *P. capsici*, providing farmers with an efficient tool to mitigate crop losses.

P1.38

HORTICULTURE-BASED ORGANIC AGROFORESTRY TO PREVENT FOREST FIRE AND CLIMATE CHANGE, AND TO KEEP THE HUMANS AND MOTHER EARTH HEALTHY

Girish Panicker

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Soil erosion and climate change are major conservation issues around the globe. Agroforestry is an innovative land management system that integrates crops, livestock, and trees. This sustainable approach harnesses the synergies between various plant and animal species to enhance biodiversity, prevent soil erosion, improve soil health, and boost farm productivity. Horticulture-based agroforestry is a collective word of land-use systems and practices where herbs, shrubs, and trees are grown for food on the same land management unit without livestock. Horticulture-based agroforestry is a scientifically designed mixed cropping system with annuals, biennials, and perennials for financial, environmental, and health benefits. This long-lasting conservation farming system deals with cereals, fruits, vegetables, tubers, nuts, legumes, spices, and condiments. Five acres of land on Memphis Silt Loam was divided into five blocks for pecans, vegetables, muscadines, blueberries, spices, and condiments. This agroforestry research program is the first of its kind in the nation with only horticultural crops where Pecans are the tree crops. The tree rows are widely spaced with a plant-to-plant distance of 45 feet and a row-to-row distance of 90 feet; hence, this system completely prevents forest fire. This forestry system is practiced in Asia and Africa, especially for the economic sustainability of small farmers and for providing them with nutritious foods. In our farming system, annual and biennial vegetables, muscadines, blueberries, corn, legumes, cover crops, chilies, ginger, cocoyam, and turmeric are raised in this agroforestry system. Inter-cropping, inter-planting, and cover cropping are practiced with organic manures for nutrient management and to prevent soil erosion. Randomized complete block (RCBD) and completely randomized designs (CRD) were used to raise perennial crops with different organic treatments including cow manure, poultry manure, plant waste, and worm castings. Annuals and biennials were raised under RCBD with different organic treatments. The C-factor research technology, developed by ASU in collaboration with USDA scientists, has been used to evaluate the growth parameters of annuals and biennials including biomass development. AccuPAR and Ceptometers were used to evaluate the leaf area index (LAI) and percent canopy cover. The protocol of the National Soil Health lab at Cornel University has been followed to collect soil samples to evaluate soil health. The presentation will cover the enormous amount of work done on these crops. This forestry system keeps the farming community healthy and economically sound. Once fully established, this agroforestry center can be utilized for training foresters, land owners, farmers, conservationists, and students.

P1.39

IMPACT OF PLANTING DATE ON IRRIGATED SOYBEAN YIELD AND QUALITY IN THE MIDSOUTH

Tulsi Kharel[1], Krishna Reddy[1], Ammar Bhandari[1], Nacer Bellaloui[2]

[1]CPSRU, USDA-ARS, Stoneville, MS, [2]CGRU, USDA-ARS, Stoneville, MS

An early soybean production system is recommended to improve soybean yield in the Midsouth USA. Planting soybeans early offers advantages such as a longer growing season, adequate light interception, and avoidance of late summer heat stress during the grain filling stage. Studies have shown that maturity groups (MG) IV and V, when planted early, yield the highest average in Mississippi, with MG IV consistently outperforming in both early and late planting dates. To fine-tune the optimal planting date for early soybean cultivars and evaluate their productivity in later planting dates, a study was conducted in Stoneville, MS, during the 2022 and 2023 growing seasons. The study employed a split-plot experiment with four planting dates and three MG soybean varieties, replicated four times. The planting dates (the second week of April, the fourth week of April, the second week of May, and the first week of June) served as the main plot factors, while the MG (MG 3.8, MG 4.5, and MG 4.8) were the subplot factors. Each plot consisted of four rows with 40'' row spacing and 100 ft length. The experiment site followed conventional tillage practices, crop management and was furrow irrigated. Soybean yield was determined by harvesting the center two rows using an 8XP two-row combine. Additionally, soybean seed sub-samples were collected, ground, and analyzed for protein, oil, fatty acid, and sugar content using a Foss NIR (NIRS™ DS3 F) instrument. The yield and quality data will be presented and discussed.

P1.40

IDENTIFICATION OF MAJOR QTLS FOR SEED VIGOR AND GROWTH-RELATED TRAITS USING A BI-PARENTAL POPULATION IN SOYBEAN

Neeraj Kumar

USDA, Agriculture Research Service, Crop Genetics Research Unit, 141 Experiment Station Road, Stoneville, MS

Soybean [*Glycine max (L.) Merr*.] is one of the world's most widely grown crops and is the main source of vegetable protein and edible oil for human consumption. Seed vigor is a critical trait for germination and seedling establishment, especially under adverse environmental conditions such as sub-optimal temperatures and moisture levels. Loss of seed vigor can greatly reduce plant density, which eventually minimizes grain yield. Seed vigor is a polygenic trait that is regulated by quantitative genetic factors. The main objective of this study is to understand the genetic control of seed vigor in soybean, estimated by the accelerated aging (AA) germination test, and its associations with pubescence color (PB), beginning flower (R1), the period from flowering to maturity (FTM), maturity (R8), plant height (Ht) and stem termination (ST) using a whole-genome quantitative trait locus (QTL) mapping approach. We developed a recombinant inbred line (RIL) population from the cross between DS25-1 and DT97-4290. The entire RIL population (247 F_6-derived lines), along with their parental lines, were genotyped using genotyping-by-sequencing (GBS) to develop > 90,000 SNP (single nucleotide polymorphism) markers. A sub-set of 201 RILs was evaluated for various phenotypic traits under field conditions at Stoneville, Mississippi for three consecutive years (2017-2019). For performing QTL analysis, the best linear unbiased prediction (BLUP) values were estimated for five quantitative traits (AA, R1, FTM, R8, and Ht). A molecular genetic linkage map was constructed using a set of polymorphic, quality-filtered markers (8,445 SNPs) and performed composite interval mapping in R/qtl. A total of 21 QTLs were detected for seven phenotypic traits (AA, PB, R1, FTM, R8, Ht, and ST) over nine different chromosomes (1, 3, 5, 6, 7, 15, 17, 18, and 19). The phenotypic variation explained (PVE) by individual QTL ranged between 0.56 and 90.6%, and the additive effects ranged from -15.3 to 9.9. Of these 21, a solitary QTL each for PB and ST, two for Ht, three for R8, four for R1, and five each for FTM, and AA were detected. Based on their significant threshold LOD scores in more than one environment, 11 QTLs consistently detected on three different chromosomes (6, 7, and 19) were considered stable. Four genomic regions exhibited co-localization of QTL on chr 6 for all the traits except ST, followed by chr 7 (AA, R1, FTM, and R8), chr3 (AA and R1), and chr19 (Ht and ST). The locations of our major loci were in close proximity to previously known genes that include a gene for pubescence (T: chr6), three for maturity (E1: chr6, E11: chr7, and E3: chr19), and a gene for stem termination (Dt1: chr19). The significant SNP markers associated with QTL for seed vigor and other agronomic traits can be converted into KASP markers for using marker-assisted selection for improving, seed quality and soybean production.

P1.41

INFLUENCE OF WINTER COVER CROPS ON CORN AND COTTON PRODUCTION UNDER RAINFED ENVIRONMENT

Nisarga Kodadinne Narayana[1], Bala Subramanyam Sivarathri[1], Mohan Bista[1], Ardeshir Adeli[2] and Raju Bheemanahalli[1]

[1]Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS , [2]USDA-ARS, Genetics and Sustainable Agriculture Research Unit, Mississippi State, MS

Winter cover cropping, followed by cash crop planting, is one of the proposed viable methods for maintaining soil health and crop productivity. However, its effects on the physiology and yield of succeeding crops remain a contention. To understand this, a multi-year field experiment has been initiated incorporating no-till practice with winter cover crops (CCs) with poultry litter application and reduced inorganic N fertilizers during cash crop planting. The objective was to evaluate the influence of different winter CCs (Vetch, Rye, Mix: Pea+Radish+Rye) and no cover crop (NCC) on the physiology and yield of corn and cotton. Leaf pigments did not differ significantly across the CC treatments in grain and fiber crops. Corn exhibited higher stomatal conductance than cotton, with no significant differences between CC and NCC treatments. In cotton, the highest greenness index was observed in CC rye and the lowest in vetch, while the CC mix and NCC showed similar greenness indices. The variation in cotton's greenness index is attributed to differences in leaf structure and canopy architecture. No differences in the greenness index were observed between CC and NCC treatments in corn. Corn yield exhibited a significant increase with the vetch treatment, resulting in 10498.1 Kg/ha, while the yield was notably lower with the rye treatment, at 8983.6 Kg/ha. No significant differences in cotton seed yield between the CC mixture and the NCC treatment indicate the possibility of maintaining productivity with less inorganic input under rainfed. However, for cotton, no variations in yield were observed between the CC treatments. These results demonstrate that winter cover crops combined with poultry litter and low nitrogen fertilizer can potentially increase corn yield in the long term. Additionally, the results highlight the crop-specific influence of CC on productivity under no-till rainfed conditions.

P1.42

PHYSIOLOGICAL AND HORMONAL ADJUSTMENTS IN SOYBEAN UNDER DROUGHT AND HEAT STRESS

Renganathan Vellaichamy Gandhimeyyan, Sadikshya Poudel, K Raja Reddy, Raju Bheemanahalli

Mississippi State University, Mississippi State, MS

Abiotic stress negatively impacts soybean production, particularly drought and heat, which affect yield and economic returns. These stressors induce physiological and phytohormonal changes that significantly modify yield and quality traits potentials. However, the mechanisms associated with individual drought, heat, and combined tolerance have not been clear in soybeans. Thus, this study was designed to understand the physiological and phytohormonal-induced changes during the reproductive stage in soybeans (DS25-1 and DT97-4290). At the reproductive stages, these genotypes were exposed to four different treatments: control (100% irrigation), heat (38°C daytime), drought (50% irrigation), and heat combined with drought (38°C + 50% irrigation). Interactive treatment induced significant changes in gas exchange parameters, with photosynthetic rates declining notably under combined stress (2.0-fold for DT97-4290 and 2.3-fold for DS25-1). Irrespective of the genotype, phytohormones such as ABA, SA, JA, and JA-Ile decreased under combined stress while tZR increased. Under combined stress, the DT97-4290 recorded a significant reduction in seed number (50%) and seed weight (56%) per plant compared to the control, which was 10% higher than the DS25-1 genotype. The sensitivity of soybeans to individual or combined stress during the reproductive stage is significantly associated with physiological and phytohormonal changes. This strongly suggests the differential physiological and phytohormonal regulation of soybeans to stressors

P1.43

EFFECTS OF LOW NITROGEN AND DROUGHT STRESS ON FINGER MILLET YIELD COMPONENTS

Chami Rampati Dewage, Mohan K Bista, Alekhya Chakravaram and Raju Bheemanahalli

Mississippi State University, Mississippi State, MS

Finger millet (*Eleusine coracana* L.) is a low-input crop that has the potential to thrive under a variety of harsh environmental conditions, including drought. This crop is popular among farmers in Asia and Africa but is still underutilized in the United States. Because of its nutraceutical and climate-resilient traits and low input requirement, this crop has been recently promoted as an alternative to traditional cereals in marginal soil and low-rainfall regions. However, the response of finger millet to individual and combined abiotic stresses is limited. In this study, high-yielding, early maturing finger millet germplasm was exposed to four growing environments: (i) control (CNT), (ii) drought stress (DS), (iii) low nitrogen (LN), and (iv) drought stress + low nitrogen (DS+LN) during the flowering stage. Results revealed that LN did not affect growth parameters except grain yield. However, DS alone or combined LN significantly affected ($p < 0.05$) most of the parameters, including plant height, days to maturity, and grain yield. The individual effects of DS or LN had no significant effect on shoot dry mass. However, their combined effect significantly reduced biomass by 23% compared with the control. The grain yield was reduced considerably by DS+LN (55%), followed by DS (30%), and LN (24%), compared with CNT. However, under DS+LN, the harvest index was reduced by 25% compared with CNT. These results suggest that though finger millet has several climate-resilient traits, more than stress during the reproductive stage might significantly limit the genetic potential of finger millet below an economic threshold level.

P1.44

WARMER NIGHTS AND DROUGHT AFFECT SOYBEAN PHYSIOLOGY AND DECREASE YIELDS

Lekshmy V Sankarapillai, Bikash Adhikari, Mohan K. Bista, K Raja Reddy and Raju Bheemanahalli

, Mississippi State University, MS

Global warming is accelerating the frequency and intensity of multiple stresses, negatively impacting crop production. The changes in global warming are asymmetric, with nighttime temperature (HNT) rising at a higher rate than daytime temperature. Exposure to drought (DS) or warmer nights substantially threatens the production of crops, including legumes. While the impact of DS on soybeans has been well-studied, the effect of HNT is becoming increasingly important. However, the combined influence of DS and HNT on soybean physiology and yield production is poorly understood. This study evaluated the physiological and yield responses of six soybean genotypes under four treatments at the peak blooming (R3) stage: (i) control (CNT: 22°C nighttime temperature + 100% irrigation), (ii) drought stress (DS: 22°C nighttime temperature + 50% irrigation), (iii) HNT (28°C nighttime temperature + 100% irrigation), and (iv) combined stress (HNT+DS: 28°C nighttime temperature + 50% irrigation). A 3.4°C increase in nighttime temperature, elevated nighttime respiration (*Rd*) by 37% and 23% with and without DS due to altered nighttime stomatal conductance and transpiration. Photosynthesis declined significantly, with the largest reduction (81%) observed under HNT+DS conditions. Combined DS and HNT caused an 81% reduction in seed yield in the susceptible genotype, followed by a 47% reduction under DS and a 34% reduction under HNT. Genotypes tolerant to HNT showed a yield reduction of over 50% under combined stress. This emphasizes the need to understand molecular mechanisms to develop genotypes resilient to warmer nights in rain-fed environments for sustaining soybean yields.

END OF THURSDAY PROGRAM

Friday, March 19, 2025
MORNING
Hall D Room 1
8:00 Welcome and Opening

O1.17

8:15 BUILDING A UAV TRAINING NETWORK IN RURAL MISSISSIPPI: EMPOWERING FAA-CERTIFIED UAV PILOTS OF COLOR IN AGRICULTURAL INNOVATION

Cadavious Jones

Rust College, Holly Springs, MS

This project aimed to outline the development and impact of a transformative training initiative in the rural Mississippi Delta, designed to diversify the unmanned aerial vehicle (UAV) technology sector. Spearheaded by Rust College, the program focused on creating a network of FAA-certified UAV pilots of color through accessible, community-based partnerships with local farming businesses and hands-on exposure to emerging technologies. Participants engaged in a comprehensive training structure, including technical coursework, real-world applications, and FAA Part 107 equivalency testing. The initiative culminated in the establishment of Mississippi's first UAV Network of Color, which empowers students, farmers, and small businesses to leverage UAV technologies for agricultural innovation. By addressing representation gaps, building sustainable workforces, and fostering community-driven economic growth, this program demonstrates the potential of localized training networks in underserved regions. Through these efforts, the program not only contributed to technological advancement but also positioned the Mississippi Delta as a leader in agricultural innovation and workforce diversity in the UAV sector.

O1.18

8:30 MOBILE PLANT CLINICS: BRINGING QUICK, TECH-DRIVEN DISEASE DIAGNOSIS TO YOUR FARM

Emran Ali, Sumyya Waliullah, Franklin Chukwuma

Alcorn State University, Lorman, MS

The Mobile Plant Clinic Program (MPC) at Alcorn State University, Lorman, MS is transforming agriculture by providing accessible, timely plant health diagnostics directly to farmers, particularly those in remote and underserved areas. Equipped with portable diagnostic tools and expert guidance, these mobile clinics deliver accurate information that helps farmers tackle plant health challenges, manage crops more effectively, and boost yields. By collaborating with extension agents, agricultural educators, and industry partners, MPC tailors' workshops, training, and resources to meet the specific needs of local farmers, enhancing agricultural knowledge and promoting best practices. MPC educates farmers on essential skills, including soil health management, eco-friendly pest control, and the use of organic fertilizers. Beyond diagnostics, the program also guides farmers in accessing high-quality seeds and resources that support healthier harvests, aiming to improve long-term crop resilience and productivity. At its core, MPC integrates innovative research, field-based teaching, and targeted outreach to address urgent plant health issues while promoting sustainable farming. In response to the growing demand for rapid, accessible plant health solutions, MPC has adopted portable diagnostic tools that allow for quick and accurate disease detection directly in the field. Using rapid, precise diagnostic assays, farmers can identify plant and soil health issues in minutes, allowing them to take immediate action to mitigate potential problems. These diagnostic techniques support sustainable, environmentally friendly farming practices that are both efficient and scalable, making them a valuable asset for modern agriculture. The program's impact has been significant, reaching 587 clients across 12 counties in 2024 through practical training and hands-on sessions. Farmers who participate in MPC benefit not only from improved knowledge of plant health management but also from practical tools that foster more sustainable farming practices. In conclusion, by providing farmers with the tools and knowledge they need to address plant health challenges, MPC is fostering resilience, productivity, and sustainability in agriculture in Sothern MS.

O1.19

8:45 IMMUNOSTRIP ASSAYS: A FAST AND FIELD-FRIENDLY TOOL FOR DETECTING VEGETABLE DISEASES

Jamiyla Watson, Sumyya Waliullah, Franklin Chukwuma, Emran Ali

Alcorn State University, Lorman, MS

The rapid and accurate detection of vegetable pathogens is critical for effective disease management, particularly for resource-limited farmers in Southern Mississippi. Immunostrip assays (IA) provide a practical, field-ready solution, allowing swift, on-site identification of specific plant pathogens without the need for specialized lab equipment. This study evaluates the use of immunostrip assays as an efficient tool for detecting vegetable diseases, specifically targeting pathogens that pose significant threats to crop health and yield. Immunostrip assays work similarly to a COVID-19 antigen test: simply place diseased plant tissue in a buffer solution, insert a test strip, and get results within minutes. In this study, we collected 110 suspected samples from various vegetable fields and tested them against multiple pathogens. Our results confirm the presence of various pathogens in the vegetable crops of this region. These assays provide clear, visual results, making it easy for farmers and field technicians to detect specific pathogens on the spot. This tool's speed and simplicity allow for early and accurate pathogen identification, enabling timely interventions to reduce disease spread and minimize crop losses. Immunostrip

assays are thus an invaluable resource for rapid diagnostics, especially in remote or resource-limited areas, offering farmers a cost-effective, accessible way to protect their crops and optimize yield.

O1.20

9:00 IMMUNOSTRIP ASSAYS: A FAST AND FIELD-FRIENDLY TOOL FOR DETECTING VEGETABLE DISEASES

Jamiyla Watson, Sumyya Waliullah, Franklin Chukwuma, Emran Ali

Alcorn State University, Lorman, MS

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O1.21

9:15 ADVANCING SOYBEAN SEED PROTEIN ENHANCEMENT: INSIGHTS FROM QQS GENE STUDIES

Ethan Brister

Mississippi State University, Starkville, MS

Enhancing soybean seed protein is of critical importance, as it improves the nutritional quality of soybeans and addresses global challenges related to food security and sustainable agriculture for both human and livestock consumption. Additionally, increasing soybean seed protein is pivotal for various industrial applications, ranging from high-protein animal feed to the production of plant-based protein products. The Arabidopsis orphan gene Qua-Quine Starch (QQS) has been identified as a significant factor in elevating protein levels in leaves and seeds across various plant species. By performing a comparative analysis of RNA transcript levels in wild-type and QQS-expressing (QQS-E) soybean leaves, we identified candidate genes potentially associated with high-protein content. These genes displayed elevated transcript levels in QQS-E lines compared to the wild type, indicating a positive correlation with increased protein levels. To further investigate the relationship between these soybean genes and protein content, we over-expressed these candidate genes in wild-type Arabidopsis thaliana plants. Quantitative transcript analysis and comprehensive evaluation of leaf and seed composition in promising lines revealed the potential of these candidate genes to enhance leaf protein content in Arabidopsis. These findings illustrate the practical applications of our discoveries and their potential to improve soybean seed composition, ultimately contributing to advances in agricultural productivity and industrial applications.

O1.22

9:30 ENHANCING NUTRITIONAL CONTENT IN SWEET POTATO THROUGH THE ORPHAN GENE QQS: A METABOLIC ENGINEERING APPROACH

Ramtin Vamenani[1], Yan Meng[2], Ling Li[1]

[1]Department of Biological Sciences, Mississippi State University, Mississippi State, [2]2Department of Agriculture, Alcorn State University, Lorman, MS

The allocation of carbon and nitrogen resources in plants, directing synthesis toward proteins and carbohydrates, is a complex, gene-regulated process that remains only partially understood. Qua-Quine Starch (QQS), an orphan gene unique to Arabidopsis thaliana, exhibits a novel and unexpected functionality without homologs in other species. Orphan genes, exclusive to specific organisms, constitute a significant portion of eukaryotic and prokaryotic genomes, and are believed to shape species-specific traits. QQS has been shown to regulate carbon and nitrogen partitioning, influencing leaf and seed composition in Arabidopsis and crops such as soybean, corn, rice, and potato. In this study, we expanded the application of QQS by introducing it into sweet potato (Ipomoea batatas, cv. Red Jewel), a crop known for its low protein content. Using Agrobacterium-mediated gene transformation, QQS was expressed in sweet potato plants, and the most promising lines were identified through RT-qPCR analysis. Protein and starch levels in leaves were quantified using the Modified Lowry Protein Assay and the Glucose Oxidase/Peroxidase (GOPOD) assay, respectively. Our results show that transgenic sweet potato plants expressing QQS demonstrated a 51.4% increase in protein content, significantly enhancing the nutritional profile of this protein-poor crop. Additionally, starch accumulation in transgenic leaves was reduced by 18.6% compared to wild-type controls. This shift in carbon and nitrogen allocation indicates that QQS effectively redirects metabolic resources from carbohydrate storage toward protein synthesis, offering a powerful tool for metabolic engineering. To our knowledge, this is the first successful transgenic approach in sweet potato that simultaneously elevates protein levels while reducing starch content. These findings highlight QQS' potential as a key target for metabolic engineering aimed at optimizing carbon and

nitrogen utilization in various crops. We are also developing a strategy with QQS interactor, Nuclear Factor Y subunit C4 (NF-YC4), to create high-protein sweet potatoes that are transgene free. This work contributes to the development of nutritionally enhanced crops, advancing sustainable agriculture and global food security.

O1.23

9:45 USING AGROBACTERIUM-MEDIATED GENE TRANSFORMATION APPROACH TO DEVELOP SWEETPOTATO GERMPLASM WITH ENHANCED PROTEIN CONTENT

John Jones[1], Tatyana Hollingbird[1], Trinity Dailey[1], Lei Wang[2], Ramtin Vamenani[2], Ling Li[2], Yan Meng[1]

[1]Alcorn State University, Lorman, MS, [2]Mississippi State University, Starkville, MS

Food and nutrition security remain critical concerns in many regions around the world. Sweetpotato (*Ipomoea batatas (L.) Lam.*) is widely cultivated in tropical and subtropical areas and ranks among the top ten most important food crops globally. However, sweetpotato has a relatively low protein content compared to staple foods such as maize, rice, wheat, and soybean. The Arabidopsis gene Qua-quine Starch (QQS) and its primary interactor, a nuclear factor Y subunit C4 (NF-YC4), play key roles regulating carbon and nitrogen partitioning to starch and protein accumulation in Arabidopsis as well as in soybean and other crops. To enhance the protein content in sweetpotato, we optimized protocols to generate transgenic sweetpotato lines expressing the QQS gene and overexpressing IbNF-YC4. The QQS gene was cloned from Arabidopsis thaliana ecotype Columbia 0 (Col-0) and sweetpotato NF-YC4 was cloned from variety PI566648 (Red Jewel). Expression vectors for Arabidopsis QQS and sweetpotato NF-YC4 were constructed and transformed into Agrobacterium tumefaciens strain EHA105. We optimized the regeneration and Agrobacterium-mediated gene transformation systems for sweetpotato, conducting glufosinate concentration tests for selection in line Red Jewel. Over 15 glufosinate-resistant plants were generated from each transformation construct, and PCR analysis confirmed successful gene insertion in more than 90% of regenerated plants. Quantification of protein and starch levels in transgenic sweetpotato leaves showed a significant increase in protein content and a reduction in starch accumulation compared to wild-type controls, indicating the potential for improved nutritional value in transgenic sweetpotato lines.

10:00 BREAK

O1.24

10:15 PRE- AND POST-HARVEST MYCOTOXIN CONTROL METHODOLOGIES

Hamed Abbas[1], Ryan Paulk[1, 2], Heather Jordan[2], W. Tom Shier[3]

[1]USDA ARS BCPRU, [2]Mississippi State University, Mississippi State, MS, [3]University of Minnesota

Mycotoxins are any secondary metabolite produced by fungi that has negative effects on animals and plants. The mycotoxins of most concern are those produced by fungi infesting food crops in the field and in storage after harvest. Regulated mycotoxins, such as aflatoxin, require vigilant testing and management to ensure animals are healthy and human food is safe. Managing mycotoxins and the fungi that produce them can be undertaken in various ways. In our research to develop methods to reduce mycotoxin exposure to the consumer, we have explored laboratory techniques for quantifying mycotoxins in various commodities and experimented with ways to reduce their occurrence in crops common to the Southern US. Prevention starts in the fields, with several methods ranging from better agricultural practices to chemical and biological control of fungi. None of these approaches are completely effective in preventing mycotoxin occurrence in the field. The most successful preventative method so far is biological control using nontoxigenic Aspergillus flavus strains that can out compete toxigenic strains. Post-harvest techniques for mycotoxin reduction can have mixed results, with some methods being themselves toxic or producing new toxic derivatives. An emerging field involves research combining the nutritional benefits from insect farming with their notable detoxifying metabolisms. There are many insects being evaluated for optimal mycotoxin detoxification, including yellow meal worm, house cricket, and black soldier fly, all of which have promising results as both detoxifying agents and livestock feed. Salvaging nutrients from mycotoxin contaminated grains in this way may be the future for a sustainable, circular economy.

O1.25

10:30 COMBINED EFFECTS OF TEMPERATURE AND CO_2 ON EARLY-SEASON GROWTH AND FLOWERING IN COTTON GENOTYPES

Navneet Kaur[1], Naflath Thenveettil[1], Manoj Kumar Reddy Allam[1], Johnie Jenkins[2], Krishna Reddy[3], K Raja Reddy[1]

[1]Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS, [2]USDA-ARS, Genetics and Sustainable Agriculture Research, Mississippi State, MS, [3]USDA-ARS, Crop Production Systems Research Unit, Stoneville, MS

The changing climate has resulted in increased fluctuations in temperature and higher CO_2 levels in the past decades, and further increases are expected in the upcoming years. CO_2 levels are predicted to reach 1000 pm by the end of this century. Cotton growth and development are affected by both environment and genotype. So, the combined effects of both temperature and CO_2 on cotton are needed to be studied in more depth. This study was conducted as a pot experiment using 6 × 18" pots filled with a sand-soil mix (3:1). Three temperature regimes (low: 22/14 °C, optimum: 30/22 °C, and high: 38/30 °C) and two CO_2 levels (ambient: 425 ppm and elevated: 725 ppm) were

imposed using the sunlit-plant growth chamber units. Four cotton genotypes (CSX 5432, CSX 8308, UA 48, and UGA 230) were grown in a completely randomized design with four replications per treatment. Plants were harvested 61 days after planting. Results showed that both temperature and CO_2 positively influenced plant growth for all the genotypes. Node addition was influenced by temperature but not CO_2. High temperature and elevated CO_2 resulted in a higher number of retained bolls despite more bolls being dropped compared to the optimum and low temperature due to the higher production of fruiting sites under these conditions. Stomatal conductance declined at elevated CO_2 levels but was highest under high temperatures. Net photosynthesis was highest at the high temperature and elevated CO_2, which led to the production of the largest leaf area under the same conditions. Similar results were observed for the total shoot dry weight. CO_2 levels did not affect root/shoot, but the plants partitioned more biomass towards roots at low temperatures than at higher temperatures. Genotypic differences were observed in morphology and biomass production. High temperature and elevated CO_2 also accelerated flowering, while the plants grown under low temperatures did not flower by the end of the experiment. The interaction of temperature and CO_2 plays a significant role in cotton growth, with temperature having a more substantial effect on some growth parameters, while elevated CO_2 may mitigate some adverse effects of high temperature.

O1.26

10:45 ANALYSIS OF PLANT SPECIES COMPOSITION AND SPECIES RICHNESS ALONG THE SRE AMBEL FLOODPLAIN IN CAMBODIAN SOUTHWESTERN COAST

Sitha Som, Sandra Correa, Joshua Granger, Vitor Souza Martins

Mississippi State University, Starkville, MS

The Sre Ambel River floodplain in southwest Cambodia is considered one of the richest biodiversity hotspots in the coastal region of Cambodia. It supports several globally threatened species of waterbirds, reptiles, mammals, and fishes. The rich floodplain ecosystem provides a great economic opportunity for more than 3000 households to support their livelihoods. The Sre Ambel floodplain faces unsustainable utilization from illegal logging of the flooded forests, riparian forests, and mangroves for agriculture, ecotourism, construction, charcoal, and new settlements. Although the floodplain plays a vital role in maintaining ecological functions and biodiversity, little is known about its characteristics, forest species composition, and functionality. The Department of Wildlife, Fisheries, and Aquaculture of Mississippi State University, Mississippi State, MS partnered with the Wildlife Conservation Society- Cambodia Program to conduct a collaborative project in this region to research this forest ecosystem entitle "Analysis of Plant Species Composition and Species Richness Along the Sre Ambel Floodplain in Cambodian Southwestern Coast". The research project aims to understand the spatial variety of tree and plant species present, assess health and identify hotspots of the forest ecosystem. Ground-truth data collection was conducted to collect relevant information for in-depth analysis of plant species diversity and distribution. Results from this research will include the species diversity, species richness, and tree growth metrics (tree height, diameter, and forest canopy cover). These results will be crucial to informing the Cambodian government how to protect and restore this important floodplain ecosystem for biodiversity conservation, forest management, wildlife conservation, ecosystem protection, and livelihood development.

O1.27

11:00 MITIGATION OF FUMONISIN B1 BY TENEBRIO MOLITOR REARED ON ARTIFICIAL DIET

Ryan Paulk[1, 2], Hamed Abbas[1], Guadalupe Rojas[1], Juan Morales-Ramos[1], Mark Busman[3], Nathan Little[4], Heather Jordan[2], W. Tom Shier[5]

[1]USDA ARS BCPRU, [2]Mississippi State University, Mississippi State, MS, [3]USDA ARS MPM, [4]USDA ARS SIMRU, [5]University of Minnesota

Ensuring the safety of insect farming will be essential for a successful and sustainable circular economy. Feed streams for the rearing of insects will inevitably include sources contaminated with fungi and their mycotoxins. Fumonisin B1 (FB1), produced by *Fusarium verticillioides*, is one such mycotoxin that is ubiquitous in corn. FB1 can cause a variety of hepatological and neurological diseases in both livestock and humans. The potential for trophic magnification through insect farming needs to be assessed. *Tenebrio molitor*, as one of many insects currently under investigation for its quality and performance as livestock feed supplement, has the potential to either magnify or mitigate mycotoxins. Here, *T. molitor* was monitored for their growth, mortality, and final FB1 content in insect meal and frass when fed artificial diets treated with purified FB1. Levels of FB1 were chosen from FDA and EFSA recommendations for different livestock which were 0 ppm, 1 ppm, 5 ppm, and 20 ppm. Growth was negatively affected by FB1 ($P<0.05$) only at the highest level, with 10.7% less growth by harvest than control. However, FB1 had no significant effects on mortality ($P=0.752$). *T. molitor* meal and frass at harvest were analyzed by HPLC-FLD and LC-MS. Meal retained less than 0.5% of FB1 in the initial diets, while 28.0-40.2% of FB1 was retained in frass. Long chain fatty acid derivatives of FB1 were detected in frass by LC-MS/MS. Our research indicates that *T. molitor* has potential use for the remediation of fumonisin-contaminated agricultural waste streams in future sustainable circular economies.

O1.28

11:15 IMPACT OF PLANTING SPEED AND DOWNFORCE ON CORN SEEDING

Oluwaseyi Olomitutu, Jagmandeep Dhillon, Michael Mulvaney, Wes Lowe, John Wallace, Jacob Meadows

Mississippi State University, Mississippi State, MS

The primary purpose of using a planter is to place seeds uniformly at the intended plant spacing and target planting depth. Increased ground speed and surface roughness linearly increase planter components vibration which compromise seed meters' ability to singulate effectively, resulting in nonuniform seed spacing distribution. Increasing downforce on row units could be used to minimize vibration. However, application of downforce can be challenging as it could compact soil, affect seeding depth, cause poor root development and uneven plant emergence. Current advances in hydraulic downforce systems make it possible to choose between dynamic and static downforce operational modes during planting. Therefore, the objective of this study is to determine the effect of planting speed and downforce settings on planter components vibration, corn seed placement uniformity and yield. The trial was conducted during the 2024 cropping season at two locations (Brooksville and Stoneville) in MS. A four-row precision planter (John Deere® MaxEmerge 2 row units retrofitted with Ag Leader® SureSpeed and SureForce) was used. The experimental design was a 2 × 2 × 3 factorial laid out in a randomized complete block design, with each treatment replicated four times. The treatments were two planting speed (8.1 and 16.1 km h^{-1}), two downforce mode (dynamic and static), and three downforce operational settings (minimum, medium, and heavy). The planter was set up to plant at 3 - 4 cm depth. Corn hybrid DKC70-27 was planted at 85,000 seeds ha^{-1}. Planter components vibration was measured using Extech VB300 3-Axis G-Force Datalogger. Data were recorded on actual plant population, plant spacing, and seed depth. Grain yield, mean plant spacing, spacing variability (standard deviation), quality of feed index, skips, multiples, and overall precision were estimated. Preliminary results will be presented.

O1.29

11:30 DECODING NATURAL DIVERSITY OF FINGER MILLET: A PROMISING RESILIENT GRAIN FOR THE FUTURE

Alekhya Chakravaram, Mohan Bista[1]Nisarga Kodadinne Narayana, Bikash Adhikari, Raju Bheemanahalli

Mississippi State University, Starkville, MS

Finger millet (*Eleusine coracana*) is a small-seeded crop known for its resilience to adverse climatic conditions. Seeds of this are packed with high nutritional value, including minerals, vitamins, and dietary fiber. At the same time, finger millet remains less prominent than other staple crops in the United States. Recent studies have begun to explore its adaptability and potential integration into sustainable agricultural systems. The present study aimed to estimate the genetic diversity among 318 finger millet genotypes and their associations with physiological, agronomic, and yield-related traits. Exploring natural variation in these traits of finger millet is essential for improving growth and yield potential. Analysis of variance revealed significant differences among the genotypes for these traits, highlighting large natural variability for genetic exploitation. Correlation studies demonstrated a positive correlation between tillering and ear number, suggesting that these traits may be selected simultaneously to improve yield. A moderate negative association was observed between leaf temperature and chlorophyll index, indicative of adaptation to stress-prone environments. Moreover, greater variability in the nitrogen flavanol index and its strong inverse correlation with the flavanol index suggests a trade-off between nutrient efficiency and stress response. Developmental traits such as days to heading, flowering, grain filling, and maturity were positively correlated, promoting synchrony in growth stages. Notably, the independence of traits such as plant height allows targeted selection, which could be advantageous for yield and stress resilience across diverse environments. Furthermore, variability in grain yield and its relationship with other traits will help select the most valuable traits and the superior genotypes. As the demand for resilient and nutritious crops grows, insights from these studies will significantly help the future of finger millet breeding and sustainable food systems.

O1.30

11:45 CHARACTERIZING AND QUANTIFYING DROUGHT RESILIENCE VARIABILITY IN COWPEA

Sujan Poudel, Lekshmy V Sankarapillai, Vijaykumar Hosahalli, Bikash Adhikari, K Raja Reddy, Raju Bheemanahalli

Mississippi State University, Mississippi State, MS

Cowpea (Vigna unguiculata) is a crucial legume species cultivated significantly globally. It is recognized for its nutritional value, versatile applications, and adaptability to varied environmental conditions. Nonetheless, drought stress (DS) can affect growth and development, particularly during critical growth phases, resulting in reduced yield potential. Despite the importance of this crop, limited studies have investigated DS impacts on different stages and explored the genetic variability in resilience to DS at vegetative and reproductive stages. To address this knowledge gaps, we conducted three experiments aimed at (i) quantifying the effects of WD at vegetative and reproductive stages on morpho-physiological traits and yield performance, (ii) evaluating the consequences of WD on root and shoot characteristics during the early vegetative stage and (ii) examining the resilience of various cowpea genotypes to WD during the flowering stage. In Exp. 1, a reduction in photosynthetic assimilation correlated with reduced biomass accumulation, with notable decrements of 68%, 49%, 58%, and 53% recorded at the V2, V4, R1, and R4 stages, respectively. Among the four stages, the R1 stage was most sensitive to WD, where seed yield was reduced by 46%, followed closely by a 35% reduction during the R4 stage. The V2 stage was most sensitive for the vegetative phase, exhibiting a yield decline of 33%, while the V4 stage accounted for a 27% reduction in yield. Further genetic variability drought resilience at V2 and R1 was quantified

using ten cowpea genotypes. At the V2 stage (Exp. 2), 15 cowpea genotypes were phenotyped for early vegetative drought resilience. Under DS, both leaf and node numbers showed significant reductions of 28% and 38%, respectively. Notably, a substantial decrease in above-ground biomass and root weight was observed by 51% and 32%, respectively. Conversely, specific leaf area increased by 29%, suggesting a potential adaptive response to DS. In Exp. 3, exposure of ten cowpea genotypes to WD at R1 significantly reduced stomatal conductance by 94% and increased the canopy temperature by 4.8°C. The chlorophyll index, which indicates photosynthetic capacity, exhibited a significant decline of 22% under WD conditions. Additionally, seed numbers and yield were adversely affected relative to control, decreasing by 52% and 47%, respectively, indicating a high sensitivity to DS. An overview of DS impacts on cowpeas and growth stages or traits of resilience to DS will be discussed.

O1.31

12:00 ASSESSING THE POTENTIAL OF BIOSTIMULANTS TO ALLEVIATE SOYBEAN HEAT STRESS

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

[1]Mississippi State University, Starkville, MS, [2]Delta Research and Extension Center, Stoneville, 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 enhance heat stress tolerance remains a challenge, given the diverse array of available products. To address this issue, a comprehensive field study was undertaken to assess the efficacy of various biostimulants on heat stress tolerance in soybeans during the reproductive stages (R1-R8). Fifteen treatments, with some treatments combined with a polymer as per the manufacturer's specifications, were used, including both untreated controls. Under heat stress, the chlorophyll index decreased by 13% compared to the control. However, BioWake and BioWake+BioFriendly increased chlorophyll index by 12% and 9.5% respectively. Azterknot and BioWake+BioFriendly increased NFI by 23% and 22% under heat stress compared to the untreated check. Stomatal conductance (gsw) and transpiration (E) increased by 54.42% and 59.50% under heat stress compared to control. BioSa+BioFriendly and BioSa+BioFriendly+Polymer increased gsw by 20.3% and 15.2%, respectively, BioSa+BioFriendly and Azterknot (16 fl oz/acre) increased E by 15.27% and 15%, respectively, under heat stress compared to an untreated check. On average, total pod weight, pod number, and total seed weight decreased by 32%, 25%, and 36%, respectively, under heat stress compared to control. BioSa+BioFriendly and BioWake+BioFriendly increased pod number and total seed weight by 1.4% and 11.4%, respectively, compared to the untreated check. These findings suggest biostimulants may play a minor role in alleviating heat stress. Overall, the negative impact of heat stress was more significant than the alleviating influence of biostimulants.

12:15 Business Meeting and Awards Ceremony

12:00 MAS General Session
Scholars Program
Hall B

Friday, March 21, 2025
AFTERNOON
Hall D Room
2:00-5:00
Mississippi INBRE Data Science Workshop

Animal, Fish, Wildlife, Veterinary Science
Chair:
Mississippi State University
Co-Chair:
Mississippi State University

Thursday, March 20, 2025
EVENING

4:00 DODGEN LECTURE /AWARDS CEREMONY
Hall B
5:00-7:00 GENERAL POSTER SESSION
(Immediately following Dodgen Event)
Hall C

P2.01

SYSTEMIC INSULIN RESISTANCE ALTERS RENAL PROXIMAL TUBULAR METABOLISM DURING PREPUBERTAL OBESITY

Sautan Mandal, Madison Patterson, Tyler Johnson, Jan Williams, Anukool Bhopatkar, Kristin Edwards, Dearrius Rhymes

University of Mississippi Medical Center, Jackson, MS

Over the past few decades, prepubertal obesity (PPO) has become a major health problem and has been associated with early signs of proteinuria. Recently, we reported that the obese Dahl salt-sensitive leptin receptor mutant (SS^{LepR}mutant) rat develops renal injury prior to puberty.

Renal proximal tubules(PTs) are highly energy demanding and active segment in the nephron and primarily rely on fatty acid oxidation (FAO) for energy production. Previous studies have demonstrated that PTenergy metabolism shifts during the development of diabetes-induced renal injury. We recently observed enhanced glucose reabsorption in the PTs of SS^{LepR}mutant rats prior to puberty. Thissuggests there may be metabolic alterations in the PTs of SS^{LepR}mutant rats contributing to renal injury.

Therefore, the current study examined renal proximal tubular metabolism in SS and SS^{LepR}mutant rats. Eight-week-old SS and SS^{LepR}mutant rats were put under isoflurane anesthesia and harvested kidney tissues. Renal PTs were isolated and used to measure glycolysis and mitochondrial bioenergetics by seahorse.

Renal cortex FAO was significantly reduced in SS^{LepR}mutant rats compared to SS rats. We observed PTs in both SS and SS^{LepR}mutant rats has reduced basal mitochondrial respiration and maximal respiratory capacity compared to SD rats. Moreover, glycolysis (via ECAR) was impared in PTs isolated from SS^{LepR}mutant rats and SS rats compared to SD rats.

These data indicate that PT in SS^{LepR}mutant rats have impairedglycolysis and reduced FAO compared to SS and SD rats which suggests PT metabolic alteration. Moreover, these results also suggest reduced mitochondrial dysfunction in SS^{LepR}mutant rats. Overall, this can lead to early renal proximal tubule injury and renal inflammation.

P2.02

EFFECTS OF BACILLUS-BASED PROBIOTICS AND Saccharomyces cerevisiae-BASED PREBIOTIC ON PERFORMANCE, EGG COMPONENTS, AND GENE EXPRESSION OF LAYING HENS DURING THE LATE PRODUCTION CYCLE

Ala Abudabos

Alcorn State University, Lorman, MS

A 16-week study is designed to explore the impacts of three strains of probiotics (Bacillus spp. (B.)) and one prebiotic based on Saccharomyces cerevisiae cell wall (SCCW) supplements on performance, egg quality, and immune-related gene expression of laying hens. 450 Hisex white layers at 52 weeks were randomly allocated into five dietary regimens: T1, basal diet; T2, basal þ 0.5 g/kg B. subtilis (DSM17299); T3, basal þ 0.5 g/kg B. subtilis (DSM 5750) and B. licheniformis (DSM 5749); T4, basal þ 0.4 g/kg B. subtilis PB6; and T5, basal þ 0.25 g/kg SCCW. Each treatment was replicated in five-floor pens, each pen had 18 birds. The results showed that hen-day egg production (HDEP) improved in T4 and T5, egg mass (EM) improved in T3, T4, and T5, and feed conversion ratio (FCR) improved in T4 and T5 compared to T1 ($p < .001$). Relative wet and dry yolk weights were higher in hens received T2, T4 and T5 ($p < .05$) and T2, T3, T4, and T5 ($p < .001$), respectively, compared to T1. Moreover, T2, T4, and T5 had higher expression of the GnRH-2 gene compared to T1 ($p < .01$). In conclusion, the dietary inclusion of SCCW-based prebiotic (T5) and Bacillus spp. probiotic strains, especially T4 B. subtilis PB6 improved production performance, egg components, and GnRH-II gene expression of laying hens during the late production cycle and hold great promise for boosting productivity and supporting the health status of layers raised on AGPs-free diets.

Cellular, Molecular, Developmental Biology

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

Thursday, March 20, 2025

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 MOUSE EMBRYONIC STEM CELLS ARE RESISTANT TO LISTERIA INFECTION AND EXHIBIT ATTENUATED RESPONSES TO INFLAMMATORY CYTOKINES

Marwah Walid Ali Alzara, Damilola Oyebode, Yan-Lin Guo

Cellular and Molecular Biology Program, University of Southern Mississippi, Hattiesburg, MS

An early embryo faces various immunological challenges during embryogenesis, yet our understanding of the immune properties of the blastocyst (the preimplantation embryo) remains limited. Our recent studies have shown that mouse embryonic stem cells (ESCs) isolated from the blastocyst exhibit distinct immunological characteristics compared to differentiated somatic cells. Notably, ESCs do not produce interferons (IFNs) in response to viral infections and display attenuated responses to

inflammatory cytokines. Both antiviral and inflammatory responses are critical components of innate immunity against microbial pathogens, but they can also cause collateral damage to tissues, negatively affecting cell proliferation and viability. We propose that the lack of innate immune responses in ESCs may help them avoid immune cytotoxicity. To test this hypothesis, we expanded our study to include bacterial infections of ESCs. Using Listeria monocytogenes (Lm), a gram-positive intracellular bacterium known to cause serious pregnancy complications, we found that mouse fibroblasts and macrophages (RAW 264.7 cell lines) are highly susceptible to Lm infection and can mount a robust immune response, as evidenced by the production of pro-inflammatory cytokines (TNFα and IL-6). In contrast, ESCs are remarkably resistant to Lm infection and do not produce TNFα or IL-6. Additionally, they exhibit lower susceptibility to cell death induced by Lm infection and to the cytotoxic effects of conditioned medium from Lm-infected RAW cells (containing various inflammatory cytokines), which significantly reduce the viability of mouse fibroblasts. We further demonstrated that the attenuated innate immune response of ESCs to Lm infection and cytokines is, at least in part, due to the lack of NFκB activation, a transcription factor that plays a key role in mediating immune responses. These findings indicate that the reduced immune response is a common feature of ESCs in response to both viral and bacterial infections, supporting our hypothesis that this may serve as a protective mechanism to limit immune cytotoxicity in an early embryo.

O3.02

9:20 FLAVIN ANALOGS FOR CAPTURE OF FAD-RNA

Faqing Huang[1], Jarrett Faulkner[1], Donald Burke-Aguero[2]

[1]University of Southern Mississippi, Hattiesburg, MS, [2]University of Missouri, Columbia, MO

Coenzymes are ubiquitous organic compounds utilized as molecular tools by many protein enzymes of all living organisms. Several coenzymes, such as FAD, CoA, and NAD, are composed of the ribonucleoside adenosine linked to an additional moiety responsible for their chemical functionalities. As adenosine is one of the four building blocks of RNA, its presence within these coenzymes suggests that they may be molecular relics of an RNA world in which they served to enhance the catalytic repertoire of RNA enzymes. Initially a theoretical proposal, RNAs capped with such coenzymes have since been elucidated in organisms of all domains of life. While the biogenesis mechanisms and biological roles of NAD caps have since been determined, attributable to the development of isolation methods for NAD-capped RNA, mechanisms and roles of RNA capping with CoA and NAD have remained elusive. Researchers striving to isolate and further analyzed FAD-linked RNAs are thus in need of a method for isolating FAD-RNA. Here, we describe a method for isolating FAD-RNA based on thiol substitution of chlorine-modified flavin analogs, subsequently allowing isolation of FAD-RNA via a mercury-derivatized PAGE gel.

O3.03

9:40 EXPLORING ANILLIN-MEDIATED ACTIN-MICROTUBULE CROSSTALK AND COORDINATION USING OPTICAL TWEEZERS AND TIRF MICROSCOPY

Md Amzadul Hoque Chowdhury[1], Abigail Moeller[1], Dana N. Reinemann[1, 2]

[1]Departments of Biomedical Engineering, University of Mississippi, University, MS USA, [2]Department of Chemical Engineering, University of Mississippi

The mechanics of the cytoskeleton stem from intricate interactions among its component proteins, which cannot be fully captured by examining them in isolation. Prior studies primarily focused on individual protein systems, such as kinesin-microtubule or myosin-actin dynamics. However, emerging evidence indicates that microtubule-actin networks interact substantially through crosslinking proteins and molecular motors, as well as through environmental factors like molecular crowding and filament density. To gain deeper insight into the coordination of various cytoskeletal proteins and filaments, we developed an in vitro optical tweezers assay that includes both microtubule and actin cytoskeletal elements, enabling the analysis of their interactions and roles in cellular dynamics. Crosslinking was achieved using anillin, which binds simultaneously to actin and microtubules and generates pN-level forces via diffusional expansion. Additionally, total internal reflection fluorescence (TIRF) microscopy was utilized to confirm colocalization of anillin with both actin and microtubules. By examining how anillin interacts with motor proteins like myosin—whose collective behavior differs significantly from that of individual molecules— we aim to reveal how molecular forces and interactions influence the organization and function of the cytoskeletal network.

10:00 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 DEPLETION OF PHAGOCYTIC HEMOCYTES WITH CLODRONATE LIPOSOMES ATTENUATES THE INNATE IMMUNE SYSTEM OF WESTERN HONEY BEE (*Apis mellifera*)

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

[1]School of Biological, Environmental, and Earth Sciences,

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The western honey bee (Apis mellifera) is an essential species for ecosystem health and agricultural productivity, relying on its innate immune system to defend against pathogens. This immune system operates through two primary mechanisms: humoral responses, where soluble molecules like antimicrobial peptides target infections, and cellular responses, mediated by hemocytes that perform functions like phagocytosis and encapsulation. Despite their importance, the role of hemocytes in immune defense is not fully understood.

In this study, clodronate liposomes were used to deplete phagocytic hemocytes and evaluate their contribution to immune responses during bacterial infections with Staphylococcus aureus and Escherichia coli. Bees treated with clodronate liposomes showed reduced survival and lower total hemocyte counts compared to controls, especially under bacterial challenge. Differential hemocyte analysis indicated that granulocytes and plasmatocytes were primarily affected, demonstrating their key roles in immune responses. These findings provide new insights into the role of hemocytes in the immune system of honey bees and their ability to resist bacterial infections.

O3.05

10:40 EFFECT OF REPURPOSING AGENTS ON METABOLIC PATHWAYS AND INFLAMMATION IN OVARIAN CANCER CELLS

Brenita Jenkins[1], Melanie McReynolds[1], Debarshi Roy[2], Taina Turner[2]

[1]Pennsylvania State University, State College, PA, [2]Alcorn State University, Lorman, MS

Ovarian cancer, the deadliest among the gynecologic cancers, poses a therapeutic challenge due to the 70% recurrence rate among patients treated with traditional chemotherapy. Novel approaches to identify chemoresistance associated markers and defining novel therapeutic strategies are in high demand for ovarian cancer treatment.

Repurposing of Metformin (Met), a biguanide used to increase insulin responses in the body, has been identified as a promising approach for therapeutic treatment in OVCA patients. Metformin has been found to trigger inhibitory properties on cancer cells mostly through the AMP-activated protein kinases (AMPK), which act as a master regulator of the glycolytic and energy sensor pathways in metabolic disorders as well as in cancer.

Another repurposing agent celecoxib, a COX-2 inhibitor widely used for pain management, can have a negative impact on carcinogenesis in several tissues.

Our study will mechanistically define the effect of combined treatment of AMPK agonist with COX-2 inhibitor in order to resensitize chemoresistant OVCA cells. Our preliminary results showed the growth inhibitory effects of metformin and celecoxib individually on ovarian cancer cells in vitro as well as through combination treatments. Cell proliferation is assessed at 48 hours using MTT Assays, colony formation assay and morphology analysis. We also propose to study cellular metabolic changes and inflammatory status of the cancer cells after treating them with the drug combinations (met and celecoxib)

We anticipate finding suppression of inflammatory markers and metabolic alterations in the OVCA cells which will decrease both cancer stemness as well as chemoresistance using repurposed metformin and celecoxib. This is an ongoing study.

O3.06, O2.01

11:00 SEASONAL VARIABILITY OF THE ANTIOXIDANT STATUS OF BOAR SEMINAL PLASMA FROM EJACULATES WITH DIVERGENT SPERM QUALITY

Serge L. Kameni, Allison Miner, Cheyenne Moran, Notsile H. Dlamini, Jean M. Feugang

Mississippi State University, Starkville, MS

The quality of boar semen constitutes a key determinant in the success of artificial insemination and the sustainability of the swine industry. However, semen quality varies among individual animals and across seasons (i.e., summer and winter), diversely affecting seminal plasma, a vital microenvironment for spermatozoa, rich in various sources of antioxidants supporting sperm functions and survival. Therefore, this study assesses the antioxidant potential of boar seminal plasma from ejaculates with varying sperm attributes during winter and summer. Semen samples were collected in winter and summer from healthy Duroc elite animals (1.5-2 years) housed in a boar stud (Prestage Farms, Westpoint, MS) through the hand-glove method. Semen was then evaluated for motility (MOT) and morphology (MOR) using a computer-assisted sperm analyzer (CASA, CEROS II) and classified as Passed (MOT$\geq$ 70% and MOR $\geq$ 70%) or Failed (MOT < 70% and MOR < 70%). Following the CASA assessment, semen was centrifuged to isolate seminal plasma for superoxide dismutase (SOD), glutathione peroxidase (GPx), total antioxidant capacity (TAC), and malondialdehyde (MDA) assays using Cayman kits. Data were analyzed using parametric statistics from SPSS with significance set at $P < 0.05$, splitting the dataset according to sperm quality and seasons. Results are presented as mean ± standard error of the mean. In both seasons, Passed semen demonstrated significantly higher MOT and MOR than Failed ones ($P < 0.05$). No differences were recorded in comparing Passed vs. Failed semen samples for SOD and MDA in winter and summer ($P > 0.05$). However, the GPx activity of Passed semen (154.17 ±18.75 nmol/min/mL) was significantly higher than that of the Failed (97.52 ± 22.22 nmol/min/mL)

in summer. Similarly, compared to Failed semen, the Passed demonstrated a significantly higher TAC in summer (2.45 ± 0.20 mM vs. 1.56 ± 0.15 mM; $P < 0.05$). Interestingly, MOT was positively correlated with GPx ($R^2 = 0.44$, $P = 0.03$) and TAC ($R^2 = 0.63$, $P = 0.001$). In summary, the seminal plasma antioxidant profile of samples collected in winter is unaffected by sperm quality. However, during summer, superior ejaculates exhibit an increase in the antioxidant defense, suggesting that the redox activity is influenced by seasonal variation.

O3.07, O2.02

11:20 SEMINAL PLASMA METABOLOMIC PROFILING

Notsile Dlamini, Serge Kameni, Jean Nguekam Feugang

Mississippi State University, Starkville, MS

Male fertility relies on high-quality semen to achieve successful fertilization and enhance reproductive efficiency. Semen is composed of seminal plasma (SP), the primary medium for sperm, which is rich in diverse biomolecules, including metabolites that influence sperm function. As a result, SP acts as a valuable reservoir for identifying novel molecular markers of semen quality and male fertility. This study aimed to investigate the metabolomic profile of seminal plasma, using the pig as a model. Semen samples (n=33) were collected from sexually mature Duroc boars at a commercial boar stud (Prestage Farms, West Point, MS). Semen samples were classified as high-quality according to predefined criteria (>70% motility and morphology, with mean+SD). Five of these samples were selected and centrifuged to isolate SP for metabolomics analysis. Untargeted metabolomics was performed using Ultra-High Performance Liquid Chromatography-Mass Spectrometry (UHPLC-MS), with significant metabolites identified based on Variable Importance in Projection (VIP > 1.5) and a significance level of $P < 0.05$. Metabolic pathways were identified using MetaboAnalyst which facilitated pathway enrichment analysis and visualization of key metabolic networks. In total, 373 metabolites were detected in positive mode and 478 in negative mode, with 32 metabolites shared between both modes, resulting in a total of 819 unique metabolites. In the positive mode, the five most abundant metabolites were carnitine, glycerophosphocholine, 2-Penten-1-ol, palmitic acid, and succinylacetoacetate, while in the negative mode, the five most abundant metabolites included citric acid, cytidine, glycerophosphoinositol, 2-Furoic acid, and glutamic acid. These metabolites, primarily classified as organic acids and derivatives, lipids, and benzenoids, play essential roles in sperm function, contributing to motility, energy metabolism, membrane stability, and antioxidant defense. Additionally, they may be involved in key metabolic pathways, including fatty acid biosynthesis, glycerophospholipid metabolism, ether lipid metabolism, pyrimidine metabolism, the citric acid cycle, arginine biosynthesis, and glutathione metabolism. In conclusion, this study provides valuable insights into SP metabolites linked to semen quality, with potential applications in improving semen assessment and processing techniques to enhance male reproductive performance.

12:00 GENERAL SESSIONS

Thursday, March 20, 2025
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 DECIPHERING CYTOSKELETAL ENSEMBLE DYNAMICS WITH QCM-D IN ACTOMYOSIN BUNDLES

Victoria Amari, Emily Kerivan, Nikki Reinemann

Departments of Biomedical and Chemical Engineering, University of Mississippi, University, MS

Cytoskeletal ensemble function does not necessarily reflect the sum of its constituent single-molecule properties. The design principles and mechanisms behind this emergent behavior are not well understood. Through previous work in the lab, we hypothesize that cytoskeletal filaments can function as force sensors to influence their fundamental motor protein behavior such as myosin's ability to create contraction, generate force, and keep the shape of the cells while movement occurs. We developed an innovative approach to understanding these emergent mechanics using a quartz crystal microbalance with dissipation monitoring (QCM-D) in actomyosin bundle systems. We demonstrate that the QCM-D can detect actomyosin bundle viscoelasticity changes due to molecular-level alterations, such as a change in concentration, nucleotide state, and actin binding affinity. These results support actin working as a mechanical force-feedback sensor, and that this QCM-D approach is a new, complementary tool to other biophysical measurements via optical trapping and fluorescence imaging for deciphering the properties and mechanisms of cytoskeletal ensemble crosstalk.

O3.09

2:00 INVESTIGATING YAP1 INVOLVEMENT IN SULFUR METABOLISM IN HISTOPLASMA CAPSULATUM

Alisa Smith, Davida Crossley

Mississippi University for Women, Cleveland, MS

Histoplasma capsulatum (Hc) is a dimorphic fungus that can exist as a mold or as a yeast. It is the yeast which causes the respiratory infection histoplasmosis. YAP1 (Yeast Associated Protein 1), a protein in S. cerevisiae, has been

shown to be involved in sulfur metabolism, and in Candida albican, it has been shown to be involved in dimorphism. In Hc, high concentrations of glutathione will trigger the yeast morphology, and low concentrations of glutathione will trigger the mold morphology. Thus, sulfur metabolism is believed to be involved in dimorphism in Hc. There is a Yap1 homolog in Hc. We investigated Yap1 involvement in dimorphism in Hc, by converting a wild-type, null, and Yap1 RNAi strain from yeast to mold, by changing the incubation temperature from 37 ºC (to promote yeast growth) to 25 ºC (to promote mold growth). When cells were grown in liquid HMM (Histoplasma Macrophage Medium), and HMM solid media, the Yap1 RNAi strain which was initially yeast, started to convert to mold but halted mold production prematurely. The wild-type and null strains were able to convert from yeast to mold completely. These results indicate that Yap1 may be involved in dimorphism. SEM studies did not show any significant morphological changes along the surface of the cells in these strains in the yeast and mold morphology. This study aims to determine if Yap1 is involved in sulfur metabolism, which is believed to be a key component of Hc's ability to convert from one morphotype to the other. The results will be gathered via a glutathione assay and measuring mRNA expression of sulfur metabolizing genes, GSH1 and GSH2, in the Yap1 RNAi, wild-type, and null strains via qRT-PCR. If the reason for YAP1 involvement of dimorphism is due to sulfur metabolism, then we would expect for all yeast strains to have high concentrations of GSH1 and GSH2 expression. However, for the mold, we would expect for the Yap1 RNAi strain to have low GSH1 and GSH2 expression in comparison to the other strains, due to the strain's inability to convert completely to mold.

O3.10

2:20 DEVELOPING MECHANICALLY TUNABLE MICROENVIRONMENTS FOR IN VITRO CYTOSKELETAL STUDY

Rupesh Kandel[1], Laurel Fishburn[2], Victoria Amari[1], Jorge Almodovar[3], Dana N. Reinemann[1]

[1]Department of Biomedical Engineering, University of Mississippi, [2]Department of Chemical Engineering, Louisiana State University, [3]Department of Chemical, Biochemical, and Environmental Engineering, University of Maryland, Baltimore County, MD

Cellular behavior is significantly influenced by the biophysical and biochemical properties of the extracellular matrix (ECM), including its biochemical composition, topography, and mechanical characteristics. These properties are extensively studied for their role in guiding cellular processes. Cytoskeletal motor proteins, essential for force generation and motility, respond to changes in their environment, especially to mechanical cues and variations in filament tracks. However, the mechanisms by which these proteins sense and adapt to such environmental changes remain largely unexplored. A major challenge in this research area is replicating physiologically relevant force-generation mechanisms in an in vitro setting. In this study, we propose a mechanically tunable microenvironment using a layer-by-layer (LbL) nanofilm assembly. This LbL technique is simple, cost-effective, and highly versatile, receiving considerable attention for applications in biomedical materials, tissue engineering, and regenerative medicine. Due to its flexibility and adaptability, LbL assembly enables the construction of biomimetic microenvironments that can exhibit specific biophysical and biochemical properties. Here, we developed six alternating bilayers of heparin and collagen (HEP/COL) on polyethyleneimine (PEI)-modified glass coverslips, characterizing the resulting nanofilms with Azure dye adsorption assays and quartz crystal microbalance with dissipation monitoring (QCM-D), which confirmed an increase in surface thickness and stiffness. This approach allows for transforming rigid glass coverslips into tunable substrates that can be adapted for use in various in vitro cytoskeletal studies, including optical tweezers, TIRF microscopy, and QCM-D, supporting advanced research on cytoskeletal motor proteins within more physiologically relevant microenvironments.

O3.11

2:40 INHIBITION OF BAI1 REDUCES THE ABILITY OF MDA-MB-231 CELLS TO GROW TUMORS AND DEVELOP METASTASIS IN A HUMAN XENOGRAFT TUMOR MODEL

Oluwatoyin Odubanjo[1], Paul B. Tchounwou[2, 3], Brenda M Ogle[4], Felicite Noubissi[1]

[1]Jackson State University, Jackson, MS, [2]MORGAN STATE UNIVERSITY, [3]Morgan State University, MD, [4]University of Minnesota Twin-Cities, Minneapolis, MN

Cell fusion has recently garnered significant attention for its role in cancer progression and tumor growth by generating hybrid cells with enhanced proliferative and invasive abilities. This fusion process increases genetic diversity, leading to tumor heterogeneity and subpopulations with adaptive traits, such as improved survival, immune evasion, and drug resistance. These hybrids promote tumor progression, metastasis, and create a resilient microenvironment, complicating treatment, and worsening patient prognosis. A recent study has shown that hypoxia and apoptotic cells increase breast cancer cell fusion. Another study has implicated Bai1 (which is overexpressed in breast cancer) and apoptotic cells as a promoter of myoblast fusion. Thus, we aimed to investigate the effects of Bai1 inhibition on tumor progression in human xenograft tumor models. We hypothesized that inhibition of Bai1 will reduce tumor growth and metastasis in xenograft. To test our hypothesis, we used CRISPR Cas9 to generate Bai1 knockout MDA-MB-231 clones. We co-injected two million Bai1 knockout MDA-MB-231 and bone marrow derived human mesenchymal stem cells (hMSCs) (1 million each) or control MDA-MB-231 and hMSCs cells into the fat pad of the breast of NOD-SCID

mice and we monitored tumor growth for eight weeks. Four mice from each group (control and experimental groups) were randomly selected to analyze the potential development of metastases in different organs. We found that inhibition of Bai1 significantly reduced tumor growth in those mice. The tumor volumes and tumor weights were significantly bigger and higher respectively in control mice compared to that in the experimental mice ($P<0.05$). H&E staining of sections of the lungs revealed development of metastases. Although both experimental and control mice developed metastasis in the lungs, the degree of metastases was more advanced in control mice. H&E staining of the other organs (Heart, liver, kidney, brain, and spleen) section did not show any signs of metastasis. Hybrid formation was assessed in the breast tumors as well as in metastases based on their expression of GFP as result of the fusion between breast cancer cells that express loxp-STOP-loxp-GFP and hMSCs that express cre recombinase. Fluorescence microscopy assessment of the tumor and organ sections did not reveal any GFP expression, however, RT-qPCR for GFP expression revealed a higher GFP expression in the breast tumors and lungs of control mice compared to its expression in the experimental mice. These findings provide compelling evidence that Bai1 contributes to tumor growth and metastatic spread. Targeting Bai1 could offer a promising therapeutic strategy for inhibiting cancer progression and metastasis. Further studies will help understand the mechanisms by which Bai1 inhibition affects cancer development and progression for drug development avenues.

THURSDAY, March 20, 2025

EVENING

4:00 DODGEN LECTURE /AWARDS CEREMONY

Hall B

5:00-7:00 GENERAL POSTER SESSION

(Immediately following Dodgen Event)

Hall C

P3.01

MICROTUBULE-DESTABILIZING EFFECTS OF VERNONIA AMYGDALINA FRACTIONS IN CANCER CELLS

Daniel Oyugi[1] and Winston Anderson[2]

[1]Department of Natural Sciences, Mississippi Valley State University, Itta Bena, MS,. [2]Department of Biology, Howard University, Washington DC

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 microtubule. 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)). 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 (IC_{50} 61.02 µg/mL; 65.82 µg/mL) than methanol fraction (IC_{50} 80.77 µg/mL) in MCF-7 cells. In DU-145 cells, methanol fraction exerted highest viability reduction (IC_{50} 44.21µg/mL) than aqueous (IC_{50} 131.7 µg/mL) and petroleum ether fractions (IC_{50} 130.5 µg/mL). 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.

P3.02

ANTITUMOR ACTIVITY OF COMBRETUM MICRANTHUM EXTRACT IN OVARIAN CANCER CELLS: A POTENTIAL DIETARY ALTERNATIVE

Ariane Mbemi, Talija Johnson, Felicite Noubissi, Kayode Komolafe

Jackson State University, Jackson, MS

Current ovarian cancer treatments often rely on chemotherapeutic agents such as cisplatin, paclitaxel, and carboplatin. While effective, these treatments frequently induce adverse side effects and chemoresistance, limiting their therapeutic potential. Combretum micranthum (CM), a medicinal plant native to West Africa, has been traditionally used for its health-promoting properties. However, its specific anticancer mechanisms remain underexplored. We hypothesized that CM may exert anticancer effects in ovarian cancer cells through anti-proliferative and pro-apoptotic mechanisms involving DNA damage and regulation of key apoptotic and cell cycle proteins. To test this hypothesis, we prepared methanol extracts from CM seeds and assessed their effects on the OVCAR-3 ovarian cancer cell line. Cell viability was measured using MTS assay and trypan blue exclusion,

while cell morphology was visualized with acridine orange/propidium iodide (AO/PI) staining and DAPI staining under a fluorescent microscope. Gene expression and protein analyses were conducted using quantitative PCR (qPCR) and Western blot, examining key apoptosis and cell cycle regulatory proteins, including p53, BAX, BCL-2, caspases 3, 8, and 9, and BID. Densitometric analysis was performed to quantify protein abundance. Results from the MTS assay demonstrated a dose-dependent reduction in cell viability, suggesting significant cytotoxicity. AO/PI staining indicated morphological changes consistent with apoptosis, including membrane disruption, cell shrinkage, organelle breakdown, and cell detachment. Western blot and densitometric analyses revealed a dose-response effect in the expression of p53, Bax, BID, and caspases 3, 7, and 9, along with a decrease in anti-apoptotic BCL-2. These findings were further corroborated by gene expression data, showing upregulation of pro-apoptotic genes and downregulation of anti-apoptotic pathways. In conclusion, this study suggests that Combretum micranthum exhibits significant antitumor activity in ovarian cancer cells, potentially serving as a dietary adjunct in cancer prevention and therapy. CM presents a promising, less toxic alternative to traditional chemotherapy, though further in vivo research is essential to validate its clinical applications.

P3.03

OVERCOMING WARBURG-INDUCED CHEMORESISTANCE IN HEPATOCELLULAR CARCINOMA USING GNETIN H AND SALINOMYCIN

Imani Kirven, Alan Mouton, Mohamed Ibrahim, Patrice Penfornis, Pier Paolo Claudio

University of Mississippi Medical Center, Jackson, MS

Introduction: Hepatocellular carcinoma (HCC) is currently the fifth most common cancer diagnosis worldwide, carrying a dismal five-year survival rate of only 18%. Following hepatic surgical resection, the majority of patients are dependent on liver transplantation as the primary treatment option due to frequent late-stage detection rates of HCC, the tumor's challenging location, and its high chemoresistance associated with enhanced glycolytic activity. Treatment with Standard-of-Care chemotherapies Regorafenib (RFB) and Sorafenib (SFB) induces mitochondrial dysfunction, leading cancer cells into the Warburg Effect, a metabolic shift in energy production from oxidative phosphorylation to glycolysis, giving rise to promising anticancer strategies for disrupting the metabolic change in energy production using inhibitors. Interestingly by using metabolic inhibitors, Sorafenib was found to be more efficacious in treating cancers containing the NRAS mutation, this synergistic effect is believed to be due to SFB mitochondrial catastrophe on HCC with compromised mitochondrial function. A mutated NRAS, found in around 1% of HCC cases, is an oncogene responsible for the regulation of cancer survival, proliferation, and mitochondrial maintenance. Taken advantage of by many cancers, the NRAS protein initializes the RAF/MEK/ERK phosphorylation cascade, resulting in MFN1/2 and OPA1 transcription to increase overall mitochondrial fortification and proliferation. A tumor's ability to increase the number of functional mitochondria is a primary survival strategy leading to reduced efficacy in the traditional SFB and RFB regimen.

In this study, we explored the effects of modulating the HCC metabolic pathways using Gnetin H (GH), a novel glycolysis inhibitor, and the mitochondrial complex-I and -II enzymes inhibitor Salinomycin (Sal), and to assess their applicability as potential adjunct therapeutics to standard-of-care chemotherapy, SFB and RFB, aiming to improve current anticancer regimens enhancing patient outcomes.

Results: Using in vitro cytotoxicity assays, we observed that SK-Hep1 resistance to Regorafenib and Sorafenib, two HCC standard-of-care chemotherapies, was decreased when combined with subtherapeutic doses of GH and/or Sal. Exploration into the metabolic effects of Sal and GH showed that their combination effectively reduced the oxygen consumption rate (OCR) and extracellular acidification rate (ECAR) in SK-Hep1 cells.

Conclusion: Our data suggests that inhibiting mitochondrial and glycolytic pathways in HCC improved the therapeutic efficacy of standard-of-care Regorafenib and Sorafenib.

P3.04

EXPLORING BEHAVIOURAL AND MORPHOLOGICAL EFFECTS OF MINOR PHYTO-CANNABINOIDS IN ZEBRAFISH DEVELOPMENT

Taylor Shamblin, Lisa Seid, Katherine Martin, Cammi Thornton, Kristine Willett, Nicole Ashpole

University of Mississippi, Department of Biomolecular Sciences, School of Pharmacy, University of Mississippi, Oxford, MS

Cannabis and cannabinoid accessibility have steadily 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. The inability to provide comprehensive 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 behavioral endpoints in zebrafish exposed to THC developmentally. 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 during early stages of development (6-96 hpf), photolocomotor 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 photolocomotor response in dose-dependent fashion. In comparison, cannabinol (CBN), a phytocannabinoid of CB1 and CB2, elicited no behavioral modifications even at the highest dose. Considering these effects, our lab is 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 neuroinflammatory pathways. Prior studies have shown Cnr2, the zebrafish homolog of CB2, is also expressed in zebrafish twenty-four hours post-fertilization (hpf) and has direct roles in zebrafish locomotor development and immune system processes, such as inflammation.

In order to test this, we will utilize a previously established transgenic Cnr2 knockout line of zebrafish and expose them to varying concentrations of minor phytocannabinoids of interest (Δ8-THC, THCV, CBD, CBG, CBN, HHC). Morphological defects and photolocomotor responses will be compared in larvae (120 hpf) that have been exposed during key stages of early development (6-96 hpf). Finally, we will continue this study to observe the persistence of morphological, hyperactive, or anxiogenic behaviors into adulthood.

P3.05

IGF2BP1 INHIBITION SENSITIZES CHEMORESISTANT COLORECTAL CANCER CELLS TO CHEMOTHERAPEUTICS

Tarreanna Ricks, Oluwatoyin Odubanjo, Felicite Noubissi

Jackson State University, Jackson, MS

Advances in chemotherapy treatments for metastatic colorectal cancers (CRC) have significantly improved CRC patient survival in recent years, yet drug resistance remains an important clinical challenge that is associated with poor patient outcomes. Metastatic CRC accounts for about 23% of new CRC cases and the five-year survival rate is about 16%. IGF2BP1 (Insulin-like Growth Factor 2 mRNA-Binding Protein 1), a direct target of the Wnt/β-Catenin signaling has emerged as a key player in the development, progression, and therapeutic resistance of CRC. As an oncofetal protein, IGF2BP1 is primarily expressed during embryogenesis but reappears in various malignancies, including CRC. It regulates the stability and translation of RNAs involved in cell proliferation, migration, and survival. Inhibition of IGF2BP1 expression was shown to sensitize CRC cells to treatment and reduce tumor growth in preclinical models. Our aim in this study is to investigate the effects of IGF2BP1 inhibition on the metastatic properties of chemo-resistant CRC cells. We hypothesized that inhibition of IGF2BP1 will sensitize chemo-resistant CRC cells to chemotherapeutics by downregulating genes involved in drug resistance and survival mechanisms. To test our hypothesis, we generated Oxaliplatin-resistant SW620 cells and used them to assess the ability of IGF2BP1 inhibition to sensitize them to the drug. The Oxaliplatin-resistant cells were characterized by immunoblotting for the expression of genes associated with proliferation, migration, invasion, and drug resistance such as the Wnt targets, CD44, CD133 and MDR1, and by cell-based assays to assess their growth and proliferation potential. We observed phenotypic changes in the drug resistant SW620 cells as well as an increase in the expression of proteins that drive drug resistance. Those cells also acquired an increase ability to grow and proliferate. Interestingly, inhibition of IGF2BP1 significantly reduced their ability to proliferate, suggesting IGF2BP1 as a potential therapeutic target for overcoming resistance and improving treatment outcomes in CRC patients.

P3.06

INVESTIGATING THE ANTI-CANCER PROPERTIES OF ETHYL PYRUVATE IN THE PRESENCE OF CHEMOTHERAPEUTIC AGENTS

Randi Johnson, Benjamin Onyeagucha

Mississippi University for Women, Columbus, MS

Ethyl pyruvate (EP) is a derivative of an endogenous anti-oxidant pyruvate. EP can scavenge reactive oxygen species and can down regulate pro-inflammatory cytokines both in vitro and in vivo. EP inhibits the RAGE receptor ligand high mobility group box-1 (HMGB1) and decrease the activation of p38 mitogen-activated protein kinase (MAPK) and NF-Kappa B. EP also preserves mucosal histology and permeability after mesenteric ischemia-reperfusion injury, survival and intestinal damage after hemorrhagic shock, and reduces injury associated with alcoholic hepatitis and coronary ischemia-reperfusion, as well as renal sepsis in mice. EP has also been shown to inhibit lung tumor growth and decrease the growth of colon liver metastasis. In gastric cancers, EP suppresses tumor growth and EP tumor growth inhibition is associated with HMGB1-RAGE and Akt pathways. However, because of its chemical instability in aqueous solution, EP needs to be prepared immediately prior to injection in Ringer's solution and used shortly after dilution, which limits its utility as a therapeutic agent. In this study, we will investigate the potency of EP and its analogue methyl-2-

acetamidoacrylate in the presence of chemotherapeutic drugs.

P3.07

EFFECTS OF VITAMIN D ON CHEMOTHERAPEUTIC AGENTS

Laila Wrenn, Benjamin Onyeagucha

The Mississippi University for Women, Columbus MS

TNBC is the most aggressive subtype of breast cancer which primarily affects women under the age of 50. It is characterized by the absence of estrogen receptors, progesterone receptors, and human epidermal growth factor receptor 2 (Her2) amplification. TNBC accounts for 15 - 20% of all breast cancers but is responsible for about 30 - 40% of the death due to breast cancer. The lack of these receptors makes TNBC unresponsive to treatments such as tamoxifen and Herceptin. As a result, TNBC is often treated with non-specific chemotherapy agents like taxanes (paclitaxel or docetaxel) in combination with anthracyclines or platinum chemotherapeutic drugs. However, chemotherapy use faces limitations because of resistance, toxicity, and severe side effects. Studies have shown a relationship between vitamin D deficiency and the triple-negative phenotype in breast cancer. Our study aims to provide insights into vitamin D's adjuvant effects on doxorubicin, paclitaxel, xeloda, and cyclophosphamide in TNBC.

P3.08

ACTIVATION OF 26S PROTEASOME BY THE SECONDARY MESSENGER cGAMP

Maryam Javanpour, Galen Collins

Mississippi State University, Starkville, MS

Proteasomes are multi-subunit protein complexes that maintain cellular homeostasis by degrading misfolded, inactive, or unnecessary proteins. This process regulates many critical biological activities, such as cell cycle progression, signal transduction, and immune responses, ensuring proper cellular function. Inadequate proteasome activity is associated with various diseases, including cancer, neurodegenerative disorders, and viral infections, highlighting the importance of understanding proteasome regulation. Recently, 26S proteasomes have been found to be activated by secondary messenger pathways to respond to stress. The cGAS-cGAMP-STING path, a central component of cellular innate immunity, detects cytosolic DNA and initiates immune responses. The cGAS-cGAMP-STING pathway has recently been shown to increase autophagy and the level of immunoproteasomes, improving MHC class I antigen presentation and stimulating adaptive immunity. However, its ability to directly activate conventional 26S proteasomes has not been studied.

We investigated the effects of cGAMP on proteasome activity and kinetics. Using the LLVY peptidase assay, we treated cells with 50 nM cGAMP at various time points and quantified chymotrypsin-like activity by measuring fluorescence upon substrate cleavage. Results showed that cGAMP rapidly increased proteasome activity in treated samples compared to controls. Furthermore, labeling 26S proteasomes with the fluorescent covalent inhibitor MVB127 demonstrated that cGAMP increases proteasome activity without increasing proteasome abundance, unlike the later induction of immunoproteasomes observed previously.

Ongoing efforts aim to elucidate cGAMP-induced proteasome activation's molecular mechanisms, including interactions with proteasome subunits or cofactors. Our findings offer valuable insights into cellular defense mechanisms and may inform therapeutic strategies for diseases characterized by proteostasis imbalance or immune dysfunction.

P3.09

DEVELOPING REVERSIBLE NIPP1-MEDIATED PP1 INHIBITION AS A NOVEL TOOL TO DECIPHER PP1 FUNCTION

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Protein Phosphatase 1 (PP1) is a pivotal enzyme regulating diverse cellular processes. PP1's activity is tightly controlled by various factors, including the PP1 inhibitory protein NIPP1 (Nuclear Inhibitor of Protein Phosphatase 1). Overexpression of NIPP1 has been used as a tool to specifically inhibit PP1 in various systems, including HeLa cells, Drosophila, and mouse forebrains, leading to significant cellular defects. However, there is a lack of tools to reversibly inhibit PP1 which has hindered the investigation of PP1's role in different cellular processes.

Therefore, this project aims to develop a novel, reversible NIPP1-mediated PP1 inhibition system in Saccharomyces cerevisiae. This system employs auxin-inducible degradation (AID) technology to precisely control NIPP1 expression. By fusing NIPP1 to an AID tag, we can rapidly degrade NIPP1 in response to auxin treatment.

We generated yeast strains expressing either wild-type (WT)-NIPP1, WT-NIPP1-AID, or a PP1-binding deficient mutant, mutNIPP1-AID off a galactose-inducible protein. All cells had normal growth in galactose-free media. However, induction of WT-NIPP1 with or without the AID-tag significantly impaired yeast growth compared to control cells (no NIPP1). Furthermore, mutNIPP1-AID had no effect on yeast growth. Addition of auxin lead to loss of AID-tagged NIPP1 (WT-NIPP1-AID and mutNIPP1-AID) but not untagged WT-NIPP1. Together, these results show that NIPP1 overexpression can impair yeast growth, and auxin-inducible degradation can remove NIPP1.

Future studies aim to (1) define the cause of this impaired growth inhibition, and (2) use auxin-inducible degradation to rescue NIPP1-mediated PP1 inhibition. Ultimately, this

reversible NIPP1-mediated PP1 inhibition system will be a research tool that can be utilized in any eukaryotic system to elucidate the cellular function of PP1.

P3.10

UNVEILING CEREBRAL PALSY RISKS: BEHAVIORAL INSIGHTS FROM METRO AND MRTF MUTANTS IN *Drosophila melanogaster*

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Cerebral palsy (CP) is the primary neurodevelopmental disorder (NDD) affecting motor function, with a prevalence of approximately 2-3 per 1,000 children worldwide. The onset of movement disorders such as spasticity, dystonia, choreoathetosis, and/or ataxia occurs within the first few years of life, resulting from disrupted brain development. Akin to other NDDs like autism spectrum disorders (ASDs) and intellectual disability (ID), no single causative factor has been definitively attributed to CP onset. However, several environmental factors, including prematurity, infection, hypoxia-ischemia, and pre- and perinatal stroke, significantly contribute to the risk of CP. Notably, around 40% of CP cases are idiopathic, with no identifiable etiology suggesting that a substantial number of CP cases are genetically inherited.

In this study, we focused on two critical genes, metro (ménage à trois) and Mrtf (myocardin related transcription factor), which are essential for neuromotor development in Drosophila melanogaster. Metro is crucial for the proper formation of synaptic junctions at neuromuscular junctions (NMJs), and its absence results in reduced growth and structural abnormalities in NMJs. MRTF is a key regulator of smooth muscle differentiation and function, with its deficiency leading to disrupted muscle gene transcription and developmental defects in NMJs. We tested null mutants for each gene alongside parallel controls in behavioral assays, such as rapid iterative negative geotaxis (RING) and locomotor behavior, circadian sleep-wake patterns to determine which mutation confers a greater risk for the development of CP in the fly model.

Our behavioral analysis suggests that mutations in either gene can increase the risk of developing pathological symptoms that are linked to CP. Our findings demonstrate that a Drosophila model of CP can be robustly generated, providing a valuable tool for further studies on the pathways likely affected by CP.

P3.11

EFFECTS ON BACTERIAL COMPETITION BY TAILOCIN TAIL FIBER MUTATION

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Bacterial reproduction requires successful competition with other bacteria for available nutrients. Insect cadavers are nutrient rich resources used by entomopathogenic bacteria, including Photorhabdus luminescens and Xenorhabdus nematophila, which are vectored between insects by their respective nematode hosts. When these bacteria infect the same insect, they compete, and the surviving bacteria and their nematode host will reproduce and go on to infect other insects. Tailocins are molecular weapons used in competition between P. luminescens and X. nematophila. These nano-machines kill opposing bacteria by binding to target cell receptors via tail fibers and creating holes in its membrane, X. nematophila tailocin coding loci can encode more than one type of tail fiber, which can influence the range of target cells killed by the tailocin. The role, if any, of these alternate tail fibers in mediating competition between X. nematophila and P. luminescens is unknown. To study this, we deleted specific tail fiber genes in X. nematophila and are testing the mutants for their ability to compete with P. luminescens in vitro and in an insect host. Understanding the function of alternative tail fibers in competition will enable predictive engineering of tailocins for their use in treating bacterial infections.

P3.12

circRNA ACCUMULATION ON NEURODEGENERATION AND FITNESS IN *Drosophila melanogaster*

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Circular RNAs (circRNAs) are a class of ubiquitous eukaryotic RNA created by back splicing. They accumulate in postmitotic cells, such as neurons, and are a hallmark of cellular aging. circRNAs are also linked to neurodegeneration in Alzheimer's Disease and repeat expansion diseases such as ALS. To limit the contribution of circRNAs to aging and pathobiology it will be essential to understand how turnover of these molecules is regulated. Unfortunately, it is not clear which enzymes are responsible for degrading circRNAs in neurons. This study evaluates the roles of four ribonucleases potentially involved in neural circRNA turnover using the model fly Drosophila melanogaster. Transgenic flies with ribonuclease inactivation induced by a mifepristone-activated Gal4/UAS gene switch were assessed for locomotion, lifespan, neural circRNA accumulation, and overall neurodegeneration through immunohistochemistry. If a candidate ribonuclease is involved in circRNA turnover, inactivation would result in hyper-accumulation which will lead to impaired neural function as measured by decreased movement, shorter lifespan, increased circRNA levels, and heightened neurodegeneration. These results will provide novel insights into our understanding of circRNA turnover in neurons and may inform potential therapeutic strategies to mitigate aging and neurodegeneration phenotypes.

P3.13

EXAMINING THE ROLE OF OmpA ON *X. nematophila* BIOFILM FORMATION

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Xenorhabdus nematophila is a symbiotic bacterium that engages in mutualistic associate with entomopathogenic nematodes, and together the nematode-bacterial complex infects and kills larval insects of the Lepidopteran order. X. nematophila is also capable of producing a biofilm, however it is unclear whether biofilm formation is critical for the mutualistic, pathogenic, or both forms of symbiotic interaction. Previous research in E. coli identified Outer Membrane Protein A (OmpA) as a virulence factor that contributes positively to biofilm formation. In order to assess the role of OmpA in X. nematophila biofilm formation, we mutated the ompA gene. The ompA mutant was grown under conditions conducive to biofilm formation, and biofilm density compared to that of the wild type strain. The results indicate that under the conditions grown, the ompA mutant did not significantly change the density of the biofilm after 24 and 48 hour growth periods. Future research will explore additional growth conditions, including additional timepoints and substrates.

P3.14

EXPLORING IMMUNE MECHANISMS AND VACCINE POTENTIAL OF Qb-Tc85pep IN CHAGAS DISEASE PATHOGENESIS

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Chagas disease, caused by the protozoan parasite Trypanosoma cruzi, remains a critical public health challenge across the Americas, with limited treatment options that often fail during the chronic stage of infection. Trypanosoma cruzi secretes parasite-derived neurotrophic factor (PDNF), which promotes host cell survival by activating anti-apoptotic pathways. PDNF works as a substrate and an activator of the serine-threonine kinase Akt, an antiapoptotic molecule, increasing receptor autophosphorylation. This activation subsequently triggers two signaling pathways, namely phosphatidylinositol 3-kinase (PI3K) and mitogen-activated protein kinase (MAPK/Erk) pathways. As a result, the phenomenon known as PDNF triggers a prolonged functional reaction that safeguards the integrity of host cells against apoptosis caused by oxidative stress, the proinflammatory cytokines tumor necrosis factor-a, and transforming growth factor-b. The Neutralizing PDNF may support infected cells in managing apoptosis and enhance immune clearance of the parasite. Likewise, interference in the acute phase of the disease may prevent the parasites from reaching the heart tissues, preventing chronic disease development. In our approach, we analyzed the Tc85 trans-sialidase 15-mer peptide sequence (AAD13347.1) using the IEDB prediction tool to select high-potential MHC-II binding regions for immune response stimulation. Qb-Tc85pep immunization of mice resulted in significant antibody production sustained over 10 weeks. Preliminary findings show that vaccinated mice demonstrated reduced parasitemia, lower cardiac tissue parasite nests, and a robust immune response compared with the unvaccinated group. Collaborations with a Brazilian research group highlighted the particle's protective effects in an experimental infection model, demonstrating Qb-Tc85pep's potential as a vaccine. These results were critical in understanding the immune defenses against T. cruzi and highlighted Qb-Tc85pep's promise in vaccine development.

P3.15

THE USE OF PCR TO IDENTIFY TRANSGENIC MICE WITH UNIQUE GENOTYPE

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Generating transgenic mice is critical in genetic research and biotechnology, particularly for studying gene function and creating disease models. Genotyping, a molecular technique used to determine the genetic composition of an organism, is a standard method for identifying transgenic mice. This study focuses on the identification of loxP-IGF2BP1-loxP-bearing mice from a group of triple transgenic lines generated in the laboratory. To achieve this identification, the genomic DNA was extracted from the tail snips of the mice using the EZ Tissue/Tail Genotyping Kit according to the manufacturer's protocol. Specific primers designed to identify all the transgenes (loxP, Kre5+/-, and Ptch+/-) and wild-type genes were obtained from IDT Biologicals and used for PCR amplification. The PCR results were analyzed using polyacrylamide and agarose gel electrophoreses. Out of the 40 mice genotyped, six were identified as homozygous and 21 as heterozygous for the loxP-IGF2BP1-loxP transgene. Using Krt-5 primers, we were able to identify a total of 18 wild-type mice. These results will serve as a valuable resource for future studies involving the site-specific knockout of IGF2BP1 and the investigation of its role in disease models.

P3.16

B CELL SUPPRESSION AND RENAL FUNCTION IN SPONTANEOUSLY HYPERTENSIVE RATS

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Mycophenolate mofetil (MMF) is widely used to prevent and treat a kidney allograft rejection. MMF is a prodrug that effectively inhibits lymphocyte proliferation. Studies have shown that the B cells are significantly reduced after MMF administration, which prevent the chance of kidney transplant rejection. Additionally, renal function is

improved in the presence of MMF, however, the distinction of those effects on male and female is unknown. In this study, we hypothesize that there are gender differences in response to MMF, shown through circulatory and renal B cells. Experiments were performed on spontaneously hypertensive rats (SHRs), male (M, age 3 months; n=14) and female (F, age 3 months; n=14), the animals were arbitrarily divided into four groups (Male-Control, Male-MMF, Female-Control, and Female-MMF). The experimental groups received MMF (20 mg/kg/day IP) for 14 days. Albuminuria and proteinuria were measured in male and female rats to assess renal injury and renal function. Circulating and renal infiltrated B cells were then quantified by flow cytometry.The albuminuria was shown to be higher in the male-control (M-C) group than the female-control (F-C) group ($p<0.05$). However, albuminuria was significantly decreased after MMF administration in both males [(M-C: 1.5±0.06 mg/24h vs. M-MMF: 0.9±0.03 mg/24h) and females [(F-C: 0.27±0.02 mg/24h vs. F-MMF: 0.1±0.04 mg/24h). Proteinuria was also significantly reduced in both males (M-C: 2.7±0.1 mg/24h vs. M-MMF: 1.1±0.4 mg/24h, $p<0.05$) and females (F-C: 1.2±0.1 mg/24h vs. F-MMF: 0.8±0.1 mg/24h, $p<0.05$). The percentage of circulating B cells in both male and female control groups were similar and both MMF-treated groups showed reduction in B cells [(M-C: 13.5±0.3 vs. M-MMF: 5.6±0.6) (F-C: 12.9±0.9 vs. F-MMF: 5.14±0.7, $p<0.05$)], especially showing a clear reduction in males ($p<0.001$). Renal B cells infiltration also was significantly decreased in both male and female groups afterchronic administration of MMF [(M-C: 11±1 vs. M-MMF: 2.5±0.8) (F-C: 6.9±1 vs. F-MMF: 2.4±0.9, $p<0.05$)]. Although significant changes are clear in circulating and renal B cells with the administration of MMF in both male and female rats, our findings indicate that MMF effects are especially greater in malerats, suggesting gender differences in response to MMF. Moreover, the mechanism(s) that B cells contribute to renal function in different gender remains to be investigated.

P3.17

DRUG CANDIDATES FOR INHIBITION OF INFLUENZA VIRUS

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Influenza A, B, and C are the only members of the Orthomyxovirus family that infect humans. Influenza A and B cause common, recurrent infections, and can cause critical human disease. Orthomyxoviruses are enveloped and have a negative sense RNA genome The envelope contains two glycoproteins: Hemagglutinin (HA) and neuraminidase (NA) . HA is the viral attachment protein and promotes fusion of the envelope to the cell membrane and hemagglutinates human, chicken, and guinea pig red blood cells The virus initially attacks and kills mucus secreting and other epithelial cells causing the loss of the primary defense system. Protection against reinfection is facilitated through the development of antibodies to HA. Since antibody responses are specific to the strain of Influenza, humans have no immunity against these novel influenza viruses. Thus, we have developed two novel drug candidates, designated EK and QR. Both drugs were designed to target influenza viruses carrying the H3 HA. We used MDCK cell lines infected with different strains of influenza A virus to evaluate the efficiency and inhibition of influenza infection. Both EK and QR were evaluated for their ability to inhibit the growth of influenza virus A/Hong Kong/68 (H3N2), with EK showing 99% inhibition of infection. Both drugs were also evaluated for ability to inhibit infection by a virus with a different HA subtype, A/NWS-Tokyo (H1N2 reassortant). To begin to understand the mechanism of action of EK and QR, we will also evaluate their ability to prevent virus binding using a hemagglutination assay, and to inhibit fusion in an in vitro fusion assay. Our original hypothesis was that the drugs would prevent the binding of the influenza virus to the cells, but the peptides influence the uninfected cell lines as well.

P3.18

USE OF HUMANIZED YEAST TO ELUCIDATE THE ROLE OF CANCER-ASSOCIATED PROTEIN PHOSPHATASE 1 (PP1) ON CELL GROWTH AND SURVIVAL.

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Disruption in the accurate regulation of M-Phase can be detrimental to human health and lead to numerous disease states. The entry and exit of M-Phase requires highly controlled oscillation of phosphatase activity, including Protein Phosphatase 1 (PP1). Fluctuations of PP1 activity are vital in the progression of and precise regulation of M-Phase transitions. Abnormalities in cell cycle regulation of M-Phase can be indicative of various pathologies, most notably cancer. Modifications in PP1 and abundance of PP1 regulatory proteins have been observed in various cancers with prognostic implications, suggesting a link between PP1 and cancer. However, exactly how PP1 dysregulation impacts cell cycle in cancer is unknown. Genome and exome sequencing is becoming increasingly common for cancer cells. Highlighting this, COSMIC and GDC (Catalogue of Somatic Mutations in Cancer and NCI Genomic Data Commons, respectively) together have over 26 million cancer-associated gene variants annotated. This sequencing has led to large datasets of human polymorphisms, with little information regarding the role these play in human health and disease. Over 800 PP1 polymorphisms are cataloged in COSMIC and GDC (combined). However, the impact these polymorphisms have on cancer development and progression is largely unknown. Humanization of Saccharomyces cerevisiae is an approach that can be utilized to elucidate the influence of cancer-associated polymorphisms. Glc7 is the gene that

encodes PP1 in S. cerevisiae. Complete loss of Glc7 activity in yeast is lethal. However, Glc7 loss can be rescued by expression of human PP1, a process known as "yeast humanization". This project utilizes a temperature sensitive (ts) mutant Glc7 strain. In this ts-Glc7 strain, Glc7 is active and yeast are viable at 25°C. However, at 37°C Glc7 activity ceases, and yeast become nonviable. We have transformed ts-Glc7 with plasmids that express wild-type (WT) human PP1 and cancer-associated mutant versions of PP1. Therefore, at 25°C Glc7 and human PP1 are active, but at 37°C only human PP1 is active, allowing the study of the in vivo effects of cancer-associated mutations in PP1. The aim of this project is to elucidate the impact of cancer-associated polymorphisms on cell proliferation, cell-cycle progression, and survival. To date, we have explored the impact of two cancer-associated PP1 variants: PP1(P57S), and PP1(G90E). These variants represent a mutation in the metal binding region (G90E) and a mutation at a site with no known function (P57S). Using spotting growth assays, we found that G90E significantly impaired cell growth compared to WT PP1 expressing yeast at both 25°C and 37°C. This clearly points to G90E having a dominant negative impact, as yeast have significant growth impairment even when a functional PP1 (yeast Glc7) is active. In contrast P57S showed enhanced growth at 37°C compared to WT PP1 expressing yeast. Taken together these results show that different PP1 cancer-associated mutations have different cellular impacts and highlight the utility of humanized yeast to screen cancer-associated mutations. Future studies are defining the cause of the growth phenotypes and expanding to more PP1 mutations.

P3.19

SEX-SPECIFIC DIFFERENCES IN MACROPHAGE TRANSCRIPTOMIC RESPONSES TO MYCOBACTERIUM TUBERCULOSIS AND POLYPHOSPHATE

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In the lungs, macrophages are key defenders that ingest and kill bacteria. Some pathogens, such as Mycobacterium tuberculosis (Mtb), evade this defense by secreting chains of phosphate residues (polyphosphate, polyP), which activate receptors in the phagosome and prevent phagosome-lysosome fusion. PolyP receptors on the plasma membrane also allow exogenous polyP to impair macrophage bacterial killing. Mycobacteria with mutations in the enzyme responsible for polyP production secrete less polyP and are effectively killed by macrophages, whereas wild-type Mycobacteria show reduced killing.

Globally, tuberculosis incidence is higher in males, accounting for 56% of cases in 2019 compared to 32% in females, with similar trends observed in the United States. Understanding how polyP inhibits bacterial killing and how male and female macrophages respond differently could lead to strategies that restore macrophage-mediated immunity, benefiting the 11 million people worldwide suffering from tuberculosis.

This study investigated how Mtb-secreted polyP affects macrophages and explored sex-specific differences. We used transcriptomics to analyze transcriptional changes, qPCR to validate gene expression, Western blot to confirm protein-level alterations, and microscopy to visualize functional changes, 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 crucial for macrophage activation and pathogen clearance. Treatment with gallein, a small-molecule inhibitor of bacterial polyP kinases, reversed many Mtb-induced transcriptional changes, restoring immune response pathways in both male and female macrophages.

In conclusion, this research highlights the critical role of bacterial polyP in disrupting macrophage functions and underscores its potential as a therapeutic target. The observed sex-specific differences provide valuable insights for developing host-directed therapies to enhance macrophage-mediated immunity and combat tuberculosis.

P3.20

MOLECULAR SCREENING OF DRUG EFFLUX PUMPS IN *Vernonia amygdalina*-Treated MCF-7 Cells

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Breast cancer is the most common cancer among women in the United States. Although deaths from breast cancer have declined, the disease remains the leading cause of death among women overall. An estimated 276,400 new cases will be diagnosed this year. Studies have also shown that chemoresistance 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 VA fractions inhibit DNA synthesis and growth of cancer cells, in vitro. In this study, gene expression profiles of multidrug resistant proteins (MRPs) in V.amygdalina (VA)-treated human ER+ breast cancer (MCF-7) cells are analyzed. RT-PCR and Gel electrophoresis is employed to detect expression of MRP1-3 and P-glycoprotein (P-gp) in cell lysates. Further, Western blot is used to detect protein expression profiles of the MRPs. A reduction in gene and protein expression of MRP in VA treated cells will confirm whether VA fractions inhibit over-expression of drug-efflux pumps in breast cancer cells, in vitro.

P3.21

CANONICAl Cdc14b SPLICE VARIANTS ARE ABSENT IN MOUSE OOCYTES

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Accurate M-Phase regulation is essential for human health and disease, including infertility. CDK1 is the major M-Phase driving kinase, with alterations in CDK1 and downstream pathways frequently observed in oocyte-based infertility. The role that CDK1, and other kinases, play in oocyte meiosis is well-studied, however, how countering phosphatases regulate M-Phase and impact oocyte meiosis is unclear. CDC14B is an evolutionarily conserved phosphatase across all eukaryotes. Despite conservation of this phosphatase, its cellular functions appear to have diverged. In yeast (budding and fission) pCdc14 is the major CDK1 countering phosphatase at M-Phase exit. In mammals, phosphatases PP1 and PP2A have largely taken over this role. However, there is clear evidence that CDC14B plays an important M-Phase regulatory role in oocyte meiosis. Canonically, CDC14B is observed in the nucleus of cells, however, in mammalian oocytes, CDC14B is always cytoplasmic and never nuclear (Schindler and Schultz 2009). Furthermore, somatic cells have multiple splice variants, canonical Cdc14b1 with a nuclear localization signal and noncanonical Cdc14b2 without a nuclear localization signal. This project tested the hypothesis that oocytes only contain Cdc14b2 splice variants, resulting in cytoplasmic localization. Exon 1 contains the Cdc14b1 nuclear localization single. Exon 1 is skipped in Cdc14b2 splice variants, with Cdc14b2's start codon located 48bp from the end of intron 1. We designed splice variant specific PCR primers to amplify these unique regions. Specifically, the forward primer bound to Cdc14b1 or b2's unique 5' region and the reverse primer to a common region in exon 2. We investigated the expression of Cdc14b1 and b2 in five different mouse tissues (liver, kidney, uterus, ovary, and lungs) and mouse oocytes. Cdc14b1 and b2 were both expressed in all tissues examined. Furthermore, mouse oocytes contained Cdc14b2 but not Cdc14b1. Future research in the lab aims to elucidate the role that cytoplasmic Cdc14b2 plays in regulating M-Phase during oocyte meiosis.

P3.22

SARS-CoV-2: ANALYSIS OF LIFE CYCLE, CURRENT VARIANTS OF CONCERN, VACCINATION MECHANISMS, AND THE POTENTIAL FOR A NOVEL CRISPR-Cas BASED TREATMENT

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COVID-19, the disease which results from infection of SARS-CoV-2, has been extensively researched and fought since its pandemic status in 2020. The virus is highly mutable, and the Omicron variant holds the title as being most infectious due to its many mutations, particularly those within its spike protein. Given that spike proteins hold the key to entering the human cell, recent CRISPR-Cas technology has shown its potential as a target for treating the disease. In this poster, we discuss the virus's structure and life cycle, current viral vaccines and their mechanisms, and how recent research on CRISPR-Cas systems may provide an alternative method of treatment through direct targeting of SARS-CoV-2 specific genomic components rather than reliance upon human machinery.

P3.23

CARDIOVASCULAR IMPACTS FOLLOWING INFLUENZA INFECTION

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Background: Influenza is a contagious respiratory virus that infects 41 million people and hospitalizes 700,000 each flu season. Recent studies have revealed a correlation between influenza and cardiovascular events. This finding suggests viral inflammation leads to an increased risk of heart attacks due to arterial inflammation and the destabilization of plaques. In a recent experiment, our laboratory detected a decrease in activity, blood pressure, and heart rate following the infection of influenza in naïve mice. Histological analyses indicated an increase in heart fibrosis and lung injury, with peak damage occurring at 9 dpi .Objective: The aim of this study is to confirm the finding of pathological effects despite the lack of virus within the heart. Methods: Mouse heart and lung tissues were harvested 1-,3-, 5-, and 9- days post-infection (dpi) from mice infected with PR8 or mock-infected with PBS. Hemagglutination assay (HA) was performed using a 2-fold serial dilution on supernatant collected from tissue homogenates and 0.5% turkey red blood cells (tRBC). Following the addition of tRBC, cell culture plates were incubated at 37ºC for 30 minutes to quantify viral titers based on the amount of agglutination observed. Results: Viral titers were detected within the lung but not the heart. Conclusion: The lack of virus within the heart suggest pathological effects are indirectly related to viral influenza infection. Future Direction: Investigate molecular inflammatory markers and their effects on inflammation throughout influenza infection.

P3.24

piRNA BIOGENESIS IN CAPITELLA

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piRNAs, a class of small RNA, play a crucial role in gene silencing, particularly for genome defense against harmful transposons. It prevents the movement of transposable elements and thus piRNAs to genomic stability across various organisms. They are primarily expressed in gonads and have recently been found to be expressed in somatic tissues as well. piRNA biogenesis involves two cycles: phasing and pingpong cycle. The ping-pong cycle boosts piRNA levels and allows PIWI proteins (P-element-induced Wimp proteins) to cleave RNA, thereby sustaining this protective cycle. Although widely studied in drosophila, piRNA biogenesis is yet to be studied in annelids. To understand the biogenesis in Capitella, we aim to use immunoprecipitation from embryo extracts with PIWI1 and PIWI2 antibodies, followed by RNA extraction and sequencing. This approach will enable us to isolate and analyze piRN associated with PIWI proteins specifically, offering insights into the piRNA profiles present during embryonic stages. Sequencing the immunoprecipitated RNA will allow us to identify the specific sequences and characteristics of piRNAs produced, understand the origin, and explore their role in transposon silencing and gene expression. This data will deepen our understanding of piRNA pathways and their regulation in Annelids.

P3.25

UNRAVELING THE ROLE OF CIRCULAR RNAs IN NEURONAL FUNCTION USING *Drosophila melanogaster*

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Circular RNAs (circRNAs) are a unique type of RNA abundant in the brain. They have a closed circular structure, making them resistant to exonuclease degradation. They are highly abundant in neural tissues and have importance in controlling gene expression. Even though it is known they are important for controlling gene activity, their function remains unknown. My research focuses on understanding the role of circRNAs in neuronal function using Drosophila melanogaster as a model organism, which provides a robust genetic system to study neural processes. In my research, I am studying the role of circRNAs in the brain using fruit flies Drosophila melanogaster, which are great for studying how genes work. To do this, I use a system called elav-GAL4 to turn off certain genes involved in making and processing RNA. By stopping circRNAs from forming properly, I can see how this affects the way the flies behave and age. Additionally, quantitative PCR (qPCR) will be used to measure the expression of specific genes. These include mbl, a key regulator of circRNA biogenesis, and neuronal genes such as plexA, scro, and camKI, which play vital roles in axon guidance, synaptic function, and neuronal signaling. This research will help us learn more about how circRNAs work in the brain and how they might be linked to diseases like Alzheimer's or Parkinson's.

P3.26

ENGINEERING PLASMID CONSTRUCTS TO STUDY SYNTAXIN-MEDIATED TNF SECRETION IN MAST CELLS THROUGH RESTRICTION CLONING

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This study focuses on performing restriction cloning to create a rescue construct plasmid that contains our desired proteins. Using plasmids pLVX-IRES-PuroR & pLVX-EGFP-IRES-NeoR, each containing a protein suspected to mediate tumor necrosis factor (TNF) secretion in mast cells, Syntaxin 3 and Syntaxin 11. TNF secretion is an inflammatory cytokine secreted by mast cells in response to pathogens and/or stressors to the immune system. Mast cells are a type of white blood cell that plays a vital role in human immunological response by guarding areas of the body easily exposed to foreign bodies like bacteria, allergens, viruses, and parasites. Restriction cloning is a process of deleting a particular sequence of DNA inside a plasmid. Using Polymerase Chain Reaction (PCR) we will install the desired protein sequence for both plasmids. We will use two restriction enzymes, EcoRI and BamHI to bind the plasmids together through "sticky ends". After the proteins are successfully inserted back into the plasmids, they will be tested on their pertinent involvement in TNF secretion in mast cells.

P3.27

IDENTIFICATION OF NOVEL GENES ENCODED BY MYCOBACTERIOPHAGE WATERFOUL TO INHIBIT GROWTH OF *Mycobacterium smegmatis*

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Bacteriophages are viruses that kill bacteria and many of the genes that are encoded in phages are needed to be characterized for their function. It's important to identify genes that produce toxins that could kill human pathogenic bacteria such as mycobacterium tuberculosis, so that it is possible to treat diseases like tuberculosis. In this study, a plate-based cytotoxicity assay has been used to screen a diverse set of 94 Waterfoul gene products capable of inhibiting the growth of the host Mycobacterium smegmatis. Out of the 94 genes tested, 32 genes showed capability of inhibiting the growth of Mycobacterium smegmatis. These Waterfoul gene products were observed to confer potential anti-mycobacterial effects, making them interesting candidates for follow-up studies and could be utilized in developing phages that could be used in phage therapies that could treat tuberculosis.

P3.28

MULTIFOCAL PRIMARY DISEASE AND TUMOR REGRESSION IN HIGH-RISK NEUROBLASTOMA ZEBRAFISH MODEL

Perla Luna-Camacho[1], Nicole Anderson[2]

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

Neuroblastoma **(NB)** is a cancer of the peripheral sympathetic nervous system **(PSNS)** -- responsible for 10% of childhood cancer deaths. NB is highly metastatic and 50% of patients are at High-Risk **(HR)**, which occurs when MYCN-amplification or metastatic disease is present at older than 18 months of age. MYCN-amplification is a genetic alteration that is a strong prognostic factor leading to poor outcomes and appears in 20% of all NB patients. A genetic study in human neuroblastoma patients identified that a change to a single nucleotide within LIM-domain-only 1 **(LMO1)** gene, was permissive for tumor formation and metastasis. The typical site for primary disease in NB patients is the adrenal gland, however, tumors can form along the paraspinal ganglia (thorax, pelvis, or cervical areas). Our study utilizes NB zebrafish models that use the dopamine-beta-hydroxylase (**dbh**) promoter to drive the expression of MYCN or c-MYC within the PSNS and result in primary tumor formation exclusively from the adrenal gland. These MYCN_TT zebrafish are an aggressive zebrafish model of HR-NB that highly expresses MYCN that spontaneously metastasizes. We crossed MYCN_TT with dbh:LMO1 to discover the impact of LMO1 overexpression on tumor formation in MYCN_TT fish. After crossing the fish we examined their offspring for tumor formation, finding early tumor growth at 9 days post fertilization (**dpf**) in neuroblasts in the jaw region arising from the paraspinal ganglia. Tumors in the jaw persisted in 60% of MYCN_TT;LMO1 fish at 14dpf and leads to the formation of new primary tumors. While primary tumors derived from the interrenal gland (**IRG**) persisted in all MYCN_TT;LMO1 zebrafish, the jaw tumors began to regress as early as 5 weeks post-fertilization (**wpf**) and continued to regress over time. At 15wpf only 20% MYCN_TT;LMO1 had a persisting jaw secondary tumor. Strikingly, 10-15% of jaw tumors go on to form massive tumors that invade nearby muscle and gill structures. Histological analysis of jaw tumors and IRG-derived tumors in MYCN_TT;LMO1 zebrafish demonstrated that both were composed of small, round, and undifferentiated neuroblasts (hallmarks of neuroblastoma). In addition, jaw tumors and IRG-derived tumors both stained positive for tyrosine hydroxylase a marker catecholamine synthesis in human NB. This study indicates that LMO1 overexpression is permissive of tumor formation outside of the IRG in the MYCN_TT zebrafish model. Despite identical genetic alterations in the MYCN_TT;LMO1 model, jaw tumors have a wide range of fates from unstable tumors that regress and disappear to giant and invasive tumors, whereas all IRG-derived tumors persist over time underscoring the influence of microenvironment. The MYCN_TT;LMO1 zebrafish is a novel model to study multifocal disease and what is needed for a tumor to be stable. By studying the mechanisms that drive tumor stability in HR-NB, we can identify new therapeutic strategies.

P3.29

ANTI-PROLIFERATIVE ACTIVITY OF *Nerium Oleander L.* ON COLORECTAL CANCER CELLS

Chloe Grizzell[1], Veronica O. Odubanjo[2], Felicite K. Noubissi[2]

[1]Department of Biology, Tougaloo College, Jackson, MS, [2]Department of Biology, RCMI, Jackson State University, Jackson, MS

Colorectal cancer (CRC) is the third most common cancer in the United States, affecting around 1.4 million people. The constitutive activation of the Wnt signaling pathway is known to drive CRC development. Current treatments have low success rates and significant side effects, highlighting the need for new, selective drugs. Nerium oleander L., a shrub from subtropical regions, has been traditionally used for its anti-inflammatory, antidiabetic, and anticancer properties. Recent studies suggest Nerium oleander, an extract from this plant, has selective antitumor effects on various cancers. This study hypothesized that Nerium oleander could inhibit CRC cell growth by downregulating the Wnt signaling pathway. The research aimed to evaluate the anti-proliferative, anti-growth, and antioxidant effects of Nerium oleander on CRC cells and its impact on Wnt target genes (IGF2BP1, β-catenin, MDR1, and NF-KB). Nerium oleander leaves were dried, powdered, and extracted in a methanol/water solution. The extract was filtered, evaporated, and freeze-dried for use in assays. Experiments on SW620, HCT 116, and RKO cell lines revealed that the extract reduced cell proliferation and colony formation dose-dependently and inhibited the Wnt signaling pathway. Additionally, it significantly reduced reactive oxygen species production, demonstrating antioxidant properties. These findings suggest that Nerium oleander L. could be a promising candidate for new CRC treatments due to its selective cytotoxicity and ability to target the Wnt signaling pathway.

P3.30

DISCOVERY AND IDENTIFICATION OF MUWOW BACTERIOPHAGE FROM COLUMBUS, MS

Olivia Carlisle, Jess Collins, James Duke, Philip Evans, Kaliyah Moore, Nykeria Pratt, Cadence Wright, Robert Sample, Benjamin Onyeagucha, Davida Crossley, Brian Burnes

Mississippi University for Women, Columbus, MS

Bacteriophages are an abundant type of virus with the ability to infect and kill bacteria while using them to replicate through lytic or lysogenic processes. Bacteriophages play a key role in the regulation of bacterial populations in various environments and are being

explored as potential tools in phage therapy. The aim of this study was to isolate, characterize, and manually annotate the genome of the bacteriophage MUWOW collected from the campus of the Mississippi University for Women in Columbus, MS at GPS coordinates 33.493021 N, 88.419611 W. MUWow was isolated from a soil sample on *Arthrobacter globiformis* B-2979. Plaque assays, spot tests, and serial dilutions were used to purify the lysate and transmission electron microscopy (TEM) were performed to determine phage characteristics. MUWow DNA was sequenced at the Pittsburgh Bacteriophage Institute. Various bioinformatics tools, including PECAAN, GeneMarkS, Phamerator, BLASTP, HHPred, TMHMM, and SOSUI, were used to determine open reading frames and predict gene function. MUWow belongs to cluster AY and displays Siphoviridae morphology, with a head diameter of approximately 50 nm and a tail length of 100 nm. Its genome has 55,034 base pairs, a GC content of 62.4%, and 98 unconfirmed genes. A subset of these genes code for proteins that have determined functions, including minor tail proteins, membrane proteins, and helix-turnhelix DNA binding domain. The annotation of the MUWow phage will advance current understanding of bacteriophage diversity, and further bioinformatic analysis is being performed to explore the structure and function of predicted proteins.

END OF THURSDAY'S PROGRAM

Friday, March 21, 2025

MORNING

Hall D Room 3

8:50 Welcome

8:50 Welcome

9:00 Cellular, Molecular, Developmental Biology Division Awards

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

9:15 Cellular, Molecular, 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 MANIPULATION OF BACTERIAL GLYCOSYLATION GENES TO UNDERSTAND GLYCOSPHINGOLIPID GLYCAN BIOSYNTHESIS PATHWAYS

Paul Boudreau

University of Mississippi School of Pharmacy, University, MS

My lab is identifying the glycosylation genes involved in bacterial glycosphingolipids by first using sequence similarity networks to parse out shared and unique metabolism across these organisms, then using gene knockouts to assess impacts on biosynthesis in the mutants. Bacterial glycosphingolipids are exciting immune stimulating agents found in both the gut microbiome, mainly from the Bacteroides, and the soil microbiome, mainly from the Sphingomonadales. Recent literature has helped to elucidate the biosynthetic pathway for these molecules in bacteria, which was previously only understood in eukaryotic systems. However, the glycosylation genes that install the complex glycans of glycosphingolipids are only known for the first enzyme that acts to install the first sugar on the lipid moiety. A problem as the glycan is known to be key to interactions with the human immune system. To elucidate these pathways, we are constructing sequence similarity networks of glycosylation genes across the Sphingomonadales to find both shared and unique enzymes that we can match to different patterns of glycans. Those enzymes unique to a particular glycan are then screened by homology to known enzymes to see if their sequence-predicted substrate preference matched the sugar installed in the glycan. As a final step we use gene knockouts to remove putative glycosphingolipid glycosylation enzymes to see if truncated glycans are produced in the mutant, as observed by LCMS metabolomics. In this way we hope to deconvolute the biosynthesis of glycosphingolipids as a step towards engineering these pathways to produce novel glycans with novel immune stimulating activity.

O3.13

9:50 LIQUID CHROMATOGRAPHY-MASS SPECTROMETRY-BASED QUANTITATIVE ANALYSIS OF DNA CONTAMINATION IN RNA PREPARATIONS

Jing Qu, Yiming Liu

Jackson State University, Jackson, MS

DNA contamination to RNA preparations affects certain downstream applications, and therefore, must be assessed quantitatively. Currently, there are no methods for quantitative assay of minute amounts of DNA present in an RNA preparation available. Herein, we report a mass spectrometric assay for sensitive and selective determination of DNA present in RNA preparations. The method is based on effective depyrimidination from DNA by chloroacetaldehyde (CAA) and reliable quantification of resulting etheno-cytosine by ultraperformance liquid chromatography-tandem mass spectrometry (UPLC-MS/MS). The assay offers a linear calibration curve with a limit of detection of 7.5 ng DNA and has a run time of 10 min. The method is validated by analysis of oligodeoxynucleotide (ODNs) and microRNAs, DNA standards (~48 kb), and RNA samples prepared from cell

culture by using different protocols. DNA mass percentage in the RNA samples tested is found in a range from 4.48 to 12.71%. The proposed LC-MS/MS assay is convenient to carry out and cost effective with good assay accuracy and repeatability.

O3.14

10:20 *Vernonia calvonea* TRIGGERS APOPTOSIS IN OVARIAN CANCER CELLS

Ariane Chitoh, Felicite Noubissi

Jackson State University, Jackson,, MS

Ovarian cancer remains a significant cause of cancer-related mortality, with limited treatment options and frequent resistance to conventional therapies. Medicinal plants, including members of the Vernonia genus, have shown potential as alternative cancer treatments due to their bioactive compounds with anti-inflammatory, antibacterial, and antimalarial properties. This study investigates the apoptotic effects of Vernonia calvonea (VC), a less-studied member of the Asteraceae family, on ovarian cancer cells. Specifically, we examined the ability of VC to induce apoptosis in OVCAR-3 ovarian cancer cells and explored the underlying molecular mechanisms. OVCAR-3 cells were treated with increasing concentrations of VC-7 (0, 8, 16, and 32 µg/mL) for 48 hours. Mitochondrial membrane potential was assessed using the JC-1 assay, which showed a concentration-dependent decrease in membrane potential, indicating mitochondrial depolarization. Fluorescence counts in VC-treated cells decreased by 0.96, 0.88, and 0.85 times at 8, 16, and 32 µg/mL, respectively, relative to control, suggesting the activation of apoptosis. Western blot analysis revealed upregulation of pro-apoptotic proteins, including p53, Bax, BID, cytochrome C, caspase-3, and caspase-9, along with a corresponding downregulation of the anti-apoptotic protein Bcl-2. Densitometric analysis confirmed the increased relative abundance of these apoptotic proteins, supporting the activation of an intrinsic apoptotic pathway. Additionally, qRT-PCR analysis showed a significant decrease in mRNA expression levels of p53, while other apoptotic proteins showed no statistically significant changes.Together, these findings demonstrate that VC-7 induces apoptosis in OVCAR-3 cells through a mechanism involving mitochondrial dysfunction and activation of the p53 pathway. This study suggests that Vernonia calvonea has potential as a therapeutic agent in ovarian cancer treatment, highlighting the need for further investigation into its bioactive components and apoptotic mechanisms in other cancer models.

10:40 – 11:00 BREAK

ORAL PRESENTATION SESSION V

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

O3.15

11:00 CYTOMORPHOLOGICAL CHARACTERIZATION OF ARIP CELLS WHEN EXPOSED TO GLUCAGON-LIKE-PEPTIDE-1

Gary L. Hamil[1], Hamed Benghuzzi[2], Michelle Tucci[3], Kenneth R. Butler[3]

[1]Belhaven University, Jackson, MS, [2]Jackson State University, Jackson, MS, [3]University of MS Medical Center, Jackson, MS

Introduction: Previous studies in our laboratory have demonstrated that tricalcium phosphate lysine (TCPL) bioceramic reservoirs loaded with PANC1 and ARIP cells show promising proof of concept on the cells' ability to adapt their insulin production levels to match glucose challenge. We found that Insulin levels increase, and glucose levels drop significantly after 48 hours of exposure to glucagon-like peptide-1 (GLP-1). Treating with 10nM GLP-1 did not alter cellular viability and proliferation. However, there is a paucity of data regarding the morphology of ARIP cells exposed to varying glucose levels and treatment with GLP1 inhibitors on morphology.

Methods: Data on the cytomorphology of ARIP cells were collected at 24, 48, and 72 hours. The data were analyzed using various statistical methods, including parametric statistics for continuous data (ANOVA with post hoc Bonferroni LSD) and non-parametric statistics (Kruskal-Wallace H) for nominal or categorical variables. In all analyses, $\alpha=0.05$ was used.

Results: The results of this investigation indicated statistically significant differences between the control and experimental groups using ANOVA and Kruskal-Wallis tests. The ANOVA results demonstrated statistically significant differences in the number of cells/high power field (HPF), nuclear, and cell area, as shown by the N/C ratio ($p<0.05$). No statistically significant differences were detected in cell count or the presence of nucleoli. Moderate to strong effect size indicated that the differences were both statistically and practically significant. Meanwhile, the Kruskal-Wallis H test provided a non-parametric assessment of the data, confirming significant differences in the distribution of ranks across groups for N/C ratio (qualitative), cellular density, proliferation, cellular appearance, cell shape, nuclear shape, nuclear border, binucleation, spindle-shaped, round shaped, cuboidal or epithelioid, pyknosis, chromatin pattern, and aggregation in clusters or sheets ($p < 0.05$). These findings suggest that the treatment of cells with GLP-1 had a notable impact on insulin and glucose levels and the cell morphology at 24, 48, and 72 hours, and post-hoc analyses were warranted to pinpoint specific group-level differences. Together, these results provide robust evidence of variability between groups, underscoring the importance of parametric and

non-parametric approaches in comprehensive data analysis.

Conclusions: This investigation builds upon prior research demonstrating ARIP cells' adaptability and suitability for possible use in the tricalcium phosphate lysine (TCPL) bioceramic reservoirs to regulate insulin production in response to physiological glucose challenges. While previous studies highlighted the role of GLP-1 in enhancing insulin secretion without compromising cellular viability and proliferation, our findings expand this knowledge by providing critical insights into the cytomorphological changes in ARIP cells exposed to varying glucose levels and GLP-1 treatments. This study advances our understanding of ARIP cell responses to glucose and GLP-1. It underscores the potential for further exploration of ARIP cells and GLP-1 to optimize therapeutic strategies in bioceramic cell-based systems to treat diabetes.

O3.16

11:20 MUTATIONS IN THE PROTEASOME GENE PSMC5 ARE ASSOCIATED WITH DEFECTIVE PROTEASOME ACTIVITY AND NEURODEVELOPMENT DISORDERS

Galen Collins

Mississippi State University, Starkville, MS

The bulk of intracellular protein degradation occurs through the ubiquitin-proteasome pathway. Therefore, this pathway is necessary for removing damaged proteins, controlling regulatory signaling cascades, and regulating cell differentiation. Although essential genes, mutations in proteasomes or deletion of a single allele result in individuals with various neurodevelopmental and possible neurodegenerative syndromes. In particular, mutations in one of the six ATPase subunits of the 26S proteasome, PSMC5, have been associated with neurodevelopmental delay in at least six unrelated children presenting with autistic-like behaviors and, in one instance, dysgenesis of the corpus callosum. In addition to primary fibroblasts from two families, we have generated CRISPR-engineered cell lines that reproduce the most common mutation (P320R). These cells have reduced degradation through the ubiquitin-proteasome pathway and decreased cell viability. These proteasomes have an assembly defect and seem to have defective regulation of ATP hydrolysis. However, these cells have the advantage of being less susceptible to translation inhibitors such as cycloheximide and hygromycin. Surprisingly, although this mutation is present only as a heterozygous lesion in patients, we were able to generate homozygous mutations in our CRISPR-engineered lines, demonstrating that this is not a null phenotype. Additionally, we can rescue the defects in ubiquitin accumulation and change the assembly patterns of proteasomes by overexpression of the wild-type PSMC5 gene. These results support the vital role of proteasomes in neurodevelopment and the importance of protein homeostasis more broadly in diseases such as autism. Increases in proteasome activity and assembly may, as a consequence, be important targets for maintaining neuronal health.

Friday, March 21, 2025
AFTERNOON
Hall D Room 2
2:00-5:00
Mississippi INBRE Data Science Workshop

Chemistry and Chemical Engineering

Chair: Scoty Hearst

Mississippi College

Co-Chair: Trent Shelby

Mississippi College

Vice-Chair: Bhanu Priya Virka Nellore

Mississippi Valley State University

Vice-Chair: Christen Robinson

Jackson State University

Thursday, March 20, 2025
MORNING
Hall D Room 2
8:30 Welcome and Opening

O4.01

8:45 HETEROTYPIC AMYLOID FIBRILS: THROUGH THE LENS OF LIQUID-LIQUID PHASE SEPARATION

Md Muzahid Ahmed Ezaj[1, 2], Shailendra Dhakal[1, 2], Malay Mondal[1, 2], Azin Mirzazadeh[1, 2], Siddhartha Banerjee[3], Ayanjeet Ghosh[3], Anant Paravastu[4], Rakez Kayed[5], Vijayaraghavan Rangachari[1, 2]

[1]Department of Chemistry and Biochemistry, School of Mathematics and Natural Sciences, University of Southern Mississippi, Hattiesburg, MS, [2]Center for Molecular and Cellular Biosciences, University of Southern Mississippi, Hattiesburg, MS,[3]Department of Chemistry and Biochemistry, The University of Alabama, 1007E Shelby Hall, Tuscaloosa, AL, [4]Department of Chemical and Biomedical Engineering, Georgia Institute of Technology, Atlanta, GA, [5]Department of Neurology, University of Texas Medical Branch at Galveston, TX

In recent years, significant clinical and pathological overlaps have been observed in many neurodegenerative disorders like frontotemporal lobar degeneration (FTLD), Parkinson's disease (PD), Lewy body dementia (LBD), and Limbic age-related TDP_43 proteinopathies (LATE). Specifically, co-amyloid deposits of proteins α-synuclein

(αS), andTDP-43 and its pathologic prion-like c-terminal fragment (PrLD), among others. Our research explores the interplay between these proteins, focusing on heterotypic aggregation and liquid-liquid phase separation (LLPS). We demonstrated that αS and TDP-43PrLD synergistically promote aggregation of each other and form heterotypic fibrils containing stoichiometric proportions of the two proteins. Such hybrid fibrils show enhanced neurotoxicity and synaptic dysfunction compared to their homotypic counterparts. By a multi-disciplinary approach involving biophysical, biochemical, structural biological, and cell biological methods, we uncover interactions to propose αS-TDP-43PrLD hybrid fibril as possible distinct entities in a multitude of pathologies. The distinct aggregation pathways observed in heterotypic vs. homotypic systems also suggest potential therapeutic targets for modulating protein interactions, offering new hope for the future of neurodegenerative disorder treatments.

O4.02

9:00 DESIGNER PEPTIDES TO STUDY THE REDOX-CONTROLLED PHASE SEPARATION OF BIOMOLECULAR CONDENSATES

Malay Mondal[1,4], Penelope E. Jankoski[2], Landon D. Lee[1], Daniel M. Dinakarapandian[3], Tzu-Ying Chiu[3], Windfield S. Swetman[2], Hongwei Wu[3], Anant K. Paravastu[3], Tristan D. Clemons[2,4], and Vijayaraghavan Rangachari[1,4]

[1]Department of Chemistry and Biochemistry, School of Mathematics and Natural Sciences, University of Southern Mississippi, Hattiesburg, MS, [2]School of Polymer Science and Engineering, University of Southern Mississippi, Hattiesburg, MS, [3]School of Chemical and Biomolecular Engineering, Georgia Institute of Technology, Atlanta, GA, [4]Center for Molecular and Cellular Biosciences, University of Southern Mississippi, Hattiesburg, MS

Biomolecular condensates (BC) are phase-separated hubs predominant with proteins and nucleic acids. Due to their increasing prevalence in biological functions, the mechanisms underlying the formation of BC have recently attracted a lot of attention. BCs are predominantly formed by liquid-liquid phase separation (LLPS), in which proteins demix from the bulk solution to form dense and dilute phases. This reversible phase separation process underlies the formation of membraneless organelles in cells. LLPS is best described by a "stickers and spacers" model in which weak multivalent interactions between the stickers separated by the disordered spacers drive phase separation. Although significant progress has been made over the past decade, the specific contribution of cysteine residues to the formation and regulation of biomolecular condensates remains unclear. In this study, we explored the role of disulfide bonds and their redox responsiveness in the behavior of biomolecular condensates. We investigated this phenomenon with designed phase-separating peptides containing cysteine residues at different positions. Our biophysical analysis revealed that cysteine residues facilitate LLPS under oxidizing conditions through disulfide crosslinks. These crosslinks can be modulated via redox reactions, offering tunable control over condensate behavior. We found that rather than acting as spacers or stickers, cysteines work as covalent nodes to prevent system-spanning percolation networks and reduce the effective concentrations for sticker interactions. This research aims to address the gap by investigating the influence of cysteine-mediated interactions on condensate dynamics, particularly in oxidative stress and other cellular environmental changes, and to develop tunable biomaterials. We believe this work provides insights into the fundamental understanding of the role of cysteine on the mechanisms underlying the formation and regulation of condensates relevant to both cellular biology and biomaterials science.

O4.03

9:15 SYNTHESIS, ANALYSIS, AND APPLICATION OF A SERIES OF HYDRAZIDE COUMARIN ENAMINE PROBES

Gavin Rose, Karl J. Wallace

University of Southern Mississippi, Hattiesburg, MS

The presence of heavy metals in the environment continues to grow yearly. Sources of such impurities could be attributed to both natural and anthropogenic sources such as erosion, industrial runoff, and pesticides. The detection of these heavy metals is the first step to the purification of bodies of water such as rivers and lakes. Through a three-step process, five hydrazide-based molecular sensors with a hydroxy coumarin backbone were synthesized to be used for metal detection. These molecular sensors were characterized using various techniques including NMR, IR, and mass spectrometry. UV-visible and fluorescence spectroscopy studies were conducted with all five molecular sensors to calculate the extinction coefficient and observe the initial luminescence, respectively. With these results, metal binding titrations were performed for each molecular sensor with Zn^{2+} salts including NO_3^-, Cl^-, and OAc^-. The titration data indicated metal binding capabilities encouraging future studies with various other metal ions including Hg^+, Ni^{2+}, Fe^{2+}, and Co^{2+}.

O4.04

9:30 CONTROLLED SYNTHESIS OF MIXED-HALIDE METHYLAMMONIUM LEAD-CADMIUM PEROVSKITE QUANTUM DOTS WITH TUNABLE OPTICAL PROPERTIES FOR OPTOELECTRONIC APPLICATIONS

Surya Poornachandiran[1,2], Dineshkumar Sengottuvelu[1], Mohammed Majdoub[1], Jagrity Chaudhary[1], Sasan Nouranian[1, 2], Ahmed Al-Ostaz[1, 3]

[1]Center for Graphene Research and Innovation, University of Mississippi, University, MS,[2]Department of Chemical Engineering, University of Mississippi, University, MS, [3]Department of Civil Engineering, University of Mississippi, University, MS

Perovskite quantum dots (PQDs) have gained significant attention in recent years due to their exceptional optoelectronic properties, including high photoluminescence quantum yields, tunable bandgaps, and efficient light absorption. These unique properties make them promising candidates for applications in solar cells, photodetectors, and light-emitting devices. The ability to tailor their composition through mixed-halide systems further enhances their performance and stability, addressing critical challenges in next-generation optoelectronics. Despite advances, achieving long-term stability and uniformity in mixed-halide PQDs remains a crucial challenge. This study explores a ligand-assisted reprecipitation method for synthesizing mixed-halide methylammonium lead-cadmium PQDs with precise control over halide composition and QDs stability. PQD growth is finely regulated by employing a dual-ligand system with oleic acid and oleylamine, and surface passivation is enhanced to increase stability. Additionally, introducing secondary ligands like trioctylphosphine or thiol-based ligands further reduces ion migration, which is crucial for mixed-halide structures. The reprecipitation process, initiated by injecting the precursors into a nonpolar solvent with ligands, ensures rapid nucleation and high crystallinity of the nanocrystals. Careful tuning of methylammonium halide ratios and lead content allows control over bandgap and emission wavelength, producing PQDs with customizable optical properties. The structure and optoelectronic properties are being studied using various techniques, including transmission electron microscopy, absorption, and photoluminescence spectroscopy. This synthesis approach yields uniform, stable nanocrystals with potential applications in optoelectronics and photodetectors, addressing phase separation challenges commonly encountered in mixed-halide perovskites.

O4.05

9:45 THE USE OF A PARA-BIS-COUMARIN-ENAMINE MOLECULAR PROBE FOR THE RAPID, ON-SITE DETECTION OF CYANIDE

Leah Case, Karl Wallace

University of Southern Mississippi, Hattiesburg, MS

A fluorescent molecular probe has been shown to detect the presence of cyanide ions via colorimetric and spectroscopic responses. The production of cyanide as a byproduct of several industrial processes is negatively impacting both environmental and human health; therefore, a simple, rapid, on-site detection method for cyanide is needed. The use of discrete molecular probes for quick and easy ion detection has become an area of increasing interest in supramolecular chemistry. Using a coumarin derivative as the fluorophore, we have designed a para-bis-coumarin-enamine molecular probe by a three-step synthesis for the purpose of ion detection. The probe was shown to selectively bind cyanide ions (CN^-) over eleven other anions (F^-, $H_2PO_4^-$, Br^-, Cl^-, I^-, NO_3^-, BF_4^-, N_3^-, HSO_4^-, SCN^-, ClO_4^-). Binding studies were performed in DMSO using UV-visible and steady-state fluorescence spectroscopy, and binding constants were calculated for both one-to-one CN^--to-probe binding ($\log K_{11} = 3.03$) and two-to-one CN^--to-probe binding ($\log K_{21} = 6.90$). The addition of CN^- ions to the solutions was observed to cause a colorimetric change, visible to the naked eye. Furthermore, metal nitrates were used to reverse CN^- binding, and a mass balance equation has been proposed for this recyclable process. The para-bis-coumarin-enamine probe was also incorporated into solid-state test strips for on-site detection of cyanide. Preliminary studies have been conducted using solid-state fluorescence spectroscopy to study CN^- binding in the solid state.

O4.06

10:00 PHYSICAL AND CHEMICAL CHARACTERIZATION OF LINEAR DENDRITIC BLOCK COPOLYMERS SOLVATED WITH CHOLINIUM AMINO ACID BASED IONIC LIQUIDS

Deauntaye Jones, Mercedes Pride

University of Mississippi, University, MS

Linear-dendritic block copolymers (LDBCs) have emerged as a promising material for targeted drug delivery that aim to minimize off-target effects; however, a major barrier to their success, depending on their structural composition and surface properties, is that they can exhibit high dispersities, poor shelf-life, and potentially high cytotoxicity to non-target interfacing blood cells during intravenous drug delivery. As an approach to bypass this barrier, ionic liquids (ILs) can electrostatically solvate LDBCs by direct dissolution and form stable and biocompatible IL-integrated LDBC nano-assemblies. While ILs can counteract the barriers of LDBCs, little is known about the different ILs, specifically amino acid-based ILs, ability to electrostatically solvate LDBCs by direct dissolution. liquids (ILs) are characterized by their low melting points (<100°C) and are composed of bulky, asymmetric cations and anions. Their structural versatility allows for precise tuning of physicochemical properties by simply changing the cation and/or anion making up the IL. This work will be focused on the characterization of biocompatible amino acid IL (AAILs) and the novel AAIL solvated LDBC nanoparticles (NPs) which will be screened as drug delivery vehicles in future work. Techniques used includes Dynamic Light Scattering, Differential Scanning Calorimetry, Thermogravimetric Analysis, Nuclear Magnetic Resonnace, and Fourier Transform Infrared Spectroscopy

O4.07

10:15 THE USE OF COUMARIN-ENAMINE BASED FLUORESCENT PROBES FOR THE DETECTION OF HEAVY METAL IONS IN ORGANIC MEDIA AND CELLULAR ENVIRONMENTS

Peyton Champion[1], Eva Riveros[1, 2], Jaden Sierra[1], Karl Wallace[1]

[1]University of Southern Mississippi, Hattiesburg, MS, [2]Fordham University, Bronx, NY

Increasing industrialization has led to significant environmental pollution by heavy metal ions, and by extension, growing levels of toxic exposure symptoms in humans. This issue has caused a dire need for the development of detection methods that are sensitive, inexpensive, and able to detect heavy metal ions on-site. More research is also necessary to elucidate the specific intracellular localization of heavy metal ions and their precise mechanisms of cellular toxicity, which can help develop methods to treat heavy metal toxicity. To address these pressing issues, two novel fluorescent probes, phenanthroline coumarin-enamine (PCE) and thiazole coumarin-enamine (TCE), have been designed and synthesized for the sensitive detection of metal ions such as Zn^{2+} and Ag^{+}. Through comprehensive structural and solvent studies, the probes were characterized, and the ideal solvent was determined. Subsequently, metal binding studies of the acetate, nitrate, and chloride salts of several metal ions, including Zn^{2+}, Cd^{2+}, Ni^{2+}, Co^{2+}, Cu^{2+}, and Ag^{+}, were monitored via NMR spectroscopy, UV-visible spectroscopy, and fluorescence spectroscopy. Ongoing work is being done to screen the probes to determine if they could be used as intramolecular metal ion probes using human embryonic kidney (HEK-293) cells and monitored via confocal microscopy. Preliminary data suggests that the PCE probe can pass through the cell membrane with no issue, cause minimal cell death, and retains the fluorescent signal. Once the intracellular work is completed with PCE, these studies will be repeated with TCE.

O4.08

10:30 QUANTITATIVE DETECTION OF POLYADENYLATED miRNA BY SYBR GREEN II NUCLEIC FLUORESCENCE-BASED ASSAY

Avinash Kumar

Jackson State University, Jackson, MS

MicroRNA, otherwise known as miRNA, are small non-coding molecules that resemble important gene expression contributors. Besides, they are the biomarkers of choice for evaluating therapy efficacy, classifying the disease, and screening. Meanwhile, unlike miRNAs, which are surprisingly challenging to differentiate, identify, and quantify, other RNA species are readily measurable in various biological matrices. MiRNA is a new class of therapeutic agents. Advances in miRNA technology demand the creation of analytical methods that perform at high efficiency. In this work, we describe how assay selectivity can improve, the development of various ways to improve the poly(A) tail length, the polyadenylation process using the poly(A) polymerase, and finally, a very accurate quantification of Poly(A) tail. Recognition of changes in poly (A) tail length may generate a significant understanding of the role of miRNA transcripts and their physiological effects. Henceforth, to ensure high detection sensitivity and a convenient quantification process, we applied an enzyme called poly(A) polymerase to extend the poly(A) tails of the miRNAs we have isolated. This, on the other hand, prevented the degradation of the miRNAs and thus made their detection in later analyses more convenient. Using miRNA-21 and miRNA 146a-5p as the model analyte, this absolute quantification method has a limit of detection of (<0.33 nM) and demonstrated a highly linear calibration curve (R^2 = 0.999) in the range from 06 pM to 01 μM. The protocol, which we designed specifically for this project, had the highest level of sensitivity and reliability. Therefore, Accurate measurement of polyadenylated levels provides insight into miRNA regulation and modification, revealing potential physiological roles of miRNA transcripts.

O4.09

10:45 DIVERSIFICATION OF THE HMDS AND BORANE-THF REACTION: PROBING INTERMEDIATES AND EXPANDING REACTIVITY THROUGH MODIFIED SILYLAMINES TO SYNTHESIS N-SUBSTITUTED BORAZINE

Al Maruf

Louisiana State University, Baton Rouge, LA

The reaction between $HN(SiMe_3)_2$ and BH_3•THF have been shown to produce tris(trimethylsilyl)borazine. Wrackmeyer has used ^{29}Si and ^{11}B NMR to probe the intermediates in the reaction including amino boranes, borylamides, bis(amido)boranes, and diborylamines. Our lab is focused on trying to diversify this reaction by utilizing different silylamine starting materials. By altering the steric and electronic parameters of the silylamine, we aim to isolate and incorporate analogous intermediates to the tris(trimethylsilyl)borazine reaction. Our efforts towards this pursuit will be presented.

O4.10

11:00 CHARACTERIZATION OF CHITOSAN FOR BIOREMEDIATION THROUGH BEAD STRUCTURE ANALYSIS

Aaliyah Newsome, Nathan Prine, Andrew Doubert, Guy Gordon, Trent Selby, Joseph Kazery

Mississippi College, Clinton, MS

Metal and metalloid pollution negatively impacts ecosystems, the environment, and public health. Also known as potentially toxic elements (PTEs), PTE pollution comes from many sources including fossil fuels, construction, and domestic wastes. These PTEs in water treatment plants are not effective at removing dissolved or small inorganic substances in wastewater. However, there are other methods of remediation. Due to PTEs not being degradable the principal method of removal is by sorption processes. Bioremediation is the use of naturally occurring substances to break down or remove pollutants, in this case, PTEs. This study uses the chitinous cuticle

(exoskeleton) of crayfish as an adsorption media for PTEs. In this study, modifications were made to chitin by deproteinating and demineralizing the material to observe its properties. A common derivative of chitin is chitosan. Chitosan is a linear polysaccharide obtained by the process of deacetylation of chitin. In this study, we compared our harvested exoskeletons to lab-grade chitosan to observe the quality of our pure chitosan. Our chitosan was then solubilized at two different concentrations to form 5% and 8% chitosan beads. The beads were then compared to observe differences in total surface area, pore size and pore volume; which are properties of overall porosity quantifying their adsorption capability. Once the optimal properties are determined, the chitosan beads will be used in an application study to determine the rate of uptake of cadmium and overall capacity of cadmium concentration adsorbed.

O4.11

11:15 CHARACTERIZATION OF CHITOSAN FOR BIOREMEDIATION THROUGH BEAD STRUCTURE ANALYSIS

Aaliyah Newsome, Nathan Prine, Andrew Doubert, Guy Gordon, Trent Selby, Joseph Kazery

Mississippi College, Clinton, MS

Metal and metalloid pollution negatively impacts ecosystems, the environment, and public health. Also known as potentially toxic elements (PTEs), PTE pollution comes from many sources including fossil fuels, construction, and domestic wastes. These PTEs in water treatment plants are not effective at removing dissolved or small inorganic substances in wastewater. However, there are other methods of remediation. Due to PTEs not being degradable the principal method of removal is by sorption processes. Bioremediation is the use of naturally occurring substances to break down or remove pollutants, in this case, PTEs. This study uses the chitinous cuticle (exoskeleton) of crayfish as an adsorption media for PTEs. In this study, modifications were made to chitin by deproteinating and demineralizing the material to observe its properties. A common derivative of chitin is chitosan. Chitosan is a linear polysaccharide obtained by the process of deacetylation of chitin. In this study, we compared our harvested exoskeletons to lab-grade chitosan to observe the quality of our pure chitosan. Our chitosan was then solubilized at two different concentrations to form 5% and 8% chitosan beads. The beads were then compared to observe differences in total surface area, pore size and pore volume; which are properties of overall porosity quantifying their adsorption capability. Once the optimal properties are determined, the chitosan beads will be used in an application study to determine the rate of uptake of cadmium and overall capacity of cadmium concentration adsorbed.

O4.12

11:30 LITHIUM COORDINATION COMPLEXES OF NITROGEN-CONTAINING POLYAROMATIC HETEROCYCLES AS LITHIUM-ION BATTERY MODEL COMPLEXES

Fahmida Islam

Louisiana State University, Baton Rouge, LA

We have successfully synthesized lithium coordination complexes of nitrogen-containing polycyclic aromatic hydrocarbons (nPAHs), to investigate intermolecular interactions, redox reactions, as model complexes for lithium organic cathode materials. Starting with simpler structures like quinoxaline and phenazine, we expanded our scope to more intricate scaffolds, such as triquinoxalinylene derivatives. For these advanced complexes, we employed crowded ß-diketiminato ligands with bulky substituents at the nitrogen atoms, which provide steric protection and stabilize the coordination environment.

O4.13

11:45 DEVELOPMENT OF CARBON BASED MAGNETO-LUMINESCENT NANOMATERIALS FOR BIOIMAGING APPLICATIONS

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

Jackson State University, Jackson, MS

Carbon-based nanomaterials are highly attractive for a variety of applications due to their exceptional properties, including high quantum yield, non-toxicity, and biocompatibility. These characteristics make them ideal candidates for bioimaging, drug delivery, sensing, and catalysis. Additionally, the ease of functionalization enables the customization of their properties to suit specific applications. This work presents a four-step synthetic approach for developing antibody-conjugated magneto-luminescent nanoarchitectures. Initially, biocompatible phenylenediamine-based carbon dots were synthesized, emitting green, yellow, and orange fluorescence at 520 nm, 560 nm, and 600 nm, respectively, through the incorporation of N, O, and S dopants. In the second step, cobalt spinel ferrite ($CoFe_2O_4$) magnetic nanoparticles were prepared via hydrothermal synthesis. These $CoFe_2O_4$ magnetic nanoparticles were then coupled with the carbon dots using 1-ethyl-3-(3-dimethylaminopropyl)-carbodiimide (EDC) and N-hydroxysuccinimide (NHS) mediated esterification reaction. Finally, the magneto-luminescent nanoarchitecture was conjugated with antibodies, resulting in an antibody-functionalized magneto-nanoarchitecture. The synthesized nanoarchitecture demonstrated selectivity in the targeting, capture, and imaging of exosomes derived from cancer cells.

12:00 Lunch

Thursday, March 20, 20254

AFTERNOON

Room Hall D Room 2

O4.14

1:00 SYNTHESIS AND COMPARABILITY OF CONVENTIONAL CHITIN BEADS FOR BIOREMEDIATION ANALYSIS

Guy Gordon, Andrew Doubert, Nathan Prine, Aaliyah Newsome, Trent Selby, Joseph Kazery

Mississippi College, Clinton, MS

Metal and metalloid pollution, known as potentially toxic elements (PTEs), in an aquatic system affects the environment while also affecting public health. Pollution of PTEs comes from a variety of sources from construction to fossil fuels to domestic wastes. Despite the extremely limited removal of tiny inorganic particles and dissolved PTEs from wastewater, remedial techniques do exist. While PTEs cannot be broken down, the principal method of removal is by absorption or adsorption. Bioremediation is the use of naturally occurring substances to break down or remove pollution, as can be used for the removal of PTEs. This study's goal is to use the chitinous waste of crayfish exoskeletons as an adsorption media for PTEs. In this study, we have modified chitin by demineralizing and deproteinating (DMDP) the material to observe its properties. We compared our harvested exoskeletons to lab-grade chitin to observe the quality of our chitin. From there, our harvested DMDP chitin was solubilized at an initial 0.5% with and a 1% concentration of chitin in our bead-making process. The beads of our DMDP beads concentrations were then compared by Brunauer-Emmett-Teller (BET) analysis to observe differences in total surface area, pore size, and pore volume. All of these properties allow for adsorption capability. Once the optimal properties are determined, the chitin beads will be used in an uptake study to determine the rate of uptake and capacity of cadmium.

O4.15

1:15 SYNTHESIS OF ISOINDOLONE PIPERIDINES AS KINASE INHIBITORS: PREPARATION OF PHOTOCHEMICAL STARTING MATERIALS

Elizabeth Hawkins[1], Zoe Elder[1], Tynai Bridges[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, but also on what substituents are tolerated during the photocyclization. The target structures, valmerins, are inhibitors to two key phosphorylating enzymes, glycogen synthase kinase-3 (GSK3) and cyclin-dependent kinases (CDKs). Inhibition of those 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.

O4.16

1:30 THE SYNTHESIS AND TESTING OF HALOFUGINONE AS A TICKBORN DISEASE

Abigail F. Taylor, Brooke L. Warren, Aiden J. Leise, Julie A. Pigza

Chemistry and Biochemistry, School of Mathematics and Natural Sciences, 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).

O4.17

1:45 ELEMENTAL ANALYSIS OF TOMATOES GROWN TRADITIONALLY VERSUS HYDROPONICALLY

Ward Adams, 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.

O4.18

2:00 MONITORING WASTEWATER TO EVALUATE DRUG CONSUMPTION

Haley Franklin, Timothy Ward, Emily Bonura

Millsaps College, Jackson, MS

As the prevalence of pharmaceuticals across the United States increases, concerns about their persistence in our water systems remains an issue. Although drinking water quality is often monitored, there are no federal regulations in place to monitor pharmaceuticals. The possibility remains that pharmaceuticals and their respective metabolites are present in our water systems. To gain insight into how large an issue this may be, i.e., how many drugs and drug metabolites are present at any given time, water samples were collected at different times from various sources. We have developed methods to monitor more than a dozen drugs and their metabolites in wastewater. Collected water samples were filtered, and preconcentrated subsequent to analysis by liquid chromatography - mass spectrometry (LC/MS). Common drugs analyzed in wastewater included cannabinoids, amphetamines, opioids, hallucinogens, and subsequent metabolites. Finally, close monitoring of water systems will better inform officials in decision-making regarding water quality, filtration systems, and contaminants that should be monitored. 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 P20GM103476-22.

O4.19

2:15 DENSITY FUNCTIONAL THEORY STUDY OF TEMPO RADICAL STABILITY

Ashlynn Palmer, Giana Coach, Hua-Jun Fan

Alcorn State University, Lorman, MS

TEMPO (2,2,6,6-tetramethylpiperidinyl-1-yl) and its derivatives play an important role in organic synthesis, material design, biomedical research, and environmental protection. TEMPO's unique stability as a radical under normal conditions makes it versatile for a wide range of practical applications. For example, in medicinal chemistry, TEMPO is used to synthesize chiral compounds and is involved in enzyme catalysis, oxidative stress studies, and the formation of reactive oxygen species (ROS) that affect cellular health. It also serves as an effective radical scavenger and antioxidant in biochemistry and medicine. TEMPO's stability makes it an ideal model for studying electron transfer reactions, which are crucial in fields such as photochemistry, biochemistry, and electrochemistry. Additionally, TEMPO is used to trap and identify transient radicals in reactions, providing valuable insights into the intermediates formed during radical-based reactions, such as in TEMPO-mediated radical polymerization (TERP). Furthermore, TEMPO plays a significant role in green chemistry and sustainable processes, including oxidative C-H activation and water treatment, where it can scavenge unwanted radicals and break down pollutants. Although experimental techniques, such as electron spin resonance (ESR) spectroscopy, have been used to study the behavior of TEMPO's unpaired electrons in various environments, these studies primarily provide information on radical lifetimes, recombination rates, and the effects of solvents or temperature on radical stability. However, a deeper understanding of the mechanisms behind TEMPO's remarkable stability is still lacking. This study aims to apply Density Functional Theory (DFT) to investigate the source of its stability, focusing on the delocalization of the unpaired electron, the contribution of resonance structures, the electron-donating effects of functional groups, and the influence of steric protection provided by bulky substituents. By elucidating the electronic factors that contribute to TEMPO's stability, this research will aid in the design of new radical species with tailored properties for specific applications, further cementing TEMPO's importance in a wide range of chemical and industrial fields.

O4.20

2:30 NOVEL PYRIDINE SYNTHESES FOR DEVELOPMENT OF HIV INTEGRASE INHIB

Tyler Twedt[1], Christopher T. Bruni[1], Sharon Suffern[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 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 challenging but essential

side-chain in the 3-position, a methine carbon carrying a tert-butoxy group attached to a carboxylic acid, requires the insertion of a carbon in the correct oxidation state if starting from traditional pyridine syntheses. To avoid some of the challenging steps, novel pyridine syntheses are employed with include the correct number of carbons in the 3-position. Preparation and modification of those compounds is discussed in this presentation. 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.

THURSDAY, March 20, 2025

EVENING

4:00 DODGEN LECTURE /AWARDS CEREMONY

Hall B

5:00-7:00 GENERAL POSTER SESSION
(Immediately following Dodgen Event)

P4.01

ANALYSIS OF COMPLEX VISIBLE LIGHT SPECTRA USING MICROSOFT EXCEL

Charles Smithhart Johnathan H. McCaskill

Delta State University, Cleveland, MS

The use of simultaneous equations or matrices to quantitatively determine the composition of two- or three-component mixtures using visible light spectrometry is a common technique taught in undergraduate Analytical chemistry.[1] In this method, the absorbance, A, of a mixture at a particular wavelength equals the sum of the absorbances of all light-absorbing species in the solution:

$$A = e_x b[X] + e_y b[Y] + e_z b[Z] + \ldots$$

where e is the molar absorptivity coefficient, b is the path length in cm and concentration is expressed in molarity. A number of equations equal to the number of components must be solved simultaneously to determine the concentration of each component. A single wavelength which represents each component is selected for these calculations. This work will attempt to use -all discrete absorbance values in both the component and unknown spectra (i.e. - several hundred absorbances) to determine if the method can be extended to an arbitrary number of components in a complex unknown's spectrum. The results of several approaches will be investigated, including the use of simultaneous equations and matrices using Microsoft Excel®. Quantitative Chemical Analysis, Daniel C. Harris, 9th ed., pp.461-465

P4.02

RADIOACTIVITY STUDIES ON SLUDGE SAMPLES COLLECTED FROM LOCAL WATER TREATMENT FACILITIES

Sanqunetta Givens, Jermiah Billa, John Adjaye

Alcorn State University, Lorman, MS

Water is one of the basic means for survival of living organisms. Prior to supplying water to their citizens, the City and County authorities tend to purify water by following advanced procedures as water is collected from sources such as ground, river, lake etc. Being part of earth's crust/ surface, water tends to dissolve nutrients and elements that may be present in soils. Levels of these nutrients in water are highly dependent on location, geological formation of ground, and presence of human activities near the water source. In this context, a study is conducted on the evaluation of radioactivity levels in sludge samples collected from treatment plants within three different cities located in South-West Mississippi. Sludge samples collected from the treatment plants are dried and analyzed for the presence of natural radioactivity (K-40, Ra-226, and Th-232, etc.) as well as possible man-made radioactivity. Sample analyses are performed using a high purity germanium detector with a relative efficiency of 35%. Further, the obtained radioactivity values are compared with the documented average values for K-40, Ra-226, and Th-232 concentrations in drinking water sludge samples.

P4.03

RADIOACTIVITY IN SOILS FROM COAL ASH PONDS

Sedomda Kpikpitse, Jermiah Billa, John Adjaye

Alcorn State University, Lorman, MS

The demand for energy is increasing drastically. Coal is one of the dominant fossil fuel sources that is abundantly available and is used in thermal power plants. In the United States, coal contributes about 25% of electricity generation. However, the contribution of coal to the world's total energy production is around 40%. During the coal combustion process, coal fly and bottom ashes containing natural radionuclides in higher concentrations are released into the environment. Disposal of the coal bottom ash in open and unlined ponds causes environmental contamination via migration of radionuclides into soils and water. Eventually these processes will increase the concentrations of natural radionuclides in aquifer system. To estimate the levels of natural radionuclides in soils near a coal ash pond in state of Mississippi, a set of 40 samples were collected in the Area of Interest (AOI) and evaluated using gamma-spectroscopic techniques. The mean activity concentrations of Ra-226, Th-232 and K-40 were determined to be (37.56 ± 10.47) Bq kg^{-1}, (38.43 ± 7.68) Bq kg^{-1}, and (260.26 ± 71.19) Bq kg^{-1} respectively, in air dried soil samples. The obtained mean concentration values are statistically compared to the world-wide average concentrations of selected isotopes using a one-tailed t-test at 95% confidence interval (CI). The results of this study were used to assess the various radiation hazard indices of soil to the residents of the area. Based on the activity values

obtained from this study, the average outdoor absorbed dose was estimated to be (52.07 ± 0.64) nGy/hr.

P4.04

RADIOACTIVITY TRANSFER FACTORS IN SWEET POTATOES

Dearrius White, Jermiah Billa, John Adjaye

Alcorn State University, Lorman, MS

Plants absorb various nutrients present in soils and ground water via the root system during their growth period. To improve crop yields, farmers add fertilizers to soils and plants tend to uptake nutrients in fertilizers during their growth process. Presence of radioisotopes in soils may result in uptake of radioisotopes into plants which will eventually accumulate in the edible parts of the plants. Root plants such as sweet potatoes would be an excellent source for providing information on uptake rates of nutrients from the soils. Being one of the prominent producers of sweet potatoes in the country, in year 2017 the state of Mississippi harvested 29,000 acres of sweet potatoes with production value of $123 million. Soils and sweet potatoes produced from Claiborne County of Mississippi were analyzed for the key isotopes of Ra-226, Th-232, and K-40 using a high purity germanium detector of 35% relative efficiency. Using the measured radioactivity values, the isotopic transfer factors (TF) from soils to edible parts of sweet potato plants were computed. As there is limited or no information on the levels of isotopic concentrations in sweet potatoes produced in the region of interest, results from this study serve as a template for researchers and agriculturalists on the levels and uptake rate of nutrients (radioisotopes) in sweet potatoes.

P4.05

ARE TOBACCO PRODUCTS SAFE - A RADIOACTIVITY BASED STUDY

Chukwuka James, Jermiah Billa, John Adjaye

Alcorn State University, Lorman, MS

Plant based materials consists of trace quantities of radioactive materials as plants uptake nutrients present in soils during their growth period. The soils contain naturally occurring elements and farmers tend to enhance nutrients in soils via the application of fertilizers. As fertilizers are derived from rocks cored from earth's surface, they may contain Naturally Occurring Radioactive materials (NORM) such as Ra-226, Th-232, and K-40. Since manufacturers tend to enhance the key elements (potassium and phosphorus) in fertilizers which results in increased concentrations of NORM activities, the fertilized soils may accumulate enhanced quantities of these NORM. One of the leaf-based products, the tobacco leaves, commonly used in the form of cigarettes, cigars, fresh tobacco leaf etc. in the US is widely cultivated in the states of Kentucky and North Carolina. To experimentally measure any radioisotopes present in tobacco leaves, a study was performed on Tobacco leaves collected from Madison County in the State of Kentucky (KY). Gamma spectrometry was performed on Tobacco leaves using a 35% relative efficient Solid-State Detector (Germanium Detector) for various gamma emitting radioisotopes. Results suggest the presence of Ra-226, Th-232, and K-40 (NORM isotopes) and man-made Cs-137 isotope. Based on the obtained experimental radioactivity values, radioactive dose from smoking tobacco leaves was estimated. This study concludes that further evaluation is required as trace quantities of Cs-137 (a man-made) isotope is present in the leaves, because the State of KY does not operate any commercial nuclear plants or there is no presence of nuclear plants in the vicinity of Madison County.

P4.06

RADON LEVELS IN GROUND WATER OF ALCORN STATE UNIVERSITY CAMPUS

April Jones, Jermiah Billa, John Adjaye

Alcorn State University, Lorman, MS

Located in rural Mississippi in the counties of Claiborne and Jefferson, Alcorn State University serves approximately 5,000 students and 500 staff members. Water supply for ASU is provided by wells (Ground Water) located on the campus. Ground water primarily consists of Radon (Rn-222), a colorless and odorless radioactive gas that is naturally present in soils and is one of the daughters of U-238. Depending on the geography, types of soil, and types of rocky materials in the earth's crust, the levels of radon significantly varies. According to the EPA, it is recommended that the community water suppliers must provide drinking water to the citizens with Radon levels no higher than 4,000 pCi/L. Per EPA, Claiborne and Jefferson counties are sunder radon zone 3 (Counties with predicted average indoor radon screening levels less than 2 pCi/L). However, there is limited data on the levels of Radon in groundwater within the region of interest. A pilot study is executed to measure Radon concentration levels in water collected from wells that supply water to ASU community using an Alpha Guard Professional Radon Meter. Multiple samples were collected (at least 10 samples for week and for up to 3 months) and analyzed for Radon concentration so that statistically justifiable and reliable results are obtained. The presented data consist of a comparison of measured radon concentration values in drinking water evaluated in this study to the EPA's recommendations on radon concentration in drinking water.

P4.07

EFFICIENCY OF SOLID-STATE DETECTORS USING EXPERIMENTAL AND COMPUTATIONAL METHODS

Zehlin Cornett, Jermiah Billa, John Adjaye, Manoj Bolugallu Padmayya

Alcorn State University, Lorman, MS

Radiation Measurement and Detection is a random process. Unless radiation decays radiation cannot be detected. More importantly, not every particle emitted from a source is detected. Typically, a unique quantity- efficiency of the detector plays a major role in radiation measurement and detection. Radiation present in any sample is obtained by taking the ratio of radiation count rate to efficiency of the detector. Additionally, radiation is measured based on the energy emitted by the isotopes and efficiency of the detector is different for different isotopes. This research focuses on finding efficiency of a Solid-State Detector using experimental and computation methods. As part of this effort, a National Institute of Standards and Technology (NIST) traceable mixed gamma standard of capacity 0.5 L Marinelli beaker (consisting of various gamma emitting isotopes in the range of 0 to 2000 keV) was purchased from Eckert and Zeigler, USA. Experiments were conducted by placing mixed gamma standard and counting for about 60 minutes. The solid-state detector is connected to a computer via the Analog to Digital (ADC) converter and efficiency was computed using software GENIE-2000 (developed by Canberra, USA). Obtained results (experimental and computational) were compared and are within 5% uncertainty. Computational methods are required when finding efficiency of irregular objects that may have been contaminated with radiation.

P4.08

PET FOOD SAFETY CONCERNS: TOXIC METAL ANALYSIS OF CAT FOOD PRODUCTS

Swizel Fernandes, Nilay Kantibhai Zalavadiya, Anuradha Ragila, Ashley Carter, Hinaben Patanvadia, Harsh Bharatbhai Patel, Katee Herman, Zarina Lala, Alya Shanklin, Mallory Wilbanks, Christina Raley, Jaylen Vance, Wilson Hooker, and Scoty Hearst

Chemistry and Biochemistry Department, Mississippi College, Clinton, MS

Toxic metals contamination is a current concern worldwide due to its toxicity, intrinsic persistence, non-biodegradable nature, and cumulative characteristics requiring vigilant surveillance. There is a growing concern about contamination of toxic metals in pet food products due to the great potential for health risks of these elements. Some studies have reported toxic metals in commercial pet foods due to poor quality ingredients used by the pet food industry. The goals of this study were to evaluate the concentrations of toxic metals in cat food products and assess their threat to pet health using consumption safety analysis. Our results will reveal the level of toxic metals in cat food products purchased in our local area and compared those level to the maximum tolerated level. Overall, this data will indicate the consumption safety of various cat food products and their threat to the health of pets.

P4.09

TOXIC METAL ANALYSIS: CONSUMPTION SAFETY OF FARM RAISED AND WILD CAUGHT SALMON

Ashley Carter, Stan Baldwin, and Scoty Hearst

Chemistry and Biochemistry Department, Mississippi College, Clinton, MS

Aquatic pollutants, such as toxic metals are a threat to human and animal health. Heavy metal pollution in aquatic environments is a growing global human health concern requiring vigilant surveillance. Aquatic environments are home to many species of wildlife including fish species harvested for human consumption potentially exposing human to toxic metals. Salmon are an important commercial fish species that can contain toxic metals, including mercury, cadmium, lead, and arsenic. We performed consumption safety testing based on toxic metal analysis of farm raised and wild caught salmon purchased in our local area. Our research indicated that the levels of toxic metals in farmed salmon were lower and below the legal limits as compared to wild caught salmon. Farm raised salmon are grown in an environment, where water and feed standards are controlled to ensure fish quality. Overall, consumption safety analysis revealed farm raised salmon as a healthier choice for consumers as compared to wild caught salmon.

P4.10

ENCAPSULATION OF LEMONGRASS OIL IN CHITOSAN NANOPARTICLES: A SUSTAINABLE SOLUTION FOR WOOD PRESERVATION

Nauman Ahmed, Gwendolyn Boyd-Shields

Department of Sustainable Bioproducts, Mississippi State University, Starkville, MS

The increasing emphasis on sustainable wood-based materials for construction and furniture has necessitated the development of innovative solutions to address wood degradation caused by fungi and termites. The use of conventional chemical preservatives, while effective, is often associated with toxicological risks, inadequate penetration, and insufficient retention, highlighting the need for environmentally friendly alternatives. Essential oils, particularly lemongrass essential oil (LGEO), have been identified as promising candidates for wood preservation due to their natural origin, non-toxic properties, and potent antimicrobial and antioxidant activities. However, the volatility and instability inherent in essential oils have posed significant challenges to their long-term application and efficacy. To address these issues, the encapsulation of essential oils in chitosan nanoparticles (CSNPs) has been proposed as an advanced approach to enhance their stability and bioactivity, enabling effective and sustained wood protection. The antimicrobial potential of essential oils is combined with the structural benefits of chitosan through the development of LGEO-loaded CSNPs (L-CSNPs), allowing for superior

penetration and retention in wood. In this review, the synthesis and characterization of L-CSNPs are discussed, with particular attention given to particle size, morphology, and loading efficiency, as evaluated using dynamic light scattering (DLS) and UV-Vis spectrophotometry. The inhibitory effects of L-CSNPs against wood-degrading fungal agents are examined through fungal inhibitory assays, and their stability is assessed using leaching tests, which also analyze the composition of treated wood and leachate. The potential of CSNP-encapsulated essential oils to function as sustainable wood preservatives is highlighted, offering a dual-action mechanism for protection against fungal and termite agents. By addressing the limitations of volatility and instability, this technology is shown to align with global efforts to promote environmentally friendly materials and foster sustainable innovations in wood preservation.

P4.11

DFT STUDIES OF FENTANYL INTERACTIONS WITH DIFFERENT PROTIC POLAR SOLVENTS

Arati Biswakarma, Wujian Miao

The University of Southern Mississippi, Hattiesburg, MS

The solubility of fentanyl (N-(1-(2-phenylethyl)-4-piperidinylium)-N-phenyl-propanamide) varies significantly in common protic polar solvents such as water, methanol, ethanol, isopropyl alcohol, and acetic acid, despite their ability to form H-bond with fentanyl. To understand the molecular-level interactions responsible for these differences in solubility, we conducted quantum computational studies using Density Functional Theory (DFT). This study includes structural optimization, energy calculation, atomic charge distribution, dipole moment analysis, and electron density evaluations for the solvents and their complexes with fentanyl. The geometries of all molecules were optimized using the B3LYP functional with the 6-311++G (d,p) basis set. The stability of the complexes formed through interactions between fentanyl and each solvent was also assessed. Our finding provides insight into the role of molecular interactions in influencing the solubility of fentanyl in these polar solvents.

https://ibb.co/HCWCknN Figure. Optimized structure of fentanyl with mulliken charges on atoms.

P4.12

COMPARISON OF SUGAR CONTENT, pH, NUTRITIONAL ELEMENTS, AND LYCOPENE LEVELS IN MULTIPLE VARIETIES OF HEIRLOOM AND HYBRID TOMATOES

Anuradha Ragila

Mississippi College, Clinton, MS

The tomato is an edible berry of the *Solanum lycopersicum* plant and native to South America, Mexico, and Central America. Tomatoes are consumed in diverse ways: raw or cooked, and in many dishes, sauces, salads, and drinks. Tomatoes are now grown all around the world, where the USA produced close to 10 million tons each year. Tomatoes are low in calories and provide important nutrients like vitamin C and potassium. A raw tomato is 95% water, contains 4% carbohydrates, and has less than 1% each of fat and protein. Tomatoes are also rich in antioxidants such as lycopene, which gives tomatoes' their characteristic color. Lycopene is said to reduced risk of heart disease and certain cancers. In this study, we compare the sugar content, pH, and lycopene levels of many different varieties of heirloom and hybrid tomatoes. The information provided in this study can be useful to those on a restricted sugar diet, such as diabetics. Also, these results can be helpful for those seeking particular varieties with higher levels of antioxidants for added health benefits.

P4.13

SYNTHESIS OF MACROCYCLIC DIAMINOPOLYPHENYLETHYNYLARENES

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Conjugated dendrimers are known for their ability to harvest light. Typical dendrimers, or those that are more well known, can lose conjugation because there is no stability in the dendrons to keep them from twisting at single bonds. This instability increases with increasing size of the dendrimer. The loss of conjugation leads to a reduction in the ability of the dendrimers to harvest light. Planar conjugated dendrimers, however, would likely be better candidates for harvesting light due to the functional group linkages in the dendrons. The focus of this project is on using bridged amine or imine linkages to potentially stabilize a planar dendrimer. With these bridged-linkages, the dendrimer cannot lose its conjugation, regardless of size. As a result, the dendrimer's ability to harvest light is not affected or lost, making it more effective and more efficient than three-dimensional dendrimers. Before attempting the lengthy synthesis of such dendrimers, we are preparing smaller model systems in order to optimize reaction conditions and verify the hypothesis mentioned above. To prepare these model compounds, 3-ethynylbenzeneamine was reacted with 1,2-diiodobenzene under Sonogashira reaction conditions. Current work involves cyclizing the diamino molecule through formation of a carbon bridge between the two nitrogen atoms.

P4.14

DEVELOPMENT OF AN ORGANOCATALYZED NUCLEOPHILIC ADDITION OF MASKED ACYL CYANIDES TO AZOMETHINE IMINES

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Noncovalent interactions (NCIs) are the collection of both favorable and unfavorable interactions between molecules and include hydrogen-bonding, ion-dipole, and π-π interactions. Squaramide organocatalysts can catalyze a wide range of reactions by taking advantage of NCIs via

two routes namely chiral anion catalysis and dual activation. Masked acyl cyanide (MAC) reagents are useful reagents that serve as a masked oxidation state 3 nucleophilic equivalents. Due to their weakly acidic methine hydrogen they can be activated by a mild base, such as a tertiary amine, which makes them compatible in organocatalyzed reactions. Azomethine imines are substrates containing a 1,3-dipole and can participate in various addition reactions. This work describes the squaramide organocatalyzed addition of MAC reagents to azomethine imines. The goal is to explore two different MAC reagents, one with an ether protecting group called MOM-MAC and the other with a silyl protecting group called TBS-MAC. Various azomethine imines were synthesized in two steps with different electronic properties, varying the substituent at the para-position of the aromatic ring. The organocatalyzed reactions were screened using achiral squaramide organocatalysts to produce racemic mixtures. The goal is to extend the reactions to the use of chiral squaramide organocatalysts to produce enantiopure products that have these nitrogen heterocycles with biological activities commonly found in pharmaceuticals and herbicides.

P4.15

CREATING ANIMATIONS AND VIDEOS TO AID IN TEACHING CHEMISTRY

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Visualization plays a crucial role in enhancing the understanding of complex concepts in chemistry. Educational research identifies three primary learning styles—auditory, visual, and kinesthetic. This project addresses two of these styles—visual and kinesthetic—by developing animations and videos to aid in the comprehension of chemical principles. Topics such as symmetry and group theory, which are inherently difficult to visualize, can be significantly improved through dynamic visual aids. The principal investigator, Dr. Joe Bentley, operates a YouTube channel (DrJoeBentley) that features instructional videos and animations, including those focused on methane and other molecular structures. These resources are primarily intended for Delta State University students but are freely accessible online to anyone interested in deepening their understanding of these challenging chemistry topics.

P4.16

SUNLIGHT-ENHANCED, PHOTOTHERMAL-SUPPORTED PHOTOCATALYTIC ELIMINATION OF SUPERBUGS UTILIZING A PLASMONIC GOLD NANOPARTICLE-COATED WO3 NANOWIRE HETEROJUNCTION

Shivangee Rai

Jackson State University, Jackson, MS

Methicillin-resistant Staphylococcus aureus (MRSA) has become a significant threat in healthcare facilities around the globe. According to a source from the Centers for Disease Control and Prevention (CDC), MRSA is responsible for a significant number of hospitalizations and deaths each year due to its resistance to many common antibiotics [1]. This situation necessitates the development of novel therapeutic strategies. This study investigates the potential of a photocatalytic composite material comprised of gold nanoparticles (AuNPs) and WO3 nanoflake (NF) for eradicating MRSA. The AuNPs-WO3 NF composite exhibited strong photocatalytic activity when exposed to visible light irradiation. The combined effect of AuNPs and WO3 NFs improved the production of reactive oxygen species (ROS), which effectively killed MRSA. This work highlights the potential of nanomaterial-based photocatalysis for combating antibiotic-resistant bacteria.

P4.17

SYNTHESIS OF CARBON DOTS FROM LEMON PEEL FOR SUSTAINABLE NANOMATERIAL APPLICATIONS

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Carbon dots (CDs) have emerged as a promising class of carbon-based nanomaterials with diverse applications, including bioimaging, drug delivery, and sensors. This study presents a novel and eco-friendly approach to obtain carbon dots from lemon peel waste, a readily available and renewable resource. The synthesis process involves a simple, cost-effective, and environmentally benign method, contributing to the development of sustainable nanomaterials. The lemon peels underwent a preliminary cleaning process with deionized water and were subsequently dried in an oven for a duration of 2 hours. Following this, the dried peels were finely powdered and weighed. The powder was subjected to a heat treatment in a muffle furnace at 200 degrees Celsius for 2 hours. The resulting material was then dispersed in 60 ml of deionized water and subjected to an hour of sonication. The synthesized carbon dots were characterized using various techniques, including UV-Vi's spectroscopy, fluorescence spectroscopy, scanning electron microscopy (SEM), and transmission electron microscopy (TEM), to confirm their structural and optical properties. The obtained carbon dots exhibited excellent photoluminescent properties, with strong fluorescence emission under ultraviolet (UV) light excitation. The size distribution and morphology, as revealed by TEM and SEM analysis, demonstrated the formation of well-dispersed and uniform carbon dots with an average size in the nanometer range. This research contributes to the growing field of nanotechnology.

P4.18

SIZE CONTROL OF IRON OXIDE NANOPARTICLES FOR HIGH PERFORMANCE T1 CONTRAST AGENT IN MAGNETIC RESONANCE IMAGING

Bosede Kolawole

Jackson State University, Jackson, MS

Magnetic Resonance imaging is one of the main procedures used to provides both anatomical and functional information with quality images in in vivo imaging procedures. MRI uses non-ionizing radiation which helps to avoid some side effects. Contrast agents are used to enhance the image contrast during MRI. Iron oxide nanoparticles is a promising alternative to conventional contrast agent for Magnetic Resonance imaging due to its biocompatibility and its excellent magnetic properties. In MR imaging, when magnetic nanoparticles are added to the tissue of the patient and accumulated, the longitudinal and transverse relaxation of surrounding protons from the nanoparticles will be shortened, resulting in a contrast enhancement. This research is focused on the size control of iron oxide nanoparticles using Bovine serum albumin protein via the chemical co-precipitation method. The nanoparticles formed ranges from approximately 4-8nm. These nanoparticles are water soluble which will encourage a lot of biomedical applications. The smallest nanoparticles (approximately 4nm) formed have shown to possess T1 contrast effect.

P4.19

DIVERSIFICATION OF THE HMDS AND BORANE-THF REACTION: PROBING INTERMEDIATES AND EXPANDING REACTIVITY THROUGH MODIFIED SILYLAMINES TO SYNTHESIS N-SUBSTITUTED BORAZINE

Al Maruf

Louisiana State University, Baton Rouge, LA

The reaction between $HN(SiMe_3)_2$ and BH_3•THF have been shown to produce tris(trimethylsilyl)borazine. Wrackmeyer has used ^{29}Si and ^{11}B NMR to probe the intermediates in the reaction including amino boranes, borylamides, bis(amido)boranes, and diborylamines. Our lab is focused on trying to diversify this reaction by utilizing different silylamine starting materials. By altering the steric and electronic parameters of the silylamine, we aim to isolate and incorporate analogous intermediates to the tris(trimethylsilyl)borazine reaction. Our efforts towards this pursuit will be presented.

P4.20

CHARACTERIZATION OF CHITOSAN FOR BIOREMEDIATION THROUGH BEAD STRUCTURE ANALYSIS

Aaliyah Newsome, Nathan Prine, Andrew Doubert, Guy Gordon, Trent Selby, Joseph Kazery

Mississippi College, Clinton, MS

Metal and metalloid pollution negatively impacts ecosystems, the environment, and public health. Also known as potentially toxic elements (PTEs), PTE pollution comes from many sources including fossil fuels, construction, and domestic wastes. These PTEs in water treatment plants are not effective at removing dissolved or small inorganic substances in wastewater. However, there are other methods of remediation. Due to PTEs not being degradable the principal method of removal is by sorption processes. Bioremediation is the use of naturally occurring substances to break down or remove pollutants, in this case, PTEs. This study uses the chitinous cuticle (exoskeleton) of crayfish as an adsorption media for PTEs. In this study, modifications were made to chitin by deproteinating and demineralizing the material to observe its properties. A common derivative of chitin is chitosan. Chitosan is a linear polysaccharide obtained by the process of deacetylation of chitin. In this study, we compared our harvested exoskeletons to lab-grade chitosan to observe the quality of our pure chitosan. Our chitosan was then solubilized at two different concentrations to form 5% and 8% chitosan beads. The beads were then compared to observe differences in total surface area, pore size and pore volume; which are properties of overall porosity quantifying their adsorption capability. Once the optimal properties are determined, the chitosan beads will be used in an application study to determine the rate of uptake of cadmium and overall capacity of cadmium concentration adsorbed.

P4.21

METAL AMIDO COMPLEXES OF POLYCYCLIC AROMATIC HETEROCYCLES AS VEHICLES FOR THE INVESTIGATION OF MOLECULAR MAGNETISM

Ekanayaka Arachchige Uthpala Nayomi

Louisiana State University, Baton Rouge, LA

Due to their unique electronic and magnetic properties, there has been considerable interest in the synthesis and magnetic properties of two—and three-coordinate transition-metal complexes. In this work, we investigate the reactivity of nitrogen-containing polycyclic aromatic heterocycles (PAHs) with open-shell metal silylamides in an effort to construct polynuclear low-coordinate complexes. The complexes have been structurally (single-crystal x-ray diffraction) and electronically (UV-vis, IR) characterized, and their electrochemical (Cyclic voltammetry) and magnetic properties (SQUID) have been analyzed. Informed by the electrochemical data, the chemical reductions of the PAH-bridged cobalt and iron complexes were carried out in the presence of 2,2,2-cryptand using KC_8.

P4.22

LITHIUM COORDINATION COMPLEXES OF NITROGEN-CONTAINING POLYAROMATIC HETEROCYCLES AS LITHIUM-ION BATTERY MODEL COMPLEXES

Fahmida Islam

Louisiana State University, Baton Rouge, LA

We have successfully synthesized lithium coordination complexes of nitrogen-containing polycyclic aromatic hydrocarbons (nPAHs), to investigate intermolecular interactions, redox reactions, as model complexes for lithium organic cathode materials. Starting with simpler structures like quinoxaline and phenazine, we expanded our scope to more intricate scaffolds, such as triquinoxalinylene derivatives. For these advanced complexes, we employed crowded ß-diketiminato ligands with bulky substituents at the nitrogen atoms, which provide steric protection and stabilize the coordination environment.

P4.23

DEVELOPMENT OF CARBON BASED MAGNETO-LUMINESCENT NANOMATERIALS FOR BIOIMAGING APPLICATIONS

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

Jackson State University, Jackson, MS

Carbon-based nanomaterials are highly attractive for a variety of applications due to their exceptional properties, including high quantum yield, non-toxicity, and biocompatibility. These characteristics make them ideal candidates for bioimaging, drug delivery, sensing, and catalysis. Additionally, the ease of functionalization enables the customization of their properties to suit specific applications. This work presents a four-step synthetic approach for developing antibody-conjugated magneto-luminescent nanoarchitectures. Initially, biocompatible phenylenediamine-based carbon dots were synthesized, emitting green, yellow, and orange fluorescence at 520 nm, 560 nm, and 600 nm, respectively, through the incorporation of N, O, and S dopants. In the second step, cobalt spinel ferrite ($CoFe_2O_4$) magnetic nanoparticles were prepared via hydrothermal synthesis. These $CoFe_2O_4$ magnetic nanoparticles were then coupled with the carbon dots using 1-ethyl-3-(3-dimethylaminopropyl)-carbodiimide (EDC) and N-hydroxysuccinimide (NHS) mediated esterification reaction. Finally, the magneto-luminescent nanoarchitecture was conjugated with antibodies, resulting in an antibody-functionalized magneto-nanoarchitecture. The synthesized nanoarchitecture demonstrated selectivity in the targeting, capture, and imaging of exosomes derived from cancer cells.

P4.24

LINEAR-ATTENUATION COEFFICIENTS OF VARIOUS SHIELDING MATERIALS

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Shielding of radioactive sources such as X-rays and Gamma rays is an important sub-field of external dosimetry. Shielding process gets more complicated as radiation sources tend to emit a wide range of energies. The Linear-Attenuation Coefficient (LAC) of materials is one of the important physical properties commonly considered prior to choosing any material for shielding purposes. In this study, a simple experiment was performed to calculate LAC of three different materials (Lead, Copper, and Aluminum). Gamma spectrometric analyzes were performed on three materials using a 35% relative efficient high-purity germanium detector (HPGe) and Cs-137 point source. The results obtained indicate that the LACs of the three materials considered in this research work are close to the standard LACs for the respective materials. However, it was noticed that these materials are not in the pure form and may be in the form alloys, which resulted in a deviation from the expected/standard values of LAC for the three materials considered in this study. As expected, lead is a better shielding material compared to the other two materials considered in this study.

P4.25

RADIOACTIVITY IN SELECTED FERTILIZERS AND THEIR RADIOLOGICAL HEALTH IMPLICATIONS

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Fertilizers are part of farming industry and they play a major role in improvement of plant growth and enhancement of crop yields. One of the essential elements, potassium, helps in root growth and drought resistance of plants. Depending on soils fertility, farmers tend to provide potassium in the form of potash fertilizer which is derived from potash rock cored from earth's crust. Rocks derived from the earth's crust consist of trace quantities of Naturally Occurring Radioactive Materials (NORM) and NORM concentrations significantly vary based on rock type, geographical location, and concentration of the rock. Potash is a commonly used fertilizer derived from potash rock and to increase concentration of potassium, manufacturers increase percentage of potash which can eventually enhance radioactive concentrations (specifically K-40) in fertilizers. To exactly estimate and experimentally verify the levels of radioactive K-40 in selected fertilizers (0-0-60), a study was performed on fertilizers available in local market. K- 40 was theoretically estimated by considering the half-life; molar mass; and decay constant while experimental studies were carried out by performing gamma-spectroscopy. Obtained results for radioactivity concentrations of K-40 from theoretical estimation and gamma spectroscopy are 15, 110 and 15, 162 Bq kg^{-1} respectively. Results suggest that both experimental and theoretical K-40 values are compatible. Further, obtained results are compared to average K-40 concentration in soils within the US. Lastly, radioactivity based radiological health hazard indicating parameters are

computed. Results indicated that radiological health hazards to living organisms from potassium enhanced fertilizers considered in this study are significantly higher to the world-wide averages of health hazard indicating parameters. This study strongly suggests that it is imperative that stringent recommendations are developed in handling and usage of these radioactivity enhanced materials.

P4.26

K-40 RADIOACTIVITY IN WATER-SOFTENERS

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Water is one of the essential entities in human lives. In the U.S., citizens living in urban areas completely rely on city water, while a vast majority of rural Americans rely on ground water. Depending on the location, water sources may consist of salts and to remove salts present in water sources, consumers add water softeners prior to using water for various purposes. One of the southern states in the U.S., the state of Mississippi consists of ~52% of rural population and vastly relies on ground based water systems. It is highly possible that citizens in these rural areas tend to use water softeners to reduce salts such as Calcium, Magnesium, and others. One of the prominently used water softeners, Potassium Chloride (KCl), consists of radioactive Potassium-40 and depending on the source of the potassium; water softeners consist of varied amounts of radioactive (K-40). In this context, a pilot study is proposed with a goal of theoretically estimating and experimentally measuring K-40 via the gamma spectroscopic analyses. Based on the obtained results, a statistical comparison of theoretical and experimental K-40 concentrations was performed using a one-tailed t-test at 95% confidence interval.

P4.27

TOXIC METAL ANALYSIS OF *Alligator mississippiensis* SPECIMENS FROM THE MISSISSIPPI RIVER NEAR DAVIS ISLAND

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American alligators (*Alligator mississippiensis*) are important members of river and wetland ecosystems, and are regarded as keystone species. Elevated levels of toxic metals in alligators from many wetland locations across the South Eastern USA have been to linked to infertility and population decline. The level of toxic metals in alligators from the Mississippi River have not be evaluated in decades and remains unknown. Alligator meat is also an important food source consumed by humans potentially exposing humans to toxic metals. Our previous studies indicated that toxic metals were elevated in predatory fish in the Mississippi River near Davis Island. The purposes of this study were to estimate the levels of toxic metals in alligator tissues and evaluate any human consumption hazards. We collected 3 alligators under 6ft in length and measured toxic metals (As, Cd, Cr, Hg, and Pb) in their tissues using an ICP-OES. Human health hazard assessments were performed to estimate consumption hazards from alligator meat from this location. Overall, our data indicated that mercury levels may be of concern in alligators from this location warranting larger scale studies throughout the Lower Mississippi River Basin to fully assess this threat to humans and alligator populations. 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.

P4.28

RADIOACTIVITY STUDIES ON LOCAL CATFISH

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Being part of surface water based resources, fish tend to uptake various elements/pollutants (if present) that may have been naturally or artificially (due to man-made activities) present in soils and water bodies. Levels of these pollutants could be impacted by factors such as size of the fish, naturally present elements in soils and water, and more importantly presence of man-made activities in the vicinity of water bodies. In this context, fish native to lower Mississippi region - Channel catfish (Ictalurus punctatus), are collected and analyzed using a 35% efficient solid-state detector for man-made and naturally occurring isotopes. For a better understanding, 10 fish samples from local catfish farms were collected and analyzed for man-made and naturally occurring isotopes. Doses resulted from consumption of these fish (River catfish and farm catfish) are estimated considering the levels of experimental radioactivity values. Results suggested presence of trace quantities of naturally occurring radioactive materials in both sets of catfish. As there are many human/industrial activities carried out along the Mississippi river, similar studies must be performed on an ongoing basis as there may be accidental releases from these industries into the river and the fish can uptake these wastes. The overall goal is to assess the doses from consumption of local fish and

compare the obtained doses to the Nuclear Regulatory Commission (NRC) recommended safety dose levels for the public.

P4.29

PHOTOCHEMICAL KEY STEPS IN THE SYNTHESIS OF ISOINDOLONE PIPERIDINES AS KINASE INHIBITORS: ASYMMETRIC PHOTOCHEMICAL CYCLIZATION

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Cyclization reactions are used in many syntheses of medicinal compounds and control of the regio- and stereochemistry is vital to ensure efficient yields. Isoindolone piperidines are used as inhibitors to target two important enzymes in cancer cells, glycogen synthase kinase-3 (GSK3) and cyclin-dependent kinases (CDKs). Valmerins are isoindolone piperidines that have been shown to inhibit GSK3/CDK enzymes during cell proliferation. In this project, we are using a photochemical key step to synthesize valmerin derivatives. To form the piperidine ring, the photodecarboxylative cyclization is employed and phthalimide is used as a chromophore to induce an electron transfer reaction with the terminal carboxylate. The syntheses are initiated from affordable building blocks and should culminate in the stereo-controlled synthesis of the target molecules. 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. 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.

P4.30

FISH AS ENVIRONMENTAL SENTINELS FOR METAL CONTAMINANTS OF HUMAN HEALTH CONCERN IN THE LOWER MISSISSIPPI RIVER BASIN

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Metal pollution in the river systems across the US is a major health concern for humans, domesticated animals, and wildlife. The level of metal contamination in fish from the Lower Mississippi River Basin and their threat to public health have not been evaluated in decades. The goals of this study were to measure metal contamination in fish species, evaluate human consumption risk, and estimate bioindicator potential for monitoring studies on a larger scale. Various fish species (n = 203) were analyzed for metal contaminants (Al, As, Ba, Cd, Co, Cr, Cu, Fe, Hg, Mg, Mn, Ni, Pb, Se, and Zn). Based on human consumption safety results, As, Cd, Cr, Hg, and Pb are a major concern in this location. Non-cancerous Human Health Hazard assessments indicated blue catfish, flathead catfish, gar species, and freshwater drum as species of concern. Consumption of all species tested posed human cancer risks. Decision tree modeling identified Hg, Pb, Zn, Cr, Co, As, and Cd as major drivers of consumption safety. Bioaccumulation factor analysis found Hg and Cd to be bioaccumulative in predatory fish species. Overall, our data indicated that fish can serve as selective environmental sentinels useful for monitoring toxic metal pollutants of public health concerns providing valuable insight to research scientist and monitoring agencies. Our results also warrant larger scale studies throughout the Lower Mississippi River Basin. 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.

P4.31

TAKE ME DOWN TO THE PARASITE CITY WHERE THE FISH ARE INFECTED IN THE MISSISSIPPI

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Emerging infectious diseases pose an ongoing threat to human and animal health. Zoonotic parasites in aquatic environments are a growing global human health concern requiring vigilant surveillance. The Mississippi River is home to hundreds of species of wildlife including fish species harvested for human consumption potentially exposing humans to pathogenic parasites. The current status of zoonotic parasites in Mississippi fish that pose a risk for human exposure and infection are currently unknown. In this study, we surveilled the Mississippi River and channel catfish for trematode parasites using eDNA followed by next generation sequencing of the ITS gene.

DNA was extracted from multiple locations alongside the Mississippi River and from channel catfish fecal matter. We found zoonotic trematodes in both the Mississippi River and channel catfish samples. These species pose a threat to public health and warrant caution, when consuming fish from the MS River or when enjoying recreational activities on the MS River. Future analysis will be perform using other primer sets for confirmation and we will also monitor variations in trematode parasitic communities with seasonal changes. 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.

P4.32

CONSUMPTION SAFETY: TOXIC METAL ANALYSIS OF HUNTER HARVESTED DUCK SPECIES

Dawson Stegall, William Janous, Jack Spear, Karleigh Butler, Landon Maloney, Nilay Kantibhai Zalavadiya, and Scoty Hearst

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Pollution in aquatic environments is a major concern for wildlife and fisheries. Discharge from the river systems and storm water runoff bring high levels of nutrients and environmental contaminants into the aquatic environments. Oil spills, coastal industry, and municipal sites are potential sources of toxic chemicals and pollution from human activities and agriculture being released into the watersheds. The levels of these contaminants in wildlife such as duck species are unknown. Ducks and geese are semi-aquatic game animals harvested by hunters for human consumption. The goals of this study were to measure metal contamination in hunter harvested duck species and evaluate human consumption risk. Our results will reveal the level of metal contaminants in meat from various duck species and the safety risks of these species for human consumption. 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.

P4.33

FIRST REPORT OF NEUROINVASIVE ZOONOTIC PARASITE *Baylisascaris procyonis* IN MISSISSIPPI RACCOONS

Joshua Berry[1], William Janous[1], Steven Mills[1], Aamani Kalluru[1], Fritz Valerio[1], Javian Ervin[1], Chinaza Nwaiwu[1], Bryan Beltran[2], Nicole Phillips[2], Steven Everman[3], Trent Selby[1], and Scoty Hearst[1]

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Raccoons have increasingly become semi-domesticated animals living in close proximity to humans in both urban and rural settings. Raccoons can be infected with a wide range of parasites including some very dangerous zoonotic parasites. Infected animals can shed parasites and parasitic eggs in their feces. These eggs can survive in the environment for extended periods of time, potentially infecting humans and their pets as well. The current status of zoonotic parasites in Mississippi raccoons that pose a risk for human exposure and infection is currently unknown. In this study, we surveilled a small number of Mississippi raccoons (49) for intestinal parasites by necropsy. Sanger sequencing was used to identify parasitic species which are a threat to public health. Baylisascaris procyonis is an extremely dangerous neuroinvasive zoonotic parasite with pediatric health concerns. Infections of this parasite are fatal due to neuroinvasive larval migrans. Baylisascaris procyonis has never been found in Mississippi, but has been reported in neighboring states. Here, we report the first cases of Baylisascaris procyonis in Mississippi raccoons. Overall, our data suggests that Mississippi raccoons harbor this dangerous parasite warranting future surveillance studies to determine raccoon infection rates throughout Mississippi and to fully assess the threat of this parasite to public health. 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.

P4.34

GCMS ANALYSIS OF SOCIAL SEMIOCHEMICALS IN MISSISSIPPI WHITE-TAILED DEER

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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. 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.

P4.35

CHEMICAL ANALYSIS OF LOCALLY GROWN MISSISSIPPI PRODUCE

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Central Mississippi has a rich agricultural history. Mississippi soil is rich in minerals and nutrients, making it ideal for growing crops. Fruits and vegetables contain many important nutrients, vitamins, and minerals. A diet high in fruit and vegetables is key to health living. Locally grown produce often has a richer flavor and higher nutrient content, making it a smart choice for consumers. The purpose of this project was to train students in chemistry techniques by analyzing the chemical composition of locally grown fruits and vegetables. We collected a wide variety of fruits and vegetables from local farms in central Mississippi. We measured the level of nutrients using an ICP-OES and sugar levels using a refractometer. We also measure other compounds such as capsaicin, a compound that gives peppers a spicy flavor, using a UV-Vis. Overall, our data indicates that Mississippi's locally grown produce is rich in important nutrients and full of flavor. 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. Produce were provided to students by local Mississippi growers and staff from the Department of Agriculture and Commerce, Mississippi Agriculture and Forestry Museum, Jackson, MS.

P4.36

IMPACT OF KRATOM EXTRACTS ON MOUSE BEHAVIOR REVEALS SAFETY CONCERNS

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Kratom (Mitragyna speciose) is a tropical evergreen tree used in herbal medicine. Kratom has opioid-like properties and some stimulant-like effects. The efficacy and safety of kratom are unclear leading many countries to regulate Kratom as a controlled substance. Recently the City of Clinton, Mississippi, banned Kratom sales in gas stations and vape shops. To explore the safety of Kratom at low and high dosages, we performed behavioral studies in mice after IP injection. We found that at high doses the compounds in Kratom supplements impairs motor function, impairs balance and coordination, have a sedative effect, and caused 10% fatality in mice. Our research supports Clinton's move to ban sales of this potentially dangerous supplement. Our research suggests that humans taking high doses of kratom could have impaired motor and balance functions that could inhibit their abilities to drive a vehicle safely. Also, the sedative effect and the 10% fatality in mice suggest that high doses of Kratom could also be fatal to humans who overdose. 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.

P4.37

FISH QUALITY ANALYSIS OF THREE LAKES IN CENTRAL MISSISSIPPI AND A NEW NON-LETHAL BIOPSY METHOD

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Emerging contaminants, such as toxic metals are a threat to human and animal health. Heavy metal pollution in aquatic environments is a growing global human health concern requiring vigilant surveillance. Lakes are home to many of species of wildlife including fish species harvested for human consumption potentially exposing human to toxic metals. Lakes and reservoirs are also used as a source for drinking water and crop irrigation, where pollution from landfills, agriculture, and industrial sources leach into these bodies of water potentially causing human exposure to heavy metals. We performed consumption safety testing based on toxic metal analysis of fish species from three lakes in central Mississippi: Wolf Lake, Eagle Lake, and the Ross Barnett Reservoir. Our results will reveal the consumption safety of fish species from these three bodies of water. Surveying toxic metal accumulation in fish requires euthanizing the fish. We also developed a nonlethal method to measure toxic metals in catfish. Similar methods have been used to measure Hg in fish without causing mortality or reducing fish survival. Our results will reveal the accuracy of the nonlethal method compared to the traditional whole-fish methods and the fish survivability of this method. Once fully developed, this nonlethal biopsy method can be used to surveil metal accumulation in catfish species without causing fish mortality. 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.

P4.38

CONTROLLED SYNTHESIS AND CHARACTERIZATION OF CALCINATED FE3O4-KAOLIN NANOCOMPOSITE FOR EFFICIENT REMOVAL OF BRILLIANT BLUE IN AQUEOUS MEDIA

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Dyes are organic compounds that represent a significant group of environmental recalcitrant pollutants. The complex structure of dyes makes it very difficult to degrade. Therefore, a low-cost and eco-friendly calcinated Fe_3O_4-Kaolin nanocomposite (C-Fe_3O_4@K) adsorbent was synthesized for adsorption of the anionic Brilliant Blue (BB) dye in aqueous media. The adsorbent was characterized by X-ray diffraction (XRD), Fourier transform infrared spectroscopy(FTIR), Brunauer-Emmett-Teller (BET) measurement, point of zero charge measurement (pH_{pzc}), amount of metal (mg g^{-1}) and percent metal oxide determination in digested sample via ICP-MS analysis. The C-Fe_3O_4@K was investigated as an adsorbent in the adsorption of four different dyes such as Crystal Violet (CV), Methyl Orange (MO), Brilliant Blue (BB), and Brilliant Green (BG), though the C-Fe_3O_4@K adsorbent exhibited better adsorption capacity for anionic brilliant blue (BB) dye. The impact of adsorption parameters such as adsorbent dosage (1-5 g/L), pH of the solution (2-8), and contact time (5-180 min) were investigated. The optimumvalue for adsorbent dosage, pH, contact time, and initial BB dye concentration was found to be1 g/L, 5, and 90 min. The Freundlich and Langmuir isotherm models were used to examine the equilibrium data. The Langmuir and Freundlich isotherm with a significant R^2 value (~ 1) effectively captured the experimental results, while the pseudo-first-order and pseudo-second-order kinetic model controlled the dye removal. Thermodynamic data of the adsorption (ΔH =+ 7.99 kJ mol^{-1}; $\Delta G > 0$) suggested that the dye adsorption was non-spontaneous and endothermic. The Langmuir maximum adsorption capacity was found to be 103.23 mg/g. Overall, the nanocomposite (C-Fe_3O_4@K) of magnetite (Fe_3O_4) and kaolin clay is a potent adsorbent for remediating wastewater containing recalcitrant dyes.

P4.39

POLYETHYLENE TEREPHTHALATE AND CORRESPONDING ENZYMES THAT BREAK IT DOWN

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Polyethylene terephthalate, also known as PET, is a commonly used polymer for plastic bottles. Since the invention of PET, the rising problem of recycling and reusing polymer became a more pressing issue. Not only is the environment affected by the number of plastic bottles lying around and not properly disposed of, but there is also a burden on our body. Microplastics that form after degradation of PET, or the tiny pieces of polymer that stay in the environment, have made their way into the our bodies not only through the food chain but also through the daily use of PET. While PET has a molecular structure of $(C_{10}H_8O_4)_n$ the bond energies can be calculated using programs like Nanoscale Molecular Dynamics (NAMD). This work focus on a computational approach to finding bond energies to learn more about how to help recycle or degrade the polymer into a nontoxic or less toxic compound. We also investigate bacteria with that make enzymes capable of breaking down plastics and microplastics to help mitigate the environmental impact of this rising issue.

P4.40

SYNTHESIS OF PROPELLER-SHAPED POLYPHENYLETHYNYLARENES

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A series of “flat” two-dimensional macrocyclic polyphenylethynylarenes were prepared in good yields. The syntheses involved Sonogashira coupling of phenylethynylarenes with the appropriate aryl halides

followed by cyclization with ether linkages. Cyclization reduces twisting and promotes electron conjugation throughout the structures. These "flat" molecules are expected to show directed energy and electron transfer within a highly conjugated system and may potentially be effective in the preparation of photoreactive materials such as electronic sensors or light harvesting materials.

P4.41

DEVELOPING AN INTERACTIVE CLOUD-BASED LEARNING MODULE FOR VIBRATIONAL ENERGY CALCULATIONS IN MOLECULES USING JUPYTER NOTEBOOKS FOR THE NATIONAL INSTITUTES OF HEALTH (NIH)

Erick Manriquez, Joseph Bentley

Delta State University, Cleveland, MS

The theoretical framework includes the quantum harmonic oscillator model, which provides an analytical approach to calculate vibrational energy levels in diatomic molecules. These calculations are supplemented with visualizations and interactive simulations implemented in Jupyter Notebooks. By integrating Python-based tools such as NumPy, Matplotlib, and SymPy, the module enables users to perform symbolic and numerical calculations, visualize potential energy curves, and explore how molecular vibrational modes influence spectroscopic properties. This learning module bridges the gap between theoretical chemistry and computational tools, fostering computational literacy and deeper understanding of vibrational energy principles. The project contributes to NIH's mission of advancing science education by providing resources that are not only educational but also scalable for broader adoption in STEM curricula. This research has been funded through the NIH Office of Data Science Strategy.

P4.42

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P4.43

PREPARATION OF CONJUGATED POLYPHENYLETHYNYLARENE MACROCYCLES

Alana Latorre, Trent Selby

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The preparation of π-conjugated macrocyclic organic molecules is a focus of our group. The syntheses of several macrocycles, with varying degrees of conjugation will be presented and can all be prepared from the same key intermediate structure, (3-ethynylphenoxy)(tert-butyl)dimethylsilane. This key intermediate was prepared from the commercially available 3-hydroxybenzaldehyde. Protection of the hydroxyl with tert-butyldimethylsilyl chloride in the presence of a weak base (imidazole), under microwave conditions gave the protected compound in 94% yield. The aldehyde functional group was converted into the terminal alkyne via Corey-Fuchs olefination reaction conditions in 87% yield. Sonogashira coupling (palladium/copper(I) iodide catalyst) of the terminal alkyne with aryl halides gave polyphenylethynylarenes in high yields. Cyclization of the polyphenylethynylarenes alcohols can be accomplished under dilute conditions via nucleophilic substitution or acylation addition/elimination reactions. Structures of this type are expected to show directed energy and electron transfer and thus should be effective in the preparation of photoreactive materials such as electronic sensors or light harvesting materials.

P4.44

ASSESSMENT OF BIOMARKERS AND THEIR DEGRADATION PRODUCTS FOR THE ANALYSIS OF PULQUE

Hannah Meyer, Estrella Castillo, Timothy Ward

Millsaps College, Jackson, MS

Potsherds from the Mesoamerican region were collected for the analysis of pulque. This region was believed to hold the remnants of the amphoras that were used for the storage/distribution of many goods, and the amphoras themselves are built based on the role they served, whether it be storage, distribution, or both. Evidence from earlier research indicated that potsherds were possibly 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 and shards from the amphora, "Blanco Levantado" 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). BSTFA was used due to its flexibility and thermal stability of its products. The products of the derivatization reaction were examined as potential biomarkers that would be indicative of the presence or storage of pulque. The amphora shards were then soaked in pulque to ensure if pulque was originally there or sustainable for the pulque. The pulque profile developed will be used as a biomarker reference for potsherds analyzed for pulque residue. In this presentation, we report on the continued development of a suitable method for the analysis of pulque residue in potsherds and the potential biomarkers of pulque in the amphora shards from the Mesoamerican region in Mexico.

P4.45

MONITORING WASTEWATER TO ASSESS SUBSTANCE USE IN PRISONS AND COLLEGES

Haley Franklin, Emily Bonura, Timothy Ward

Millsaps College, Jackson, MS

Although drinking water quality is often monitored, there are no federal regulations in place to monitor pharmaceuticals. As the use of pharmaceuticals across the United States continues to increase, concerns about their persistence in our water systems remains an issue. The possibility remains that pharmaceuticals and their respective metabolites are rising in our water systems. To gain insight into how large an issue this may be, i.e., how many drugs and drug metabolites are present at any given time, we have developed methods to monitor more than a dozen drugs and their metabolites in wastewater. The samples have been collected at different times from various sources. Collected water samples were filtered and preconcentrated subsequent to analysis by liquid chromatography - mass spectrometry (LC/MS). Common drugs analyzed in wastewater included cannabinoids, amphetamines, opioids, hallucinogens, and subsequent metabolites. Comparison of national average trends can be compared to the trends present at colleges and prisons to infer risks present in these institutions. Finally, carefully monitoring water systems will better cater to officials when making decisions regarding water quality, filtration systems, and contaminants. 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 P20GM103476-22.

P4.46

COMPUTATIONAL MODELING OF CANNABINOID STABILITY THROUGH DENSITY FUNCTIONAL THEORY STUDY

Hua-Jun Fan, Jy'Mya Robinson, Giana Coach

Alcorn State University, Lorman, MS

[**Background**] In 1996, California's legalization of medical marijuana through the Compassionate Use Act initiated a wave of similar legislation across the United States. This momentum accelerated in 2012 when Colorado and Washington became the first states to legalize recreational marijuana, marking a significant shift in public policy and societal attitudes toward cannabis. Today, nearly half of the states have legalized marijuana for recreational use, with many others adopting medical marijuana laws. This legalization has led to increased cannabis consumption, which presents both significant health implications and therapeutic potential. Understanding the consequences of cannabis use and its effects on the human body is crucial for developing effective public health strategies. This understanding necessitates robust data on the stability and safety of cannabinoid products. [**Subject**] Significant advancements in research can facilitate the development of improved delivery systems that enhance bioavailability and therapeutic outcomes. While the American Academy of Family Physicians (AAFP) acknowledges the potential therapeutic benefits of cannabinoids, there are also clear negative health and public health consequences associated with their use. The primary psychoactive component of the cannabis plant, Cannabis sativa, is delta-9-tetrahydrocannabinol (THC), whereas cannabidiol (CBD), the most abundant cannabinoid, is largely considered non-psychoactive. The endocannabinoid system comprises two G-protein coupled receptors (GPCRs)—CB1 and CB2. [**Approach**] In this study, we will employ computational modeling to investigate the stability of eight cannabinoids in figure 1. With the rapid evolution of computer hardware and software algorithms, particularly the development of AlphaFold 3 (AF3), we can now study the interactions between small drug molecules and various protein structures. This capability allows us to predict binding sites and optimize drug candidates, potentially revolutionizing the field of pharmacology. These advancements build upon AlphaFold 2 (AF2), which can predict 98% of all protein structures in the human genome sequences. Research has shown that cannabidiol exhibits varying stability depending on its formulation. Additionally, environmental factors such as light, temperature, and oxygen exposure critically influence the degradation of cannabinoids, affecting their efficacy and safety. [**Objectives**] In this study, we will utilize density functional theory (DFT) to explore the property-structure relationships of these eight cannabinoids, enhancing our understanding of their interactions and stability. This knowledge is essential for optimizing formulations for therapeutic use. The modeling predictive capabilities are vital for developing products that maintain their stability and therapeutic properties.

P4.47

SYNTHESIS AND COMPARABILITY OF CONVENTIONAL CHITIN BEADS FOR BIOREMEDIATION ANALYSIS

Guy Gordon, Andrew Doubert, Nathan Prine, Aaliyah Newsome, Trent Selby, Joseph Kazery

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Metal and metalloid pollution, known as potentially toxic elements (PTEs), in an aquatic system affects the environment while also affecting public health. Pollution of PTEs comes from a variety of sources from construction to fossil fuels to domestic wastes. Despite the extremely limited removal of tiny inorganic particles and dissolved PTEs from wastewater, remedial techniques do exist. While PTEs cannot be broken down, the principal method of removal is by absorption or adsorption. Bioremediation is the use of naturally occurring substances to break down or remove pollution, as can be used for the removal of PTEs. This study's goal is to use the chitinous waste of crayfish exoskeletons as an adsorption media for PTEs. In this study, we have modified chitin by demineralizing and deproteinating (DMDP) the material to observe its properties. We compared our harvested exoskeletons to lab-grade chitin to observe the quality of our chitin. From there, our harvested DMDP chitin was solubilized at an initial 0.5% with and a 1% concentration of chitin in our bead-making process. The beads of our DMDP beads concentrations were then compared by Brunauer-Emmett-Teller (BET) analysis to observe differences in total surface area, pore size, and pore volume. All of these properties allow for adsorption capability. Once the optimal properties are determined, the chitin beads will be used in an uptake study to determine the rate of uptake and capacity of cadmium.

P4.48

INVESTIGATION OF SYNTHETIC ROUTES TOWARD HALOFUGINONE AS AN A PROBE TO INHIBIT BLOOD-BORNE VIRUSES OF TICK ORIGIN

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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. It has been shown that the febrifugine, bioactive constituent of *Dichroa febrigua* Lour. of the Saxifragaceae family, has validated antimalarial activity. A halogenated analog of febrifugine, called halofuginone, is used globally as a feed-additive to prevent diseases in poultry farms. Recently, both febrifugine and halofuginone 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 to synthesize derivatives for testing to develop new compounds with improved properties. Assays for testing require hundreds of milligrams so the only viable method for obtaining them is through chemical synthesis from commercially available starting materials. In this presentation, the efforts toward the synthesis of halofuginone and derivatives are described. Halofuginone with molecular formula C16H17BrClN3O3 and molecular weight 414 g/mol, contains two key fragments, a piperidine with two stereogenic centers and a quinazolin-4-(3H)-one, connected by a three-carbon ketone. The effort involves the dissection of halofuginone into two fragments, the piperidine and quinazolin-4(3H)-one, for convergent coupling via SN2 reaction. The quinazolin-4(3H)-one is readily prepared by a condensation reaction of commercially available anthranilic acids with ammonium formate in ethanol. A small library of 15 of these fragments has been produced by this method so far. The piperidine, with the three-carbon ketone linker, is considerably more challenging to access due to the presence of the two stereogenic carbons at C2 and C3 on the ring. With the overarching goal of exploring the structure-activity-relationship (SAR) of halofuginone, the first-generation route has focused on deleting the C3 secondary alcohol functional group to determine the nature of its influence on inhibition in the biological assays. To that end, commercially available 2-(piperidinyl)ethanol was sulfonylated to protect the ring nitrogen throughout the sequence. The primary alcohol was oxidized smoothly with the Dess-Martin periodinane to the aldehyde group allowing for a subsequent addition of methylmagnesium bromide to install the remaining carbon atom the sidechain linker. To complete that fragment, oxidation of the secondary alcohol to the ketone and regioselective bromination of the methyl ketone will allow for the crucial union of the piperidine to the quinazolin-4-(3H)-ones. It is anticipated that this route will allow for pinpointing the influence of quinozalin-4(3H)-one substitution patterns in the SAR studies. Once that data has been obtained, the full-fledged halogofuginone piperidine with secondary alcohol intact will be pursued with consideration to controlling the C2 and C3 relative and absolute stereochemistry.

P4.49

EXPLORING REZUROCK AS A POTENTIAL TGF-b RECEPTOR 1 INHIBITOR IN MACROPHAGE REGULATION

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Chronic rejection remains a significant challenge after solid organ transplantation (SOT). One of the main features of chronic rejection is macrophage-mediated graft tissue fibrosis. Migration, graft infiltration, and extensive proliferation of macrophages play a key role in pro-fibrosis events. Our studies have demonstrated that pharmacological inhibition of ROCK2 significantly impairs these macrophage functions, highlighting the therapeutic potential of kinase inhibitors in modulating immune responses. Rezurock (belumosudil), initially

developed as a selective ROCK2 inhibitor, has been shown to interact with additional kinases, including Casein Kinase 2 (CK2). Given its high affinity for multiple kinases, questions about its selectivity and potential off-target effects have arisen. TGF-Beta Receptor 1 (TGFBR1) is a key regulator of macrophage behavior, influencing immune responses, inflammation, and fibrosis through the TGF-beta signaling pathway. Given its role in fibrosis, a crucial factor in chronic rejection, understanding whether Rezurock can engage with TGFBR1 provides new insights into its therapeutic scope. This study employed molecular docking, MM-GBSA refinement, and molecular dynamics simulations to evaluate the binding affinity of Rezurock with TGFBR1, ROCK2, and CK2. Structural alignment revealed moderate similarity among these kinases, with the highest conservation observed between ROCK2 and TGFBR1 (39%). While docking scores suggested moderate affinity of Rezurock toward TGFBR1, MM-GBSA calculations demonstrated even higher binding energy than its co-crystallized inhibitor, indicating strong interactions. Molecular dynamics simulations further confirmed the stability of these complexes, supporting the potential repurposing of Rezurock for TGFBR1-associated pathways, including macrophage regulation in chronic rejection. Our findings suggest that Rezurock could influence macrophage-driven fibrosis and immune modulation via TGFBR1, potentially expanding its therapeutic applications beyond ROCK2 inhibition. However, its lack of strict selectivity indicates the need for further investigation into its mechanistic effects and potential synergy with other inhibitors, particularly in post-transplantation settings where macrophage modulation could mitigate chronic rejection.

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P4.50

STRUCTURE-BASED OPTIMIZATION OF siRNA FOR MOLECULAR DOCKING AND FRAGMENT SCREENING TARGETING TP53 GENE

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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 siRNA and its carrier. This study established a computational methodology for optimizing nanocarriers using a molecularly imprinted polymer approach. We evaluated different siRNA construction techniques using Schrodinger, AlphaFold, and SimRNA, highlighting structural discrepancies and the advantages and limitations of each method. Using two methodologies as benchmarks, we modeled five backbone modifications of TP53-targeting siRNA, incorporating 2'-OMe and 2'-F sugar modifications, phosphorothioate backbone modifications, and DNA substitutions based on clinically validated approaches. Each structure was optimized using the Schrodinger Software Package and subjected to 500 ns molecular dynamics (MD) simulations to refine and validate siRNA structures in a physiological environment. Minimized structures and the ten most populated MD trajectory clusters from each siRNA model were used as docking targets, resulting in 110 TP53 siRNA models for molecular docking. A library of 1065 RNA-binding fragments from ASINEX was screened via molecular docking to identify potent siRNA binders. An in-house Python pipeline was developed to analyze docking data and select the 100 top-scoring fragments across all models. These fragment-siRNA complexes were then subjected to MM-GBSA calculations for further evaluation. Our findings identified 10 highly promising fragments suitable for synthesizing molecularly imprinted polymers, offering novel strategies for stabilizing siRNA and targeted therapeutic applications. These results establish a foundation for the rational design of siRNA-targeting molecules, enhancing therapeutic potential in gene-silencing technologies.

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P4.51

UTILIZING COMPUTATIONAL CHEMISTRY APPROACHES TO UNCOVER NATURAL REMEDIES TARGETING PARP1 IN THE TREATMENT OF CANCER

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Poly (ADP-Ribose) Polymerase 1 (PARP1) has recently emerged as a potent target for cancer therapies due to its critical role in DNA damage repair. Activation of PARP1 upon DNA damage triggers enzymatic activity essential for genomic stability. Several synthetic inhibitors, including Talazoparib, Olaparib, Niraparib, and Veliparib, have demonstrated remarkable efficacy in targeting PARP1 for

cancer treatment. In this study, the Schrödinger Software Package was employed to computationally screen an in-house library of natural citric essential oils (232 ligands) and a MolPort compound database (over 10,000 ligands) for potential PARP1 inhibitors. As a benchmark, five PARP1 structures were retrieved from the Protein Data Bank (PDB IDs: 7KK2, 7KK3, 7KK4, 7KK5, and 7KK6), with one in its apo form and the remaining four co-crystallized with potent drugs. Cross re-docking was performed to determine the most reliable protein structure. Induced Fit Docking (IFD) was applied to the smaller database, while a high-throughput virtual screening workflow utilizing Glide was employed for the larger MolPort database. Screening of the natural compound library identified neohesperidin as a promising hit. From the MolPort database, the top 25 compounds were subjected to Molecular Mechanics/Generalized Born Surface Area (MM/GBSA) refinement, revealing four additional potential inhibitors. Molecular Dynamics (MD) simulations using Desmond were performed to assess these inhibitors' stability. Neohesperidin, Olaparib, Veliparib, and four top-scoring MolPort compounds (MolPort-001-740-645, MolPort-027-835-54, MolPort-039-338-741, and MolPort-001-741-384) underwent a long one μs MD simulation. The results indicated that only the potent drugs and MolPort-039-338-741 remained stably bound to PARP1. MolPort-039-338-741 has also demonstrated higher binding affinity and stability than Veliparib, exhibiting properties similar to Olaparib. These findings highlight the potential of computational chemistry in accelerating hit identification for PARP1 inhibitors, mainly from natural sources. Although experimental validation is ongoing, this study provides strong computational evidence supporting the development of novel PARP1 inhibitors with potential applications in cancer therapy.

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P4.52

COMPUTATIONAL APPROACHES FOR PREDICTING SARS-COV-2 VARIANT INTERACTIONS WITH ACE-2 AND ANTIBODIES

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While COVID-19 is no longer the primary global health concern, the rapid mutation rate of SARS-CoV-2 presents an ongoing threat, with emerging subvariants, such as JN.1, continuing to evade immune responses and cause reinfections. The angiotensin-converting enzyme 2 (ACE-2) receptor serves as the primary entry point for SARS-CoV-2, making its interaction with the spike glycoprotein receptor-binding domain (RBD) a crucial factor in viral infectivity. Additionally, neutralizing antibodies play a key role in preventing viral entry by blocking RBD interactions with ACE-2. While early studies extensively characterized these interactions for initial viral strains, gaps remain in understanding how recent mutations influence both ACE-2-RBD binding affinity and antibody-mediated neutralization, impacting viral transmissibility and immune escape mechanisms. To address these gaps, this study applied molecular modeling to investigate two critical interactions: (i) Antibody-RBD complexes, which determine neutralization potential, and (ii) ACE-2-RBD complexes, which affect viral entry efficiency. To model antibody-RBD interactions, three computational approaches were tested: forced placement with extended molecular dynamics (MD) simulations, PIPER-based protein–protein docking, and AlphaFold-driven complex prediction. The murine antibody 2B04, known to neutralize SARS-CoV-2 by blocking ACE-2 binding, was tested against a panel of subvariants. Comparative analysis revealed trade-offs in predictive accuracy, with AlphaFold demonstrating the highest overall reliability for antibody-RBD complexes. However, modeling ACE-2-RBD interactions posed distinct challenges, as AlphaFold showed lower accuracy in predicting this specific protein-protein complex, producing inconsistencies in binding site predictions. Instead, PIPER-based protein–protein docking was found to be the most reliable approach for modeling ACE-2-RBD interactions, accurately capturing binding affinities and structural conformations. These findings highlight that different computational strategies are required for accurate modeling of antibody-RBD and ACE-2-RBD interactions. This study not only identifies the strengths and limitations of various computational approaches but also elucidates key mechanisms of antigenic escape and viral transmissibility in new SARS-CoV-2 variants. These findings provide a computational framework for rapidly assessing vaccine efficacy and predicting antibody resistance, ensuring a proactive response to potential viral resurgences.

This work 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 (K.K.). It was also partially supported by the National Science Foundation (NSF) award numbers OIA-2414445 (K.K.), OIA-2414444 (J.L.), #2205788 (M.F.), and #1826699 (S.B.).

P4.53

PH-SELECTIVE PD-L1 INHIBITORS FOR ENHANCED CANCER IMMUNOTHERAPY: COMPUTATIONAL APPROACH

Jordhan Booth[1], Roderick C. McDowell[2], Allyson McGowan[1,3], Wojciech Kolodziejczyk[2], Santanu Banerjee[1], Manliang Feng[1], and Karina Kapusta[1]

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Immunotherapy, particularly through PD-1/PD-L1 checkpoint blockade, has revolutionized cancer treatment by reactivating the immune system to recognize and eliminate tumor cells. However, systemic inhibition of PD-L1 can lead to severe immune-related adverse effects due to unintended immune activation against healthy tissues. To overcome this limitation, we propose a pH-selective targeting strategy that selectively inhibits PD-L1 within the acidic tumor microenvironment, minimizing off-target effects in normal tissues. Using *in silico* computational approaches, including virtual screening, molecular mechanics (MM), and molecular dynamics (MD) simulations, we screened a library of ~10,000 natural compounds from the MolPort database. The simulations were performed under two distinct pH conditions, physiological pH (7.4) and acidic tumor-like pH (5.5), to mimic the environmental differences between normal and cancerous tissues. Through this dual-environment screening, we identified MolPort-001-742-690 as a promising pH-selective PD-L1 inhibitor, displaying strong binding affinity in acidic conditions while exhibiting significantly lower toxicity than established inhibitors such as BMS-202 and LP23. To validate the stability and binding efficiency of MolPort-001-742-690, we conducted long-term MD simulations (1000 ns) of the inhibitor-PD-L1 complex under both acidic and physiological conditions. The results confirmed that the inhibitor remained stably bound to PD-L1 under acidic conditions, while its affinity decreased at physiological pH, suggesting a potential mechanism for tumor-selective binding. Further binding free energy calculations using MM-GBSA analysis provided additional evidence supporting the pH-dependent interaction profile of this compound. Our findings demonstrate the feasibility of pH-selective immune checkpoint inhibition as a novel approach for enhancing the safety and efficacy of PD-L1 inhibitors. By leveraging computational drug discovery tools, we provide a framework for designing next-generation immunotherapies that reduce immune-related toxicity while maintaining potent anti-tumor activity. While experimental validation is currently underway, this work highlights the potential of structure-based drug design in tailoring small-molecule inhibitors for improved cancer immunotherapy.

This work was supported by the National Science Foundation (NSF), award number OIA-2414445 (K.K.). 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 (K.K.) and the NSF awards #2205788 (M.F.) and #1826699 (S.B.).

P4.54

ANALYSIS OF SELF- AND PHYSICIAN-COLLECTED CERVICAL AND VAGINAL SAMPLES FOR HUMAN PAPILLOMAVIRUS DETECTION THROUGH NEXT GENERATION SEQUENCING

Trey Cocroft[1], Hannah Hayes[2], Brad S. Schneider[3], Manliang Feng[1], and Karina Kapusta[1]

[1]Department of Chemistry and Physics, Tougaloo College, Tougaloo, MS, [2] Veracyte, Inc., South San Francisco, CA,

[3]Pinpoint Science Inc, San Francisco, CA

Human papillomavirus (HPV) is the leading cause of cervical cancer worldwide. Screening for HPV is crucial for early detection and prevention. This study aims to compare the efficacy of self-collected versus physician-collected cervical and vaginal samples for HPV detection using next-generation sequencing (NGS) technology. All personal information and the labs of origin were kept confidential. Around 50 to 60 samples were collected from participants with vaginas or cervixes. Collected samples were then screened. Samples were then subjected to DNA isolation. The MagMAX Viral/Pathogen Nucleic Acid Isolation Kit isolated the DNA from the lysis. Isolated DNA was then put in the KingFisher machine for purification. After purification, samples were prepped using Chapter Dx. The Illumnia NextSeq 2000 was used to sequence and identify the HPV strains in all the samples. Sequenced samples were then analyzed and recorded. The findings suggest that self-collected cervical and vaginal samples are not effective as physician-collected samples for HPV detection using NGS technology. These results show an inconsistency between the self-collected and physician-collected samples. NGS offers high sensitivity and specificity for HPV detection and provides detailed genotyping information, aiding in targeted interventions and personalized treatment strategies. Further studies are warranted to create a better version of the self-test kit and improve the accuracy of the self-collected samples compared to physician-collected ones.

This work 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 (K.K.) and the NSF HBCU-UP Targeted Infusion Project, Award #2205788 (M.F.).

END OF THURSDAY'S PROGRAM

Friday, March 21, 2025
MORNING
Hall D Room
8:30 Welcome and Opening

O4.21

8:45 HIGH-YIELD, ENVIRONMENTALLY-FRIENDLY, AND SUSTAINABLE SYNTHESIS OF SILVER NANOWIRES USING TANNIC ACID AND THEIR APPLICATION IN CONDUCTIVE INK PREPARATION: ECONOMIC ANALYSIS AND RHEOLOGICAL INVESTIGATION

Shohreh Hemmati[1], Sina Kaabipour[2], Finley Neal[1]

[1]The University Of Southern Mississippi, Hattiesburg, MS, [2]Oklahoma State University, Stillwater, OK

Silver nanowires (AgNWs) have garnered significant attention during the past decade thanks to their applications in conductive inks used for electronic applications. The polyol process, widely used for AgNW synthesis, is known for its effectiveness in producing high aspect ratio and high yield nanowires. However, this process suffers from drawbacks such as high energy consumption and use of unsustainable reagents derived from non-renewable resources, which makes its large-scale utilization and economic feasibility challenging. In contrast, green synthesis methods offer potential solutions by employing environmentally friendly and cost-effective approaches. In this study, we offer a high-yield (90 %) approach for the inexpensive, environmentally friendly, and sustainable synthesis of AgNWs, and show that the production cost per grams of AgNWs can be reduced by 33.2 % compared to the polyol process. In addition, we investigate the rheological behavior of the synthesized AgNW-based conductive ink under screen printing and direct writing conditions using flow sweep, peak hold, and frequency sweep tests. The rheological behavior of the AgNW-based conductive ink provides valuable information regarding its use for various printing applications. The proposed cheaper and more sustainable method can serve as a promising alternative for industrial conductive ink manufacturing for printed electronic appliances such as printed circuit boards (PCBs) and flexible transparent conductive films (TCFs).

O4.22

9:15 LATE TRANSITION METAL COMPLEXES OF NITROGENOUS POLYAROMATIC HETEROCYCLES

Clifton Wagner

Louisiana State University, Baton Rouge, LA

The electrochemical and photophysical properties of nitrogen-containing polycyclic aromatic hydrocarbons (nPAHs) have resulted in their application in many modern technologies including conductive polymers, photosensitizers, magnetic metal organic frameworks, and organic lithium-ion batteries. Our research aims to isolate and characterize the principal coordination complexes featuring nPAHs with main group and transition metals relevant to ion batteries and magnetism respectively.

O4.23

9:45 MERCURY LEVELS IN FRESHWATER FISH OF CENTRAL MISSISSIPPI AND HUMAN HEALTH CONCERNS

Scoty Hearst[1], Luke Parker[1], Chinaza Nwaiwu[1], Trent Selby[1], Joseph Kazery[2], Steven Everman[3], Manliang Feng[4], Lillian Sisson[1], Alison Cevallos[1], James Lock[1], and Matthew Sinclair[1]

[1]The Department of Chemistry and Biochemistry, Mississippi College, Clinton, MS, [2]The Department of Biology, Mississippi College, Clinton, MS, [3]The Department of Medicine, The University of Mississippi Medical Center, Jackson, MS, [4]The Department of Chemistry, Tougaloo College, Tougaloo, MS

Pollution in the aquatic systems across the United States is a major health concern for humans, domesticated animals, and wildlife. The level of metal contamination in fish in central Mississippi and their threat to public health are unknown. The goals of this study were to measure metal contamination in fish species from multiple locations across central Mississippi and evaluate human consumption risks. Various fish species from the Mississippi River, Eagle Lake, Wolf Lake, and the Ross Barnette Reservoir were analyzed for metal contaminants (Al, As, Ba, Cd, Co, Cr, Cu, Fe, Hg, Mg, Mn, Ni, Pb, Se, and Zn). Based on human consumption safety results, Hg levels are a major concern in these locations. Mercury enters bodies of water through atmospheric pollution deposition, industrial waste incineration, and from contaminated soil runoff. Mercury can bioaccumulate in the food chain, particularly in fish, causing human consumption risks. Overall, our data indicated that fish can serve as selective environmental monitors of metal pollutants of human health concerns providing valuable insight to research scientist and monitoring agencies. Our results also warrant larger scale Hg studies throughout central Mississippi. 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.

O4.24

10:15 TRANSFORMING CHEMISTRY EDUCATION WITH AI: OPPORTUNITIES, CHALLENGES, AND FUTURE DIRECTIONS

Shawnta Chatman, MD Khan, Sonia Eley, Hua-Jun Fan

Alcorn State University, Lorman, MS

Artificial intelligence (AI) is rapidly transforming chemistry education, reshaping teaching methodologies, curriculum design, and student engagement. This talk explores the role of AI in our chemistry instruction, focusing on emerging technologies such as AI-empowered adaptive learning, machine learning, and natural language

processing. These tools enable personalized learning paths, real-time feedback, and novel ways to engage students, enhancing both learning experiences and outcomes. The presentation will offer an overview of current developments within the department, the challenges we face in implementation, and the potential for AI to reshape traditional chemistry education. Key opportunities, such as adaptive learning systems and automated assessments, will be highlighted, along with strategies for effectively integrating AI into chemistry curricula. Emphasizing the need to balance technological innovation with human-centered teaching practices, the talk will explore how AI can complement traditional pedagogy while optimizing student learning. This will highlight the importance of institutional training for academics and staff to ensure the safe and responsible use of AI in academia. Additionally, we will address the limitations of AI in handling visual or graphical illustrations in the field of chemistry. Ultimately, the future of chemistry education in the AI era will depend on blending cutting-edge tools with pedagogical expertise to prepare students for an increasingly AI-driven world.

O4.25

10:45 INTERACTION OF VOLATILE CHEMICALS AND THE EVOLUTION OF RESPIRABLE AEROSOL PARTICLES IN INDOOR ENVIRONMENTS

MD Khan, Shawnta Chatman, Sonia Eley, M. Ebdah, Tanea Fisher, Debarshi Roy, Hua-Jun Shawn Fan

Alcorn State University, Lorman, MS

Indoor air quality has emerged as a significant concern for public health. Reported in 2024 by the World Health Organization (WHO) that there are 3.2 million people annually die prematurely due to household air pollution. There are potential sources of volatile and semi-volatile organic compounds (SVOC) from indoor activities and infiltration from outdoor ambient air. Indoor comfort factors, such as temperature, relative humidity, and carbon dioxide, also play a great role in driving complex indoor chemistry and particle pollution. Aerosol particles with an aerodynamic diameter of 2.5 or less pose a considerable risk as they can penetrate deep into the lower airways. Populations such as children and the elderly may be particularly vulnerable to the exposure of tiny invisible particles, VOCs, and SVOC. The incidence of respiratory and cardiovascular diseases, including asthma, bronchitis, chronic obstructive pulmonary disease (COPD), heart attacks, high blood pressure, and shortness of breath among people, increase proportionally and significantly as indoor air pollution rises. This paper will illustrate the significant sources, trapping methods, and laboratory analytical processes for the key indoor air pollutants, including carbon monoxide (CO), ozone (O_3), formaldehyde (HCHO), benzene, and various SVOC. Advanced analytical techniques, such as high-resolution mass spectrometry combined with gas chromatography and liquid chromatography, will facilitate the precise identification and source fingerprinting of SVOCs. Condensation-based particle counting will help assess particle size distribution and explore new particle formation processes. Additionally, studying indoor activities, including those of crawling infants, cooking practice and light movements, will provide insight into particle resuspension, chemical and physical interaction and their effects on poor indoor air quality. A modeling approach will be used to assess health risk, identify potential sources of indoor pollutants and examine their physical and chemical interactions. This presentation will explore a comprehensive literature review to understand the entire process of aerosol formation and examine their chemical and physical interactions with VOC and SVOC towards the worsening of indoor air pollution and their potential health effects.

O4.26

11:15 PALLADIUM COATING AND SUBSEQUENT THERMAL ANNEALING OF HISTIDINE TAGGED BARLEY STRIPE MOSAIC VIRUS (BSMV-HIS) VIRUS-LIKE PARTICLES (VLPS)

Shohreh Hemmati[1], Vindula Basnayake Pussepitiyalage[2], Emilie Hayes[1], Akash Vaidya[3], Kevin Solomon[4]

[1]The Univeersity of Southern Mississppi, Hattiesburg, MS, [2]Oklahoma State University, Stillwater, OK, [3]University of Delaware, Newark, DE, [4]University of Delaware, Newark DE

Histidine-Tagged Barley Stripe Mosaic Virus (BSMV-His) Virus-Like Particles (VLPs), displaying histidine residues on its surface, provide a robust platform for the synthesis of palladium nanorods (PdNRs) through biotemplating. The introduction of 6 histidine residues at the surface-exposed C-terminus of BSMV capsid proteins is compatible with protein folding and particle assembly, as confirmed by transmission electron microscopy (TEM). Thick Pd mineralization layers on BSMV-His VLPs are achieved with as few as two coating cycles. The impact of various Pd precursor solutions on mineralization thickness was examined in this study, alongside kinetic studies probing metal precursor ion adsorption by BSMV-His VLPs. Following two Pd coatings, BSMV-His VLPs were thermally annealed to 200 °C and characterized using in situ TEM. Energy-dispersive X-ray spectroscopy (EDS) and high-angle annular dark-field (HAADF) analysis confirm the conversion of the organic biotemplate core to amorphous carbon during thermal annealing. In situ TEM reveals a reduction in Pd coating grain boundaries due to Ostwald ripening during thermal annealing.

11:45 Chemistry and Chemical Engineering Division Awards Ceremony

12:00 Chemistry and Chemical Engineering Division Business Meeting

12:00 MAS General Session

Friday, March 21, 2025
AFTERNOON
Hall D Room 2
2:00-5:00
Mississippi INBRE Data Science Workshop

Ecology, Entomology, Evolutionary Biology, and Zoology

Chair: Seung-Joon Ahn

Mississippi State University

Co-Chair: Nina Baghai-Riding

Delta State University

Vice-Chair: Alex Acholonu

Alcorn State University

Thursday, March 20, 2025
MORNING
Hall C Room4

8:00 Welcome and Opening

8:10-10:10 Divisional Symposium

8:10 PALYNOLOGY OF THE BOONEVILLE DINOSAUR SITE, MISSISSIPPI, U.S.A. – FLORISTICS, BIOSTRATIGRAPHY, AND CLIMATE

Nina Baghai-Riding

Delta State University, Cleveland, MS

A Campanian vertebrate fossil site (The Tolar-Stevens Dinosaur locality) near Booneville, Mississippi contains exceptionally well preserved and diverse assortment of palynomorphs that provide important age and palaeoecological data. Palynomorphs are from interlaminated carbonaceous clays, silts, and fine-grained sands of the lower Coffee Formation. The faunal assemblage includes a partial skeleton of an adult hadrosaur, the most complete dinosaur found in Mississippi to date, along with the dentary of a very young hadrosaur, suggesting that this assemblage may have included a nesting site. Crocodilians, sea turtles, an aulopiform fish, sharks and macroinvertebrates also occur. Palynomorphs include freshwater algal spores, trilete and monolete spores, and gymnosperm and angiosperm pollen. Species of Normapolles (= Fagales) are prominent, making up between 10% and 30% of all angiosperms; their abundance suggests a warm and subhumid or seasonally dry climate. The abundance of bryophytes, lycophytes, pteridophytes and freshwater algal cysts suggest the bone bed is high in the estuary or under strong deltaic distributary influence.

8:40 NONE OF THESE THINGS ARE LIKE THE OTHER: PHENOTYPIC VARIATION AMONG MOSQUITOES

Donald A. Yee

University of Southern Mississippi, Hattiesburg, MS

Among the 3,700 species of mosquitoes, less than 10% are actually involved in pathogen transmission, with the other 90% having little contact with humans. From this emerges a staggering fact, most of our knowledge of mosquitoes comes from those few hundred species, and in reality we base most of our ecological, physiological, genetic, and biological knowledge about them on just a small group of medically important species. We often view all mosquitoes as the same: small and dark in color. However, mosquitoes vary in size and come in all different colors and patterns. Herein I will explore several mosquito phenotypes to show the amazing diversity of mosquito body shapes and forms, and discuss what this may mean for our understanding of their ecology and evolution.

9:10 THE IMPACT OF SOIL POREWATER SALINITY AND FIRE MANAGEMENT ON SALT MARSH TO PINE SAVANNA

Wei Wu, Devin Jen

Gulf Coast Research Laboratory, The University of Southern Mississippi, Ocean Springs, MS

Coastal marshes are one of the most productive and intensively used ecosystems in the world, providing numerous ecosystem services that are critical to the communities that surround them and beyond. However, they are under threat due to a variety of natural and anthropogenic stressors, such as climate change and sea-level rise (SLR). SLR can cause marshes to drown, converting them to open water. Meanwhile, marshes can respond to SLR through landward migration when suitable geomorphological condition and habitat are available. This research focuses on the mechanisms that drive landward migration of salt marshes including the role of proscribed fire. One objective is to predict how soil porewater salinity and prescribed fire affect productivity of salt marshes, and understory vegetation and pine trees in pine savannas, along the gradient of salt marsh-ecotone-pine savanna in the Grand Bay National Estuarine Research Reserve, MS. Using Bayesian multi-level models, we found that fire management likely helped facilitate landward migration of coastal marshes by increasing productivity of salt marsh vegetation and understory vegetation in ecotone and upland forests as well as decreasing tree height growth through increased salinity stress. The findings provide insights as to how salt marshes respond to SLR and fire management.

9:40 DIRECT EFFECTS AND INTERACTION OF CERTAIN FUNGICIDES AND VIRUSES ON HONEY BEE HEALTH: A NOVEL CELL CULTURE APPROACH

Michael Goblirsch, John Adamczyk

Thad Cochran Southern Horticultural Research Laboratory, USDA ARS, Poplarville, MS

Historically viewed as safe for insect pollinators, the toxicity of fungicides applied to flowering crops is being reconsidered because accumulating evidence suggests exposure to these agrochemicals can cause negative effects to these beneficial insects when they visit treated crops for food. Insect pollinators like honey bees may be exposed to fungicides while foraging on flowering crops land deposit contaminated food resources in the hive upon their return to the nest. It is likely that fungicide exposure may occur in tandem with other stressors to honey bee health, such as viral infections, yet the effects of this common interaction is understudied. Here, we wanted to apply a cell-based approach to characterize some of the negative effects of fungicide exposure and viral infections on honey bees. We exposed AmE-711 honey bee cells to relevant concentrations of the widely used fungicide, chlorothalonil, and infected the cells concurrently with the honey bee virus, Acute bee paralysis virus (ABPV). We then established a dose response relationship for cell viability, measured mitochondrial function via mitochondrial membrane potential (MMP) assay, and quantified expression of oxidative stress and immune signaling genes. Preliminary findings demonstrate that changes to cell viability, MMP, and oxidative stress response gene expression occurred mainly in response to individual stressors. However, we did observe an additive effect of fungicide exposure and ABPV infection on expression of the immune peptide gene, hymenoptaecin. Our findings provide motivation for additional research using AmE-711 as a platform for developing models of interacting stressors relevant to honey bee health and to help predict adverse outcomes.

10:10 BREAK

O5.01

10:20 MOSQUITO SUGAR-FEEDING IN THE TROPICAL ISLAND OF PUERTO RICO

Ella J Branham[1], Dan A Peach[2], Donald A Yee[1]

[1]School of Biological, Environmental, and Earth Sciences, University of Southern Mississippi, Hattiesburg, MS; [2]Department of Integrated Life Sciences; University of Georgia, Athens, GA

Mosquito sugar-feeding has often been eclipsed by blood-feeding, which has generally led to an unbalanced view of mosquito life history. Combined with knowledge about blood feeding, sugar-feeding can offer a more complete story of mosquito life history that can lead to a better understanding of mosquitoes as vectors of pathogens that cause disease. Mosquitoes have been shown to take sugar meals from a variety of sources, with floral nectaries the most commonly visited. Many species of flowers have unique characteristics such as shape, ubiquity, and color / ultraviolet (UV) reflectance that attract pollinators and nectar feeders. Studies on mosquito sugar-feeding has generally been limited to more "arid" environments with relatively few in tropical climates. Puerto Rico, a tropical island, has been the site of many extensive studies within the Luquillo Long Term Ecological Research (LTER) site, including studies centered around mosquitoes. To increase knowledge of mosquito nectar-feeding in Puerto Rico, it is important to investigate broad questions to lay groundwork for future studies. To determine the general flower nectar-feeding relationships and patterns with mosquito species *Culex antilliommagnorum* at the LTER I investigated 2 questions: What flowers are *Culex antilliommagnorum* feeding on? Are these flowers UV dark or UV bright? To investigate whether UV reflectance of flowers affects mosquito sugar-feeding sources, I took UV photos of as many flowers from plant species as possible around the LTER. In addition, samples of all plants were collected for DNA extraction to create a DNA database via GenBank. Adult sugar-fed mosquitoes of both sexes were collected from a variety of sources such as under culverts and between rocks along streams. Plant DNA in the mosquito's gut was extracted and compared against the plant DNA database in a general sense to narrow down potential flower nectar sources used by mosquitoes. Investigating local mosquito flower preference and sugar interactions can lead to a better understanding of sugar use in mosquitoes. Patterns discovered between UV reflectance in flowers and mosquitoes could help explain floral sugar-feeding behaviors; increasing knowledge in this relatively new field, as well as laying the foundation for future studies.

O5.02

10:40 FACTORS ASSOCIATED WITH ABUNDANCE OF LARVAL *Culex antillummagnorum* (Diptera: Culicidae) in bracts of *Heliconia caribaea* IN EL YUNQUE NATIONAL FOREST, PUERTO RICO

Cassandra Urquhart, Jaclyn Everly, Donald Yee

School of Biological, Environmental, and Earth Sciences, University of Southern Mississippi, Hattiesburg, MS

Mosquito larvae inhabit a variety of different standing water sources, including certain phytotelmata, like bromeliads, pitcher plants, bamboo internodes, and fallen palm spathes. The genus *Heliconia* includes plants with large inflorescences, called racemes, that hold water in sections, called bracts, that often contain a multiple of different species of invertebrate larvae, including mosquitoes. One such species in Puerto Rico, *Heliconia caribaea*, occurs in clusters throughout El Yunque National Forest. In 1997 and 2017, invertebrates were sampled from these clusters and the number species plus

the number of individuals per species was recorded per bract and across the raceme for two to three sizes of raceme, depending on the year. The mosquito, *Culex antillummagnorum*, likely the primary vector of malaria in local populations of Anolis lizards, was the most abundant mosquito species found in these bracts. This mosquito is common throughout Puerto Rico and displays a unique oviposition pattern for its genus. Here, the number of larval *Cx. antillummagnorum* is examined in comparison to multiple potentially influential factors, including number of other invertebrates present, number of unique species present, size of raceme, age of bract, and collection year. Identifying potential habitat and community effects on larval abundance may provide insight into possible adult behavioral patterns, such as oviposition choice, or increased understanding of the lizard malaria disease system in the forest.

O5.03

11:10 THE TRADE-OFF IN POOR-NUTRIENT ENVIRONMENTS OF A NEMATODE-TRAPPING FUNGUS

Tsui-Ting Hsu

Department of Biology, University of Mississippi, Oxford, MS

When facing a poor environment and in need of seeking a more resourceful environment, there are two strategies that a fungus can apply: whether to expand the mycelium, or to form some dispersible conidia. Previous studies also showed that the time duration for a fungus to germinate could be an even more important adapted trait than mycelium growth rate. Since the energy is limited, there can be potential trade-offs in the investigation into those different traits. *Arthrobotrys oligospora* is a nematode-trapping fungus. Although the research on molecular mechanisms and genomes of *A. oligospora* are plentiful, the ecological and evolutionary models of *A. oligospora* are largely unestablished. To see if there was any trade-off between the traits, I cultivated *A. oligospora* in a poor-nutrient media and measured the mycelium growth rate, the time it took to germinate, and the time it took to form conidia. The result showed there was a significant negative correlation between growth rate and the time it took to germinate, indicating a trade-off between being the first or being fast to grow. This research serves as a pilot study for modeling the interaction between *A. oligospora*, the nematodes and the environment. Further study about the evolutionary strategies in different environments and communities, and about how the stability of the strategies can be maintained, will be subjects to conduct.

O5.04

11:30 HARNESSING GENETIC DIVERSITY IN *Populus trichocarpa* TO INVESTIGATE PHYSIOLOGICAL AND MOLECULAR MECHANISMS OF HEAVY METAL TOLERANCE

Raphael Ployet[1], Amith Devireddy[2], Naira Ibrahim[3], Wellington Muchero[1]

[1]OakRidge National Laboratory, Oak Ridge, TN; [2]Claflin University, Orangeburg, SC; [3]Department of Biology, Jackson State University, Jackson, MS

Heavy metal (HM) contamination poses a significant environmental threat, with cadmium (Cd) being particularly concerning due to its toxicity and prevalence in soil and water sources. In response to this environmental challenge, phytoremediation strategies have been developed to leverage the ability of plants to remove metal pollutants from the soil. Among the plant species employed for phytoremediation, *Populus species* stand out as promising candidates due to their rapid growth and biomass production. In this study, we utilized genome-wide association studies (GWAS) and expression quantitative trait loci (eQTL) mapping to identify effective poplar genotypes in mitigating heavy metal levels in soil, with a particular focus on Cd. Through physiological and multi-omics analyses, we investigated the role of three poplar genotypes in alleviating the adverse effects of Cd toxicity. Additionally, we performed an integrative analysis to explore the complex relationships between transcriptomic changes, physiological responses, and ionomic profiles in response to Cd treatment. Our findings shed light on the mechanisms underlying Cd tolerance in poplar genotypes, particularly highlighting genotype BECS-440 for its resilience to Cd stress and ability to alleviate its harmful effects. These insights will aid breeding and genetic transformation efforts aimed at developing superior *P. trichocarpa* varieties specifically tailored for phytoremediation applications.

11:40 Divisional Business Meeting

12:00 Lunch

THURSDAY, March 20, 2025

EVENING

4:00 DODGEN LECTURE /AWARDS CEREMONY

Hall B

5:00-7:00 GENERAL POSTER SESSION
(Immediately following Dodgen Event)

P5.01

INORGANIC FERTILIZERS AND THEIR ENVIRONMENTAL IMPACTS IN MISSISSIPPI SOILS

Tanea Fisher[1], Bryson Porter[1], MD Firoz Khan[2], Debarshi Roy[2], LaShunda Hodges[3]

[1]Department of Biology, Alcorn State University, Lorman, MS; [2]Department of Chemistry & Physics, Alcorn State University, Lorman, MS; [3]Department of Plant and Soil

Sciences, Southern University A&M College, Baton Rouge, LA

Inorganic fertilizers are considered a key component in the agricultural world. They play a significant role in improving plant productivity. Inorganic fertilizers can benefit farms by getting the highest yield and proficiency from a crop of choice. When improperly used the inorganic fertilizers are unsuitable for air quality and the environment. As previously studied, inorganic fertilizers have been determined to increase above-ground biomass and decrease plant diversity but substantially obtain plant diversity loss with the increase of nutrients such as nitrogen (N), phosphorus (P), and potassium (K). Notably, environmental pollutants such as trichloroethylene (TCE) are proven to have harmful effects on human and animal health. Fertilizer volatilization is a process in which fertilizers have not been absorbed by the soil washed away by water contributes to air pollution. When heated by the sun, fertilizers release a toxic gas called urea. Once the urea is introduced into the air, it combines with combustion pollutants like nitrogen oxides and sulfates from vehicles and exacerbate air pollution. In areas heavily reliant on livestock or crop production, the sun's effect on urea from manure and raw fertilizer can increase air humidity, consequently causing respiratory problems and other health issues.

P5.02

COMPILATION OF A "MOVABLE CALENDAR" AS A METHOD OF PREDICTING THE FLOWERING TIME OF HONEY PLANTS

Elena Kostyleva[1], Sarah Kennedy[1]

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

For migratory beekeeping, it is important to determine the beginning of flowering of basic honey plants in advance. However, in various years, the flowering periods of honey plants, as a rule, do not coincide. Nevertheless, our observations have shown that the sequence of flowering of individual species as well as the intervals between their flowerings remain more or less constant, regardless of weather conditions. Respectively, the objective of our study was to develop an improved method for predicting the flowering dates of the main honey plants in the state of Mississippi. Based on the observation data, we have developed a more detailed method, compared to the previous procedure published by Kostyleva (2023), for predicting the flowering periods of honey plants. The method is associated with compilation of the so-called "movable calendar", which in turn is based on the calculation of the duration of the intervals between the average honey plants flowering periods, following immediately after each other. Since the intervals between adjacent flowering periods of honey plants are taken into account, weather fluctuations can have a significantly smaller impact on them, and their flowering can be predicted much more accurately compared to the previous method by the authors. With the help of the "movable calendar", it is possible to productively use the flowering periods of honey plants right away in the first year, without waiting for the accumulation of long-term observations. We have compiled such a calendar for the conditions of the state of Mississippi. To calculate the flowering date of the desired species using this calendar in a given year, it is necessary to determine the flowering date of the species that serves as a reference point - Hazel alder (*Alnus serrulata* (Aiton) Willd.) or the species following it, and to add to this date the average numbers of days remaining until the beginning of flowering of the species of interest.

P5.03

EFFECTS OF EXOPOLYSACCHARIDES FROM *Rhizobium tropici* ON WHEAT GROWTH AND PHOSPHORUS AVAILABILITY IN FERTILIZED SOILS

Trinity Stark[1], Fengxiang Han[2], Huimin Zhang[1], Christian Cole Lipe[1],Liang Xiao[1]

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Phosphorus (P) is a vital nutrient for plant growth, playing a key role in numerous biochemical processes and in agricultural production. However, imbalanced soil P levels can lead to detrimental environmental effects. This study focuses on the impact of exopolysaccharides (EPS) produced by *Rhizobium tropici* on wheat (*Triticum aestivum*) growth under varying fertilizer conditions. We conducted a greenhouse experiment with three EPS concentrations (0, 0.2, and 0.4‰) and different fertilizer regimes (N-K, P, and N-K-P). Utilizing the Hadley fractionation method, as modified by Tiessen and Moir, we assessed total phosphorus extraction and identified specific phosphates in agricultural soil previously used for corn cultivation. Our primary objective is to evaluate how EPS inoculation influences wheat growth in relation to various fertilizer applications. We anticipate that the addition of EPS will positively affect wheat growth metrics, including plant height, biomass, and nutrient uptake, particularly when combined with appropriate fertilizers. Preliminary results suggest that EPS enhances phosphorus availability, leading to improved root development and overall plant performance. This research aims to provide insights into the synergistic effects of microbial inoculants and fertilizers, contributing to sustainable agricultural practices and improved crop yields.

P5.04

DIRECT ANALYSIS OF MICROPLASTICS DEPOSITED ON SILICON FILTERS FROM INDOOR AIR ENVIRONMENTS USING μ-FTIR: DISTRIBUTIONS, COMPOSITIONS, AND MORPHOLOGY

Ruojia Li, James Cizdziel

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Microplastics (MPs), small synthetic polymers <5 mm is size, are a global contaminant. Research on MP pollution has focused on their presence, characteristics, fate, and impacts in aquatic and terrestrial environments. There has been significantly less attention given to airborne MPs, particularly in indoor environments where people spend most of their time and where concentrations are higher due to numerous sources, including textiles (e.g., carpet and clothing). Here, we investigated MP fallout onto silicon (which is transparent in the mid-IR range) in residential areas and an academic building in Oxford, Mississippi. This sampling approach allows for direct analysis using micro-Fourier transform infrared spectroscopy (μ-FTIR) negating potential losses and contamination with sample preparation and speeding analyses. The deposition rate (MPs/m^2/d) among fifteen sampling sites ranged from 12.6 × 10^3 to 159 × 10^3. The highest MP fallout was generally observed in the bedroom, followed by the kitchen, group office (work) space, living rooms, and personal (work) offices. MPs <100 μm were mostly fragments, whereas MPs >100 μm were primarily fibers. The dominant polymers (~83.6%) were those of the nylon family, especially polyamide and polyarylamide (a partially aromatic polyamide), which were sourced primarily to carpet. Overall, we conclude that indoor environments are prone to serious MP pollution and that MP levels vary greatly due to different characteristics of indoor settings.

P5.05

TESTING THE EFFICACY OF BIOPESTICIDE COMPOUNDS IN GUAYULE RESIN ON SOUTHERN PINE BEETLE

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The southern pine beetle is one of the most problematic pests of southern pine species in the southeastern USA. It has been estimated to cause about $43 million in losses per year in the southeastern United States between the early 1980s and 2011 and over $900 million loss in pine forests to date. The methods of control of outbreak activities of southern pine beetle have been through silvicultural activities that remove affected trees and maintain a less-dense pine forest. These silvicultural approaches include the increasing spacing among trees, thinning of high-density pine stands, and salvage logging trees that are already diagnosed with symptoms from the attack of the southern pine beetle. The use of synthetic pesticides for the control of southern pine beetle has been identified as a cause of build-up of resistance to the pesticides by the bark beetles, in addition to the persistent environmental impacts of synthetic pesticides. Presently, there are no other methods of controlling southern pine beetles besides silviculture; meanwhile the southern pine beetles continue to cause damage and loss of trees in the pine forests, coupled with waste of salvaged trees that are continuously felled to prevent the spread of the bark beetles in pine forests and the eventual economic loss. Therefore, it is important to look for alternative means of controlling or limiting southern pine beetle outbreak activities from spreading further to healthy pine trees. In this study, guayule resin was tested as a control for southern pine beetle because guayule resin consists of biopesticide compounds that have been found to be effective against insect pests, including beetles, termites, and cockroaches. These biopesticide compounds include guayulins A-D and partheniol, which are grouped as sesquiterpenes, and argentatins and incanilin, which are grouped as terpenoids. This study encompasses solvent extraction, characterization of fractions, and isolation of fractionation from guayule resin. Preliminary laboratory tests compared the dissolving strengths of acetone, hexane, and dimethyl sulfoxide on guayule resin. In the experiment, 20 ml of each solvent was tested with varying amounts (0.25, 0.5, 0.75, and 1 g) of guayule resin. The resin and solvent mixture were stirred with a stirring crucible and a stirrer, with low heat applied when necessary to aid in dissolving the mixture. The time taken for a homogeneous mixture was recorded and compared across the solvents. Acetone dissolved the resin in less than fifteen minutes for all resin quantities, while dimethyl sulfoxide was slower at dissolving the resin. The preliminary results indicate that acetone was more effective than both dimethyl sulfoxide and hexane in dissolving guayule resin, which is important for characterizing guayule resin and testing its efficacy on southern pine beetle.

P5.06

REVISITING THE DETOXIFICATION REPERTOIRE OF THE CORN EARWORM, *Helicoverpa zea*

Courtney Wynn, Seung-Joon Ahn

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The corn earworm, *Helicoverpa zea*, is a notorious agricultural pest that devastates numerous economically important plants. Detoxification gene families play a critical role in host-plant adaptation and insecticide resistance. In this study, we aim to identify a complete set of detoxification gene families from the recently-assembled long-read reference genome sequence and to map differentially expressed genes across eight different larval tissues. Here we present an update on the five major detoxification gene families: cytochrome P450 monooxygenase (CYP), carboxyl/cholinesterase (CCE), glutathione S-transferase (GST), uridine diphosphate glycosyltransferase (UGT), and ATP-binding cassette transporter (ABC). Our focus includes their gene structure, differential expression, and phylogenetic analysis. This

study lays a foundation for further investigations into the functional analysis of specific genes of interest and provides insights into how the corn earworm thrives on a variety of host plants. It offers valuable information for developing strategies to manage this pest species.

P5.07

COMPARING PLANTED SHORTLEAF AND LOBLOLLY PINE SEEDLING SURVIVAL IN CENTRAL MISSISSIPPI

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Historically, shortleaf pine ecosystems had much greater presence on the landscape in much of Mississippi. However, due to the active suppression of fire beginning in earnest around 100 years ago, and the planting of the more easily regenerated and faster growing loblolly pine after the virgin forest was cut, shortleaf pine now occupies a significantly lesser amount of acreage. However, due to poor pulpwood markets, and an inability for landowners to find loggers willing to harvest pulpwood aged and sized trees, pine plantations are now commonly established using lower planting densities. At these lower planting densities, an initial pulpwood-dominated first thinning is no longer a necessity. Thus, there is the potential for shortleaf pine to be more commonly planted due to its stem form and ability to produce more valuable sawlogs of high quality at these lower planting densities as compared to the currently more commonly planted loblolly. A pine species trial comparing loblolly and shortleaf was established on nearly a 3-acre area in central Mississippi south of Crystal Springs on the Mississippi Agricultural and Forestry Experiment Station (MAFES) Truck Crops Branch Experiment Station. 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 for many years, compaction occurred, and therefore 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. Container shortleaf and bareroot Elite loblolly seedlings were hand planted deep in March of 2024. Shortleaf was planted during early March and loblolly was planted during mid to late March. An over-the-top of the seedlings first-year chemical herbaceous weed control treatment was conducted in late April of 2024. Percent survival, average groundline diameter, and average height of seedlings were measured during mid-June of 2024. Across both species, percent survival was 97% while groundline diameter averaged 5.16 mm and total height averaged 14.0 inches. The tallest and shortest seedlings had heights of 26.5 and 4.5 inches, respectively. Seedlings with groundline diameters of 12.93 and 1.18 mm were the largest and smallest, respectively.

P5.08

EFFECT OF GOSSYPOL ON DIAMIDE INSECTICIDE TOLERANCE IN *Helicoverpa zea*, A COTTON PEST

Charles Thompson, Sujin Lee, Seung-Joon Ahn

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

The corn earworm (*Helicoverpa zea*) is a polyphagous pest that infests various crops, including cotton, and has evolved sophisticated detoxification mechanisms to counter xenobiotics, such as gossypol, a defensive secondary metabolite produced by cotton plants, and chlorantraniliprole, a widely used diamide insecticide. Gossypol acts as a natural deterrent against herbivorous insects and is detoxified by adapted insects using their detoxification mechanisms, which also contribute to the breakdown of synthetic insecticides. In this study, we examined the impact of gossypol exposure on the tolerance of corn earworm to chlorantraniliprole (CHL), investigating whether pre-exposure to this plant toxin primes detoxification pathways that could confer cross-tolerance to CHL. The study also included the fall armyworm (*Spodoptera frugiperda*), a pest with similar P450 enzyme-mediated detoxification systems, to understand broader implications for insecticide resistance. Results showed that larvae pre-exposed to gossypol exhibited elevated P450 enzyme activity, enhancing their ability to metabolize and tolerate subsequent exposures to chlorantraniliprole. These findings suggest that prior exposure to natural plant toxins like gossypol could increase tolerance to industrial insecticides, highlighting potential challenges for managing resistance in agricultural pest populations.

P5.09

A COMPARATIVE STUDY OF COGNITIVE ABILITIES: EXPLORING PROBLEM-SOLVING SKILLS IN CROWS AND PARROTS

Donald Coleman, Johnetta White and Nina Baghai-Riding

Division of Mathematics and Sciences, Delta State University, Cleveland, MS

This study investigated the problem-solving abilities and intelligence of parrots and crows. Tool-use challenges from our own experiment and the Behavioral Ecological Research Group at the University of Oxford reveal remarkable similarities in parrots and crows' cognitive abilities, with nuanced differences in problem-solving strategies between the two. To conduct the experiment, our BIO 462, Ornithology group at Delta State University mimicked natural habitats found in the Mississippi Delta

and recruited native crows and parrots familiar with the local environment. The birds were tasked with tool-use challenges, spatial reasoning tests, and object permanence trials designed to assess different aspects of cognitive functioning in both crows and parrots. Our study found crows demonstrated proficiency in tool use and efficiency in foraging behaviors, while parrots exhibited greater flexibility and adaptability in navigating delta-specific environments. The goal of this research was to understand the cognitive development of avian intelligence better and to gain a deeper appreciation for the diverse ways in which the animals navigate their environments and solve challenges.

P5.10

PLANT ANATOMICAL FEATURES OF *Galium aparine* (RUBIACEAE)

Savannah Conway, Brady Bozeman, Ezell Landrum, Nina Baghai-Riding

Division of Mathematics and Sciences, Delta State University, Cleveland, MS

Galium aparine L. (cleavers, bedstraw) in the Rubiaceae is a naturalized weedy herbaceous plant that grows throughout the southeastern United States. Native to Europe, Asia, and North Africa, this species thrives in the Mississippi Delta throughout the early spring. It commonly occurs in lawns, woodlands, forests, gardens, prairies, meadows, disturbed areas and along stream banks that possess moist soils. Its leaves are simple, linear, and arranged in whorls of six to eight. The stems are green, sprawling and forming dense tangles, while the taproots branch out but not strongly attached to the stem. Flowers are star-shaped, 2-3 mm wide with four white to green ovate petals and occur in leaf axils. Fruits are abundant and globular, possess hooked bristles, and contain one to four seeds. During the Spring 2024 semester, our group enrolled in BIO 410 Plant Anatomy at Delta State University analyzed anatomical characteristics of this species. Longitudinal, paradermal, and cross-sectional cuts of roots, stems and leaves were made manually using single-edged razor blades. Clear nail-polish peels of the upper and lower epidermis of leaves and the epidermal layer of stems also were examined. Stains such as neutral red aided in bringing out cell features and to provide contrast. Digital images were taken under 40x, 100x, and 400x magnifications with an Olympus Q-Color 3 camera attached to an Olympus BX43 microscope. Of special interest are the unicellular, uniseriate trichomes that frequently curve at the apex on leaves and stems. Stomata mostly occur on the abaxial leaf epidermis and are paracytic. Secretory cells are associated with the adaxial epidermis. Leaf petioles commonly have four-lateral wings at their apex that contain three to more rows of collenchyma. The roots possess a protostele with abundant cortical aerenchyma. Stems possess a derived siphonostele (eustele); helical xylem secondary thickening was associated with the internodes. Fruits possess a well-defined mesocarp and endocarp; a distinct ring of cells separates the mesocarp from the endocarp. Future research will be to further investigate anatomical and chemical features of *Galium aparine* since this species is known to have medicinal uses and serve as a coffee substitute.

P5.11

VEHICULAR COLLISIONS WITH RAPTORS IN THE MISSISSIPPI DELTA

Olivia Pharr, Nina Baghai-Riding

Division of Mathematics and Sciences, Delta State University, Cleveland, MS

Raptor birds are bioindicators and their populations depend on a sustainable environment with limited human disturbances. They are apex predators helping to eliminate overpopulated ‘pest’ species such as rodents that harm residences and crops. The development of automobiles and highways has negatively impacted raptors. These birds are common victims of vehicle collisions. They may die from direct impact or suffer eye injuries, broken bones, wing damage, head trauma, and more. Owls, hawks, and vultures are raptors that hunt or scavenge for animals, particularly rodents. Highways in rural areas including the Mississippi Delta, have contributed to the death of raptors. In October-December 2024, two Barred owls (*Strix varia*) and one Turkey Vulture (*Cathartes aura*) were found dead after being struck by vehicles on Highway 35 and Highway 8 in Holcomb, Grenada County. Another Barred owl, and supposedly, a Red-tailed hawk (*Buteo jamaicensis*) also occurred dead on Highway 35 in Cascilla and Holcomb, Tallahatchie County. Based on accounts from the residents of this area, raptor bird fatalities caused by motorists have been an ongoing issue for a number of years. Both highway locations are geographically heterogeneous, separating the alluvial cropland and adjacent swamps from coniferous and hardwood forests; the forests provide nesting sites for each species while the cropland and swamps are a sufficient place for finding a variety of prey. The three Barred owls were estimated to be adults (2 years or older) based on the presence of mature features; they were estimated to be 36 cm tall. The Turkey Vulture was considered immature as it had a red and grey head and was approximately 45 - 61 cm tall. The Red-tailed hawk, age unknown, was estimated to be 30 - 45 cm tall. All three species are resident birds in the Mississippi Delta. Although the exact time of death is unknown for the five raptor birds, assorted studies have indicated that oncoming car headlights may temporarily blind raptors, when they are searching for prey. Turkey Vultures are reported to not react quickly when vehicles travel at speeds greater than 56 mph. Juvenile/immature vultures also are at a higher risk as they are inexperienced flyers and scavengers. Throwing food out of car windows attracts animals to the road that raptors consume. Literature and studies, regarding the death of raptor birds due to vehicle collisions in Mississippi and studies regarding raptors in general, are scarce. Three recommendations are proposed here that may eliminate vehicle accidents with raptors: place information boards

about raptors at rest areas and wildlife refuges, install signage near raptor sightings, and employ social media posts. These three strategies are affordable as well as raise public awareness about hunting/scavenging behaviors and the ecological importance of raptors.

P5.12

THE AVIAN INFLUENZA TAKES ITS TOLL ON THE BIRDS OF NORTH AMERICA

Olivia Pharr, Olivia McDade, Savannah Conway, Nina Baghai-Riding

Division of Mathematics and Sciences, Delta State University, Cleveland, MS

The Avian Influenza or "the bird flu" is a contagious viral disease among domestic and wild birds. Around 52,695,450 birds lost their lives from this disease in 2022, and numbers have risen since then. Avian flu is a major threat to the health of poultry within the agriculture industry, the health of wild and domesticated animals including humans, and the U.S. economy and food industries. The first case of H5N1 was detected in late 2021 among wild migratory birds. It later spread and continues to spread across the United States from migratory waterfowl, poultry, dairy cows, and mammalian wildlife including marine mammals such as dolphins. Both wild and domesticated birds were detected carrying the H5N1 virus in the state of Mississippi. Lafayette, Winston, Quitman, Leflore, Issaquena, Oktibbeha, Grenada, Smith, Madison, and Tallahatchie counties have reported infected raptors and waterfowl since 2022. Snow geese (*Anser caerulescene*) are the most infected migratory bird species; they come into contact with numerous North American birds when migrating along the Mississippi Flyway in the spring and fall. Black vultures (*Coragyps atratus*) are the most common raptor species infected as they feed on deceased mammals and birds carrying H5N1. The H5N1 strain of the Avian Influenza has adapted and has had a longer lasting effect on birds and mammals than previous strains of the virus (HPAI). The CDC has recommended safe practices to the general public such as keeping a distance from injured or dead birds and reporting them to local health organizations. The CDC are taking precautions in dealing with H5N1 infected animals to prevent the spread to other wildlife, poultry and cattle, and humans as well.

P5.13

ANATOMICAL FEATURES OF *Taraxacum Officinale* (COMMON DANDELION)

Meredith Rice, Jordon Kloth, Mikayla Kloth, Nina Baghai-Riding

Division of Mathematics and Sciences, Delta State University, Cleveland, MS

Taraxacum officinale (common dandelion) exists across North America and has become naturalized throughout the United States. It occurs in all 50 states. It prefers to grow in moist open habitats throughout temperate areas: roadsides, ditches, lawns, waste areas, and more. It can stand up to 45 cm tall. Taraxacum officinale can be found by spotting a yellow flower head that possesses many ray florets or as a round, ball-like structure of whitish-gray tuff or plumes of achene fruits that emerge from a long peduncle stalk. The tuffs are hair-like and possess fine bristles. Leaves have a basal arrangement and are deeply serrated with pointed tips. Its taproot is long. *Taraxacum officinale* has a long, dark brown taproot that is usually 15 - 45 cm in length. For this project, our group analyzed anatomical structures from fresh specimens of *T.* officinale. Transverse, longitudinal, and paradermal sections were made manually using commercial single-edged razor blades of the root, leaves, petiole, peduncle, flowers, and fruit. Digital photographs were taken with an Olympus Q-Color 3 camera attached to an Olympus BX43 microscope. A phase contrast condenser was utilized when viewing transparent features such as guard cells on leaf epidermal peels. Leaves are amphistomatous with anomocytic stomata and two to more layers of abaxial palisade parenchyma. Leaf cells also possess abundant chloroplasts. Stems, petioles, and peduncles have a eustele arrangement; the secondary thickening of the xylem is helical. The root has a protostele arrangement; there is a central core of xylem that contains numerous vessels. Other anatomical features include conical-like barbs associated with fruit and seed structures, anatropous ovules, and abundant chloroplasts in peduncle and leaf cells. These features are in concordance with published accounts associated with the Asteraceae, subfamily Cichorioideae, which includes the genus *Taraxacum*.

P5.14

SELECTIVE MODULATION OF NITROGEN AVAILABILITY BY EXOPOLYSACCHARIDES: AMMONIUM RETENTION AND NITRATE MOBILITY

Christian Lipe[1], Huimin Zhang[1], Trinity Stark[1], Liang Xiao[1], Steven Larson[2], Fengxiang Han[1]

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Nutrients like nitrogen (N) and phosphorus (P) are vital for plant growth, and their availability is influenced by interactions with soil organic matter. Exopolysaccharides (EPS), environmentally beneficial macromolecules, can modify nutrient solubility and mobility. Previous studies showed that EPS strongly binds P through carboxylic and phenolic groups, forming clusters and flake-like structures, enhancing P solubility in soils through complexation and solubilization. Building on these findings, the current study investigates the potential role of EPS in modulating the availability of N in its two primary forms, ammonium (NH_4^+) and nitrate (NO_3^-), using bath experiments, as well as dialysis methods. The aim is to compare the methods in terms of selectivity, adsorption capacity, and reduction of

interference. Additionally, the impact of EPS on nitrogen transformation processes also was evaluated to clarify its role in nitrogen cycling and nutrient retention. Preliminary results indicate that EPS exhibits negligible adsorption capacity for NO_3^-, while showing significant affinity for NH_4^+, as revealed by isotherm data. Kinetic results suggest rapid initial adsorption of NH_4^+ by EPS, followed by a gradual stabilization phase. Dialysis experiments further corroborated these findings, indicating enhanced retention of NH_4^+ in EPS-dominated systems, potentially through ionic interactions. These results suggest that EPS may selectively modulate the bioavailability of NH_4^+ while having minimal effect on NO_3^-, with implications for improving nitrogen use efficiency and reducing nitrate leaching in agricultural soils.

P5.15

OCCURRENCE AND DISTRIBUTION OF MICROPLASTICS & TIRE WEAR PARTICLES IN STORMWATER RUNOFF IN OXFORD MISSISSIPPI

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Plastic pollution has become a critical environmental issue, with plastic production increasing 20-fold over the past 50 years. This study focuses on the quantification and characterization of microplastics (MPs) and tire wear particles (TWPs) in stormwater runoff collected from a university campus following three consecutive days of rain. Using a one-pot method for sample extraction, followed by stereomicroscopy and µ-FTIR analysis, we identified and quantified the MPs and TWPs present in the runoff samples. Results indicated a high concentration of MPs, averaging 162.6 particles/L, predominantly composed of polycarbonate (PC), PC/ABS, and PE/EVA. TWPs were also present, averaging 25.3 particles/L. The size distribution analysis revealed that MPs were primarily in the 30-50 µm range, while TWPs were larger, exceeding 130 µm. These findings highlight the significant role of stormwater runoff in transporting MPs and TWPs into aquatic ecosystems. The study underscores the need for long-term monitoring and effective mitigation strategies to address the growing environmental impact of plastic pollution.

P5.16

THE RENEWABLE ENERGY SOLUTION FOR THE MISSISSIPPI DELTA

Makayla Stasher, Reginald Rodges

Coahoma Community College, Clarksdale, MS

The Mississippi Delta, like many areas across the United States, faces challenges when it comes to energy. These communities often rely on outdated infrastructure, and many people still lack access to reliable, affordable energy sources. The main objective of this research is to explore how renewable energy could be used to address the energy needs of rural Mississippi. Specifically, this essay will examine the feasibility of using solar, wind, and biomass energy in rural areas of Mississippi. First, data on energy consumption patterns, current energy costs, and renewable energy potential in Mississippi will be gathered from government reports, energy studies, and local utility companies. Surveys will also be conducted with rural residents and businesses to assess their energy needs, challenges, and willingness to adopt renewable energy solutions. In addition, case studies of other rural areas in the U.S. that have successfully implemented renewable energy will be analyzed to identify best practices and lessons learned. Finally, an economic analysis will be conducted to evaluate the costs and benefits of installing solar panels, wind turbines, and biomass energy systems in the Mississippi Delta. The expected results of this study suggest that renewable energy can provide an affordable and reliable alternative to traditional energy sources for rural Mississippi. Solar power, in particular, is expected to be the most viable option due to Mississippi's sunny climate.

P5.17

INVESTIGATION OF POLLUTANTS IN TREATED WATER IN SIX CITIES IN THE MISSISSIPPI DELTA

A'Shyiah Young, Ashton Harris, Ouida McAfee

Coahoma Community College, Clarksdale, MS

Water pollutants in the Mississippi Delta present a significant environmental and public health concern, impacting both surface and groundwater sources. We explored the primary sources of pollution, including agricultural runoff, industrial discharge, and socioeconomic factors, which introduce contaminants into our water supply. Data was collected from state monitoring reports and water quality assessments across six cities in the Mississippi Delta. The study further evaluates the effectiveness of current state and federal regulations, as well as proposed solutions such as improved agricultural practices, wastewater treatment advancements, and community-driven conservation efforts. These insights aim to guide policymakers in implementing strategies to mitigate water pollution, protect aquatic ecosystems, and ensure safe water access for Mississippi residents.

P5.18

INVESTIGATION OF THE PRESENCE OF MICROPLASTICS IN TREATED AND UNTREATED WATER SAMPLES IN THE MISSISSIPPI DELTA

Ashton Harris, Kaleb Malone, Hope Thomas, Ouida McAfee

Coahoma Community College, Clarksdale, MS

Small plastic particles, typically >5 millimeters in diameter, are called microplastics. They come from two sources. The first is the breakdown of larger plastic waste.

The second is intentional use. Microplastics that breakdown from eiterh source have become a serious environmental concern. The purpose of this study is to analyze treated and untreated water samples in the Mississippi Delta to determine if microplastics are present. Experiment results identified microplastics if present under UV light. Microplastics are ubiquitous in marine, freshwater, and terrestrial ecosystems. They are believed to pose potential significant risks to wildlife. Ingestion of microplastics can lead to physical harm; ingestion with stomach contents can lead to problems like blockage and tearing of the stomach or intestines. Microplastics may serve as very effective vectors for transporting "diseases".

Friday, March 21, 2025

MORNING

10:00-12:00 Field Trip (See Flyer in the Symposia and Workshop Section) Mississippi Aquarium*

***Note:** Dr. Nina Baghai-Riding will meet conference attendees at entrance of the Aquarium on Friday, March 21, 2025

Geology and Geography

Chair: Claire Babineaux

Mississippi State University

Co-Chair: Alyson Brink

University of Southern Mississippi

Thursday, March 20, 2025
MORNING
Hall D Room 4

8:10 Welcome and Opening

O6.01

8:20 THE STARKVILLE CLOVIS

James Starnes

MDEQ, Mississippi Office of Geology, Jackson, MS

Earlier this year, an early Paleoindian period artifact was found near Starkville in Oktibbeha County, Mississippi by Ryan Mann and brought to the attention of the State Geological Survey, at MDEQ. It is an exquisitely made Clovis tradition artifact measured 77mm long, 30mm wide, and 14 mm in thickness. Dating to more than 13,500 years in age, Clovis points are the earliest recognized human artifacts known to Mississippi and earliest wide-spread lithic tool tradition in North America. His important discovery was made along the western edge of the prairie region and is instrumental to the understanding of the state's deeper ancient cultural history. It is the earliest human artifact yet to be recorded in the county, filling an important gap in the distribution of Clovis culture artifacts. It is also one of the finest examples of the expert craftsmanship of the Clovis tradition ever to be found in Mississippi, with basal channel flaked called "flutes" on both sides. The prairie and bordering flatwoods region of Oktibbeha County have no natural stone resources adequate for flint knapping native to the geology of the immediate area, so essential stone tool manufacturing materials had to have been sources from more exotic geologic resource areas. The Starkville Clovis is manufactured from Fort Payne Chert found along the Tennessee River in what is now Pickwick Lake. The use of Fort Payne Chert by the early Paleoindian people also hints at the strictness and attention to detail for the Clovis tradition of tool manufacturing in the area. Poorer quality chert gravels of the Tuscaloosa Formation were an adequate lithic resource, sourced a bit little closer than the Fort Payne, but purposefully overlooked by these early ice-age inhabitants crossing the prairie region until much later traditions evolved. The Starkville Clovis was found in an area where springs occur bordering the edge of the prairie region emanating from channel sands of the Paleocene Clayton Formation incised unconformably into the Cretaceous Prairie Bluff Chalk. The geological setting provided the Pleistocene inhabitants with consistent freshwater resources and would have attracted an abundance of ice-age fauna from across the northeast Mississippi prairie region. Documentation of the Starkville Clovis leads to a better understanding of these earliest Mississippians and their cultural patterns across the late Pleistocene landscape.

O6.02

8:40 THE GEOLOGICAL AND EDUCATIONAL VALUE OF MISSISSIPPI'S LOCAL GEOHERITAGE SITES AND THEIR FUTURE SUSTAINABILITY

Renee Clary

Mississippi State University, Starkville, MS

Mississippi's fossiliferous Cretaceous and Paleogene strata have been the focus of geological investigations for more than 200 years. Beginning in 2012, four Mississippi field sites were regularly integrated within paleoenvironmental reconstruction projects in university paleontology classrooms; community engaged learning (CEL) was introduced in 2018. Within CEL projects, students assisted local organizations with educational optimization and/or protection of some of Mississippi's fossiliferous landscapes. The four Mississippi sites (Blue Springs, W.M. Browning Cretaceous Fossil Park, Osborn Prairie, Smith County lime pit) qualify as geoheritage sites because of their scientific and educational value, and/or potential geotourism opportunities. Analysis of student surveys demonstrated that students also were overwhelmingly positive toward Mississippi's landscapes and CEL inclusion in paleontology courses. Students acknowledged 'real-world' interdisciplinary experiences moved them beyond the course content and made them stakeholders in

modern issues. While the geoheritage value of these sites is established, the long-term sustainability is uncertain: only one site, W.M. Browning Cretaceous Fossil Park, is preserved for future generations. The other locations (Blue Springs, Osborn Prairie, Smith County) face challenges in their long-term sustainability. Since the geoheritage movement is gaining increased visibility within both national and international arenas, multiple opportunities exist for Mississippi to be at the forefront of interpretation and protection of vulnerable geoheritage sites.

O6.03

9:00 GEOLOGIC CONTRIBUTIONS TO THE ATOMIC ALERT EXHIBIT AT THE TWO MISSISSIPPI MUSEUMS IN JACKSON, MISSISSIPPI

Jonathan Leard[1], Samuel Butz[2], Ivette Ray[2]

[1]Mississippi Office of Geology, Jackson, MS, [2]Mississippi Department of Archives and History, Jackson, MS

Atomic Alert!: Confronting 'The Bomb' in the New Atomic Age was a temporary exhibit displayed at the Two Mississippi Museums in Jackson, Mississippi, from September 7, 2024, to November 2, 2024. This traveling exhibit featured historic cultural artifacts related to the Federal Civil Defense Administration and the sobering realities of living under the threat of a potential nuclear strike on American soil during the Cold War. The exhibit was particularly significant for Mississippi, as the state was the site of the detonation of two subsurface nuclear tests at Tatum Salt Dome, located in Lamar County. These tests, part of Project Dribble, were carried out by the United States Atomic Energy Commission in the early 1960s. During a Certified Public Manager (CPM) course in the fall of 2023 for Mississippi government employees, the author was introduced to the exhibit. Its organizers were coauthors Samuel Butz and Ivette Ray from the Mississippi Department of Archives and History. This meeting led to an interagency collaboration to include a Mississippi-specific section in the national exhibit. The geology of Tatum Salt Dome was central to this Mississippi section. To enhance the exhibit, the Mississippi Office of Geology loaned several significant items, including a Geiger counter, a scintillator, and a salt core sample from Tatum Dome. These artifacts provided visitors with tangible links to the state's involvement in nuclear testing and geological research. A team from the Mississippi Office of Geology and the Mississippi Department of Archives and History also organized a field trip to the Jamie Whitten Forest Management Area. This site is home to the ground zero monument for the Project Dribble tests, marking the locations of the Salmon and Sterling nuclear detonations. The Salmon test, conducted on October 22, 1964, was a nuclear detonation at a depth of 2,700 feet, yielding an explosion of 5.3 kilotons. The subsequent Sterling test, conducted on December 3, 1966, used a smaller 0.38 kiloton test to study the effects of underground detonations and decoupling. The author was invited to speak at the exhibit opening, sharing insights about the historical and geological significance of the tests. Additionally, he led a gallery talk on October 22, 2024, commemorating the 60th anniversary of the Salmon Event. His presentation highlighted the scientific and historical context of the tests, their impact on local communities, and the ongoing importance of geological studies in understanding and mitigating the effects of such activities. The collaboration and exhibit not only shed light on Mississippi's unique geological features and historical events but also fostered interagency cooperation through the CPM program. Through these efforts, visitors gained a deeper understanding of Mississippi's geological importance and its significant role in the broader narrative of the Cold War era.

O6.04

9:20 HYDROGEOLOGICAL OVERVIEW AND WATER RESOURCES OF LEE COUNTY, MISSISSIPPI

Ginger Trochesset

Mississippi Department of Environmental Quality, Jackson, MS

This presentation was prepared by the Mississippi Department of Environmental Quality (MDEQ) Office of Land and Water Resources (OLWR) to delineate groundwater availability for Lee County in northeast Mississippi. Because of the county's former reliance on groundwater resources and subsequent switch to surface water, the status and availability of the groundwater resources in Lee County are of interest for municipal, industrial, agricultural, and domestic purposes. For more detailed descriptions, figures, and cross sections, see the MDEQ Hydrogeological Overview and Water Resources of Lee County, Mississippi digital publication. When Lee County began to expand in the 1960s, the principal water resources were groundwater supplies from the Eutaw-McShan and Gordo aquifers. By 1990, the demand placed on these aquifers by population and industrial growth became unsustainable, particularly in the Tupelo area. To mitigate the consequences of poor well spacing and overpumping, surface water was imported from the Tombigbee River to be used in lieu of groundwater. Most of the wells that were turned off were put on standby status, where many remain today. Transitioning usage from groundwater to surface water allowed the water levels in the Eutaw-McShan and Gordo aquifers to recover to their pre-pumping levels. Drawdown availability may suggest that groundwater withdrawal could resume in parts of Lee County; however, groundwater resources should be used in moderation to prevent recurrence of a significant cone of depression and to prolong the sustainability of the aquifers. Continued conjunctive water use would be recommended.

O6.05

9:40 MONITORING SURFACE-SUBSURFACE WATER FLUXES FOR A HEADWATER STREAM BASIN IN THE GOODWIN CREEK EXPERIMENTAL WATERSHED, PANOLA COUNTY, MISSISSIPPI

Andrew M. O'Reilly[1], Md Samiul Alim[2], Elsie Buskes[2, 3], Robert M. Holt[2], Leti T. Wodajo[3], Craig J. Hickey[3], William B. Rossell[1]

[1]USDA Agricultural Research Service, National Sedimentation Laboratory, Oxford, MS, [2]University of Mississippi, Department of Geology & Geological Engineering, Oxford, MS, [3]University of Mississippi, National Center for Physical Acoustics, Oxford, MS

Agricultural land management practices can change surface-subsurface water fluxes by affecting the partitioning of precipitation into runoff, evapotranspiration (ET), and infiltration, with the potential to exert beneficial or deleterious impacts on downgradient groundwater and surface water resources. A multidisciplinary approach including hydrological, geological, and geophysical research is being applied to define the spatiotemporal variability of these processes along a transect covering a hillside pasture adjoining a flat riparian row-crop field in the Goodwin Creek Experimental Watershed (GCEW). Goodwin Creek is a headwater tributary of the Yocona, Yazoo, and Mississippi Rivers, and GCEW is a 2,100-ha mixed land-use catchment (pasture, row crop, and 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, ground surface slopes >10%, and focused subsurface flow. The research site consists of a transect of five wells installed in 2024 in the perennial water table, which likely supports baseflow exchanges with the creek. An electrical resistivity tomography (ERT) survey was conducted along the 501-m transect and shows that the aquifer is relatively thin (<10 m) near the creek and thick (>30 m) under the pasture. An electromagnetic induction (EMI) survey was conducted using an EM31 instrument over ~13-ha area to provide greater spatial coverage. The depth of the aquifer is variable, outcropping or thinly confined over a short distance (<30 m) in the pasture but confined on both sides of the outcrop. Soil samples were collected down to 1.5 m at multiple locations along the profile following the ERT survey. Collected soil samples were analyzed to characterize grain size, porosity, bulk density, soil moisture content, and soil moisture retention properties, and were generally consistent with the ERT survey, indicating downward coarsening texture in the outcrop area and fine-grained texture in the confined area. The EMI survey indicates the outcrop area is limited (<3,000 m^2), and a narrow band (0-20 m wide) of higher resistivity soils occurs along the creek. Future work includes installation of sensors in or adjacent to each well to measure: groundwater level and temperature; soil moisture content, temperature, and electrical conductivity (5, 10, 20, 51, and 102 cm depths); and soil matric potential (20, 51, and 102 cm depths). 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 to topics such as transport of sediments, nutrients, and pesticides.

10:00 Break

O6.06

10:20 3D ANALYSIS OF Fe-Ti OXIDES: ESTIMATING VOLUMES AND IMPACTS ON RHEOLOGY OF GABBRO

Jeremy Deans, Sarah Hill

University of Southern Mississippi, Hattiesburg, MS

Fe-Ti oxides are weaker compared to silicates that compose gabbro including olivine, plagioclase, and pyroxene under amphibolite conditions. Most gabbroic systems only crystallize 5% Fe-Ti oxides like ilmenite and magnetite, however, some systems, namely oceanic core complexes (OCC), formed along slow-spreading ridges, may have up to 30% Fe-Ti oxide. Oceanic core complexes are bathymetric highs of lower oceanic lithosphere exhumed along a detachment shear zone, and have thick intervals (~1 km) of crystal-plastic deformation. Fe-Ti oxides have been described at the Atlantis Bank oceanic core complex, Southwest Indian Ridge, and have recorded a history of crystal-plastic deformation during exhumation. If the Fe-Ti oxides are in isolated pods, they do not likely impact the rheology of these systems, even in large proportions. However, if the Fe-Ti oxides are in higher abundances and form interconnected layers, they are very likely to reduce the strength of this system and extend the window of crystal-plastic deformation to lower temperatures than those predicted for silicates alone. Most studies have focused on 2D descriptions that do not fully characterize the role and impact of Fe-Ti oxides in these systems. This study analyzed 15 gabbro samples from Atlantis Bank using microCT scanning to estimate the volume and interconnectedness of Fe-Ti oxides in comparison to crystal-plastic fabric intensity. MicroCT measures how X-rays pass through a sample to reconstruct a 3D image; since Fe-Ti oxides are much denser than

silicates, they are more easily isolated from other phases. The samples used ranged from having no crystal-plastic fabric to samples with a mylonitic fabric. Fe-Ti oxide volume ranges from 1%-25%. The Fe-Ti oxide percent is higher in shallower samples, which are within the detachment shear zone. Six of the samples have obvious banding of Fe-Ti oxides with most bands anastomosing around pyroxene. These results suggest that intricate, 3D anastomosing bands of Fe-Ti oxides may form as phase separation increases between plagioclase and pyroxene changing the main deformation mechanism from dislocation creep in plagioclase to grain boundary sliding and granular flow in Fe-Ti oxide-rich bands. This results in these zones of focused Fe-Ti oxides to be weaker, making them more likely to accommodate strain, making the lower oceanic crust weaker leading to broader zones of deformation aiding exhumation and the formation of OCCs.

O6.07

10:40 LITHIUM IN THE TRIASSIC SUBSURFACE OF THE NORTHERN GULF OF MEXICO BASIN

Tim Palmer

MDEQ, Office of Geology, Jackson, MS

Along the periphery of the northern Gulf of Mexico basin a deposit of lithium-rich brine has been discovered in reservoir quality Late Jurassic carbonates (Smackover Formation), commingled with high-salinity brines (>250,000 ppm T.D.S; >250 ppm Li) and trapped by overlying evaporites and shale. The deposit has the potential to host one of the largest and highest-grade resources of lithium-rich brines in the world. To date the primary focus of exploration and academic endeavor with respect to lithium-rich brine deposits has been on Cenozoic geothermal fluid flow and leaching in closed continental basins (e.g., Clayton Valley, Altiplano-Puna, and McDermitt Caldera) sourced by rhyolitic magmas and associated lithium-bearing rocks and minerals. Deep-basinal lithium-rich brines are poorly understood. High salinity brines (>250,000 ppm TDS) trapped in the Late Jurassic, concentrated by the deposition of Bajocian-Callovian evaporites (Werner and Louann formations) and fluid-rock interaction, provide an underexplored resource for lithium-rich brines. A positive correlation between brine salinity, potassium, radiogenic strontium, and lithium concentration exists based on analysis of public brine data. In general, potential lithium source rocks include: 1) evaporites, 2) organic-rich sediments, 3) feldspars, 4) volcanics, and 5) micas. However, lithium source rocks have yet to be discovered and defined in the northern Gulf of Mexico basin. Preliminary results based on brine geochemistry, whole-rock elemental analysis, XRD, and thin-section petrography show that the source of lithium in the Late Jurassic brine is from Triassic syn-rift lithic fragments (Eagle Mills Formation) with average mica/illite composition approaching 50 weight percent and 200 ppm lithium. Deep drilling updip, along the periphery of the basin where the Bajocian-Callovian pinches out, shows that the thickness of the rift deposit exceeds 7,000 feet. Downdip, the true thickness of the rift-phase of the basin has not been realized considering the economic limit of the basin has typically been the top of the overlying evaporites. Lithium is released from mica/illite in direct hydraulic connectivity with magnesium-rich, high-salinity, and acidic brines derived from evaporite deposition by diagenesis and dissolution of mica/illite. The grade of lithium in the brine increases with mica/illite concentration, increased burial depths, and salinity. Basin hosted lithium source rocks act as a natural heap leach for the dissolution and diagenesis of lithium bearing minerals. Modern metallurgical techniques to recover lithium from spodumene and lepidolite show that lithium recoveries increase with heat, time, acid strength, and decreasing crush size (grain size). The syn-rift section of the northern Gulf of Mexico basin is a lithium-factory for the generation and eventual trapping of lithium-rich brines in overlying reservoir rocks.

O6.08

11:00 EXCAVATION OF A COMPLETE FOSSIL TUSK OF COLUMBIAN Mammoth (*Mammuthus columbi*) FROM LATE PLEISTOCENE STREAM ALLUVIUM IN THE BIG BLACK RIVER WATERSHED ALONG THE JACKSON PRAIRIE REGION OF WESTERN MADISON COUNTY, MISSISSIPPI

James Starnes[1], Jonathan Leard[1], Eddie Templeton[2], George Phillips[3]

[1]MDEQ, Mississippi Office of Geology, Jackson, MS, [2]Burns Cooley Dennis, Inc., Hattiesburg, MS, [3]Mississippi Museum of Natural Science, Jackson, MS

On a Saturday, August 3rd of 2024 an important vertebrate fossil discovery was made by Eddie Templeton (an avid avocational artifact and fossil collector) in western rural Madison County, Mississippi. The find was made while exploring a stream where he had found fossils before, near the historic community of Livingston, when he came across a portion of a fossil ivory tusk from an extinct late Pleistocene Proboscideans exposed in the alluvium along a steep channelized embankment. Mississippi was once home to at least three Proboscideans known from the fossil record during the last ice age: mastodon (*Mammut americanum*), Gomphothere (*Cuvieronius hyodon*), and mammoth (*Mammuthus columbi*) and all three animals possessed ivory tusks. Mastodon were browsers, making them the most common the most adaptive Proboscidean found in Mississippi. Their fossil record dates back to the late Miocene epoch in the eastern Gulf of Mexico, particularly from finds in the Tunica Hills region of Louisiana. Mammoths are far less common finds in Mississippi, preferring the grassland habitat of the prairie regions. Little is known about Gomphothere in Mississippi, their fossil record dates back to the Late Miocene and presence here during the late Pleistocene only known from

isolated teeth from Mississippi River alluvium. The team successfully excavated the Madison County find entirely intact from the outcrop, encased in a plaster jacket, and delivered it to the Mississippi Museum of Natural Science for permanent curation. The strong curvature of the massive two-meter-long tusk helped to properly identify it as a Columbian mammoth (*Mammuthus columbi*), the first of its kind known from the Jackson Prairie region of central Mississippi. During the excavation, the base of the tusk was discovered to be lying almost upright, leaning against the ancient coarse-grained fluvial sediments of a buried sandbar with the mid-portion lying directly on top unconformably with the underlying Eocene marine clays of the Yazoo Formation. This is in its original position as it came to rest in a paleochannel before burial by finer-grained, loess-derived stream alluvium. The animal likely had died nearby, and its remains were then carried along the stream's channel, possibly the result of a flooding event within the Big Black River drainage. Mammoths would have played an important role in maintaining the rich late Pleistocene ecosystem of the Jackson Prairie. Due to the intact nature and degree of preservation of the fossil tusk, much can be gleaned about the individual because details of its entire life and the environments it inhabited are recorded in the chemical signatures preserved in the fossil. From the fossil record of the Jackson Prairie region, the mammoth shared a home with a variety of other megafauna including herds horses and giant bison, giant ground sloths, giant tortoises, giant beavers, and tapirs. It was also home to a number of ice-age predators known from the region such as dire wolves, saber-toothed cats, American lion, and even to the earliest human inhabitants to occupy the Jackson Prairie during the late Pleistocene epoch.

O6.09

11:20 HOLOCENE MARINE FOSSILS ALONG THE NEW ORLEANS BARRIER BAR TREND AND A NEW FOSSIL LOCALITY AT LONG BEACH, HARRISON COUNTY, MISSISSIPPI

David T. Dockery III[1], James E. Starnes[1], Cole Moody[2], Kristi Gay[3]

[1]MDEQ Office of Geology, Jackson, MS, [2]University of Southern Mississippi, Hattiesburg, MS. [3]Mississippi State University, Starkville, MS

The present Mississippi coastline once extended to New Orleans. The buried sandy beach under New Orleans is called the New Orleans Barrier Bar Trend. It has been encountered in bore holes for building and infrastructure foundations. The barrier sand under the city is largely not compactable as compared to the mud-rich delta deposits that overlie it and thus makes a better foundation substrate. The sand also contains the remains of fossil marine creatures, especially molluscan seashells. There are two published Holocene fossil localities associated with the New Orleans Barrier Bar. The Rowett (1957) site published in the Gulf Coast Association of Geological Societies Transactions, volume 7, was discovered during the construction of Interstate 10 in the Little Woods area of eastern New Orleans. The Tulane site was discovered in September of 1975 when a large number of marine mollusk shells were noted in the material dredging to deepen the Intra-coastal Waterway to 27 meters (88.6 feet). Over a period of nine months, ending in May of 1976, Tulane geology students collected and identified 43 species of gastropods, 50 species of bivalves, and two species of scaphopods. The estimated age of the New Orleans Barrier Trend and these fossils is around 5,000 years old. Hollander and Dockery published the Mollusca of the Tulane site in the Fall 1977 issue of The Compass (v. 55, no. 1, p. 1-28). This year University of Southern Mississippi and Mississippi State University students and MDEQ Office of Geology staff collected equivalent Holocene marine fossils from a site at Long Beach, Mississippi in Harrison County. The shells are largely bleached of color and many are darkly stained as if storm surges washed them into organic-rich marsh or other estuarine environments. Associated with the fossils are flagstones of fossiliferous sandstone beach rock. A preliminary collection of mollusks in the long beach assemblage includes the gastropods *Cantharus cancellarius* (Conrad, 1846), *Architectonica nobilis* (Roding, 1798), *Oliva (lspidula) sayana* (Ravenel, 1834), *Thais (Stramonita) haemastomafloridana* (Conrad, 1837), *Busycon contrarium* (Conrad, 1840), *Fasciolaria !ilium hunteria* (Perry, 1811), *Crepidula plana* (Say, 1822), and the pelecypods *Corbula swiftiana* (C.B. Adams, 1852), *Anadara* (*Grandiarca*) *floridana* (Conrad, 1869), *Corbula* (*Caryocorbula*) *contracta* (Say, 1822), *Trachycardium (Dallocardia) muricatum* (Linne, 1758), *Dosinia* (*Dosinidia*) *discus* (Reeve, 1850), *Dinocardium robustum* (Lightfoot, 1786), *Crassostrea virginica* (Gmelin, 1791), *Mercenarfa campechiensis* (Gmelin, 1791), *Rangia cuneata* (Sowerby, 1831), *Argopecten gibbus* (Linne, 1758), *Aequipecten glyptus* (Wood, 1828), *Chione clenchi* (Pulley, 1952), *Cyrtopleura* (*Scobinopholas*) *costata* (Linne, 1758), *Chione intapurpurea* (Conrad, 1849), and *Donax variabilis* (Say, 1822). Echinoid fossils include the clypeaseroid *Mellita quinquiesperforata* (Leske, 1778). Encrusting Scleractinia coral and byozoans along with *Cliona* sponge borings, and pholad clam boring were noted on a number of the mollusk shells. Vertebrate fossils from the Long Beach Fossil Site include cetaceans; vertebra of bottle nosed dolphin *Tursiops* sp. and an unidentified much larger whale rib bone fragment. Shark teeth include Sand Tiger, Lemon; several species of *Carcharhinus* including Bull Shark and Oceanic White Tip; and Great White. Fossil crustacean burrow casts of both *Thalassanoides* and *Ophiomorpha ichnotaxa* were collected.

O6.10

11:40 A NEW OCCURRENCE OF *Lepidenteron* (ICHNOTAXA), FOSSILS FROM THE MIDDLE EOCENE (BARTONIAN) MOODYS BRANCH FORMATION OF YAZOO COUNTY, MISSISSIPPI

James Starnes

MDEQ, Mississippi Office of Geology, Jackson, MS

The Middle Eocene (Bartonian) transgressive beds of the Moodys Branch Formation consist of fossiliferous shallow marine deposits containing a diversity of tropical fossil mollusks and vertebrates preserved in sand and clay-rich glauconitic marls. Three distinct beds of the Moodys Branch Formation are recognized at outcrop approaching the axis of the Mississippi Embayment in Yazoo County, Mississippi: a lower clay bed dominated by gastropods, a fossiliferous marl bed dominated by pelecypods of the genus *Glycymeris*, and an echinoid-dominated barrier bar sand containing fossils of the Clypeasteroid *Pariarchus lyelli*. The Moodys Branch is heavily bioturbated with the *Thalassanoides* and *Ophiomorpha* throughout its extent, though another ichnotaxa, *Lepidenteron* abundantly occurs in the *Glycemeris* bed and upper sand bed. *Lepidenteron* is an unbranching burrow without a constructed wall that is lined with the numerous fossil remains of small fish including bones, scales, and otoliths. When these fossils were first encountered loose, reworked from the outcrop, they were thought to be coprolites. It wasn't until numerous fossils were found in-situ, oriented vertically at outcrop in the Moodys Branch Formation, that they were properly attributed to the ichnogenus, *Lepidenteron*. *Lepidenteron* are best known from the much older, late Cretaceous deposits of Poland. *Lepidenteron lewesiensis* (Mantell 1822) is described from the Middle Turonian to the Lower Maastrichtian marine deposits of the Opole Trough, the Miechow Trough, the southeastern areas of the Border Synclinorium, and the Mazury-Podlasie Homocline. The preservation of numerous fish remains lining the walls of the fossil burrows suggests that fish were pulled down as prey into the burrow by the animal that constructed it. Ichnologists have proposed that the late Cretaceous *Lepidenteron* occurrences from Poland might be burrows from fish-eating eunicid polychaetes. It is unclear if the same type of animal from the late Cretaceous of Poland is responsible for the Moodys Branch *Lepidenteron*, though they do appear strikingly similar. It is more likely that the Moodys Branch Formation *Lepidenteron* may have been made by crustaceans. The author suggests that maybe these *Lepidenteron* were made by stomatopods or decapods with lifestyles similar to that of the modern mantis shrimp. Stomatopods have a fossil record dating back to the Lower Devonian period of the Paleozoic era. Mantis shrimp have a burrowing habit and are one of the most significant predators in the ecosystems of tropical and subtropical shallow marine environments of today. A number of new fish taxa have been described in studying the fossil remains uniquely preserved in the *Lepidenteron* fossil burrows from the Cretaceous of Poland. Likewise, the fish remains in the *Lepidenteron* fossils from the Moodys Branch Formation of Yazoo County, Mississippi, hold this same potential for significantly expanding our understanding of the fish diversity in the Upper Eocene deposits of the northern Gulf of Mexico, along with insight into the prey preferences of the animal responsible for these fossil burrows.

12:00 2nd Annual Women in the Geoscienes
Hall D Room 4

Thursday, March 20, 2025
AFTERNOON
Hall D Room 4

O6.11

1:30 WEB SCRAPING AND WAYBACK: TRACKING THE ILLICIT MASSAGE BUSINESS INDUSTRY USING OPEN SOURCE INTELLIGENCE

Nina Kallaus[1], Kayla Stan[2]

[1]Morningside Analytics, Gainesville, FL, [2]University of Southern Mississippi, Hattiesburg, MS

Illicit massage businesses (IMBs) remain one of the most visible retail activities in the informal economy. Over the last two decades, the transition of IMBs to online advertising and marketing spaces has fostered the development of extensive community-driven forums. These online networks provide a valuable source of geographically relevant data, revealing new patterns in the locational strategies of IMBs. Current research has focused on local-level census demographics in sporadic U.S. cities, often limited to single snapshots in time. As an industry with a highly transient nature, this methodological approach limits our understanding of the industry's spatial evolution over time. This presentation, therefore, aims to show how researchers can leverage web scraping and geoanalytics to address challenges of studying heterogeneous and temporally limited datasets. By combining web scraping with internet archives, we extract a more extensive dataset that can be geocoded and analyzed with analytical techniques. The transient nature of IMBs, along with the grey market economy they operate in, makes them an ideal case study for applying backward-looking technologies to assess changes in scope, scale, and locational strategies over time. These techniques are not limited to this application alone and instead can be more broadly applied across a range of subjects with an internet presence, potentially building data-driven analytics and solutions for previously data poor industries.

O6.12

1:50 VECTORIZATION OF THE TISHOMINGO COUNTY, MISSISSIPPI 7.5-MINUTE GEOLOGIC QUADRANGLE MAP COVERAGE

Bailee Ozbirn, Jonathan Leard

Mississippi Office of Geology, Jackson, MS

Geologic mapping of Tishomingo County, Mississippi was completed by Robert K. Merrill in 1988 at a 7.5-minute quadrangle scale. Vectorization of Merrill's geologic maps began as a project started by the Mississippi Geological Survey in 2020. Since the inception of this project, other mapping priorities have taken precedence, resulted in the lack of a completed digital geologic map of Tishomingo County. Between 2020 and 2021, the 7.5-minute geologic quadrangle maps of Iuka, Tishomingo, Belmont, Paden Southeast, and Fulton Northeast were completed. The continued work by the author on the project of the vectorization of the remaining Tishomingo quadrangle maps was to gain valuable knowledge and experience in using ArcMap as well as to accomplish the goal of completing the composite map for the county. The Paden 7.5-Minute Geologic Quadrangle map was the first task assigned and has now been published. In addition to the GIS experience, the author gained a familiarity with the outcrop belts described in Tishomingo County, which include the late Cretaceous Coffee Formation, Eutaw Formation, McShan Formation, Tuscaloosa Group, and the Paleozoic Hartselle Formation, Pride Mountain Formation, Tuscumbia Formation, Fort Payne Formation, Chattanooga Formation, and the Ross Formation. The original blue-line draft maps that are being used were produced by Robert K. Merrill in 1988 for the Tishomingo County Bulletin. The raster files were georeferenced in ArcMap in order to begin the digitization process. From there, a digital map outline was created through the published USGS GEMs tools. Vector lines were then digitized using ArcScan, and topology errors were corrected manually. Once lines were validated, they were converted into polygons. These polygons were attributed to geologic units in accordance with existing Mississippi Office of Geology and GEMs schemas. From there, each map unit was symbolized using the Office of Geology style standard. This has a corresponding color that is already established and was given to each polygon respectively. After the map was completely digitized, it was compared to adjoining quadrangle maps to rectify any edge matching issues. Comparison of the blueline map with surrounding digitized maps helped to ascertain any discrepancies. Future work by the author will include subsequent vectorization of the remaining geological quadrangle maps to produce a composite digital Tishomingo County Map. These digital products will be incorporated into an updated composite State Geologic Map of Mississippi.

O6.13

2:10 THE ROLE OF NON-CREDIT GIS EDUCATION: BUILDING SKILLS, CAREERS, COMMUNITIES

Claire Babineaux, John Cartwright

Mississippi State University, Starkville, MS

The GEO Project advances geospatial education through non-credit GIS courses that address gaps in technology, skills, and workforce readiness, with an emphasis on empowering communities and fostering professional growth. Accessibility is central to the GEO Project's mission. Non-credit courses offer an affordable, flexible entry point for those without formal GIS education and a resource for professionals updating their skills to keep pace with geospatial advancements. The GEO Project also emphasizes workforce development, providing local, state, and federal government employees with hands-on training tailored to industry needs. Participants gain critical skills in geospatial analytics, environmental planning, and other areas essential for addressing community challenges. One example discussed in this presentation, the GEO Project in collaboration with stakeholders, delivered GIS training and tools to Alaska Native communities. This partnership exemplifies the project's mission by incorporating affordable access, workforce-oriented skills, and community empowerment. This will allow local officials to address regional issues such as disaster response, public health monitoring, and conservation. Through its work, the GEO Project shows how non-credit GIS education fosters equity, resilience, and workforce growth by connecting technology and training with those who need it most.

O6.14

2:30 THE INCORPORATION OF AUTHENTIC DATA IN AN ONLINE INTRODUCTORY OCEANOGRAPHY COURSE

Christa Haney

Mississippi State University, Starkville, MS

This presentation will highlight the use of Ocean Observatories Initiative (OOI) resources to add authentic data and interactive labs to an online Oceanography course. Incorporating raw and idealized datasets into course assignments increased students understanding of oceanographic processes while enhancing student engagement with the material. The transfer of the Pioneer Array to the Mid-Atlantic Bight is an exciting opportunity to learn more about diverse oceanographic processes in a complex (and inadequately understood) region. Advantages of using authentic data include an increase in student engagement with the material and added relevance of course material given the real-world datasets used. The use of authentic datasets also supports the development of transferable skills including data analysis, graph interpretation etc.

THURSDAY, March 20, 2025

EVENING

4:00 DODGEN LECTURE /AWARDS CEREMONY

Hall B

5:00-7:00 GENERAL POSTER SESSION
(Immediately following Dodgen Event)

P6.01

PALYNOLOGICAL EVIDENCE FOR CONIACIAN AGE FOR A NEW RECORD OF THE AQUATIC ANGIOSPERM *QUEREUXIA* FROM WESTERN ALABAMA, U.S.A.

Nina Baghai-Riding[1], Carol Hotton[2], Olivia Pharr[1], James Starnes[3], Elizabeth Hermsen"[4], Chase Egli[5], Adiel Klompmaker[6]

[1]Division of Mathematics and Sciences, Delta State University, Cleveland, MS, [2]Department of Paleobiology, National Museum of Natural History, Smithsonian Institution, Washington DC, [3]Mississippi Office of Geology, Jackson, MS, [4]Milwaukee Public Museum, Milwaukee, WI, [5]Department of Geological Sciences & Department of Museum Research and Collections, University of Alabama, Tuscaloosa, AL, [6]Department of Museum Research and Collections & Alabama Museum of Natural History, University of Alabama, Tuscaloosa, AL

The enigmatic rhizomatous aquatic angiosperm *Quereuxia*, an element in many Late Cretaceous-Paleogene western North American and northeastern Asian floras, has recently been recognized in a locality in Pickens County, western Alabama, representing a range extension for this taxon. Leaves of *Quereuxia* were collected from two outcrops 16 meters apart in the McShan Formation. The McShan Formation unconformably overlies the coarse-grained continental deposits of the Tuscaloosa Group and represents fluvial-deltaic lower beds intermediate in the marine transgression to the overlying Eutaw Formation. The leaf-bearing unit, consisting of light gray to buff, laminated mudstones and two additional darker gray laminated mudstones about 50 cm below the megafloral level, were sampled for palynological analysis and dating. The palynoflora was only moderately well preserved, which made identification of many of the grains challenging. All three samples were dominated by spores (between 50-60% of the total of a 300-point count), including bryophytes and lycophytes, as well as representatives of the fern families Anemiaceae, Schizaeaceae, Gleicheniaceae, Dipteridaceae, Polypodiales and ferns of uncertain affinity. Gymnosperms comprised 25-30% of the total and included mainly bisaccates (mostly Pinaceae) as well as rare Araucariacee, Cupressaceae and Cheirolepidiaceae (an extinct xerophytic conifer family). Angiosperms comprised 15-22% of the total and included monocots, eudicots of uncertain affinity (tricolpates and tricolporates) and members of the Normapolles group (= Fagales). All samples contained large numbers of fresh-water algal cysts (not included in counts) but not dinocysts. The abundance of algal cysts and spores and the absence of dinoflagellates indicate that these sediments were deposited in a fresh-water pond or shallow lake. Biostratigraphically significant taxa in these floras were compared to the three palynological assemblage zones devised by Christopher (1979) for the middle and upper Magothy Formation of the mid-Atlantic region and revised by Christopher & Prowell (2010) and Sugarman et al. (2021). The presence of *Praecursipollis plebius* (= *Praecursipollis* sp. A of Christopher (1979), *Plicapollis* cf. *P. incisa*, and *Complexiopollis* sp. V of Christopher (1979) suggest that our palynoflora belongs to the middle *Pseudoplicapollis longiannulata-Plicapollis incisa* Assemblage Zone, because the First Appearance Datum of *Plicapollis incisa* is at the base of this zone, and the Last Appearance Datum of *Complexiopollis* sp. V is just above the top of this zone. *Santalacites minor* is also present in our palynoflora, and it is one of the nominate species in the underlying *Complexiopollis exigua-Santalacites minor* Assemblage Zone. However, given the presence of those other taxa mentioned above, our palynoflora is unlikely to belong to this lower Assemblage Zone. Following the updated correlations of Sugarman et al. (2021), our samples are therefore likely middle Coniacian in age.

P6.02

THE MICROVERTEBRATE FOSSILS OF THE MIDDLE MISSISSIPPIAN STE. GENEVIEVE FORMATION FROM MAMMOTH CAVE NATIONAL PARK, KENTUCKY, USA

Alyssa Wurtz[1], John-Paul Hodnett[2], Renee Clary[1], Athena Nagel[1]

[1]Mississippi State University, Mississippi State, MS, [2]Maryland-National Capital Parks and Planning Commission, Upper Marlboro, MD

Microvertebrate analysis may provide new insights into the paleoecology and biodiversity of the ancient marine environment preserved within Mammoth Cave National Park, Kentucky, represented by three geologic formations deposited within the Mississippian Period, ~340-330 million years ago. We collected approximately 5.5 liters of sediment from various sites within the Ste. Genevieve Formation of Mammoth Cave. The collection process targeted areas where chondrichthyan (cartilaginous fish) fossils were previously found; collection was deliberate and minimal to preserve the cave as much as possible. Sediment processing using six sieves (4 mm, 1.4 mm, 1 mm, 0.5 mm, 0.42 mm, and 0.25 mm) has resulted in the recovery of over 50 specimens so far. These include 17 chondrichthyan scales (dermal denticles), which most likely belong to the in situ *Saivodus striatus* (ctenacanth) skull located directly above where the sediment was collected; a janassid petalodont tooth, a euchondrocephalan tooth, a cladodont-type tooth, two *Bransonella* teeth (xenacanth), and a buccal (cheek) membrane denticle. Two major subclasses of

chondrichthyans are recognized: Elasmobranchii, which includes extant sharks and rays; and Euchondrocephali, which includes extant holocephalans (ratfish and kin). These discoveries provide important new data that have the potential to further characterize the Mammoth Cave chondrichthyan paleoecosystem. Our ongoing analysis aims to classify these specimens and contribute to a more comprehensive understanding of the region's paleontological history.

P6.03

USING GEOGRAPHIC INFORMATION SYSTEMS TO DETECT LANDCOVER CHANGE FROM HURRICANES IN COASTAL MISSISSIPPI

Emma Graham Graham, Timothy Menzel

University of Mississippi, University, MS

Hurricanes have been demonstrated to impact local economies and environments. The predicted increases in hurricanes and economic and population growth make probable greater impacts in the future. Some of these changes may be detectable using Geographic Information Systems (GIS). We compared landcover change in coastal Mississippi towns between high hurricane and low hurricane years, over different economic periods of the last 20 years, to determine the relative importance of hurricanes and economics on change in different landcover classes.

P6.04

THE SPREAD OF BLUES MUSIC USING GEO CODING AND LIDAR

Kayla Stan[1], Maurice Sutton JR[2, 3]

[1]University of Southern Mississippi, [2]Hattiesburg High School, Hattiesburg Mississippi,, [3]Mississippi Base Pair Consortium Hattiesburg, MS

Studying the trends of Blues music and its evolution, personal preference often influences said trends and further strengthens it. Blues music plays not only a very pivotal part in culture, but in music as a whole. People are aware that the genre has transported its embedded Southern roots to a national treasure. From a geographical standpoint it is incredible to collect the data and track the spread, creating an accurate map showing the large range it truly has. I have created a spreadsheet of where the artists are from, locations of the world that hold their top five in listening, and a chart of the seven selected artists' concerts and biggest tours locations. With that being said, the data hasn't been quantified and not knowing how the music and artists have spread is the bigger investigation. The immense impact of the research is to spread the awareness of culture and see its spread through the people and to fully understand the influence, effects, and the way it is kept alive through the people many decades later with the use of the geographical mapping system and Lidar scanning. To assist further research, crowdsourcing concerts, tours, and trends of music industry data sources track how a selection of Southern-born artists changes through time, in addition to how they remained popular over time.

P6.05

ANALYSIS OF BIOTURBATION IN X-RADIOGRAPHS OF SEDIMENT CORES FROM THE SUBAQUEOUS MISSISSIPPI DELTA

Sarah Kennedy

Alcorn State University, Lorman, MS

In recent decades, the lower Mississippi River Delta has undergone significant changes in sediment supply to its offshore regions due to anthropogenic changes to hydrology. This has led to notable alterations in the underwater landscape and the overall ecosystem of the area, although these changes are sparsely documented. This study is an initial step to explore changes in seabed depositional patterns. An efficient way to identify relative sedimentation patterns of the subaqueous Mississippi River Delta is to use X-radiographs of sediment cores and analyze sedimentary fabric created by sedimentation and bioturbation. We chose 18 cores to analyze which were taken between July 18th-25th, 2023. The seabed depths of each core range from 12.1m to 136.1m. We hypothesize analysis of sedimentary fabric from locations with high sediment discharge will be primarily stratified, and conversely that lower discharge and sedimentation rates will yield sedimentary fabrics that are predominantly bioturbated. Sedimentary fabrics were analyzed using published methods of image analysis (Bentley et al., 2006; that this research will provide foundational insights for shaping future field and modeling studies Courtois et al., 2024). Bioturbation intensity down each core was generated by visual identification of physical versus biogenic features displayed on each X-radiograph on 1cm grids, then averaged horizontally.

P6.06

SIMULTANEOUS REAL-TIME MEASUREMENTS OF AIR POLLUTION IN WOOD-PELLET MANUFACTURING AND BACKGROUND COMMUNITIES

Arlencia Barnes, Cristina Nica, Barbara Graham, Nina Franzen-Lee, Sage Lefebvre, Erica Walker

Brown University, Providence, RI and Jackson State University, Jackson, MS

Previously, we have measured PM2.5, Ozone, Nitrogen Dioxide, and Total Volatile Organic Compounds across two rural Mississippi communities–one impacted by wood biomass manufacturing and a background community with no industrial manufacturing and found that Gloster had the highest levels of PM2.5, Ozone, and Total Volatile Organic Compounds while Mendenhall surpassed Gloster in Nitrogen Dioxide. In this previous analysis, we measured air pollution concentration at incongruent time intervals, resulting in our inability to examine concentrations in the same time period. To remedy this temporal limitation, we have conducted simultaneous real-time air pollution measurements across three Mississippi cities: one impacted

by wood pellet manufacturing, a background community with no industrial pollution, and Mississippi's largest and capital city. In this updated analysis we find that West Jackson (WJXN) generally exhibits higher concentrations for all pollutants compared to Gloster. However, PM 2.5 shows a significant range in both locations, indicating occasional spikes in particulate matter

END OF THURSDAY'S PROGRAM

Friday, March 21, 2025

MORNING

Hall D Room

8:15 Welcome

O6.15

8:20 MISSISSIPPI AQUIFER INVENTORY

Kris Arrington, Thomas Devall, Sarah Strickland

Organization, City, State

O6.16

8:40 PRELIMINARY SEDIMENTOLOGICAL STUDIES OF UPPER CATAHOULA FORMATION IN COVINGTON COUNTY, MISSISSIPPI

Kentorria Brown[1], James Starnes[2], Ezat Heydari[1]

[1]Jackson State University, Jackson, MS, [2]Mississippi Office of Geology, Jackson, MS

About 100 feet (30.5 m) of the Catahoula Formation (Oligocene-Miocene) was acquired in a research well by the Mississippi Geological Survey (MGS Plum Creek #5) in Covington County, Mississippi. The cored interval occurs in the upper portion of this rock unit approximately 80 feet below its contact with the overlying Hattiesburg Formation. This study examined variations in lithology, sedimentology, grain size, and grain composition of this core by visual and binocular microscope observations to determine depositional environments of the upper Catahoula Formation in this area. Future petrographic analysis will provide additional details about this rock unit in this locality. This preliminary investigation indicates three distinct lithologic intervals in this core. Its basal 40 feet (12.2 m) consists of cyclic alternations of two lithologies. At the base of each cycle is a beige color, bioturbated mudstone to fine-grained muddy sandstone that is devoid of any carbonates. The mudstone/sandstone layer is overlain by a white, bioturbated, sandy, and glauconitic limestone via a sharp contact. Limestone layers contains abundant bivalve mollusks and the benthic *Heterostigina* foraminifera. The middle interval consists of about 18 feet (5.5 m) of gray, medium to coarse-grained sandstone that alternates with beige, fine-grained muddy sandstone. Sandstone layers appear to be bioturbated. The middle member is devoid any carbonates and its contact with the basal interval is sharp. The top interval of the core is composed of 30 feet (9.1 m) of white, fine- to medium-grained quartz sandstone which display lamination and possibly cross bedding. Unfortunately, the core recording the transition from the middle interval to the top interval was not recovered. The top interval is also devoid of carbonates. Fossils of bivalve mollusks and *Heterostigina* foraminifera indicate that layers of the basal interval of core were deposited in a marine environment. The abundance of bioturbation, the absence current induced sedimentary structures, and contrasting lithologies suggest sedimentation below wave base in a rapidly changing environment. Although marine fossils were not observed, but bioturbation and similarity between the fine-grained sands of the basal and the middle interval suggest that the middle member was most likely deposited under marine conditions. The depositional environment of white, quartz sandstone layers of the top interval is enigmatic. Plane laminates and cross beds suggest deposition under high energy conditions. Abundance of iron oxide in a bed with the top interval may suggest the presence of a soil zone associated with an exposure surface.

O6.17

9:00 A STUDY OF COMPOSITIONAL AND PHYSICAL PROPERTIES TO ELUCIDATE DEPOSITIONAL CONDITIONS AT THE COON CREEK TYPE SECTION

Makayla Capasso[1], Samantha Chapman[1], Alyson A. Brink[1, 2], Jeremy Deans[1], Jack Garrett[1], Jennifer M. K. O'Keefe[3], Jean M. Self-Trail[4], Michael A. Gibson[5], Alan Youngerman[5], Joshua Ratliff[5]

[1]School of Biological, Environmental, and Earth Sciences, University of Southern Mississippi, Hattiesburg, MS, [2]Vertebrate Paleontology, Sam Noble Oklahoma Museum of Natural History, University of Oklahoma, Norman, OK, [3]Department of Engineering Sciences, Morehead State University, Morehead, KY, [4]U.S. Geological Survey, Florence Bascom Geoscience Center, Reston, VA, [5]Department of Agriculture, Geosciences, and Natural Resources, University of Tennessee at Martin and UT Martin Coon Creek Science Center, 256 Brehm Hall, Martin, TN

Sediments from the type section of the Upper Cretaceous Coon Creek Formation (Coon Creek Science Center in McNairy County, Tennessee) were sampled in the summer of 2023 and analyzed for compositional and physical properties. The first sample was taken near the base of the creek channel and subsequent samples were taken every 30 centimeters up to 810 centimeters. Using a portable X-Ray Fluorescence (pXRF) analyzer, elemental constituents were measured and documented for seven samples. Loss on ignition (LOI) and magnetic susceptibility (MS) were also measured. The data show prominent levels of silica and carbonate that are inversely correlated, and an increase in the quartz component was documented at 70 and 100 cm. The alternating relationship of the silica and carbonate

levels suggests the possibility of fluctuations in terrestrial input from the proximal shoreline. The geochemistry of the sediments also showed high aluminum concentrations, which suggests an influx of more muddy sediments, but also that clay may be contributing more to the parent material than quartz during these intervals. Two samples (40 and 190 cm) had higher LOI values, which may suggest the presence of greater quantities of organic matter. The results of this study will be combined with other data (e.g. oxygen isotopes, palynology, and carbon isotope data) to more thoroughly understand the Coon Creek depositional history and the paleoenvironmental conditions that led to the exceptional preservation of the abundant marine invertebrates, marine microfossils and vertebrate fossils.

O6.18

9:20 PRELIMINARY SEDIMENTOLOGICAL STUDIES OF THE PALEOZOIC STRATA IN SCOTT COUNTY, MISSISSIPPI

Brooklyn Carter[1], Paul Parish[2], Ezat Heydari[1]

[1]Jackson State University, Jackson, MS, [2]Mississippi Department of Environmental Quality, Office of Geology, Jackson, MS

With the exception of a small area in Tishomingo County, Mississippi, Paleozoic rocks are largely obscured by thick Mesozoic and Cenozoic deposits. As a result, the lithology, sedimentology, depositional environments, and geological evolution of the state's strata from the Phanerozoic Era remain mostly unknown. Fortunately, a wildcat oil and gas well, Pan American #1 McGee Unit, acquired a 30-foot long conventional core of the Paleozoic rocks in Scott County. This preliminary investigation by visual and binocular microscope was conducted to determine sedimentological characteristics and depositional environments of strata in this core. Future petrographic analysis will provide additional details about these rocks. The basal 15 feet (4.6 m) of the core is composed of gray to black color layers that range in thickness from a few millimeters to a few centimeters. Bioturbation is absent and laminations and layers of this interval are extensively contorted. This interval displays diverse lithologies including mudstone, siltstone, and highly unsorted pebbly sandstone. In addition, irregular and discontinuous laminations of pink- and white-colored coarse-grained sandstone are present throughout this interval forming a sedimentary structure that is similar to a lenticular bedding. Furthermore, sparse fragments of rounded and angular pebbles appear throughout the interval. The basal interval is overlain by 2 feet (0.6 m) of white conglomerate that is overlain by 5 feet (1.5 m) of black laminated mudstone and sandstone. Upward, the core consists of 4 feet (1.2 m) of red beds that consist of layers of mudstone to fine-grained sandstone. Two feet (0.6 m) of white, medium- to coarse-grained sandstone occurs at the top of the core. The age and geologic context of Paleozoic strata are undefined in this area. However, diverse lithologies, ranging from highly unsorted pebbly sandstone to mudstone, along with the extensive occurrence of lenticular bedding, a lack of marine fossils, and the absence of bioturbation in the basal interval of the core indicate deposition in an environment that experienced episodic flows. High-energy periods deposited pebbly and coarse-grained sandstones, and the slack periods formed the mudstone laminae. A tidal flat environment could be a potential depositional setting for the basal interval of the core. Another environment is sedimentation in a shallow lake that was subjected to repeated flooding. A more likely environment is deposition in a flood plain. The overlying intervals including the white conglomerate, red bed layers, and top white sandstone layers may represent fluvial deposits or the distal portion of an alluvial fan. Contorted bedding is most likely deformational in origin and formed during the Alleghanian Orogeny.

O6.19

9:40 VEIN GROWTH RELATED TO EXTENSION AND HYDRATION OF THE OCEANIC LITHOSPHERE, ATLANTIS MASSIF, MID-ATLANTIC RIDGE

Payton Townsend, Lyndsey Tutor, Jeremy Deans

University of Southern Mississippi, Hattiesburg, MS

This study analyzed several thin sections of serpentinized harzburgite from the Atlantis Massif oceanic core complex, Mid-Atlantic Ridge, sampled during IODP Expedition 399 to study vein formation related to hydration of the oceanic lithosphere. The availability of fluids is necessary for serpentinization reactions, one of the major exchanges of heat and mass between the mantle and the hydrosphere. Veins provide pathways for fluids to enter and leave the lithosphere, however, little is known about these pathways. Expedition 399 drilled a 1.2 km deep section through the oceanic lithosphere drilling the longest section of mantle in the ocean. Atlantis Massif formed ~1.5 Ma along the Mid-Atlantic Ridge exhumed along a detachment shear zone/fault causing embrittlement and fracturing opening up fluid pathways. Serpentine, chlorite, and calcite veins are present with calcite veins crosscutting the other two. Serpentine and calcite crystals are aligned sub-perpendicular to the vein wall. Chlorite veins are granular. Sigmoidal veins are observed indicating left lateral, normal motion. These veins represent a down temperature record of fluid ingress into the oceanic lithosphere starting with serpentine and ending with calcite. Serpentine and chlorite veins indicate a more rock-dominated fluid, whereas calcite veins indicate a more seawater-dominated fluid. Mineral alignment in the serpentine and calcite veins indicate they grew when the least compressive stress was sub-vertical and sub-horizontal sigmoidal vein tips indicate that the greatest compressive stress was sub-horizontal. In most extension systems, the least compressive stress is sub-horizontal and the greatest compressive stress is sub-vertical. At Atlantis Massif, upwards of 50° of rotation has been estimated, suggesting that some veins, especially those formed at higher temperature, could have formed and

then passively rotated explaining the difference in stress orientation. Chlorite veins may have formed during a static period leading to the granular texture. Further work will be completed to form a model of down temperature embrittlement, fluid ingress and exchange, and tectonic rotation.

10:00 Break

O6.20

10:20 GEOMETRIC MORPHOMETRIC ANALYSIS OF THE BOONEVILLE DINOSAUR: A SAUROLOPHINE HADROSAURID FROM AN EARLY CAMPANIAN LOCALITY.

Derek Hoffman[1], George Phillips[2], Alyson Brink[1], James Starnes[3], Nina Baghai-Riding[4], Carol Hotton[5], Olivia Pharr[4], Dave Hanes[6]

[1]School of Biological, Environmental, and Earth Sciences, University of Southern Mississippi, Hattiesburg, MS, [2]Mississippi Museum of Natural Science, Jackson, MS, [3]Mississippi Department of Environmental Quality, Office of Geology, Jackson, MS, [4]Division of Mathematics and Sciences, Delta State University, Cleveland, MS, [5]Department of Paleobiology, National Museum of Natural History, Washington, DC, [6]Columbia Gem & Mineral Society (AFMS affiliated), Columbia, SC

The dinosaur fossil record of Mississippi comprises nearly 90 specimens, most of which are fragmentary and poorly preserved. Among these, hadrosauroids are the most abundant, yet none have provided sufficient diagnostic features for classification at the species, genus, or even family level. Here, we present the most complete dinosaur ever discovered in the state: a saurolophine hadrosaurid (MMNS VP-12239) from the early to mid-Campanian Coffee Formation in northeastern Mississippi. This specimen, uncovered ~2011 near Booneville, Prentiss County, is interpreted as an estuarine to deltaic environment within the Gulf Coastal Plain along the eastern Mississippi Embayment. The site has yielded remains from at least two individuals: a juvenile, represented by a toothless dentary, and an adult, represented by multiple postcranial elements. Additional associated fauna includes bivalves, gastropods, ammonites, turtles, sharks, and bony fishes. Taxonomic identification of hadrosauroids typically relies on cranial characteristics due to extensive cranial modification within the group. However, the adult specimen lacks cranial material, complicating its identification. This challenge is further compounded by the limited comparative dataset of southeastern hadrosauroids. Geometric morphometric analyses of cranial material have been effective in highlighting taxonomically significant differences among hadrosauroids, while studies of postcranial elements have also shown promise for classification at the subfamily level. Preliminary geometric morphometric analysis suggests that the pubic morphology of MMNS VP-12239 aligns more closely with saurolophine than lambeosaurine hadrosaurids. This finding indicates that saurolophine hadrosaurids inhabited the Mississippi Embayment during the Late Cretaceous and contributes to a broader understanding of dinosaur diversity in southern Appalachia.

O6.21

10:40 PREDICTING CRUCIAL PARAMETERS FOR FAILURE SIMULATION OF LEVEE MATERIALS: AN ARTIFICIAL NEURAL NETWORK APPROACH

Haitham Saleh, Mudhaffer Alqudah, Yavus Ozeren, Ahmed Al-Ostaz, Yacoub Najjar

University of Mississippi, Oxford, MS

Flooding is considered one of the most destructive natural phenomena in the United States. The retaining structures holding the water are usually earthen dams and earthen levees alongside rivers. In Mississippi alone, there are more than 6500 dams and more than 1600 miles of levees along the Mississippi River and its tributaries. In this study, two vital parameters regarding the overtopping of levees are being predicted for levee soils: the Critical Shear Strength, τ_c, and the Erodibility Coefficient, k_d using an artificial neural network (ANN) model that utilizes few basic geotechnical properties as its inputs. These two critical parameters can be used to reasonably simulate the breach of a levee using various numerically based software programs. In this study, 2 ANN-based models were developed to predict these parameters, the first one is based on 39 datasets and the other one is based on 146 datasets. The difference between these two models lies within their inputs and the apparatus used to calculate the Critical Shear Strength, τ_c, and the Erodibility Coefficient, k_d. However, both ANNs use basic geotechnical properties including soil texture, natural water content, and dry density. The best ANN structure was determined based on the highest coefficient of determination (R^2), the lowest mean absolute relative error (MARE), and the lowest average squared error (ASE). The best model has an average R^2 of 97.5% which shows a good fit between the predicted values and the experimental results.

O6.22

11:00 CONNECTING THE PAST TO THE PRESENT: INTERPRETING THE NATURAL AND GEOLOGIC HISTORY OF CAMPANIAN MARINE STRATA AT A LIME QUARRY IN CLAY COUNTY, MISSISSIPPI

Natalya Usachenko[1], Renee Clary[1], Athena Nagel[1], George Phillips[2], Darrel Schmitz[1]

[1]Mississippi State University, Strakville, MS, [2]Mississippi Museum of Natural Science, Jackson, MS

Stratigraphic, biostratigraphic, and paleontologic investigations of late Campanian-aged marine deposits were conducted within a lime quarry in Clay County, Mississippi. This project included both fieldwork and

laboratory analyses. Field work involved measuring and describing the section's lithologic intervals, collecting fossil and sediment samples from measured beds and outwash, and developing a classification system to distinguish between chalk-dominant and marl-dominant beds, which were the two primary lithologies at the site. Lab analyses consisted of extracting and assessing fossils from sediment samples and quantifying faunal occurrences within each measured layer. Results indicate that the strata represent an approximately 400,000-year depositional period that occurred ~ 75 million years ago; the strata fall within the upper to uppermost Muldrow Member of the Demopolis Formation. Deposition occurred within a shallow marine outer-shelf setting which underwent multiple rhythmic clastic dilution cycles. Faunal analyses suggest the site supported diverse benthic, epibenthic, and nektonic communities. Sediment surfaces preserved a dense assortment of ichnofossils, suggesting a high degree of infaunal activity. Many ostreid and pectinid bivalves were observed, several of which exhibited evidence of cementing behavior and morphological plasticity. Polychaete and clionaid boring traces were observed, as were predation traces from decapod crustaceans and naticid gastropods. Few teeth and skeletal remains were found, though these confirmed the presence of marine reptiles and multiple osteichthyan and chondrichthyan fish in the ancient ecosystem. In addition to the scientific report, the research results were summarized in an educational outreach report, which consisted of a fossil display, infographic, and general overview of the quarry's paleontologic history.

O6.23

11:20 THE SANTONIAN AGE CHONDRICHTHYES OF THE MISSISSIPPI EMBAYMENT AND BEYOND

Olivia Wooton[1], Sydney Kennedy[1], Alyson Brink[1, 2], George Phillips[3]

[1]University of Southern Mississippi, Hattiesburg, MS, [2]Vertebrate Paleontology, Sam Noble Oklahoma Museum of Natural History, University of Oklahoma, Norman, OK, [3]Mississippi Museum of Natural Science, Jackson, MS

A diverse assemblage of elasmobranchs was collected from the Tombigbee Sand Member of the Eutaw Formation (late Santonian) in northeastern Mississippi. The Vinton Bluff locality, in Lowndes County, has so far produced many hundreds of teeth, including specimens of *Scapanorhynchus texanus* and *Ischyrhiza mira*. This collection will be compared to correlative faunas from the Gulf Coastal Plain, the Atlantic Coastal Plain, and from the Western Interior Seaway to determine if there are differences in relative abundance and diversity. One possible explanation for potential differences includes latitudinal variation impacting water temperature, or different ocean circulation patterns that may have restricted some species.

O6.24

11:40 THE MICROVERTEBRATE FOSSILS OF THE MIDDLE MISSISSIPPIAN STE. GENEVIEVE FORMATION FROM MAMMOTH CAVE NATIONAL PARK, KENTUCKY, USA

Alyssa Wurtz[1], John-Paul Hodnett[2], Renee Clary[1], Athena Nagel[1]

[1]Mississippi State University, Mississippi State, MS, [2]Maryland-National Capital Parks and Planning Commission, Upper Marlboro, MD

Microvertebrate analysis may provide new insights into the paleoecology and biodiversity of the ancient marine environment preserved within Mammoth Cave National Park, Kentucky, represented by three geologic formations deposited within the Mississippian Period, ~340-330 million years ago. We collected approximately 5.5 liters of sediment from various sites within the Ste. Genevieve Formation of Mammoth Cave. The collection process targeted areas where chondrichthyan (cartilaginous fish) fossils were previously found; collection was deliberate and minimal to preserve the cave as much as possible. Sediment processing using six sieves (4 mm, 1.4 mm, 1 mm, 0.5 mm, 0.42 mm, and 0.25 mm) has resulted in the recovery of over 50 specimens so far. These include 17 chondrichthyan scales (dermal denticles), which most likely belong to the in situ *Saivodus striatus* (ctenacanth) skull located directly above where the sediment was collected; a janassid petalodont tooth, a euchondrocephalan tooth, a cladodont-type tooth, two *Bransonella* teeth (xenacanth), and a buccal (cheek) membrane denticle. Two major subclasses of chondrichthyans are recognized: Elasmobranchii, which includes extant sharks and rays; and Euchondrocephali, which includes extant holocephalans (ratfish and kin). These discoveries provide important new data that have the potential to further characterize the Mammoth Cave chondrichthyan paleoecosystem. Our ongoing analysis aims to classify these specimens and contribute to a more comprehensive understanding of the region's paleontological history.

LUNCH

Friday, March 21, 2025

AFTERNOON

Hall D Room

1:30 Business Meeting with 2025 Chairperson Elections (Attendance required for nomination)

2:00 Student Awards (Attendance required for award)

Health Sciences

Co-Chair: Xiaoshan Judy Gordy
University of Mississippi Medical Center

Co-Chair: Gary Lamar Hamil
Belhaven University

Co-Vice-Chair: Merlin M. Manogaram
University of Mississippi Medical Center

Co-Vice-Chair: David Gordy
University of Mississippi Medical Center

Program Coordinator: Olga McDaniel
University of Mississippi Medical Center

Committee Members:

Lance Keller
University of Mississippi Medical Center

Maricica Pacurari
Jackson State University

Jacob Daniels
University of Mississippi Medical Center

Driscoll Duval
University of Mississippi Medical Center

Thursday March 20th 2025
MORNING
Hall D Room 11

8:30 AM Welcome
Dr. D. Olga McDaniel

8:35-10:00 AM
Oral Presentation **Session A**
Topics:
Obesity, Health Determinants, and disease prevention

Moderators: Drs. Judy Gordy and Gary Lamar Hamil
University of Mississippi Medical Center and Belhaven University

O7.01

8:35 PREDICTING OBESITY LEVELS BASED ON EATING HABITS, PHYSICAL ACTIVITY, AND DEMOGRAPHIC FACTORS

Martha Ravola, Babu George, Madhu Manthati

Alcorn State University, Lorman, MS

This study investigates the relationship between lifestyle factors and obesity levels using a dataset of 2,111 individuals. Employing machine learning techniques, we developed a predictive model to classify individuals into different obesity categories. The dataset includes features such as age, height, weight, vegetable consumption, physical activity frequency, and technology usage. Our analysis revealed significant correlations between obesity levels and factors like family history, height, weight, vegetable consumption, and physical activity. Two predictive models were developed and evaluated - a Logistic Regression model and a Random Forest model. The Random Forest model achieved a significantly higher accuracy of 95.06%, outperforming the Logistic Regression model. Analysis showed that weight, height, and age were the most influential factors in predicting obesity levels. Additionally, K-Means clustering was performed to explore the grouping of individuals based on similar lifestyle and demographic factors. The resulting clusters provided valuable insights into different obesity-related lifestyle patterns. The study highlights the importance of lifestyle factors in obesity prediction and provides a robust model for health risk assessments.

O7.02

8:45 INVESTIGATING THE VARIABILITY IN DELIVERY OF ORTHODONTIC CARE ACROSS ACPA APPROVED TEAMS IN THE UNITED STATES

Kendall Pitre, Emily Hecox, Ronald McCall, Ian Hoppe, Laura Humphries

University of Mississippi Medical Center, Jackson, MS

Objectives: American Cleft Palate and Craniofacial Association (ACPA)-approved teams consist of trained professionals collaborating in an interdisciplinary approach to optimize outcomes for patients with cleft palate. Orthodontic care is essential to correct dental malocclusion, guide maxillary growth, enhance surgical outcomes, and improve oral function and aesthetics. While ACPA approval requires an orthodontist in the multidisciplinary team, the methods of delivering orthodontic care remain unclear. This project aims to elucidate how orthodontic care is integrated into ACPA-approved teams. **Methods**: A list of ACPA-approved teams (n=204) and reported orthodontists (n=374) was obtained from the ACPA directory. Teams outside the U.S. and duplicate listings were excluded. Each team's website was reviewed to identify orthodontists, care delivery types (Hospital/University, Private Practice, Mixed, Not Listed), and Craniofacial Orthodontic Fellowship status. Team geographic distribution was compared across the four U.S. CDC Census regions: West (AK, AZ, CA, CO, HI, ID, MT, NM, NV, OR, UT, WA, WY), Midwest (IA, IL, IN, KS, MI, MN, MO, ND, NE, OH, SD, WI), South (AL, AR, FL, GA, KY, LA, MS, NC, SC, TN, VA, WV, DE, DC, MD, OK, TX), and Northeast (CT, MA, ME, NH, NJ, NY, PA, RI, VT). Descriptive statistical analyses were used to compare variables of interest. **Results**: A total of 184 ACPA-approved teams, with 335 orthodontists (1 to 7 per team), met the inclusion criteria. Only 46.7% (n=86) listed orthodontists on their websites: 53.5% were hospital/university-based (n=46), 39.5% were private practice-based (n=34), and 7% were a mixed model (n=6). Among these, 34.9% (n=30) included a craniofacial

fellowship-trained orthodontist. Notably, 53.3% (n=98) of teams did not list an orthodontist on their website. The distribution of ACPA-approved teams varied by region: 25% of teams (n=46) with 25.1% of orthodontists (n=84) in the West; 21.7% of teams (n=40) with 23% of orthodontists (n=77) in the Midwest; 33.2% of teams (n=61) with 33.1% of orthodontists (n=111) in the South; and 20.1% of teams (n=37) with 18.8% of orthodontists (n=63) in the Northeast. **Conclusion**: These findings highlight significant variability in the delivery, visibility, and distribution of orthodontic care among ACPA-approved teams. Less than half of the teams specifically listed an orthodontist on their website, with hospital/university-based teams being the most common and many teams relying on private-practice models. Additionally, most teams lacked a craniofacial fellowship-trained orthodontist, indicating the need to explore the role of specialized training further. Regional differences were also noted, with the South having the highest concentration of teams and orthodontists, and the Northeast having the lowest, despite its high population density. These variations in care delivery may affect care access and coordination, warranting further investigation into the variable quality of care delivery and its impact on patient outcomes.

O7.03

8:55 EXPLORING HETEROZYGOUS INTERFERON-DEFICIENT MICE AS A NOVEL MODEL FOR CHIKUNGUNYA VIRUS CARDIAC INFECTIONS AND INTERLEUKIN-17A BASED THERAPIES (Graduate Student)

Shazeed-Ul Karim[1], Farzana Nazneen[1], Prince M. D. Denyoh[1], David S. Bai[2], Fengwei Bai[1]

[1]The University of Southern Mississippi, Hattiesburg, MS, [2]Oak Grove High School, Hattiesburg, MS

Although cardiovascular complications caused by chikungunya virus (CHIKV) are frequently observed in clinical settings, the mechanisms driving these outcomes remain poorly understood, largely due to the absence of suitable animal models. In this study, we demonstrate that CHIKV infection in homozygous interferon α/β receptor-deficient (ifnar1$^{-/-}$) and interferon α/β/γ receptor-deficient (ifnag$^{-/-}$) mice resulted in significantly elevated viral loads in the heart as early as day (D) 1 post-infection (p.i.), accompanied by 100% mortality within three days p.i. Conversely, heterozygous ifnar1$^{+/-}$ and ifnag$^{+/-}$ mice survived CHIKV infection while exhibiting higher viral loads in cardiac tissues compared to wild-type (WT) controls. Flow cytometry analysis revealed enhanced infiltration of leukocytes, particularly neutrophils, in the hearts of ifnar1$^{+/-}$ and ifnag$^{+/-}$ mice compared to WT mice. Furthermore, immunohistochemistry indicated CHIKV-induced vasculitis in the left ventricles by D5 p.i. in both heterozygous models, as well as vacuole formation and pyknosis specifically in ifnar1$^{+/-}$ mice. Evidence of cardiac fibrosis was also observed, indicated by increased expression of the Connective Tissue Growth Factor gene in the hearts of ifnar1$^{+/-}$ mice. These findings highlight the utility of heterozygous ifnar1$^{+/-}$ and ifnag$^{+/-}$ mice as valuable models for studying the pathogenesis of CHIKV-induced cardiac disease and for evaluating potential therapeutic interventions. Given our previous discovery of IL-17A's role in CHIKV pathogenesis, this study also explores its potential as a therapeutic target. We propose IL-17A modulation in ifnar1$^{+/-}$ mice to evaluate its ability to mitigate cardiac inflammation and fibrosis while preserving antiviral immunity. Our findings shed light on the delicate interplay between immune-mediated protection and inflammation-driven cardiac damage in CHIKV infection, paving the way for targeted interventions to manage viral heart disease.

O7.04

9:05 THE ROLE OF RESIDENTIAL GREEN SPACE IN CHRONIC HEALTH OUTCOMES: A SYSTEMATIC REVIEW OF GLOBAL EVIDENCE (Graduate Student)

Fazlay Faruque, Lauren Pongetti, Elizabeth Hinton, Ariel Wilson, Benjamin Walker

University of Mississippi Medical Center, Jackson, MS

Introduction: Residential green spaces- defined as areas with natural vegetation- are increasingly recognized as a determinant of health, particularly for chronic conditions such as cardiovascular disease, type 2 diabetes, and hypertension. Green space exposure has been linked to improved mental health and reduced mortality. Factors underlying associations include improved air quality, stress reduction, increased physical activity, and social interaction. Although systematic reviews have examined the relationship between green space and health, few specifically address residential green space in chronic disease, apart from studies focused on mortality and older adults. This review fills a critical gap by examining the evidence on residential green space and its impact on chronic health outcomes in adults, with a focus on exposure measurements and socioeconomic inequalities. **Methods:** This systematic review followed PRISMA 2020 guidelines. A comprehensive search was conducted in PubMed, Embase, and CINAHL, initially on June 29, 2023, and updated on September 4, 2024. Search terms, developed with a research librarian, targeted studies reporting objective measures of residential green space (e.g., Normalized Difference Vegetation Index [NDVI], proximity to parks) and chronic health outcomes in adults. Studies were excluded if they focused on mental health diagnoses, communicable diseases, or mediating/ moderating effects.

Screening and data extraction were completed in Rayyan and EndNote 20. Extracted data included study characteristics, exposure metrics, health outcomes, statistical analyses, confounder adjustments, and results. Study quality was assessed using the NIH Quality

Assessment Tool for Observational and Cross-Sectional Studies, with ratings based on percentage scores. Findings were narratively synthesized by health outcome categories. **Results:** A total of 123 studies met inclusion criteria, representing diverse methodologies and participant sizes ranging from 583 to over 2 million. Green space exposure was measured using indices like NDVI, Enhanced Vegetation Index (EVI), and park proximity across buffer sizes of 500 to 3,000 meters. **Cardiovascular Health**: Residential green was associated with improved cardiovascular outcomes, reduced risk of hypertension, ischemic heart disease, and myocardial infarction. Green exposure also lowered systolic and diastolic blood pressure and arterial stiffness. **Neurological Health**: Increased green space exposure was linked to lower risks of dementia and Alzheimer's disease and improved structural brain measures, including cortical thickness and white matter integrity. **Respiratory Health**: Green space was associated with reduced respiratory mortality and improved respiratory health, though regional variations highlighted potential interactions with air pollution, socioeconomic factors, and urban design. **Metabolic Health**: Greenness was associated with reduced risks of diabetes, obesity, and metabolic syndrome. Longitudinal studies demonstrated significant mitigation of weight gain and improved glycemic control over time. Mechanisms included physical activity and stress reduction. **Other Outcomes**: Other benefits included reduced all-cause mortality, improved outcomes in chronic kidney disease, lower stress biomarkers, and healthier aging trajectories. **Conclusion:** We systematically reviewed the role of residential green space in mitigating chronic disease. We found associations were often stronger in socioeconomically deprived populations, emphasizing the need for equitable urban green space access. Our findings support prioritizing residential green space in urban planning as a cost-effective public health intervention to reduce global health disparities and chronic disease burden.

O7.05

9:30 COMMON SOCIAL DETERMINANTS OF HEALTH ACROSS THE STATE OF MISSISSIPPI (AT CENSUS TRACT LEVEL) (Graduate Student)

Tasnim Tabassum, Salit Chakma, Abedin Md Minhazul, Benjamin H. Walker, Fazlay Faruque

University of Mississippi Medical Center, Jackson, MS

Understanding social determinants of health (SDOH) is critical for addressing health disparities and improving community well-being. Without understanding the inequities at the smallest scale, it is extremely challenging to implement the required policy changes to improve population health outcomes. We explored 20 indicators under the 14 broad SDOH outlined by the National Institutes of Health (NIH) to compare and contrast the 878 census tracts of Mississippi state. We considered SDOH under housing ownership and characteristics, living arrangements, single parents, elderly population, education, employment status, commuting challenges, poverty, food security, access to essential resources, such as plumbing, kitchen facilities, and broadband connection, etc. Census tracts gives detailed statistically accurate information for a state. This is why the study has collected tract data from Census.gov, accumulated by American Community Survey five-year estimates. We used Stata for detailed statistical analysis. Quartile-based categorization was conducted for each variable, with quartiles as benchmarks for assessing the performance. The fourth quartile is the most socio-economically disadvantaged, while first quartile represents the most advantaged. To determine which census tract is having the most difficulties, we looked at how these quartiles overlapped across the factors. Each census tract was assigned a unique value by summing the quartile positions for all the indicators representing the most and least vulnerable geographic areas. The study visualized spatial distribution patterns through ArcGIS, offering a clear depiction of SDOH disparities across the state. Census tracts from Mississippi Delta are the most vulnerable in terms of SDOH. On the other hand, census tract 9501 under Holmes County is the worst-performing one, which consists of about 24% of Holme's total population. Results revealed that several census tract disproportionately fall into the worst quartiles for poverty, housing quality, having mobile home, and SNAP, while others consistently ranked best. Demographic analysis highlighted that the worst performing ones often have higher concentrations of minority populations, elderly residents, and individuals living alone. Conversely, the best quartiles were associated with better access to resources. The concerning issue is majority of people are 65 years or older in the worst performing ones, with elevated percentages of females. Having one elderly female living alone increases the odds of being a worst census tract at 7%. The African American people make up 64.18% of the population of these census tracts, where the diversity index is approximately 39%. We found a strong correlation between racial differences and worst performance in SDOH. Moreover, their housing characteristics and living conditions also make them vulnerable. These findings emphasize the need for targeted policy interventions to address structural inequities. The integration of GIS mapping provides actionable insights into the geographic clustering of disparities. It offers a valuable tool for planners and stakeholders.

O7.06

9:40 TRANSCRIPTIONAL LANDSCAPE IN DRAINING LYMPH NODES FOLLOWING mRNA-LNP VACCINATION

John Bates, University of Mississippi Medical Center, Jackson, MS

Recent advances in spatial transcriptomics make it possible to survey gene transcription in tissue at near single-cell resolution. We immunized C57BL/6 mice in the gastrocnemius muscle with a lipid nanoparticle-based

vaccine containing mRNA encoding chicken ovalbumin, ovalbumin protein mixed with alum, or PBS as a negative control group. Twenty-four hours following immunization, draining popliteal and inguinal lymph nodes were harvested, formalin fixed, and paraffin embedded. Tissue sections were cut and processed for spatial transcriptomic analysis using the Visium HD Spatial Gene Expression platform manufactured by 10x Genomics. Custom probes specific for chicken ovalbumin mRNA were included in the assay to identify cells expressing vaccine-encoded antigen. The resulting transcriptomic library contained approximately 1.8 billion sequences assessing the expression of over 9,000 genes. Bioinformatic analysis of this library revealed differential gene expression profiles in lymph node tissue as a function of vaccine type. Vaccine mRNA was detected in the cortex of draining lymph nodes and colocalized with Type I interferon gene signatures.

O7.07

9:50 A RETROSPECTIVE STUDY IN A NAFLD POPULATION: DOES INCREASED LIVER FIBROSIS INCREASE THE RISK FOR ABNORMAL BONE DENSITY? (Graduate Student)

Aubrey Smyly[1, 2], Emilia Patiño[3], Mary Madison Pevey[3], John Hollis Tackett[3], Seth Lirette[4], Merlin Manogaram[5], Elliot Varney[1, 4], Candace Howard[1, 4]

[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]School of Medicine, University of Mississippi Medical Center, Jackson, MS, [4]Department of Biostatistics and Bioinformatics, University of Mississippi Medical Center, Jackson, MS, [5]University of Mississippi Medical Center, Jackson, MS

Background: Osteoporosis is a common, silent disease affecting approximately 10 million Americans, that is frequently underdiagnosed until a fracture occurs, and costs roughly $17 billion annually. Osteoporotic hip fractures have a 10% mortality rate at 1 year, and 50% of people with an osteoporotic fracture have never undergone bone density screening. Commonly, osteoporosis can coexist with non-alcoholic fatty liver disease (NAFLD), the most common liver disease globally and estimated to affect 25% of the population. There are >60 million CT scans conducted annually in the U.S. that include the spine along with associated bone density, which provides an opportunity to study the relationship between NAFLD and osteoporosis. **Objective:** To evaluate how a NAFLD index relates to bone density. **Methods:** This retrospective single-center observational study included 563 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 right and left lobe of the liver, spleen, portal vein, IVC, aorta, 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 clinical index (calculated from serum laboratory values), and liver attenuation. Regression coefficients of beta weights and odds ratios were calculated to understand the effects of bone mineral density on NAFLD clinical index and liver attenuation. Inter-class correlation coefficient (ICC) values were also calculated to determine interobserver and intra-observer agreements of all measurements conducted. **Results:** Trabecular bone attenuation at L1 and L2 was inversely proportional to NAFLD clinical index. For every 1 unit increase in NAFLD Clinical Index, there was a decrease in trabecular bone attenuation of 5.5 HU at L1 (β = -5.50; 95% CI: -8.48 to -2.53, $p<0.001$) and 4.91 HU at L2 (β = -4.91; 95% CI: -7.90 to -1.92, p=0.001). **Conclusion:** The results of this study show a strong association between NAFLD and bone mineral density. An increase in NAFLD index correlated with decreased bone mineral density.

O7.08

10:00 ADVANCEMENTS IN THE MANAGEMENT OF PEDIATRIC AND ADULT INFLAMMATORY BOWEL DISEASE: A SYSTEMATIC REVIEW OF TREATMENT STRATEGIES AND LONG-TERM OUTCOMES (Post Doc)

Charles Adedara, University of Mississippi Medical Center, Jackson, MS

Inflammatory bowel disease (IBD), including Crohn's disease and ulcerative colitis (UC), remains a clinically complex condition in children and adults. This study is a systematic analysis of key developments in the treatment of inflammatory bowel diseases, as well as their efficacy and safety over time. Early diagnosis of pediatric IBD is very important since it affects growth and development in children. New therapeutic approaches like biological agents, small molecules, and gene or targeted drugs have given the medical fraternity new treatment protocols. There is a trend towards more selective therapies for adult IBD, especially for anti-tumor necrosis factor (anti-TNF) biologics, integrin antagonists, and interleukin-12/23 (IL-12/23) inhibitors. This review emphasizes the need for patient management where early intervention leading to mucosal healing has been identified to predict durable outcomes. Systematic analysis of existing literature comparing childhood and adult populations shows that morbidity, pathophysiology, therapeutic outcome, as well as the potential for adverse outcomes are dissimilar, which supports the need for differentiated therapy. This work also looks at long-term consequences of the intervention course, the avoidance of surgery, and an improvement in the quality and stability of life as well as reduction in further development of malignant transformation. The new developing strategy of gut microbiome modification and nutrition support for maintaining remission is also argued. Despite these progresses, issues still persist concerning the

effectiveness of treatments, side effects, and patients' compliance. These recommendations give this review a prospective outlook of treatment regimens likely to define the future of IBD management for all age groups.

10:10 Break

10:20-12:00

Hall D Room 11

Interactive Workshop

Topic: Metabolomics

Levearging Metabolomics for Biomarker Discovery in a Multi-Omics Landscape:"Oncology"

Presented by: Micaiah Ward, Ph.D.

The Metabolon Company

12:00 Lunch Break

Thursday, March 20, 2025

AFTERNOON

Hall D Room 11

1:00-3:00 PM

Health Sciences Division Symposium

Theme: Disease Diagnostics and Therapies

"The Future is Here"

Moderators:

Drs. D. Olga McDaniel and Lance Keller

University of Mississippi Medical Center

(**Speakers information can be found in the section on Divisional symposia and Workshop**)

1:00-1:30 PM

Topic: Chimeric Antigen Receptor Therapy: Indications, Management, and Future Directions

Carter P. Milner, MD

Hematology/Oncology,

University of Mississippi Medical Center

1:35-2:10 PM Topic: Chronic Liver Disease and Advanced Technological Strategies for Diagnosis Across the Disease Spectrum

Elliot T. Varney, MD, PhD

Diagnostics Radiology,

University of Mississippi Medical Center

2:15-2:45 PM Topic: TBD

James H. Hamilton, MD

Electrophysiology, Cardiology,

University of Mississippi Medical Center

2:45-3:15 PM Question and Discussion

3:15 Health Science Division Business Meeting

THURSDAY, March 20, 2025

EVENING

4:00 DODGEN LECTURE /AWARDS CEREMONY

Hall B

5:00-7:00 GENERAL POSTER SESSION

(Immediately following Dodgen Event)

General Poster Session I

Coordinators for General Posters:

Drs. D. Olga McDaniel, Michelle Tucci

Coordinators for HSD Posters:

Drs. Merlin M. G. Manogaram and David Gordy

Topics: Population health/Molecular Approach/Diagnostics/Technology

(Faculty- Staff Graduate Students)

P7.01

MOLECULAR CROSS-TALK IN VASCULAR CALCIFICATION

D. Olga McDaniel[1], Larry S. McDaniel[2], Charles K. Moore[3], William F. Campbell[3]

[1]Department of Surgery-SOM, [2]Center for Immunology and Microbial Research, Cell and Molecular Biology, [3]Medicine-CARD, University of Mississippi Medical Center, Jackson, MS

Background: Vascular and coronary artery calcification (VC and CAC) are life-threatening condition associated with pathophysiological mechanism initiated by genetic variations, chronic inflammation, oxidative stress, demonstrated with osteogenic trans-differentiation (Ost-Diff) of vascular endothelium known as (EndoMT). Together with calcium and phosphate abnormality, the endothelial cells participate in vascular and coronary artery calcification. We hypothesized that calcification is assisted by three major entities; 1) genetic factors, 2) chronic inflammation, specifically due to the heterogeneity of macrophages, and 3) metabolic pathways such as glycolysis. Goals: Understanding the current molecular mechanisms underlying determinants and risk factors associated with coronary and vascular calcification may allow strategies to prevent early development of the condition. Methods: This study is a hybrid of a mini-review of the literature and experimental studies using coronary artery cultured cells. Primary cells were isolated from left anterior descending (LAD) coronary arteries. The LAD is one of the largest coronary arteries, that supplies blood to the heart muscle. The artery was minimally dissected, mixed in a DMEM low glucose and the procedure was followed by the ATCC guidelines. The cultures were

generated to test the role of cytokine storm (AIF-1, IL-18, TGF-β, IL-1β, IL-6, TNF-α) production in vitro to determine whether this resulted through activation of coronary endothelial cells due to monocyte induced cascade of adaptor proteins associated with TLR-signaling pathway using a modification of Boyden chamber. We have reviewed the available papers published within the last five years (648 publications) and our own database associated with markers in vascular calcification. We selected studies that utilized various sample types, either peripheral or molecular diagnostic methods for either coronary artery or vascular calcifications. A literature search using PubMed (NCBI/NIH) http://www.ncbi.nml.gov/geo for identification of most recent publication. Results: Genome-wide association studies in populations have identified many genes associated with VC and CAC, but most recently, in addition to endothelin-1 (Endo-1), four novel genes have been identified as important factors for calcification. The genes are insulin like growth factor binding protein (IGFBP3), Fibroblast growth factor (FGF23), protein-coding gene (AR1D5B) and the 6-phosphofructo-2-kinase/fructose-2,6-biphosphatase 3 enzyme (PFKFB3) genes. All of these genes are associated in different ways with calcification and are potential clinical targets. Macrophages promote calcification by releasing inflammatory factors contributing to calcium deposition in the arteries. This in part is developed due to matrix protein binding calcium ions through glutamate residues (Gla residues), and bone morphogenetic protein (BMP). Gla residue mutation at position 56 and 60 or 67 and 71 to glycine causes inhibition of BMP and prevention of osteogenic differentiation and calcification. In a trans-well co-culture monocytes vs. primary endothelial cells generated from human LAD artery, we observed selected cytokine production at different time intervals linked to Endo-MT differentiation. Such differentiation plays a significant role in vascular and coronary calcification. Through the literature review, it was shown that PFKFB3-mediated glycolysis promotes osteogenic trans-differentiation and inhibition of PFKFB3 by Metformin reduces vascular calcification in vitro and in vivo. In summary, chronic inflammation, metabolomes & genes regulate the pathophysiological outcomes that lead to calcification and cardiovascular disease.

P7.02

NEONATAL BRAIN INFLAMMATION ENHANCES METHAMPHETAMINE-INDUCED REINSTATED BEHAVIORAL SENSITIZATION IN ADULT RATS ANALYZED WITH MACHINE LEARNING

Jonathan W Lee[1], Kuo-Ching Wang[2], Norma B Ojeda[3], Haifeng Wang[4], Han-Sun Chiang[5], Michelle A Tucci[6], Han-Chi Wei[5], Asuka Kaizaki-Mitsumoto[7], Sachiko Tanaka[8], Nilesh Dankhara[1], Lu-Tai Tien[5], Lir-Wan Fan[1]

[1]Department of Pediatrics, Division of Newborn Medicine, University of Mississippi Medical Center, Jackson, MS 39216, USA, [2]Department of Anesthesiology, Shin Kong Wu Ho-Su Memorial Hospital, Taipei City, Taiwan, [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]School of Medicine, Fu Jen Catholic University, Xinzhuang Dist, New Taipei City 24205, Taiwan, [6]Department of Anesthesiology, University of Mississippi Medical Center, Jackson, MS 39216, USA, [7]Department of Pharmacology, Toxicology & Therapeutics, Division of Toxicology, School of Pharmacy, Showa University, Shinagawa-ku, Tokyo 142-8555, Japan, [8]Center for Research and Development in Pharmacy Education, School of Pharmacy, Nihon University, Funabashi, Chiba 274-8555, Japan

To investigate the effect of neonatal systemic LPS exposure-induced dopaminergic injury, we used our neonatal rat model of systemic lipopolysaccharide (LPS) exposure (1 or 2 mg/kg, intraperitoneal injection in postnatal day 5 male rats) to examine methamphetamine (METH) sensitization as an indicator of drug addiction in adult rats. On P70, animals began a treatment schedule of 5 daily subcutaneous (s.c.) administrations of METH (0.5 mg/kg) (P70-P74) to induce behavioral sensitization. Ninety-six hours after the 5th treatment with METH (P78), animals received 0.5 mg/kg METH (s.c.) to reintroduce behavioral sensitization. A random forest model was used as the detector to extract the feature interaction patterns among the collected high-dimensional locomotor data. Our approaches identified neonatal systemic LPS exposure dose and METH-treated dates as features significantly associated with methamphetamine-induced behavioral sensitization, reinstated behavioral sensitization and perinatal inflammation in this experimental model of drug addiction. Neonatal LPS exposure also enhanced METH-induced reduction of dopamine transporter (DAT) expression, decrease in mitochondrial complex I activity, and increases in the interleukin-1β concentration in the P78 rat striatum. These results indicate that neonatal systemic LPS exposure produces a persistent lesion in the dopaminergic system which leads to a long-lasting change in the brain reward system as indicated by enhanced METH-induced behavioral sensitization and reinstated behavioral sensitization later in life. These findings show that early-life brain inflammation may enhance susceptibility to the development of drug addiction later in life, which may be associated with chronic inflammation-induced striatal mitochondrial dysfunction and alterations in striatal DAT expression.

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Newborn Medicine Funds from the Department of Pediatrics, University of Mississippi Medical Center, and 100-SKH-FJU-04 and SKH-8302-104-DR-21 from Shin Kong Wu Ho-Su Memorial Hospital, Taipei City, Taiwan.)

P7.03

MICROGLIAL SUPPRESSOR AZITHROMYCIN REDUCES NEONATAL BRAIN INFLAMMATION-INDUCED BRAIN INJURY, OXIDATIVE STRESS, AND PRE-SOCIAL INTERACTION IMPAIRMENTS IN NEONATAL RATS

Yu-Ching Tu[1], Jonathan Lee[2], Jenna Hart[2], Madison Klim[2], Md Rokibul Hasan[3], Rachel Palmer[2], Michelle Tucci[4], Norma Ojeda[5], Lir-Wan Fan[2]

[1]Department of Long-Term Care Management, Chung Hwa University of Medical Technology, Rende Dist, Tainan City, 71703, Taiwan, [2]Department of Pediatrics, Division of Newborn Medicine, University of Mississippi Medical Center, Jackson, MS 39216, USA, [3]Department of Data Science, University of Mississippi Medical Center, Jackson, MS 39216, USA, [4]Department of Anesthesiology, University of Mississippi Medical Center, Jackson, MS 39216, USA, [5]Department of Advanced Biomedical Education, University of Mississippi Medical Center, Jackson, MS 39216, USA

Increasing data provide support for the hypothesis that microglia activation-related pro-inflammatory cytokines mediate inflammation-induced injury to the neonatal brain. Our previous studies have shown that systemic administration of endotoxin lipopolysaccharide (LPS) induces sensorimotor neurobehavioral dysfunction and brain inflammation in neonatal rats, which is associated with the production of pro-inflammatory cytokines by activated microglia. The objective of this study was to determine whether azithromycin, a suppressor of microglial activation, reduces brain inflammation and neurobehavioral disturbances caused by systemic LPS administration. Postnatal day 5 (P5) Sprague-Dawley rat pups were given an intraperitoneal (i.p.) injection of LPS (2 mg/kg) or sterile saline. 5 minutes later, azithromycin (40 mg/kg) or vehicle (PBS) was injected. On P6, 24 hours after LPS administration, neurobehavioral tests were performed, and brain inflammation and oxidative stress markers were measured. Our results showed that azithromycin significantly reduced LPS-induced reduction in body temperature and neurobehavioral deficits, such as decreases in pre-social interaction (ultrasonic vocalization), allodynia, hyperalgesia, and sensorimotor neurobehavioral deficits in P6 rats (n=12/sex/group, $p<0.05$). Azithromycin also significantly reduced LPS-induced brain injury as indicated by the reduction in brain size and increases in brain ventricle size in P6 rats (n=6/sex/group, $p<0.05$). Neonatal systemic LPS-induced increases in interleukin-1b levels and thiobarbituric acid reactive substances (TBARS) contents in the P6 rat brain and spinal cord were also attenuated by azithromycin treatment (n=6/sex/group, $p<0.05$). These results suggest that microglial suppressor azithromycin may provide protection against systemic LPS exposure-induced brain injury, inflammation, lipid peroxidation, and neurobehavioral dysfunction, and that the protective effects are associated with its ability to reduce LPS-induced microglia activation-related pro-inflammatory cytokines.

P7.04

THE EFFECTS OF PALMAR COOLING ON REPEATED SPRINTING ABILITY

Jacob Daniels[1], Michael Brown[1], Marli Crabtree[2], Kenneth Thompson[1], William Pannell[1], Ryan McGlawn[1], Joshua Murphy[1] University of Mississippi Medical Center, Jackson, MS, [2]Duquesne University, Pittsburgh, PA

Purpose: Repeated sprinting ability is key for athletic performance in a variety of sport settings. Significant degradations in work output (i.e. fatigue) have been shown to develop after just one sprinting bout. This pilot study investigated the effects that noninvasive transient temperature manipulation has on an individual's ability to perform repeated sprints. The primary aim of this randomized placebo-controlled trial was to explore the effects of palmar cooling on repeated sprinting performance and recovery. Methods: Fifteen graduate students were randomly assigned to either a palmar cooling intervention or placebo group (males: n=8, females: n=7; Avg. age: 24.06 yrs.) After a ten-minute warm-up, participants completed ten sixty-meter sprints that included two 180-degree changes of direction. Three bouts of two-minute rest occurred utilizing the intervention or placebo device: immediately following the warm-up, sprint five, and sprint ten. Data for sprint times, heart rate, and RPE were collected throughout testing. A muscle soreness rating was collected via survey 48 hours post-intervention. Results: Utilizing an independent samples t-test, statistically significant differences were found between groups for the first recorded heart rate after the second rest interval ($t(11) = 2.276$, $p = .044$). The average heart rate for the intervention group was nearly 14 beats lower than the control average. Between group soreness ratings were also found to be statistically significant ($t(12) = 2.190$, $p = .049$), with the intervention group averaging a 1.83 lower soreness rating when compared to the control group. Although the analysis of sprinting times did not demonstrate statistical significance, there was a clinical significance found between the first and the sixth sprint, with a large effect size (Cohen's d -.819). On the first sprint of the second series, after utilizing the palmar cooling device, participants on average lost 0.719 s less time than the control. Conclusion: The intervention group utilizing the palmar cooling device demonstrated less degradation in sprint times, lower heart rate after the second rest interval, and a lower soreness rating 48 hours after testing. More research is needed with a larger sample size to determine if these practical and statistically significant differences will be maintained. A larger sample size would also allow for a more robust multivariant analysis and could result in the findings being generalizable to larger population.

P7.05

HEALTH EQUITY AND ASPIRIN USE FOR CARDIOVASCULAR DISEASE PREVENTION IN MISSISSIPPI

Raed Bahelah

University of Mississippi Medical Center, Jackson, MS

TBA

P7.06

COMPARATIVE EFFICACY AND SAFETY OF THROMBECTOMY VERSUS THROMBOLYSIS FOR LARGE VESSEL OCCLUSION IN ACUTE ISCHEMIC STROKE: A SYSTEMIC REVIEW ***(Research Fellow)***

Charles Adedara,

University of Mississippi Medical Center, Jackson, MS

Acute ischemic stroke (AIS) is a common cause behind a significant number of people who develop disabilities or die worldwide. Most of the strokes that occur globally are attributed to AIS as a result of large vessel occlusions that typically occur in arteries like the internal carotid and middle cerebral arteries. Primary treatments for AIS are mechanical thrombectomy (MT) and intravenous thrombolysis (IVT), and the clinical scenario can dictate what method would provide the most optimal outcome for the patient. MT has a more favorable efficacy and safety profile but can be more technically challenging and time-consuming. This article conducts a comparison with regard to safety and efficacy between MT and IVT, which are the primary treatment methods for AIS.

The PubMed, Cochrane Library, Europe PubMed Central, Science Direct, and Google Scholar databases were used to search for relevant articles. This search was conducted from June 2024 to July 2024. The process involved examining the titles and abstracts of all relevant publications after which, the selected articles were read entirely to confirm eligibility. The Risk of Bias in Nonrandomized Studies of Interventions I tool was used to assess for bias in the articles selected. The management of AIS involving IVT with or without MT is highly dependent on the clinical scenario. Nevertheless, MT alone has demonstrated better or comparable functional outcomes in patients compared to both bridging therapy (BT) and IVT alone. However, it is important to note that in select patient groups, such as those with large artery atherosclerosis, BT has been able to show better efficacy than MT alone. Given the significant burden of AIS on patient quality of life and healthcare spending, it is prudent to continue to explore newer thrombolytics and thrombectomy techniques.

P7.07

AGOMELATINE PROTECTS AGAINST NEONATAL BRAIN INFLAMMATION-INDUCED ATTENTION-DEFICIT/HYPERACTIVITY DISORDER (ADHD)-LIKE BEHAVIOR IN JUVENILE RATS (Research Fellow)

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Neonatal lipopolysaccharide (LPS) exposure-induced brain inflammation plays an important role in brain injury and 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 reduction in white matter oligodendrocyte numbers, 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. Agomelatine also reduced neonatal LPS-induced brain injury and inflammation in P25 rats 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.

P7.08

AN UNUSUAL CASE OF OVARY WITH METASTATIC ENDOMETRIOID ADENOCARCINOMA AND EXTENSIVE KERATIN GRANULOMAS (Postdoc research)

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Ovarian granulomas are a rare finding. Most of the reported cases are non-neoplastic, foreign body reaction, or infectious, in origin. They are often diagnosed as an incidental finding or as part of granulomatous disease workup. We present a case of ovarian granulomas associated with a neoplastic process.

A 70-year-old female presented with prolonged post-menopausal bleeding of several months duration. Computed tomography scan revealed an enlarged uterus with thickened endometrium and right adnexal mass. She underwent a total abdominal hysterectomy with bilateral salpingo-oophorectomy. Gross examination revealed a 4.8 cm mass in the endometrial cavity and an enlarged nodular right ovary. Microscopic examination of the endometrial mass and right ovary showed endometrial endometrioid adenocarcinoma with extensive squamous differentiation and metastasis to the ovary. The ovarian tumor also showed numerous keratin granulomas. The left ovary and both fallopian tubes were uninvolved.

A rare finding in patients with endometrioid carcinoma with squamous differentiation is the presence of keratin granulomas which involves various sites in the peritoneal cavity including adnexa, omentum, uterine and bowel serosa. These lesions consist of a central mass of keratin and necrotic squamous cells surrounded by foreign body granulomatous reaction. It is important to distinguish pure keratin granulomas from lesions with viable tumor cells and keratin accompanied by a foreign body type giant cell reaction. Pure keratin granulomas have been associated with favorable prognosis. Therefore, pure keratin granulomas should not be diagnosed as metastatic endometrioid carcinoma. A viable appearing carcinomatous component is required for its diagnosis. Post operatively, recommended care included chemotherapy and radiation therapy. The patient sought treatment at an outside institution and was lost to follow up.

P7.09

COMPLEX PRESENTATIONS OF DISSEMINATED BLASTOMYCOSIS BEYOND THE LUNGS

*Tejas Maheshwari, Vamshi Gorantla, Sumit Sontakke, Patrick Kyle, Robert Brodell, William Daley, Poonam Sharma. **(Postdoc Research)**. University of Mississippi Medical Center, Jackson, MS*

Blastomycosis is a rare but severe fungal infection caused by the dimorphic fungus belonging to the genus Blastomyces. The annual incidence in the U.S. is estimated to be less than 2 cases per 100,000, and the mortality rate exceeds 17%, according to the CDC. The infection primarily affects the lungs but can disseminate to other organs and result in significant morbidity particularly in immunocompromised individuals. Despite its clinical importance, blastomycosis is often under-recognized due to its nonspecific symptoms and diagnostic challenges. Its manifestations can mimic those of bacterial infections, other fungal infections, and malignancies. This case series provides a comprehensive analysis of multiple cases of disseminated blastomycosis encountered at our institution over a single year, and focuses on diagnostic hurdles, clinical presentations, and treatment outcomes.

We reviewed the medical records of patients with confirmed blastomycosis, diagnosed through culture, antigen testing, histopathology, and/or molecular testing. The first case involved a patient with pulmonary involvement and atypical dermatologic presentation, showing clean-appearing ulcerations without the typical hyperkeratotic, verrucous nodules. In the second case, a cheek lesion was noted, and a urine antigen test was positive for blastomycosis. Punch biopsy revealed pseudoepitheliomatous hyperplasia, with periodic acid-Schiff and Grocott's methenamine silver stains highlighting thick-walled yeast forms. The third case involved disseminated blastomycosis presenting as a right parathyroid abscess with a thyroid mass. Molecular sequencing identified Blastomyces species complex, and the patient had extensive involvement of skin, soft tissue, and possibly bone, given severe back and pelvic pain.

This case series highlights the diagnostic challenges associated with blastomycosis, emphasizing its importance in differential diagnoses for respiratory and systemic infections, especially in endemic areas. Early recognition and timely initiation of antifungal therapy, such as amphotericin B followed by itraconazole, are essential for positive outcomes. These findings underscore the variability of clinical presentations involving disseminated blastomycosis and the need for a high index of suspicion in patients with atypical symptoms.

P7.10

CYSTIC OR MALIGNANT? A RARE CASE OF HEPATIC LEIOMYOSARCOMA

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(Research Fellow)

Background: Primary hepatic leiomyosarcoma (PHL) accounts for 0.2-2% of all primary hepatic malignancies. It is a rare malignant neoplasm composed of cells exhibiting smooth muscle differentiation. These tumors are infrequently encountered and present with varied clinical manifestations. Only a limited number of cases have been reported in the English literature. We present a case of primary hepatic leiomyosarcoma presenting as a multiloculated cystic mass in an 80-year-old male. **Case Report:** An 82-year-old male presented to the Emergency Department with altered mental status and confusion. He

reported significant weight loss (>20 lbs) over the past year but was otherwise active and in good health. He was found to have a complicated urinary tract infection (UTI) with urinary retention, hypovolemic hyponatremia and Escherichia coli bacteremia and was started on intravenous antibiotics. Renal ultrasound showed an enlarged prostate measuring 7.4 cm. Computed tomography (CT) of the abdomen, performed to rule out a prostate abscess, revealed a 6.6 x 4.2 x 3.7 cm multiloculated hypodense mass in the inferior right hepatic lobe with peripheral enhancement, raising suspicion for an abscess.

The patient underwent an image-guided drainage and biopsy of the cystic mass. The specimens were sent for histopathological and microbiological analysis. Microbiological analysis returned negative. Histopathological examination showed a spindle cell neoplasm with moderate nuclear atypia and increased mitotic activity., Immunohistochemical stains showed positivity for caldesmon, desmin, and smooth muscle actin (SMA), and negativity for broad-spectrum cytokeratin, DOG-1, and CD117. A final diagnosis of leiomyosarcoma was rendered.

PET scan was performed to assess the tumor burden and guide further management, revealing multiple metastatic lesions in the lungs, prostate, and lymph nodes. The patient was not a candidate for surgical resection and is currently receiving palliative chemotherapy. Per the last follow-up, he is doing well.

Conclusion: The presentation of hepatic leiomyosarcoma as a cystic mass is uncommon. Primary hepatic mesenchymal tumors are rare, with sarcomas comprising only 1% to 2% of all primary malignant liver tumors, the majority being hepatocellular carcinoma or cholangiocarcinoma. Most hepatic leiomyosarcomas are metastatic, commonly originating from the gastrointestinal tract, uterus, retroperitoneum, or lung. Thus, excluding metastatic disease is essential when diagnosing primary hepatic leiomyosarcoma. In summary, primary hepatic leiomyosarcoma is a rare tumor with varied presentations, often associated with delayed diagnosis and poor prognosis.

P7.11

A FASCINATING CASE OF COMBINED HEPATOCELLULAR CARCINOMA-CHOLANGIOCARCINOMA (cHCC-CCA) DIAGNOSED ON LIVER CORE BIOPSY (Postdoc-Research)

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Introduction: Combined hepatocellularcholangio-carcinoma (cHCC-CCA) is a rare primary hepatic malignancy accounting for 2-5% of primary liver carcinomas. cHCC-CCA is defined by presence of histologic features of both hepatocellular carcinoma (HCC) and cholangiocarcinoma (CCA). In this submission, we present an interesting case of cHCC-CCA and highlight the important features and significance of correctly diagnosing cHCC-CCA.

Case Report: We report an interesting case of cHCC-CCA in a 66-year-old male with a 5 cm targetoid mass in hepatic segment 8, suspicious for an atypical HCC. The patient underwent an image guided liver mass biopsy. H&E slides of the core biopsy showed two distinct morphologies. The first population of tumor cells demonstrated polygonal cells with abundant eosinophilic to amphophilic cytoplasm, and prominent nucleoli. Adjacent to the this population, a second population of tumor cells demonstrated poorly formed glands set within a desmoplastic stroma, cytologically showing pleomorphism and prominent nucleoli.

Immunohistochemical stains of the first population were positive for glypican-3, Hep Par-1(rare cells), arginase-1 (rare cells), while being negative for CK7, and CK19. Special staining for reticulin showed a loss of staining. These immunomorphological features are suggestive of hepatocellular carcinoma. The immunoprofile for second population of the tumor showed positive for CK7 and CK19, and negative for glypican-3, Hep Par-1, and arginase. These characteristics are consistent with cholangiocarcinoma. This case was signed out as Combined hepatocellular-cholangiocarcinoma (cHCC-CCA).

Discussion: CHCC-CCA requires presence of two morphologically and immunohistochemically distinct populations of HCC and CCA and there is no minimum cut-off for the amount of each component for the diagnosis of cHCC-CCA. The two components can be either close to each other or intermingled, however, collision tumors are not part of this entity. Distant metastasis of this tumor can show either cHCC-CCA features or any individual component of the combined tumor.

Conclusion: Correct diagnosis of cHCC-CCA is of utmost importance given that cHCC-CCA has a worse prognosis and different clinical follow-up pattern than a conventional HCC. As cHCC-CCA are treated clinically as a more aggressive tumor along the lines of the CCA component so we should always keep this rare diagnosis in our mind when examining the liver neoplastic biopsies.

P7.12

A SCOPING REVIEW OF SELF-CARE BURNOUT AND PATIENTS WITH CHRONIC DISEASE (Postdoc-Research)

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Background: Chronic diseases (CD) are the leading cause of death in Mississippi, with 1.9 million residents suffering

from at least one chronic condition. In 2021, Mississippi ranked 44th in the U.S. for adults with three or more chronic health conditions, affecting 13.8% of the population, compared to the national average of 9.6%. The CDC advocates for healthy behaviors—such as balanced eating, regular exercise, and adequate sleep—as key to preventing CD. However, growing evidence suggests that psychological factors, like anxiety, depression, and perceived social support, play a significant role in a patient's ability to adhere to lifestyle changes and disease management.

Burnout, originally identified in the workplace, is a psychological syndrome resulting from chronic stressors and is characterized by emotional exhaustion, cynicism, and a sense of inefficacy. It is a spectrum, ranging from mild to severe, and can affect patients managing chronic diseases in ways similar to occupational burnout. Factors such as healthcare inefficiencies, excessive treatments, lack of control over medical decisions, and ongoing self-care burdens contribute to this burnout. This condition is linked to poorer quality of life and increased risks for conditions like cognitive impairment, diabetes, and cardiovascular disease.

This scoping review aims to explore the nascent relationship between burnout and CD self-care management, emphasizing the need for comprehensive strategies to address these challenges. Given the potential relationship between burnout and CD self-management, this research explores an important aspect of healthcare that may affect patient outcomes.

Methods: An initial search was conducted in multiple databases (PubMed, MEDLINE, CINAHL, PsycInfo, and Web of Science) to identify relevant articles on burnout, patient compliance, personal efficacy, CD, and chronic conditions. The search retrieved 1,038 citations which were imported into EndNote. After removing duplicates, 626 unique citations were available for screening.

The selection process involved two independent screeners who reviewed titles and abstracts. Articles related to occupational burnout, rare diseases, medication interactions, and youth (under 18) were excluded. A third screener helped resolve any disagreements. After further review, an additional 596 articles were deemed unrelated to patient burnout, resulting in exclusion from the scoping review. The remaining studies focused on patient burnout in adults with CDs. In total, 111 articles were reviewed for full-text eligibility, resulting in 70 articles included in the review. These articles were categorized based on the disease state.

Results: This research examines burnout and burnout-related constructs across multiple CD states, revealing that burnout is prevalent in various chronic conditions. This relationship may impact patients' abilities to manage their health and contribute to negative health outcomes. This scoping aims to explore the applicability of self-care burnout as a model to improve patient-provider interactions.

Conclusion: Burnout is a significant issue across CDs, with common themes of emotional exhaustion, detachment, and reduced self-care. This review reveals the need for (1) further research to investigate burnout systematically as part of CD management and (2) a standardized burnout instrument that can be applied across diseases to enhance patient care.

P7.13

A FATAL CASE OF CORONARY THROMBOSIS IN A YOUNG MALE TRIGGERED BY MARIJUANA USE (Postdoc-Research)

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Background: The use of marijuana for therapeutic and recreational use is rising. The effects of marijuana on the central nervous system are well documented, but its effect on the cardiovascular system is not well understood. The available evidence suggests that there is an Increased risk of cardiac arrhythmia and myocardial infarction with continued use of marijuana. Case reports have documented instances of ST-elevation myocardial infarction (STEMI) in otherwise healthy individuals with a history of marijuana consumption. In this study, we report a rare autopsy study of a young man with a history of marijuana use. Design: We report an autopsy study of a 34-year-old man with no previous medical history except for marijuana use who had a sudden cardiac death. Result: A complete autopsy was performed and samples for toxicological examination were obtained. Gross examination was normal except for mild cardiomegaly. Microscopic examination revealed focal complete occlusion of the proximal left anterior descending coronary artery due to an organized thrombus. The possibility of a postmortem thrombus was excluded by performing a Trichrome stain (Figures 1 and 2). There was no underlying atherosclerosis in the coronary arteries. No acute myocardial infarction was noted. Blood and vitreous fluid toxicology revealed elevated levels of delta-9THC (50mg/ml). Conclusion: Only rare reports of the effect of marijuana on the cardiovascular system exist in the literature. Cannabis smoking is a potential predisposing factor in young healthy adults. The proposed mechanisms include arteritis, vasospasm, and platelet aggregation. Our case illustrates that organized coronary thrombosis leading to coronary artery occlusion may be the cause of myocardial ischemia and fatal cardiac arrhythmia in individuals with marijuana use. This case also highlights the importance of considering coronary artery occlusion without atherosclerosis as a cause of sudden death and emphasizes the potential role of drug use in contributing to adverse cardiovascular outcomes.

P7.14

CASE OF LEPROMATOUS LEPROSY (Postdoc-Research)

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Leprosy, commonly known as Hansen's disease, is a chronic granulomatous disease caused by Mycobacterium leprae and Mycobacterium lepromatosis. It is prevalent in developing countries. Each year, up to 225 people in the U.S. and 250,000 around the world are diagnosed with Hansen's disease. Approximately 75% cases within the United States resulted from immigrants. We present a case of an elderly man who presented with erythematous plaques, diffuse edema, pain in upper and lower extremities, and difficulty in walking. He had a reported history of mycobacterial disease and had been treated with multiple courses of interrupted antimicrobials (trimethoprim/sulfamethoxazole, doxycycline, and azithromycin). He grew up in a rural farm with animals and worked in the farming industry for over 30 years. The only reported travel history included travel to Korea in 1960s. His inflammatory markers were elevated with a normal WBC count. Skin biopsies were obtained, which showed 4+ acid fast bacilli (AFB) on Kinyoun stain. No Mycobacterium was isolated on culture. Histopathologic examination of the biopsy showed granulomatous inflammation in the superficial and deep dermis and associated dermal edema. Ziehl-Neelsen stain demonstrated numerous bacilli present singly, in clusters, and as globular masses throughout the dermis Because no growth occurred in the culture, despite having a high mycobacterial burden, the fixed tissue block was sent to an outside institution for broad-range PCR analysis for identification, including sequencing regions of the rpoB gene. The identification returned as Mycobacterium leprae. The final diagnosis was lepromatous leprosy. Due to the prior unsuccessful antimicrobial treatment courses, in addition to the associated pain and edema, the case is best categorized as a reversal reaction. The case demonstrates that correlation of all the microbiologic, histologic, molecular, and clinical findings was necessary to successfully reach the diagnosis.

P7.15

OPTIMIZING BLOOD CULTURE PRACTICES TO ADDRESS SUPPLY INTERRUPTIONS *(Postdoc-Research)*

Akhila Aravind, Sumit Sontakke, Vonda Clack, Darlene Hamilton, Patrick Kyle, William Daley, Robert Brodell, Poonam Sharma, University of Mississippi Medical Center, Jackson, MS

Background: Blood cultures remain the gold standard for diagnosing bloodstream infections, offering critical insights into causative pathogens and guiding antimicrobial therapy. However, challenges such as low sample volumes, contamination, and interruptions in blood culture supply can affect clinical outcomes. This year, the FDA issued a nationwide warning regarding BACTEC blood culture system interruptions, prompting the Clinical Microbiology Lab at the University of Mississippi Medical Center to optimize blood culture practices in anticipation of a potential shortage. **Methods:** We evaluated average sample volumes, contamination rates, and the associated costs of contamination each month. We analyzed which clinical areas had the highest contamination rates. Additionally, we encouraged physicians to prioritize ordering blood cultures only for patients at high risk of bacteremia, such as those with septic shock, endovascular infections, or septic arthritis, while advising against cultures in cases with a low likelihood of positive yield. We also validated new glass blood culture bottles to mitigate shortages. A comparison was set up to compare the new glass culture vials to the previously used plastic culture vials. The comparison included the positive and negative patient specimens with known results as well as ATCC® quality control organisms. For the negative blood matrix fresh human blood and the remnant blood from the blood bank were used. **Results:** Following our interventions, the average blood collection volume increased from 3.7 mL per bottle in July 2023 to 5 mL per bottle by August 2024. While the recommended volume per adult bottle is 8-10 mL for optimal pathogen recovery, contamination rates improved, dropping from 1.22% to 0.42%. This saved valuable culture vials and reduced monthly contamination costs by approximately $61,040. During the validation study, we found a one hundred percent accuracy and precision of our new glass bottles. However, despite our recommendations, there was no reduction in the total number of blood culture orders by the clinical attendings. **Conclusion:** Implementing best practices enabled our lab to manage the blood culture shortage effectively. However, the number of blood culture orders remained unchanged, indicating that further interventions- such as hard and soft stops in ordering systems- may be necessary to reduce unnecessary testing and preserve limited resources.

P7.16

THERMO-PHOTO-RESPONSIVE PRIMER FOR DEBONDING APPLICATIONS ***(Graduate Student)***

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Objectives: Removing high-strength ceramic restorations involves the laborious and destructive use of mechanical rotary instruments. This removal process lacks materials that offer efficiency, non-destructiveness, and time savings. We have developed an innovative photo-responsive primer. Our aim is to characterize this primer by comparing microbrush and pipette application methods, and evaluate its potential for debonding applications for lithium disilicate ceramics. **Methods:** Novel photo-

responsive primer was applied on cementation surface of lithium-disilicate specimens (3mm-thickness; n=3/gp) using either microbrush or pipette (1-3 applications). Surface roughness was analyzed using 3D profilometry, ceramic-primer interaction by scanning electron microscopy (SEM) and energy dispersive spectroscopy (EDS). Photo-responsiveness was evaluated using PinkWave (Vista Apex) for 20,40,60s duration, temperature monitored with Infrared camera (Optris). ANOVA followed by Tukey's test was used to analyze the roughness and thermal data ($p<0.05$). **Results:** Surface-roughness (Ra) significantly differed between 1vs3 and 2vs3 applications for both pipette and microbrush groups ($p<0.05$). Ra values for 1,2 and 3 applications were 0.93±0.04 µm, 1.00±0.21 µm, and 2.27±0.51 µm (pipette) vs 0.90±0.12 µm, 1.03±0.13 µm, and 1.12±0.09 µm (microbrush), respectively. For Rz, pipette application showed higher values only for 3 applications, with values for 1,2 and 3 applications being 25.19±3.20 µm, 28.65±6.53 µm, and 63.59±14.18 µm (pipette) vs 25.73±7.45 µm, 34.23±6.78 µm, and 34.15±6.85 µm (microbrush). SEM and EDS confirmed uniform dispersion of the primer with single applications, while increased clustering was observed with two and three applications. Application-method, exposure-time, and their interaction significantly affected temperature ($p<0.001$). The primer deposition using pipette resulted in higher temperatures (59.18°C) than microbrush application (43.67°C) after 3 applications and 60s light-curing. Significant differences ($p<0.01$) were observed between application methods for 2 and 3 applications at 40s. **Conclusions:** The novel primer exhibited significant thermo-photo responsiveness and increased surface roughness of lithium disilicate ceramics when applied three times using either pipette or microbrush.

P7.17

IDENTIFYING GEOGRAPHIC INEQUITIES IN FAMILY PLANNING SERVICE UPTAKE IN PAKISTAN: A COMPARATIVE STUDY OF PDHS 2006 AND 2017 USING CLUSTER HOTSPOT ANALYSIS *(Graduate Student)*

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Family planning (FP) services are crucial interventions for improving maternal and child health outcomes and promoting gender equity. However, ensuring equitable access to these services remains a significant challenge, particularly in countries like Pakistan, where sociocultural norms, economic disparities, and geographic barriers hinder FP uptake. This study utilized spatial analysis techniques, including hotspot analysis, to investigate geographic disparities in FP uptake in Pakistan using data from Pakistan Demographic and Health Surveys (PDHS) conducted in 2006-2007 and 2017-2018. ArcMap 10.1 was used for spatial analysis and Stata 12.0 for statistical analysis. Results revealed significant spatial variations in FP uptake, with urban areas exhibiting higher uptake rates than rural regions. Hotspot analysis identified dynamic changes in contraceptive prevalence rates (CPR), with significant clustering in some regions and dispersion in others. It also identified areas with high unmet needs, low intention to use FP services, and preference for family size (>3 children), highlighting the need for targeted behavioral change interventions. This innovative spatial approach provides nuanced insights for policymakers and program planners to develop targeted interventions based on localized data to improve FP service delivery, mitigate disparities, and ultimately advance efforts to improve maternal and child health outcomes. The application of geospatial analysis is an effective tool for enhancing program planning, evaluation, and resource allocation in diverse geographical contexts.

P7.18

RETROSPECTIVE ANALYSIS OF ESTROGEN RECEPTOR EXPRESSION IN PROSTATIC NEOPLASMS: IMPLICATIONS ACROSS AGE AND RACIAL GROUPS (Graduate Student)

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Background: Prostate cancer (PCa) is the most common cancer in men in the United States, aside from non-melanoma skin cancer. The roles of estrogen receptor α (ERα) and estrogen Receptor β (ERβ) in PCa have not been fully elucidated yet. This study aims to evaluate the expression levels and localizations of ERα and ERβ in benign prostatic tissue (BPT) and PCa across different racial and age groups. **Methods:** Immunohistochemistry (IHC) for ERα and ERβ was performed on tissue microarrays (TMA) containing 240 samples of BPT and PCa from Black and White individuals and age groups ≤60 and >60 years. The localization of the IHC signal for ERα and ERβ was determined in glandular and stromal regions. Expression levels of ERα and ERβ were quantified using an IHC score, calculated by multiplying the area score (percentage of stained cells: 0 for no staining, 1 for <10% staining, 2 for 10-50% staining, and 3 for >50% staining) by the intensity score (0 for no signal, 1 for weak, 2 for moderate, and 3 for strong staining). Statistical analysis was performed using Student's t-test; a p-value ≤0.05 was considered significant. **Results:** In entire population, the IHC scores for glandular ERα, stromal ERα, and glandular ERβ were lower in all PCa cases than in BPT, but significant difference was only seen in glandular ERβ between PCa and BPT (3.43±2.3 vs. 4.86±2.8; p=0.0021). Interestingly, the IHC scores for all of glandular ERα, stromal ERα, and glandular ERβ were significantly lower in metastatic PCa than in BPT (p=0.014, p=0.0001, and p=0.0035, respectively). While entire population was

stratified by race, there was no significantly difference of IHC score for glandular ERα, stromal ERα, or glandular ERβ in both BPT and PCa between Black and white populations. While entire population was stratified by age, individuals with age >60 years had significantly lower IHC scores for glandular ERα (p=0.0023) and stromal ERα (p=0.03), but not for and glandular ERβ (p=0.1) in BPT; and significantly lower IHC score for stromal ERα (p=0.0036). **Conclusions:** These findings suggest that ERα and ERβ could be potentially diagnostic and prognostic biomarkers for PCa. Declined expression levels of glandular ERα, stromal ERα, and glandular ERβ may correlate to the oncogenesis, progression and disparities in race and age PCa.

P7.19

INVESTIGATING THE ANTICANCER PROPERTIES OF BITTER KOLA IN HUMAN OVARIAN CANCER CELLS *(Graduate Student)*

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Bitter kola, a medicinal plant traditionally used in African medicine, has demonstrated therapeutic potential in treating diabetes, inflammation, and infertility. However, the precise molecular mechanisms underlying its anticancer properties remain poorly understood. This study aimed to elucidate the cellular and molecular effects of bitter kola on ovarian cancer cells using the OVCAR-3 cell line as a model. We hypothesized that bitter kola induces cytotoxicity and apoptosis, modulates the expression of stress-related genes, and affects the cell cycle by targeting specific regulatory proteins. To investigate these potential mechanisms, we conducted MTS assays to measure cell viability and Western blot analyses to assess the expression levels of key regulatory proteins involved in apoptosis and cell cycle control, including p53, BAX, BCL-2, caspases 3 and 9, Cyclin A, and Cyclin D1. Quantification of protein expression changes across a range of bitter kola concentrations by densitometry revealed significant dose-dependent effects. Notably, bitter kola treatment resulted in upregulation of the tumor suppressor protein p53 and pro-apoptotic BAX, alongside downregulation of anti-apoptotic BCL-2. Additionally, the activation of caspase 3 and caspase 9 indicated the involvement of an apoptotic pathway. Bitter kola also significantly impacted cell cycle regulation by decreasing the expression of Cyclin A and Cyclin D1, suggesting a potential cell cycle arrest. The study findings indicate that bitter kola induces cell cycle arrest through activation of the p53 pathway, promoting apoptosis and inhibiting cell proliferation. These results suggest that bitter kola's cytotoxic effects may involve interaction with the retinoic acid receptor and inhibition of growth and differentiation. Collectively, these insights contribute to our understanding of bitter kola's molecular mechanisms in cancer treatment and underscore its potential as an alternative therapeutic agent against ovarian cancer. Further in vivo studies are necessary to validate its clinical applicability.

Topics:
Diagnostics/Molecular/Technology/Therapeutics
(Graduate and Undergraduate Students)

P7.20

IMPACT OF CHRONIC INFLAMMATION INDUCED BY MICROPLASTICS AND OBESITY ON STREPTOCOCCUS PNEUMONIAE INFECTION (Graduate Student)

Lucas Crosby, Fahim Khan, Eva Bengten, Lance Keller, University of Mississippi Medical Center, Jackson, MS

Streptococcus pneumoniae is a Gram-positive bacterium known to cause several diseases, such as meningitis, pneumonia, and otitis media. Microplastics (MPs) are ubiquitous in the modern world and there is still little known about their effects on bacterial growth and invasion. MPs are extremely prevalent in the environment and have been isolated from all types of human tissues and is present in all humans to some degree. These MPs induce an inflammatory response from the host and can impact the virulence or severity of S. pneumoniae infections. Obesity also causes chronic inflammation, which is well-studied, but minimal experimental data is available for MP exposure in obese populations. To examine the relationships between chronic inflammation and S. pneumoniae we used a diet induced obesity murine model with and without exposure to MPs. Mice were feed either a normal or high fat chow and MP exposed groups were nasally instilled with MPs biweekly for four weeks before infection. Furthermore, we also observed the effects MPs may have on neutrophil recruitment and macrophage polarization through flow cytometry analysis of the murine BALF before infection. Microscopy was used to examine interactions of S. pneumoniae and MPs. Chronic inflammation seems to play a role in the ability of the pneumococcus to colonize, regardless of the chronic inflammation source, but these effects do not seem to be additive. Variations in immune cell recruitment were observed in our inflamed mice. We conclude that chronic inflammation impacts S. pneumoniae colonization and possibly effects pathogenicity. This effect is likely due to variations in the resident innate immune cells in chronically inflamed mice. Future work will examine if modulation of innate immune cell populations to those seen in non-inflamed can provide protection from S. pneumoniae infection.

P7.21

POSS, NOT YOUR ORDINARY BANDAGE!! (Med1 student)

Aiden Leise, Landry Smith, Michelle Tucci, University of Mississippi Medical Center, Jackson, MS

Up to the present, autologous skin grafts or flaps have been widely used for repairing skin and soft tissue defects. However, improved reconstruction poses greater donor site problems. To resolve these problems, skin substitutes have been developed using tissue engineering. However, in order for skin substitutes to be applied to patients with full-thickness skin loss, the substitutes should function as an alternative to autologous skin, form an effective barrier against bacterial invasion, minimize inflammation and scar formation, improve fibrovascular tissue ingrowth, and have excellent reproducibility. Polyhedral oligomeric silsesquioxane (POSS) with a distinctive nanocage structure consisting of an inner inorganic framework of silicon and oxygen atoms, and an outer shell of organic functional groups is one of the most promising nanomaterials for medical applications. Enhanced biocompatibility and physicochemical (material bulk and surface) properties have resulted in the development of a wide range of nanocomposite POSS copolymers for biomedical applications, such as the development of hemostatic agents, biomedical devices, drug delivery systems, dental applications, and tissue engineering scaffolds. The purpose of our experiment was to determine the short-term effects of applying POSS to a partial thickness skin wound using the pig as a model. Biopsies were taken after 3 and 7 days to determine the acute response to the material which was compared with wounds which were treated with traditional antibiotic cream or saline alone. The data show POSS was able to induce early tissue formation and reduce inflammation and scar formation when compared to antibiotic wound coverage.

P7.22

THE IMPACTS OF MULTIGENERATIONAL LIVING AND ADOLESCENT PREGNANCY ON THE HEALTH AND WELLBEING OF ADULT MOTHERS IN MISSISSIPPI: A CONVERGENT PARALLEL ANALYSIS (Graduate Student)

Christopher S. Clark[1], Katie Cranston[2], Rebekah Andrew Ayyasamy[1], Kerri Ivey[1], Breanna Wade, Benjamin Walker[1], Abigail Gamble[1]

[1]University of Mississippi Medical Center, Jackson, MS, [2]University of Texas Southwestern Medical Center, Dallas, TX

P7.23

IDENTIFYING TRENDS IN RACIAL AND ETHNIC DISPARITIES IN LABOR NEURAXIAL USE (Med1 student)

Joseph Landry Smith, Nickhil Rugnath, Aiden Leise, LaToya Mason, Michelle Tucci

University of Mississippi Medical Center, Jackson, MS

Neuraxial anesthesia, which includes epidural and spinal analgesia, is widely used for pain management during labor. In the US, the literature shows estimates between 60%- 75% of women utilize neuraxial analgesia during labor. However, the literature also shows lower utilization rates among marginalized racial and ethnic groups. The objective of our study was to evaluate the trend in neuraxial analgesia use for vaginal delivery from January 1-31, 2024 at the University of Mississippi Medical Center, Wiser Hospital. Labor and Delivery logs from the labor and delivery ward at Wiser hospital were evaluated for live births during the Month of January, 2024. Race and Hispanic ethnicity were recorded, along with type of delivery and use of neuraxial analgesia. The data were further placed into a REDCAp database and exported into Microsoft Excel in order to evaluate the data. The rate of neuraxial analgesia was 61.8% among 214 births. At our institution, the percent of vaginal deliveries by race were 60% for black individuals and 57% for white and Hispanic individuals. In assessing epidural use for vaginal delivery, it was found that 38% of Hispanic individual utilized neuraxial analgesia, while greater than 90% of black and white individuals. Our data suggests the need for better communication with our Hispanic women to understand if the lack of utilization or resistance of use is due to cultural myths, financial burden of self-pay, or lack of education.

P7.24

ADRENAL CORTEX CHANGES IN THE FEMALE OVARIECTOMIZED RATS (Med1 Student)

Dax Murphy[1], Landry Smith[2], Prasanna Guduru[1], Aiden Leise[2], Michelle Tucci[2]

[1] Mississippi State University, Starkville, MS, [2]University of Mississippi Medical Center, Jackson, MS

The adrenal glands are small, triangular shaped endocrine glands that are located on top of the kidneys. The adrenal gland consists of two distinct regions, the adrenal cortex and adrenal medulla, which are important for regulating several bodily functions including metabolism, blood pressure, and the body's response to stress. During transition to menopause, females have tendency to experience significant changes in energy balance and stress which are symptoms of adrenal imbalance. The objectives of our study were: (1) to evaluate histological changes in the cortex and medulla of the adrenal glands in an ovariectomized rat and to determine if sustained delivery of either estrogen or an NPY 1 receptor antagonist (NPY-1RA) prevents histological changes of the gland, and (2) to determine if changes in the adrenal cortex are consistent with physiological changes at menopause such as weight gain and bone loss. Our results show that removal of ovaries (OVX) without treatment resulted in increased body weight, histological changes in the adrenal cortex zones, and resulted in significant bone loss within 8 weeks compared to ovary intact female rats. Treatment of OVX with either estrogen or an antagonist to NPY Y1 receptor reversed the metabolic and histological changes. The results suggest that estrogen loss impairs disrupts the zonation of the adrenal cortex and may be an important component of the metabolic changes associated with menopause.

P7.25

USE OF Y1 RECEPTOR ANTAGONIST CAN IMPROVE BONE QUALITY IN FEMALE ADULT SLE MICE (Med1 Student)

Joseph Landry Smith, Nickhil Rugnath, Aiden Leise, Bernadette Grayson, Jayla Sandifer, Erin Taylor, Michelle Tucci, University of Mississippi Medical Center, Jackson, MS

Systemic lupus erythematosus (SLE) is a rheumatic disorder related to numerous organs damage, dysregulated autoantibodies production. Bone involvement such osteoporosis, avascular necrosis of bone, and osteomyelitis have been observed in higher rates in SLE compared to the general population. Lupus predominately occurs in females and alterations in proinflammatory cytokines with higher levels of NPY have been found in circulation of patients with SLE. Our previous in vivo studies found increases in circulating NPY following loss of estrogen in a rat model led to a decreased volume of cancellous bone and inhibition of the osteoblast cell activity, which was reversed using an antagonist to the Y1 receptor (NPY-1RA). Our objective was to determine if administering an NPY-1RA could protect bone loss in older SLE mice. Twenty SLE adult female mice were randomly divided into two groups. Group 1 animals received an osmotic pump containing vehicle, and animals in group 2 received an osmotic pump set to release NPY-1RA at a concentration of 5ug/kg/day for four weeks. At the end of four weeks, the animals were euthanized and the femurs were harvested and bone density, peak load, and histological assessments were determined. Our results antagonizing the Y1 receptor improves bone strength and bone quality compared with SLE animals receiving vehicle only.

P7.26

THE IMPACT OF MEDICAID EXPANSION ON STATE-LEVEL MEDICAID REIMBURSEMENT FOR ORTHODONTIC CARE: A COST ANALYSIS (Med1 Student)

Ron McCall, Ashlie Elver, Kendall Pitre, Ian Hoppe, Laura Humphries, University of Mississippi Medical Center, Jackson, MS

Background: Presurgical orthodontia improves outcomes for cleft lip and palate (CL/P) patients undergoing alveolar bone grafting and orthognathic surgery. A 2020 American Dental Association survey reported average overall cost of dental procedures of $2,692.42 for Phase 1 and $5,369.51 for Phase 2 orthodontia. While Medicaid payments offset costs of these procedures, reimbursement varies by state. Medicaid Expansion has sought to alleviate these strains with improved access and richer benefits for many more low-income families. This study analyzes state-level Medicaid reimbursement rates for presurgical orthodontia across U.S states. **Methods:** Provider reimbursement rates for 2024 were collected from state websites for the following CPT codes associated with CL/P orthodontia: D8020 (Phase 1/Limited Orthodontic Treatment of Transitional Dentition) and D8080 (Phase 2/Comprehensive Orthodontic Treatment of Adolescent Dentition). Reimbursement rates for each code were normalized using the latest poverty and cost of living data and categorized into Expansion and Non-Expansion states. Comparisons were made across four U.S. CDC regions (South, Northeast, Midwest, and West). Means were calculated for each code by group. States lacking coverage for D8020 or D8080 were excluded, as was TN due to unavailable data. Independent t-test and ANOVA were used to assess significance ($p<0.05$). **Results:** Medicaid Expansion has not been adopted by 20% (n=10) of states (AL, GA, ID, KS, MS, NE, SC, TN, TX, and WY). 97.5% (n=39) of Medicaid expansion states and 60% (n=6) of non-expansion states offered coverage for D8080. The mean-adjusted Medicaid reimbursement rates associated with D8080 were significantly higher for Medicaid expansion vs. non-expansion states ($2,139.34 ±SD=$1465.92 vs $1,196.91 ± SD=$467.57; p=0.005, respectively). In addition, 62.5% (n=25) of Medicaid expansion states and 50% (n=5) of non-expansion states covered services for D8020. The mean-adjusted Medicaid reimbursement rates for D8020 did not significantly differ between expansion and non-expansion states $1,084.72 ± SD $1,251.74 vs $1,076.82 ±SD=$892.22; p=0.987, respectively). There were no significant differences in mean-adjusted Medicaid reimbursement of either D8020 or D8080 by region. **Discussion:** Our analysis reveals a significant disparity in Medicaid reimbursement rates for D8080, with Expansion states offering higher rates than Non-Expansion states regardless of region. Higher costs associated with D8080 procedures makes it unreasonable for many families on Medicaid to consider orthodontia alongside CL/P repair. While Medicaid Expansion has improved access for low-income families, reimbursement for orthodontic services remains inadequate. Increasing these rates is crucial to reducing financial barriers for families of patients with cleft and other craniofacial conditions, ensuring better surgical outcomes and quality of life.

P7.27

VARIABILITIES IN ACCESS TO SPECIALTY CARE FOR SURGICAL TIMING IN HEAD AND NECK CANCER PATIENTS (Med1 Students)

Kendall Pitre, Ashlie Elver, Ronald McCall, Henry Taylor, Edward Facundus, Adam Fleming, John Phillips, Sara Islam, Jesse Austin, Ignacio Velasco Martinez, Soheil Vahdani, Benjamin McIntyre, Laura Humphries, University of Mississippi Medical Center, Jackson, MS

OBJECTIVES: Free-flap reconstruction is the gold standard for reconstruction after resection of advanced head and neck (H&N) cancer. Sociodemographic factors often influence delayed diagnosis and access to specialty care. This study aims to investigate the association of race,

insurance coverage, and statewide social vulnerability index (SVI) on the timing of patients receiving H&N reconstruction at one tertiary care center. **METHODS:** A retrospective chart review was conducted for patients with H&N cancer who underwent oncologic resection with oral surgery, with or without subsequent free flap reconstruction by plastic surgery at a tertiary care center from 2016 to 2024. Patients were divided into sociodemographic cohorts based on race (White, African American, Unknown/Other), insurance status (government, private, uninsured), and SVI quartiles: Q1 (0-25th percentile, least vulnerable), Q2 (26-50th percentile), Q3 (51-75th percentile), Q4 (76-100th percentile, most vulnerable). Days between symptomatic onset, initial encounter, and reconstructive surgery were compared between cohorts using ANOVA tests for multiple comparisons with post-hoc Tukey's HSD tests to assess significance ($p<0.05$). **RESULTS:** There were 183 patients included for analysis. Majority of patients were White (71% vs. African American: 23.5% vs. Other: 5.5%), had government insurance (59.6% vs. private: 32.2% vs. uninsured: 8.2%), and were in the least vulnerable SVI (Q1: 32.8% vs. Q2: 21.3% vs. Q3: 23% vs. Q4: 21.9%). The most vulnerable patients in SVI experienced longer delays from symptomatic onset to initial encounter when compared to those in lesser vulnerable SVI quartiles (Q4=345.35d, Q3=140.93d, Q2=177.66d; $p<0.05$). Uninsured patients had a significantly longer delay from their initial tertiary care center encounter to reconstructive surgery compared to insured patients (uninsured=59d, government=34.1d, private=28.03d; $p<0.05$). **CONCLUSIONS:** Socially vulnerable patients with H&N cancer experience delays in initial presentation, potentially due difficulties in accessing specialty care and transportation issues. Uninsured patients with H&N cancer face longer delays in scheduling surgery, possibly due to financial burdens of self-payment for healthcare. These findings highlight the need for improved access and targeted interventions for at-risk groups with head and neck cancer in our center to deliver timely and equitable care.

P7.28

ANALYSIS OF AIRWAY MANAGEMENT TYPE AND DURATION IN ONCOLOGIC HEAD AND NECK RECONSTRUCTION (Med1 Student)

Henry Taylor, Ashlie Elver, Kendall Pitre, Ron McCall, Edward Facundus, Adam Fleming, John Phillips, Soheil Vahdani, Ignacio Velasco, Benjamin McIntyre, Laura Humphries

University of Mississippi Medical Center, Jackson, MS

Objectives: Oncologic head and neck (H&N) reconstruction requires careful intra- and postoperative airway management, yet limited data exists regarding differences in airway selection on clinical course. This study investigates airway management type and postoperative ventilation duration on hospital course and postoperative outcomes. **Methods:** A single-center retrospective study reviewed patients who underwent H&N reconstruction with plastic surgery after oncologic resection from 2016 to 2024. The airway type was recorded as tracheostomy or naso/oropharyngeal. The duration of postoperative ventilation was noted in days. Outcomes compared demographics, critical care, and hospital length of stay (LOS), acute and chronic complications (<30 & ≥ 30 days), and reoperations. ANOVA, independent t-tests, and chi-squared tests were used for analysis. **Results:** Of 116 patients who underwent reconstruction, 93 (80.17%) received tracheostomy and 23 (19.83%) had naso/oropharyngeal intubation. There were more overall complications in tracheostomy patients (1.52 ± 1.43 vs. 0.91 ± 1.04; $p=.029$), and acute complications (0.58 ± 0.50 vs. 0.30 ± 0.47; $p=.013$). There were no differences in LOS or reoperations. 52 patients had no ventilatory support after surgery, 34 patients were ventilated for 1 day, and 16 patients for ≥ 2 days. There were no differences in LOS or complications. **Conclusion:** The approach to airway management is guided by patient and oncologic characteristics. Tracheostomy patients experienced more complications but did not require longer LOS. Postoperative ventilatory support is helpful in certain scenarios but was not associated with higher risks or longer LOS. Reconstructive surgeons should select the safest airway management with minimal differences in anticipated hospital course.

P7.29

EXPLORING THE CAUSES OF REDUCED FEMALE MORTALITY RATES IN THE MISSISSIPPI DELTA (Undergraduate Student)

Hope Thomas, Shari'a Davis, Coahoma Community College, Clarksdale, MS

A reduction of mortality rates has been apparent in the female population of the Delta. Despite extensive research, resources have been scarce to aid in the epidemic. This study aims to address the causes of the reduced mortality rates by viewing the statistics on female mortality rates, measuring variables that are related to the mortality rates in the Delta. We hypothesize that the reduction of the female mortality rates will be directly proportional to the lack of resources and advanced technology in the Mississippi Delta. The findings may provide insight for medical practitioners and inform directors of the improved outcomes in the mortality rates.

P7.30

***BATTLING HIV/AIDS IN MS DELTA* (Undergraduate Student)**

Shadiah Robinson, Coahoma Community College, Clarksdale MS

HIV/AIDS has been a STD that has been talked about a lot and should be known for most. The issue at hand is combating the STD in the MS Delta. It is time to fight against HIV/AIDS and I will discuss how we can go about

doing so. This study aims to find the best solution for fighting against HIV/AIDS to better understand how to be safe from it. A survey will be conducted to see how many people practice safe sex practices, get tested with their partner(s), and how many people practice abstinence. I will ask both male and females in the general age of 16-35. I expect for a lot of the results to be people having sex with others without getting tested since it is known that there are many cases of STDS in the MS Delta. The findings from this study will matter as it may help people realize why the cases of HIV/AIDS are high and may slow down the rate of transfer for STD. This may also help someone who thinks they may have it to go get tested. This will inform MS Delta on things they can do to better combat HIV/AIDS.

P7.31

EFFECT OF ORAL CANNABIDIOL INTAKE ON THE VIRAL IMMUNE RESPONSE IN THE LUNG OF JUVENILE RATS (Undergraduate Student)

Lexi J. Holdiness, Shirley X. Guo-Ross, Kylee Burroughs, Angela K. Ross, Caera A. Taylor, Katelyn N. Sette, Russell L. Carr, Center for Environmental Health Sciences, Department of Comparative Biomedical Sciences, College of Veterinary Medicine, Mississippi State University, Mississippi State, MS

Cannabidiol (CBD) is a major non-psychotomimetic phytocannabinoid found in the plant Cannabis sativa. In 2018, the FDA approved the use of the CBD-rich drug Epidiolex for the treatment of two forms of severe epilepsy in children. Some studies have also suggested that CBD is beneficial in the treatment of anxiety, attention-deficit/hyperactivity disorder (ADHD), autism spectrum disorder, and pain relief. Over recent years, parents have become more open to the use of CBD oil to treat their children for hyperactivity and restlessness, even if that child has never been diagnosed with ADHD. Adult animal studies have previously demonstrated that CBD administered as a therapeutic can have effects on immune function. However, it is unclear if daily exposure to CBD will alter the immune response to a subsequent immune challenge in developing animals. For the purpose of this investigation, 12-day-old male and female juvenile rats were orally administered either corn oil, 20 mg/kg CBD, or 60 mg/kg CBD daily for 5 days. In order to challenge the rat's immune response, a single-strand RNA viral mimic, Resiquimod (R848), was delivered intranasally 24 hours after the final dosing. Six hours post-treatment, rats were sacrificed to collect lung tissue for analysis of the gene expression of several pro-inflammatory and anti-inflammatory cytokines via real-time PCR. Treatment with R848 induced a strong antiviral immune response as evidenced by alteration of the gene expression of multiple cytokines. Of the cytokines whose expression was altered by challenge with R848, pretreatment of rats with CBD suppressed the R848-induced gene upregulation of IL-1beta, IL-8, IL-10, and MIP-2. However, CBD pretreatment did not affect the gene expression patterns of the cytokines IL-1alpha, IL-18, TGF-1beta and TNF-alpha which were also altered by R848. If these changes in expression translate into changes in actual cytokine levels, the modification of cytokine levels could alter the innate immune response needed to respond to an infection. However, it is unclear if this would be advantageous or detrimental.

P7.32

IMPACT OF FOOD ACCESS AND HEALTH ACCESS ON COLORECTAL CANCER INCIDENCE RATES IN MISSISSIPPI (Undergraduate Student)

Debarshi Roy[1], Doaa Mohamed[1], Subhajit Chakrabarty[2], Udaysinh Rathod[2], Sweta Singh[2], Mridula Mavuri[2], Devesh Sarda[2]

[1]Alcorn State University, Lorman, MS, [2]Louisiana State University Shreveport, Shreveport, LA

Colorectal cancer (CRC) is a complex disease influenced by multiple factors. It ranks as the third most diagnosed cancer and the second leading cause of cancer-related deaths globally. The exact causes of colorectal cancer are still not fully understood. While early detection can greatly enhance prognosis, patients often show no specific symptoms or only vague signs in the early stages, which leads to a low rate of early diagnosis. Mississippi leads the nation in CRC mortality, with an age-adjusted rate of 17.7 deaths per 100,000 people. In 2019 alone, the state recorded over 1,700 new CRC cases and more than 640 related deaths. Despite the importance of early detection, over one-third of Mississippi adults aged 45 and older remained unscreened for CRC in 2020. CRC incidence and mortality rates in Mississippi are higher than national averages, with especially higher rates among Black males, who experience the nation's highest CRC mortality rate. Access to healthy food and access to healthcare are two critical denominators of socio-economic status which can create an impact on the occurrence and progression of cancer and other chronic diseases. These underscore the rationale for research in this area. Our first specific objective was to analyze the relationship of healthy food access and health care access, with the incidence rates of CRC, in the counties of Mississippi. Our second specific objective was to identify spatial groupings. Socioeconomic data was obtained from State Cancer Profile portal of CDC. Geospatial maps of counties were obtained to perform spatial analysis. The methods for the first objective involved geo-statistical interpolation techniques, to estimate missing values across the dataset. Next spatial regression was performed. For the second objective, spatial clustering was performed. The outcome for the first objective was a spatial regression model. For the second objective, the outcome were spatial clusters that were computed and shown through data visualization. The study may be considered significant because it uncovered spatial and demographic factors that could inform targeted public health interventions and policy decisions.

P7.33

SEEING IS BELIEVING: CHAIRSIDE MICROSCOPE USE FOR PERIODONTAL EDUCATION AND COMPLIANCE

Emily Barnes, Andrena Black, Kay Newell, Ashley Smith, Reagan Spengler

School of Dentistry, University of Mississippi Medical C

This review aimed to evaluate the effectiveness of phase-contrast microscopy as a chairside tool for enhancing patient education and treatment adherence in periodontal care. To investigate this, a literature review was conducted using Google Scholar, PubMed, and Wiley Library. Key search terms included "periodontal microscopy," "point-of-care diagnostics," "chairside education," "phase-contrast microscope," "patient care," "periodontitis," "health literacy," and "patient education with microscopes." A total of 17 articles published within the last five years were identified and reviewed. Of these, six studies were deemed directly relevant to the hypothesis, including a meta-analysis, observational study, experimental study, randomized controlled trial, and critical analysis. Additionally, a seminal article frequently cited in the literature was included to provide foundational context. The selected studies examined the impact of visual reinforcement on patient behavior, with a particular focus on the use of phase-contrast microscopy in chairside diagnostics. Findings suggest that patients who observed live microorganisms before and after treatment showed a reduction in pathogenic bacteria, reinforcing the importance of visual aids in promoting behavior modification. Conversely, patients with lower compliance exhibited increased pathogenicity. In conclusion, phase-contrast microscopy offers a promising approach to improving patient education, treatment adherence, and overall periodontal health, underscoring the importance of “seeing is believing” in enhancing patient outcomes. Further research is needed to quantify these effects and refine this diagnostic tool.

enter, Jackson, MS

P7.34

THE IMPACT OF AI IN THE DIAGNOSIS,MANAGEMENT, AND TREATMENT OF HEAD & NECK CANCERS

Hannah Campbell, Meagan Daneault, Aiyah McKinney, Nathan Nguyen, Angie Garner, Angie.

School of Dentistry, University of Mississippi Medical Center, Jackson, MS

Oral cancer (OC) is the sixth most common cancer worldwide, with high morbidity and mortality due to late-stage diagnoses. Early detection and timely treatment can significantly improve survival rates, but most OC cases are diagnosed at advanced stages, resulting in a 45% two-year survival rate. This delay is often caused by inadequate screening and surveillance at the local care level. Artificial intelligence (AI) has the potential to improve early detection, diagnosis, and treatment by enhancing diagnostic accuracy and optimizing clinical workflows. To explore the role of AI in OC management, a literature review was conducted using 16 publications from PubMed and Google Scholar. The focus was on studies that assessed the utility of AI in diagnosing and managing head and neck cancers. The review included a mix of observational case studies, systematic reviews, randomized and non-randomized trials, all published in English within the last five years. AI technologies, including machine learning algorithms and advanced image processing tools, were found to assist in several ways. These include improving diagnostic precision, reducing chairside time, and aiding clinical decision-making in oral surgery, orthodontics, and periodontics. AI also enables at-home lesion scanning by patients, improving access to early detection. However, challenges such as false positives and negatives, as well as the dependency on data quality, must be addressed. While AI shows promising potential, further research is needed to refine these technologies and validate their clinical effectiveness. With continued advancements, AI could revolutionize OC management by enabling earlier detection, better treatment outcomes, and more efficient use of healthcare resources.

P7.35

PERIODONTAL DISEASE AND COGNITIVE DECLINE: UNRAVELING MOLECULAR MECHANISMS.

Lindsey Huffman, Hailey Manning, Jana Montgomery, Kelsey Welch.

School of Dentistry, University of Mississippi Medical, Jacksin, MS

Periodontal disease, a chronic inflammatory condition affecting the oral cavity, has been linked to several systemic diseases, including diabetes, cardiovascular diseases, and cognitive decline. This study investigated the relationship between periodontal disease and cognitive impairment, focusing on how oral pathogens contribute to neurodegenerative conditions such as Alzheimer’s disease. Specifically, *Porphyromonas gingivalis* (*P. gingivalis*) and other gram-negative anaerobic bacteria, including *Treponema denticola* and *Tannerella forsythia*, are implicated in both periodontal disease and neurodegeneration. *P. gingivalis* has been shown to enter the bloodstream and cross the blood-brain barrier, leading to neuroinflammation, a key factor in cognitive decline. To explore this connection, we conducted a literature review using databases such as PubMed, CINAHL, Google Scholar, and ResearchGate. Studies published in the last five years that focused on the relationship between periodontal disease, oral pathogens, and cognitive function were selected. In total, eight peer-reviewed articles met the inclusion criteria, with research methodologies including microbial analysis, neuroinflammation assessment, and animal models. One study demonstrated that mice inoculated with *P. gingivalis* and *T. denticola* showed increased neurodegeneration in the hippocampus compared to control animals. Another study found that *P.*

gingivalis was able to permeate neural cells, exacerbating cognitive impairment and potentially advancing Alzheimer's disease. These findings support a positive correlation between periodontal pathogens and cognitive decline, suggesting that oral bacteria like *P. gingivalis* may exacerbate neurodegeneration. Modifiable risk factors, such as oral hygiene, smoking, and obesity, may influence the progression of both periodontal disease and cognitive decline. Further research is needed to examine demographic variations and develop strategies for integrating oral health into dementia care.

P7.36

EARLY DIAGNOSIS IN HEAD AND NECK CANCER: SQUAMOUS CELL CARCINOMA AND SALIVARY GLAND CARCINOMA IN DENTISTRY

Aleigh Flynn, Morgan Kaminski, Sydney Moore, McKenzi McQuaig.

School of Dentistry, University of Mississippi Medical Center, Jackson, MS

Oral cancer, particularly squamous cell carcinoma (SCC) and salivary gland carcinoma (SGC), has a poor prognosis when diagnosed late, with early detection significantly improving survival rates. However, current screening methods, primarily visual inspection, are often insufficient, especially in low-income communities with limited access to preventive care. Dental hygienists play a crucial role in detecting early signs, yet studies show gaps in knowledge and a lack of standardized screening protocols. This review synthesizes findings from six articles, including four systematic reviews, one experimental study, and one observational study, to identify key risk factors for delayed diagnosis, such as inadequate preventive care, low awareness, and insufficient training among dental professionals. Using key terms like "oral cancer," "early diagnosis," and "dental hygienists," we conducted literature searches on PubMed and Google Scholar. Our analysis suggests that implementing standardized screening protocols for SCC and SGC in dental practices could significantly improve early detection and patient outcomes. The review emphasizes the need for targeted education and the development of consistent diagnostic procedures for dental professionals. Standardizing screening practices and increasing awareness among dental hygienists can enhance early detection, ultimately improving survival rates for patients with oral cancers.

P7.37

PROVIDONE IODINE FOR CARIES PREVENTION.

Samantha Lawrence, Bailie Roberts, Anna Claire Shaw, Brittany Funderburg

School of Dentistry, University of Mississippi Medical Center, Jackson, MS

Dental caries remains a global health concern, particularly in children. While sodium fluoride is a proven caries-preventive agent, povidone iodine's antimicrobial properties offer potential as an adjunctive therapy. This study evaluates the effectiveness of combining povidone iodine with sodium fluoride to prevent dental caries. A literature review was conducted using PubMed and Google Scholar with the keywords "povidone iodine" and "caries prevention." Out of 24 identified studies, eight were selected, including five randomized controlled trials, two critical appraisals, and one meta-analysis. The review focused on povidone iodine's antimicrobial efficacy, its impact on Streptococcus mutans, and plaque reduction when used alongside sodium fluoride.

The findings consistently demonstrated that povidone iodine inhibits bacterial growth, particularly gram-negative bacteria associated with caries progression and periodontal disease. Combined with sodium fluoride, the therapy showed significant reductions in plaque and caries risk, especially on occlusal surfaces in children. Repeated applications of the combination were deemed critical for sustained effectiveness, as supported by several studies. This study confirms that povidone iodine enhances the caries-preventive properties of sodium fluoride, supporting its potential role in dental care. However, additional research is needed to establish standardized treatment protocols and long-term clinical viability. These findings highlight the value of evidence-based approaches in advancing preventive dentistry and addressing the global burden of dental caries.

P7.38

STRESS LESS, SMILE MORE: THE CONNECTION BETWEEN STRESS AND ORAL HEALTH

Carly Durr, Sara Scott Gideon, Kayla Reece, Barbara Brent

School of Dentistry, University of Mississippi Medical Center, Jackson, MS

A recent literature review of eight studies explores the significant impact of stress on oral health, highlighting the relationship between psychological stress and various dental conditions. The review, based on research published in the last five years, synthesizes findings from PubMed and EBSCOhost, focusing on keywords such as stress, anxiety, oral hygiene, and bruxism. Key findings reveal that stress contributes to parafunctional behaviors like teeth clenching and grinding (bruxism), gum-chewing, and lip-biting, all of which are linked to temporomandibular joint (TMJ) disorders and facial pain (Soman et al., 2024; Vlăduțu et al., 2022). Additionally, stress exacerbates periodontal disease, with higher stress levels correlating with increased clinical attachment loss (CAL) and more severe periodontal issues (Kolaparthy et al., 2022). Psychological stress also impairs immune function, hindering recovery from dental procedures and infections (Cao et al., 2023). Stress-related dental anxiety, a barrier to care, further complicates oral health outcomes. Many individuals avoid dental visits due to anxiety, contributing to untreated conditions and worsening oral health (Hoffmann et al., 2022; Valastro et al., 2024). This is especially common among high-risk groups like college

students (Ball & Darby, 2022). The findings highlight the need for integrated care that addresses both psychological and physical aspects of oral health. Dental practitioners are encouraged to screen for stress, offer psychological support, and educate patients on the connection between stress and oral health to improve outcomes.

END OT THURSDAY'S PROGRAM

Friday March21, 2025
MORNING
Hall D Room 5

8:05 AM Welcome
Dr. Olga McDaniel
University of Mississippi Medical Center

8:10-9:50 A Changing Landscape
Pros and Cons for Trending Medical Advancement
Scientific Debate
Hall D Room 5
Moderator:
D. Olga McDaniel
University of Mississippi Medical Center

Topic I Genome Editing
8:15-9:00
Speakers:
Shazeed-Ul Karim, Graduate Student
Dr. Poonam Sharma, Assistant Professor-Research
Ring Master Dr. Lance Keller
University of Mississippi Medical Center

Topic II Artificial Intelligence
9:05-9:50
Speakers
Aubrey Smyly, Graduate Student
Dr. Merlin M Manogaram, Project Manager
Ring Master Dr. Elliot Varney,
University of Mississippi Medical Center

10:00 Health Science Division Orals
Concurrent Sessions
Hall D Room D5
Session B
Moderators:
Drs. Merlin M. Manogaram and Larry S. McDaniel
University of Mississippi Medical Center

Topics: Microbial Genetics/Cell Biology/Diagnostics

O7.09

10:00 INVESTIGATING BLEOMYCIN EFFECT ON BODY WEIGHT USING MOUSE MODEL OF PULMONARY FIBROSIS

Maricica Pacurari, Obriana Davis, Jackson State University, Jackson, MS

Background: Pulmonary fibrosis (PF) is a progressive lung disease. After diagnosis, the survival average is ~3-5 yrs which is close to many cancer types. PF pathological mechanisms are complex and a hallmark of PF is collagen deposition in the lungs which leads to stiffness of the lungs and loss of lungs elasticity. Bleomycin is a chemo-drug used to treat several cancer types and also an inducer of PF in animal models. **Hypothesis:** In the present study, we investigated the effect of bleomycin (BLM) on mouse body weight in a mouse model of PF. **Materials and Methods:** C57BL6J male mice of 10 weeks old were purchased (Jackson Laboratories) and housed in the animal vivarium at Jackson State University (IACUC Protocol 2003) and maintained at 25°C and 55%± % humidity with a 12-hr light-dark cycle with ad libitum access to water and standard feed. The mice were acclimatized for 1 week before any treatments. The mice were grouped into 3 groups and each group was treated ip with PBS (control), BLM (BLM), and BLM + Pirfenidone (BLM+PFD). BLM was prepared in PBS and administered to animals at 1.5U/kg bwt every other day for a total of 4 administrations thus receiving a total of 1.5U/kg bwt BLM. PFD was administered at 200 mg/kg bwt every other day for a total of 10 days to mice treated with BLM for 21 days. All animals were monitored for any signs of distress. Body weights were measured every week for a total of 4 wks. **Results:** Over the course of 4 wks, BLM decreased body weight whereas the group receiving the treatment with PFD, body weight slowly increased from week three until week 4 at which point all mice were sacrificed. In conclusion BLM decreased body weight whereas treatment with PFD stabilized body weight loss. PFD is used to treat PF in humans.

07.10

10:10 CALCIUM AND MAGNESIUM RELEASING CARBONATED APATITE COATINGS ON TITANIUM DENTAL IMPLANTS TO IMPROVE OSSEOINTEGRATION (Graduate Student)

Amisha Parekh, Amol Janorkar, Michael Roach, University of Mississippi Medical Center

Introduction: With the rising demand for dental implants, there is an increasing need to improve implant longevity. Titanium implants have a long history of successful use but lack an ideal for good osseointegration. Conventional plasma-sprayed hydroxyapatite coatings have been shown to improve osseointegration but are prone to delamination and implant failure. Anodized hydroxyapatite coatings, in contrast, have shown improved adhesion strengths. Calcium (Ca) and Magnesium (Mg) ions are critical bone

tissue minerals and have been shown to promote osteoblast differentiation. The aim of this research study was to create Ca and Mg ions releasing anodized hydroxyapatite coatings for improving osseointegration of dental implants. **Methods and Materials:** In the present study, commercially pure titanium discs were anodized in a novel electrolyte to form oxides consisting of hydroxyapatite. Optical and Scanning electron Microscopy (SEM), thin film x-ray diffraction (XRD), electron dispersive spectroscopy (EDS), Fourier transform infrared spectroscopy (FTIR), Inductively Coupled Plasma Optical Emission Spectroscopy (ICP - OES) and VDI 3198 standard Rockwell C indentation test were utilized to characterize the surface morphology, crystallinity, chemistry, molecular structure ion release profiles and oxide layer adhesion quality of the oxide coatings. **Results:** SEM analyses revealed petal-like surface nanostructures, while XRD analyses revealed a combination of alpha-tricalcium phosphate and hydroxyapatite formation in the oxides. EDS results showed Ca, P, and Mg uptake into the oxides with a surface Ca/P ratio of approximately 2. FTIR analyses revealed the characteristic OH^- hydroxyapatite peak at 3570cm^{-1} to be poorly defined but substituted with carbonate peaks at 875,1570 and 1450cm^{-1}, indicative of carbonated or bone-like apatite formation. Furthermore, ICP-OES revealed the anodized coatings to show a substantial release of Ca^{2+} and Mg^{2+} ions over a 30-day period in a phosphate buffered saline solution. SEM and VDI adhesion quality analysis of the oxide coating showed the presence of bi-layered oxide with good oxide layer adhesion quality. **Conclusion:** The present study successfully formed Ca and Mg, releasing carbonated apatite and tri-calcium phosphate coatings on titanium with acceptable adhesion strengths. Thus, these novel implant coatings show much promise to improve osseointegration and future patient outcomes.

O7.11

10:20 THERAPEUTIC TARGETING OF METABOLIC SENSING RECEPTORS GPR35 IN BREAST CANCER BONE METASTASIS (Postdoc-Research)

Gunjan Sharma, K.M. Abdullah, Seema Singh, Ajay Singh, Jawed Siddiqui

Department of Cell and Molecular Biology, University of Mississippi Medical Center, Jackson, MS

Purposes of the study: Breast cancer (BC) cells have a high propensity to disseminate into the bone, but the molecular mechanisms of bone metastasis (BoM) are not yet fully elucidated. BC cells establish bidirectional interactions with the bone microenvironment through altered expression of several chemokines and their receptors to facilitate metastasis. The physiological roles of most chemokines and their cognate receptors have been well characterized. A recent report suggested that metabolite sensing, G protein-coupled receptor 35 (GPR35), is the cognate receptor for CXCL17 and is associated with numerous cellular activities such as tumor growth, drug resistance, and metastasis of cancer cells. However, no investigation has been conducted showing the role of GPR35 in the modulation of bone microenvironment and progression and BoM. **Pertinent experimental procedures and data summary:** We have analyzed the expression profile of chemokines and their cognate receptors across a panel of 30 breast cancer cell lines (ELIXIR database, EMBL). Data revealed that GPR35 was expressed in most BC cell lines; consistently, CXCL17 expression frequency was also high. To ascertain the clinical significance, we have analyzed the expression of GPR35 in the BC dataset and have found that GPR35 expression was elevated in cancer patients compared to normal healthy control. Furthermore, we have found that BC patients with higher GPR35-expressing tumors showed poor overall survival. Further, GPR35 expression is enriched in human as well as syngeneic bone metastatic cell lines (SCP2, SCP28, and E0771/Bone) compared to their parental BC cell line (MDA-MB-231 and E0771P) respectively, suggesting the highly supportive role of GPR35 in BC-BoM. P7731 (derived from a metastatic bone lesion of a breast cancer patient) is an advantageous model for studying bone metastasis-related events showing increased expression of GPR35. Further, immunohistochemistry of breast carcinoma tissue microarray analyses has indicated the significant up-regulation of GPR35 as compared to the normal adjacent breast tissues and positively correlated with the stages of BC tissue samples. Since most of the BC-BoM is osteolytic (bone destructive) in nature, in this consideration, we have examined the autocrine effect of rhCXCL17 on osteoblasts (OBs) and Osteoclasts (OCs). In alkaline phosphatase (ALP) activity and qRT-PCR, we have found that rhCXCL17 and BC bone metastatic cell's conditioned media (CM) modulate the differentiation of OBs and in Tartrate resistant acid phosphatase (TRAP) staining and qRT-PCR, rhCXCL17 and CM accelerated the differentiation of OCs. To see the therapeutic benefits of targeting the GPR35 receptor, we used a noble GPR35 inhibitor (GPR35i), which exhibits a high degree of selectivity. In functional studies, we performed a wound-healing experiment in which GPR35i tremendously reduced the metastatic potential of E0771/Bone and SCP2 bone metastatic cell lines. Furthermore, in the trans-well migration assay, GPR35 inhibition significantly decreases the invasiveness of both BC bone metastatic cells. **Conclusions:** Our data suggest that high $GPR35^{+ve}$ tumor cell migrates towards the high CXCL17, providing a solid rationale for targeting GPR35 to attenuate the BC-BoM.

07.12

10:30 IDENTIFYING THE PERCEIVED BARRIERS THAT IMPACTING THE ATTITUDE TOWARDS BREAST CANCER SCREENING AMONG 18-39 YEARS OLD FEMALE COLLEGE STUDENTS IN MISSISSIPPI (Graduate Student)

Dinan Noor[1], Noverra Mahmud[2], Tanya Funchess[2], Azad R Bhuiyan[1]

[1]Jackson State University, Jackson, MS, [2]University of Southern Mississippi, Hattiesburg, MS

Background: Breast cancer is the second leading cause of death among women worldwide and in the US. Mississippi has the highest breast cancer mortality rate and has the lowest screening rate. According to the CDC, approximately 73.53% of women aged 50 to 74 years had a mammogram within the past two years in 2020 in Mississippi; this is lower than the national average of 78.3%. Mississippi's breast cancer screening rate is consistently lower over the last 10 years. **Purpose:** This study aims to understand the knowledge and perceived barriers of breast cancer screening tests among Mississippi female college students aged 18-39 years and identify factors that may impact intentions to participate in breast screening at their recommended age. **Methodology:** Study population includes female students from Mississippi aged 18-39 years. This study has two phases. First phase includes the quantitative part. For participant recruitment, we are using convenience sampling technique. After getting IRB approval, the study started recruiting participants from Jackson State University and University of Southern Mississippi by sending the survey via academic email and from other Mississippi colleges through social media. Second phase of this study includes the qualitative part. We will conduct several focus groups to understand the indepth perceptions of the participants. We used SAS 9.4 to conduct the preliminary univariate analysis for the first phase. We will conduct the Chi-square analysis and logistic regression after completing the study. **Result:** Sample size is 853 till now in our ongoing survey. In preliminary analysis mean age of our participants 25.88 years. Among respondents, 10.2%Whites, 81.9%Blacks, 2.4%Hispanic/Latino, 2.8%Asian and 2.8%other races. 80% of the female students are intended to do the screening at their recommended age. 39.9% of the participants said fear of positive finding, 34.7% said lack of knowledge as the inhibiting factor for breast cancer screening. 30.8% said their insurance may not cover breast cancer screening.

Implementation: This study will help to develop targeted policies for improvement of screening rate. By understanding perceived barriers, policies can be developed to address specific needs. For example, providing mobile mammography units in rural areas to overcome geographical challenges or offering free or low-cost screenings for uninsured women.

07.13

10:40 COMPUTATIONAL MODELING OF LAMINA CRIBROSA MICROARCHITECTURE: ASSESSING THE IMPACT OF PORE VARIATIONS ON DEFORMATION UNDER ELEVATED INTRAOCULAR PRESSURE (Undergraduate Student)

Lindee Wilson, Lydia Miller, University of Mississippi, University, MS

Glaucoma, a leading cause of blindness worldwide, is strongly linked to elevated intraocular pressure (IOP), which is thought to damage retinal ganglion cell axons at the lamina cribrosa (LC) - a collagenous network within the optic nerve head at the back of the eye. The LC provides structural support for these axons, yet the mechanism by which elevated IOP leads to axonal damage remains poorly understood. It is hypothesized that elevated IOP induces deformation of the LC's collagen beams, potentially straining adjacent axons and causing damage. However, experimental evidence to validate this hypothesis is limited. In this study, we used computational modeling to explore this relationship, developing a series of 2D models of the LC with variations in pore number, shape, distribution, and alignment. These models simulate different structural configurations to assess how specific changes in LC microarchitecture influence axonal strain under elevated IOP.

Our baseline model, constructed to reflect an anatomically accurate LC structure based on literature, features an elliptical disk with a major axis of 1.58 mm, a minor axis of 1.54 mm, and a thickness of 0.015 mm. The model includes elliptical pores, aligned radially with their major axes pointing toward the LC center, reflecting a natural configuration that likely aids in distributing mechanical loads and resisting deformation under IOP. Our baseline model contains 296 pores, consistent with reported healthy LC pore densities, which typically range from 200 to 400 pores. The collagen beams separating these pores vary in thickness from 0.008 mm to 0.0143 mm. To capture anatomical heterogeneity, the baseline model also incorporates quadrant-specific pore sizes, with larger pores (0.058 to 0.080 mm) in the superior and inferior quadrants and smaller pores (0.045 to 0.050 mm) in the nasal and temporal quadrants.

Using this baseline model as a control, we systematically varied pore number, shape, and alignment to examine their individual effects on LC deformation under simulated elevated IOP. For pore number, we altered collagen beam thickness, which controls pore density. In the baseline configuration with 296 pores, we halved the beam thickness to increase pore count to 353 and doubled the beam thickness to reduce the pore count to 177. For pore shape, we compared elliptical and circular configurations. The baseline model featured elliptical pores; to simulate circular pores, we calculated an equivalent circular area for each elliptical pore, maintaining a constant total pore area. For pore alignment, we modified the baseline's radial orientation. In the baseline, elliptical pores were radially aligned with their major axes pointing toward the center of the LC. We created two additional configurations: circumferential alignment, where the minor axes oriented toward the center, and random alignment without directional constraints. These controlled variations in pore number, shape, and alignment provide a framework for

understanding how specific microstructural features influence LC deformation, offering insights into structural factors that may contribute to glaucoma progression. In future work, we aim to incorporate retinal ganglion cell axons within the pores to study how these structural variations specifically affect IOP-induced axonal deformation.

10:50 Break

07.14

10:55 PREVALENCE OF CARDIOMETABOLIC RISK FACTORS IN NON-ALCOHOLIC FATTY LIVER DISEASE WITH AND WITHOUT RENAL OR CARDIOVASCULAR DISEASE (Med1 Student)

Emilia Patiño[1], Mary Madison Pevey[1], John Hollis Tackett[1], Aubrey Smyly[2, 3], Merlin Manogaram[4], Seth Lirette[5], Candace 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]University of Mississippi Medical Center, Jackson, MS, [5]Department of Biostatistics and Bioinformatics, University of Mississippi Medical Center, Jackson, MS

Background: Up to 30% of the adult U.S. population has non-alcoholic fatty liver disease (NAFLD), which includes simple steatosis, steatosis with inflammation, non-alcoholic steatohepatitis (NASH), and NASH cirrhosis. Due to its high association with obesity, which is increasing in incidence, NAFLD and NASH are also increasing in incidence. Cirrhosis, which can be a complication of NAFLD, is frequently underdiagnosed until decompensation, when complications of liver disease become clinically evident with the presence of jaundice, ascites, bleeding varices, and/or hepatic encephalopathy. Treatment of liver fibrosis and cirrhosis is aimed at stopping or delaying progression to cirrhosis to reduce or delay complications of decompensated cirrhosis. NAFLD has become one of the most common causes of liver transplants worldwide. Early detection of NAFLD is imperative to prevent irreversible fibrosis which occurs in the later stages of the disease. NAFLD often occurs alongside other cardiometabolic processes such as diabetes mellitus, dyslipidemia, and hypertension. NAFLD patients frequently have comorbidities such as cardiovascular or renal disease. **Objective:** The objective of this study was to compare cardiometabolic risk factors such as diabetes, hypertension, and dyslipidemia and rates of renal and cardiovascular disease in non-alcoholic fatty liver disease patients. **Methods:** A retrospective, single center observational study was conducted focusing on patients diagnosed with NAFLD using CT between July 2004 and January 2016. All patients underwent a routine non-contrast CT exam at baseline with follow up assessments using data up to December 2023. Patients with poor image quality on CT were excluded, resulting in a final cohort of 439 patients. Electronic health records were used to collect lab values, BMI, history of cardiovascular or renal disease, and prior diagnoses associated with increased cardiometabolic risk (diabetes, hypertension, dyslipidemia). Anthropometric measurements such as sagittal abdominal diameter and waist circumference were performed on both the baseline and follow up CT imaging. Fibrosis 4 scores were calculated using the above data for each patient. **Results:** Renal disease was found to occur in a higher proportion of women when compared to the cardiovascular disease group. African Americans had a significantly higher prevalence of renal disease. However, Caucasians had a higher prevalence of cardiovascular disease. Metabolic risk factors such as diabetes mellitus, hypertension, and dyslipidemia were similar between NAFLD groups with and without renal or cardiovascular diseases. There was a significant difference in the prevalence of metabolic risk factors between groups with and without cardiovascular or renal disease. Less than 10% of the NAFLD patients had advanced fibrosis, while 58% to 68% showed no signs of fibrosis. **Conclusion:** Prevalence of cardiometabolic risk factors is higher in NAFLD with renal or cardiovascular disease. Cardiovascular disease or renal disease often manifest before the onset of advanced fibrosis.

07.15

11:05 NPY Y1 RECEPTOR ANTAGONIST AMELIORATES FETAL GROWTH RESTRICTION, INFLAMMATION, AND LIPID PEROXIDATION FOLLOWING MATERNAL INFLAMMATION AND REDUCED UTERINE PERFUSION PRESSURE IN RATS (Med 1 Student)

Ashya Richardson[1], Jonathan Lee[1], Madisyn Avery[2], McKenzee Henson[2], Madeline Harris[2], Norma Ojeda[3], Michelle Tucci[4], Lir-Wan Fan[1]

[1]Department of Pediatrics, Division of Newborn Medicine, University of Mississippi Medical Center, Jackson, MS 39216, USA, [2]Mississippi INBRE Research Scholar, 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 Anesthesiology, University of Mississippi Medical Center, Jackson, MS 39216, USA

Pregnancy increases uterine blood flow, which is necessary for normal fetal growth and development. Neuropeptide Y (NPY) mediates different biological effects, such as vasoconstriction, which might be associated with preeclampsia, a pregnancy complication usually resulting in persistent high blood pressure. Experimental studies have proposed a connection between reduced uterine perfusion pressure (RUPP), maternal inflammation, and increased NPY levels leading to reduced fetal development. The current study examined whether

treatment of NPY Y1 receptor antagonist (Y1R-ANT) reduces maternal inflammation and RUPP-induced fetal inflammation, lipid peroxidation, and poor fetal development in rats. Lipopolysaccharide (LPS) (100 µg/kg) was administered intraperitoneally into pregnant rats on day 13 of gestation (G13), and RUPP surgery was performed on G14. G14 rats were treated with Y1R-ANT via intraperitoneal micro-osmotic pump infusion at 5 µg/kg/day for 6 days. On G20, placenta and fetal tissue were collected to assess fetal development. Our results showed that Y1R-ANT treatment reduced maternal inflammation and RUPP-induced reduction in placental efficiency and fetus weight. Y1R-ANT treatment also attenuated maternal inflammation and RUPP-induced increases in fetal proinflammatory cytokines and thiobarbituric acid reactive substances (TBARS) contents at embryonic day 20 (E20). These results suggest that Y1 receptor antagonization may reduce vasoconstriction-associated maternal LPS exposure and RUPP-induced fetal inflammation and lipid peroxidation. Additionally, normalized placental efficiency and fetal weight values may be useful for studying mechanisms involved in inflammation and RUPP-induced poor fetal development and have potential uses in the development of therapeutic strategies.

(Supported by NIH grant NIH/NIGMS P20GM103476-Institutional Development Award (IDeA), NIH-NIGMS-P20GM121334-MSCEPR-COBRE, and Newborn Medicine Funds from the Department of Pediatrics, University of Mississippi Medical Center).

07.16

11:15 ALLELIC VARIATION IN PNEUMOCOCCAL GENE IMPACTS CERULOPLASMIN BINDING TO THE BACTERIA AND MEDIATES HOST-PATHOGEN INTERACTION THROUGH DIFFERENT MECHANISMS (Graduate Student)

Md Fahim Khan[1], Lucas Crosby[1], John Crawford[1], Rohinton Dossabhoy[2], D Ashley Robinson[1], Lance Keller[1] 1University of Mississippi Medical Center, Jackson, MS, [2]Millsaps College, Jackson, MS

Background: Streptococcus pneumoniae, or pneumococcus, is the primary cause of community-acquired pneumonia. It also causes other diseases, such as meningitis, otitis media, and septicemia. The innate immune response uses various serum proteins to aid in bacterial clearance through multiple mechanisms. The pneumococcus can bind various serum proteins to reduce the effectiveness of the innate immune response, but binding of serum proteins can also provide other benefits to the bacteria. This study aims to study how genotypic variations in pneumococcal strains alter the binding to the acute phase protein ceruloplasmin and impact host-pathogen interaction. **Methods**: A library of 96 pneumococcal strains was sequenced, and high throughput flow cytometry was used to study the binding of ceruloplasmin. GWAS was used to identify genetic variations that impact ceruloplasmin binding. Biofilm assays and colonization efficiency of wild-type strains, mutants, and complementation were assessed in a murine model. **Results:** GWAS identified nucleotide polymorphisms in the neuraminidase nanA as a target that alters ceruloplasmin binding. Based on phylogenetic analysis, these nanA alleles that impact ceruloplasmin binding were identified in multiple lineages. Flow cytometry indicates that ceruloplasmin binding varies based on the nanA allele present and that gene deletions and complementation restored wild-type phenotypes. Biofilm formation and colonization were impacted based on the nanA allele present. **Conclusion:** Ceruloplasmin transports copper and increases local copper concentrations in the tissue, resulting in bacterial clearance. This is the first described mechanism of bacterial clearance. This is the first described mechanism of ceruloplasmin interaction with the pneumococcus, which can aid in reducing local copper accumulation and promote bacterial survival and disease. Identification of novel mechanisms of innate immune resistance is necessary to understand better the ability of bacteria to cause disease and aid in developing new therapeutics.

07.17

11:25 A RETROSPECTIVE PILOT STUDY EXPLORING THE IMPACT OF NAFLD IN SEVERE COVID-19 (Med 1 student)

Mary Madison Pevey[1], Emilia Patiño[1], John Hollis Tackett[1], Aubrey Smyly[2, 3], Merlin Manogaram[4], Seth Lirette[5], Elliot Varney[2, 3], Candace 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]University of Mississippi Medical Center, Jackson, MS, [5]Department of Biostatistics and Bioinformatics, University of Mississippi Medical Center, Jackson, MS

Background: The COVID-19 pandemic reached an overall death toll of 18.2 million worldwide. Severity of the illness ranges from mild - moderate - severe - critical illness. Patients are considered to have severe illness if they have an oxygen saturation <94% on room air. These patients require hospitalization for respiratory support among other therapies. The illness can become more critical as patients develop respiratory failure, shock, and multiorgan dysfunction or failure requiring intensive critical care which may include ventilator support and invasive therapies or interventions. Severe illness is most often seen in individuals with underlying comorbidities such as cardiovascular disease, diabetes, obesity, and chronic liver disease. The U.S. population has increasing rates of non-alcoholic fatty liver disease (NAFLD), which includes simple steatosis, steatosis with inflammation, non-

alcoholic steatohepatitis (NASH), and NASH cirrhosis. COVID-19 in chronic liver disease patients often causes a more severe illness and leads to progression of fibrosis. A non-invasive method of estimating the degree of fibrosis in these patients is the fibrosis-4 (FIB-4) score with results greater than 3.25 indicating advanced fibrosis. Values less than 1.45 are considered normal with a negative predictive value of approximately 90% when used to detect advanced fibrosis. **Objective:** The objective of this study is to examine the severity and outcome of NAFLD patients with COVID-19 infection. **Methods:** A single-center HIPAA-compliant retrospective observational cohort study examined patients previously diagnosed with NAFLD with non-contrast or contrast and non-contrast CT imaging from January 1, 2004, to June 30, 2016 (N=313). Demographic, imaging, clinical, and laboratory data were obtained from the electronic medical record at baseline. This data was also obtained at admission with COVID-19 from 2019-2021. Liver attenuation measurements were performed on non-contrast abdominal CT images using a circular region of interest. Serologic FIB-4 scores were calculated. A liver attenuation threshold of < 40 HU served as a surrogate for hepatosteatosis and a FIB-4 score of > 3.25 for advanced fibrosis. Descriptive statistical analysis was performed. **Results:** Among the patients with severe COVID-19, 2 of the patients had a FIB-4 score >3.25, which indicated advanced fibrosis and was associated with a higher mortality rate with both patients dying. The remaining 5 patients with severe COVID-19 NAFLD did not exhibit progression to advanced fibrosis despite the prevalence of cardiovascular and renal metabolic comorbidities. 65% (13/20) of the COVID-19-positive NAFLD patients were treated on an outpatient basis without requiring hospitalization. Interestingly, although 8 (61%) of the patients were morbidly obese, only one patient presented with a FIB-4 score <1.45. **Conclusion:** Progression of liver fibrosis in patients with NAFLD seems to impact survival. Larger studies are needed to better establish the findings and help understand the impact of NAFLD progression to fibrosis and COVID-19 infection can aid in risk stratification and management strategies for affected individuals.

10:00

Health Science Division Oral Presentations

Hall D Room 8

Session C

Moderators: Drs. Driscoll Duval and Jacob Daniels

University of Mississippi Medical Center

Topics: Population Health, Childhood disease, Mental and Physical Health Care, Telehealth

07.18

10:00 THE EFFECTS OF MULTIPLE MRNA DOSES OF COVID-19 VACCINE ON ADVERSE HEALTH OUTCOMES AMONG YOUNG POPULATION: A CASE STUDY FOR THE STUDENTS OF UNIVERSITY OF SOUTHERN MISSISSIPPI

Sumitra Paudel, and Md Roungu Ahmmad,

The University of Southern Mississippi, Hattiesburg, MS

Background: The COVID-19 pandemic has severely impacted global public health, with millions of infections and deaths. Preventive measures like vaccination, social distancing, and mask-wearing, etc. have been essential in controlling the virus. However, the effects of multiple mRNA COVID-19 vaccine doses on public health outcomes, particularly in younger populations, are not unclear. Identifying factors influencing COVID-19 transmission is crucial for designing effective interventions, especially in university settings where young adults gather in large groups.

Methods: Self-reported health status, vaccination doses, and other demographic information were collected from the USM students who had received at least one dose of the COVID-19 vaccine. To enhance the generalizability of the findings regarding the association between adverse health outcomes and multiple doses of the mRNA COVID-19 vaccine, we employed bootstrapping sampling and analyzed the data using both unadjusted and adjusted logistic regression models. For validation, we utilized a machine learning model and a nomogram to predict the risk of adverse health outcomes for multiple doses.

Results: Multiple doses of mRNA COVID-19 vaccine were not statistically significant associated with adverse health outcomes in the young adult population. Our findings also indicate that COVID-19 vaccinations are safe for young adults, and booster doses are not linked to an increased risk of adverse health outcomes.

Conclusion: Our study finding support the continued use of booster's doses for young adults and encourage booster uptake to maintain high vaccination rates without hesitancy and to protect themselves against COVID-19.

07.19

10:10 FACULTY AND STUDENT PERCEPTIONS OF CLASSROOM OFF-TASK TECHNOLOGY USE IN THE POST-PANDEMIC ERA

Britney Reulet, Jacob Daniels, Kristy Cole, Driscoll DeVaul, Robin Thompson, Katie Cassady, Seena S. Edgerton, Xiaoshan Z Gordy

University of Mississippi Medical Center, Jackson, MS

Background: The COVID-19 pandemic has permanently changed the landscape of education. Prior to the pandemic, technology was often utilized to supplement traditional teaching methods. However, since the pandemic technology has become the primary conduit of instructional delivery. Students have grown more accustomed to using technology in the academic classroom, leading to a significant increase in off-task technology use. Given the shifting role of technology in

education in this post-pandemic era, it is essential to study this issue under the new circumstances. **Objective:** The purpose of this study is to explore the perceptions of faculty and students regarding students' classroom off-task technology use in the post-pandemic era. Through gaining insights into their perspectives, we can better assist faculty in refining their teaching methods and support students in adapting their learning strategies. **Methods:** This mixed-methods study will employ the sequential explanatory design. The target population includes faculty who teach and students who attend in-person classes. Faculty who teach and students who attend online classes will be excluded. Quantitative data will be collected first through a cross-sectional survey of faculty and students exploring their perceptions of students' classroom off-task technology. Qualitative data will be collected through semi-structured interviews. **Results:** Data collection will take place soon. We anticipate that faculty and students will express contrasting perceptions regarding the extent and impact of off-task technology use in the classroom. Faculty may view off-task technology as a distraction that hinders learning and engagement, while students may perceive it as a necessary tool for multitasking. Additionally, we expect to identify key factors that contribute to off-task technology use, such as class structure, teaching methods, and student motivation. These insights will inform recommendations for faculty to develop strategies that foster focused technology use, potentially enhancing the learning environment and supporting student success in the post-pandemic educational landscape. **Conclusion:** Following data collection, a better understanding of the changing role of technology use in the post-pandemic classroom should emerge, offering valuable insights into faculty and student perspectives on off-task technology behaviors. By understanding these perceptions, we can support the development of teaching strategies that minimize distractions and foster a more engaged learning environment. The findings have the potential to guide both faculty practices and student learning strategies, ultimately enhancing educational outcomes in an era where technology plays an integral role in the classroom.

This project is sponsored by the University of Mississippi Medical Center School of Health-Related Professions Educational Enhancement Plan, Jackson, MS.

07.20

10:20 AN ACCELERATING DANGER: ACCIDENTAL INFANT DEATHS IN MISSISSIPPI, 1980-2022

Manuela Staneva, University of Mississippi Medical Center, Jackson, MS

Introduction: Mississippi has consistently suffered from the highest infant mortality rate in the country. In 2022, for instance, Mississippi's infant mortality rate of 9.1 deaths per 1,000 live births was nearly twice as high as the national average of 5.6 deaths per 1,000 live births. To understand the causes behind this troubling statistic, we investigated the proportion of infant deaths related to unintentional injuries and examined how this proportion has changed over a 43-year period. **Methods:** For this cross-sectional study, we analyzed Mississippi's birth certificate data from 1980 through 2022. We conducted a trend analysis with Join point regression statistical software (version 5.2.0, National Cancer Institute). This method registers statistically significant fluctuations in the trendline (i.e., join points) and creates distinct segments. The slope of the regression line measures the annual percentage change (APC) for each segment and estimates the average annual percentage change (AAPC) for the entire period. **Results:** During the study period, there were 19,768 infant deaths in Mississippi and 957 (5.8%) were coded as unintentional injuries. Between1980 and 2022, the relative decline in the overall infant mortality rate was 46.2% (from 17.0 to 9.2 deaths per 1,000 live births) with a negative AAPC of -1.5% (95% CI; −1.7 to −1.2). Despite this overall downtrend, the infant mortality rate increased during the last 2 years of the study period. The overall trend in the proportion of accidental infant deaths was positive, with a marked relative increase of 175.5% (from 4.9 in 1980 to 13.5 in 2022) and an AAPC of 2.9% (95% CI; 1.4 to 4.3). There were four segments in the trendline of accidental infant deaths. For the first 23 years of the study period, the trend remained relatively stable, but deaths rose by an APC of 3.4% (95% CI; 1.4 to 4.3) between 2003 and 2014. This uptrend reversed briefly for three years from 2014 through 2017. During the last six years of the study period, however, the proportion of accidental infant deaths increased sharply with an APC of 52.5% (95% CI; 30.2 to 113.5). These deaths spiked, particularly, during the last two years of the study period. In 2021, 8.5% (29/327) of all infant deaths in Mississippi were due to unintentional injuries. In 2022, this proportion increased to 13.5% (43/319), reaching its highest level during the 43-year study period. **Conclusion:** Alarmingly, Mississippi's infant mortality rate has been increasing in recent years. Accidents were one of the major factors contributing to the state's excessively high infant mortality and its increase during the 2020-2022 period. To curtail its relentlessly high infant mortality, Mississippi needs to develop an in-depth research agenda on the causal factors driving up fatal infant injuries and initiate targeted measures to prevent such avoidable and tragic deaths.

07.21

10:30 TRENDS IN EMERGENCY DEPARTMENT VISITS FOR CHILDHOOD ASTHMA IN SOUTH CAROLINA, 2010 TO 2019: A JOINPOINT REGRESSION ANALYSIS (Graduate Student)

Minhazul Abedin, Benjamin Walker, Joshua Mann, Fazlay Faruque

University of Mississippi Medical Center, Jackson, MS

Introduction: Childhood asthma is a prevalent chronic condition affecting approximately 4.8 million children in

the United States. It imposes a significant economic burden on the healthcare system, costing an estimated $6 billion annually. This study aims to estimate the emergency department (ED) visit rates for childhood asthma in South Carolina from 2010 to 2019 and to analyze significant changes in trends over this period.

Methods: Hospital emergency department visit records due to asthma were analyzed for South Carolina from 2010 to 2019 across all census tracts. Rates were age-adjusted using the SEER (Surveillance, Epidemiology, and End Results Program) standard population for males and females. Joinpoint regression analysis was applied to identify significant trend changes and calculate the annual percent change (APC) for males and females. All rates were expressed per 1,000 children per year.

Results: The overall childhood asthma ED visit rate was 7.2 per 1,000 children per year. Male children had higher rates of ED visits (8.7 per 1,000) compared to females (5.6 per 1,000). Between 2010 and 2014, asthma-related crude rates increased significantly for both genders, with females showing an APC of +5.37% and males an APC of +3.71%. However, from 2014 onward, the trend reversed sharply. Females exhibited a decline in asthma-related ED visit rates with an APC of -8.23%, while males experienced an even steeper decline, with an APC of -8.69%.

Conclusions: The findings indicate a transition from increasing to significantly decreasing asthma ED visit rates post-2014, suggesting potential improvements in asthma management or a reduction in environmental risk factors. Despite this progress, the rates remain high, reflecting the ongoing impact on children's quality of life and healthcare costs. Further research should explore census tract-level determinants to identify factors contributing to disparities and variability in asthma outcomes.

07.22

10:40 HEAT IN THE MAGNOLIA STATE: CHARACTERIZING EXTREME EVENTS AND MAPPING THE EXPOSURE (Graduate Student)

Salit Chakma, Lauren S. Pongetti, Minhaz MD Abedin, Tasnim Tabassum, Benjamin Walker, Mohammad Z. Al-Hamdan, Fazlay Faruque

University of Mississippi Medical Center, Jackson, MS

Heat waves, known as silent killers, have serious negative impacts on human health. Humid heat (combined effect of air temperature and humidity) exceeding human tolerance and causing mass mortality across the continents was reported recently. The heat index (HI) is a widely used measure of human-perceived heat in outdoor shades and accounts for the presence of humidity in the atmosphere. This study uses high-resolution downscaled HI data to understand the characteristics of extreme humid heat events in Mississippi. Extreme humid heat was defined using two absolute thresholds – 90 °F and 100 °F; temperatures exceeding these thresholds were reported to affect human health adversely. Additionally, a temporal threshold of at least three consecutive days was used in identifying extreme events, as prolonged exposure limits resting and restoration. The North American Land Data Assimilation System (NLDAS) data between 2015 and 2022 were downscaled to 1 kilometer for the contiguous USA, and HI was calculated. Image subsets covering Mississippi State were extracted for warm seasons, May – September. A total of 1,232 images were analyzed using data cubes made from them. The Nonparametric Mann-Kendall test was used for trend analysis, and Theil-Sen's slope was used to calculate the change rates. In recent years, the number of extreme events was found to be increasing, especially around the urban areas, while forested areas had no change or decreasing trend. This study improves past research with improved precision and accuracy. Such improvement would allow the delineation of areas needing precautionary measures to minimize the impacts of the extreme humid heat on human health.

10:50 Break

07.23

10:55 DIETARY SIMPLE SUGARS DISRUPT GUT MICROBIOTA AND EXACERBATE COLITIS IN MICE

Sumyya Waliullah[1], Hasan Zaki[2]

[1]Alcorn State University, Lorman, MS, [2]UT Southwestern Medical Center, TX

The elevated incidence of inflammatory bowel disease (IBD) in Western countries suggests a link between the Western diet and IBD risk. High sugar consumption, a defining characteristic of this diet, is associated with numerous noncommunicable diseases, yet its role in IBD remains unclear. In this study, we examined how simple sugars, particularly glucose and fructose, affect colitis development in both wild-type and Il10−/− mice. Wild-type mice given a 10% glucose solution in their drinking water or a high-glucose diet exhibited severe colitis when exposed to dextran sulfate sodium. Similarly, Il10−/− mice on a high-glucose diet experienced aggravated colitis compared to their glucose-untreated counterparts. While short-term exposure to high glucose or fructose did not immediately provoke inflammation in a healthy gut, it significantly altered the gut microbiota. Notably, there was an increased presence of mucus-degrading bacteria, such as Akkermansia muciniphila and Bacteroides fragilis, along with an enrichment of mucolytic enzymes derived from bacteria. This led to erosion of the colonic mucus layer in both sugar-fed wild-type and Il10−/− mice. The exacerbation of colitis by sugar was not observed when mice were treated with antibiotics or maintained in germ-free conditions, indicating that microbiota changes play a crucial role in sugar-induced colitis. Additionally, germ-free mice colonized with microbiota from sugar-treated mice showed heightened susceptibility to colitis. These findings suggest that consuming simple sugars increases

the risk of colitis and worsens its pathogenesis through gut microbiota modulation in mice.

07.24

11:05 ADVERSE CHILDHOOD EXPERIENCE MATTERS FOR COGNITIVE DECLINE IN ADULTHOOD: RESULTS FROM A COUNTRY REPRESENTATIVE SURVEY IN THE UNITED STATES (Graduate Student)

MD Rokibul Hasan,

University of Mississippi Medical Center, Jackson, MS

Dementia such as Alzheimer's disease pose a great threat to public health in the US. Subjective cognitive decline (SCD) is the best potential indicator for dementia. Having adverse experiences in childhood affects people's mental health in adulthood which may result in SCD. This study is based on Behavioral Risk Factor Surveillance System (BRFSS) 2023 which is the latest survey of BFRSS series. The adverse childhood experiences (ACE) module is adopted in Nevada, New Jersey, Delaware, Florida, Georgia, Missouri, Oregon, Rhode Island, Virginia and Tennessee.

The objective of this study is to find the effects of ACE and socio-economic determinants on cognitive decline. SCD has been coded for age 45 or above. Elder age groups have higher odds compared to age 45-49, such as age group 50 to 54 has 28% higher odds. The low-income groups have higher odds compared to those who earn more than 200,000 or more a year. People who earn 15,000 or less have more than two times higher odds. Smokers have higher odds than non-smokers. People with diabetes are at higher risks of SCD.

Findings reveal that before the age of 18, people who lived with depressed people had 52% higher odds of SCD compared to those who didn't live with depressed people. Living with people who are problem drinkers poses 19% higher odds of SCD. Sharing household with people who were sentenced to serve time in prison has 24% higher odds of SCD. Childhood experience of physical abuse, verbal abuse and sexual abuse increases the likelihood of SCD, the odd ratios range from 23 to 55% comparing those who did not suffer these incidents in childhood. The results emphasize taking necessary steps to provide better childhood to today's children to possess a better mental health in future.

07.25

11:15 MISSISSIPPI'S SCHOOL-BASED TELEHEALTH PROGRAM (tSBHP) PROVIDES ACCESS TO MENTAL AND PHYSICAL HEALTHCARE IN A RURAL AND MEDICALLY UNDERSERVED STATE (Graduate Student)

Cameron Cloud, Christina Wright, Tearsanee Davis, Saurabh Chandra

University of Mississippi Medical Center, Jackson, MS

Mississippians face significant barriers to healthcare accessibility across the state's primarily rural and medically underserved landscape, which adversely influences population health outcomes. Telehealth, a virtual mode of communication, helps address these challenges for patients with comparable effectiveness and often superior accessibility to traditional in-person care. When integrated into educational settings, telehealth helps promote student health, well-being, and academic success. School-based telehealth programs (tSBHPs) can help provide preventive and routine health services, addressing urgent and chronic health conditions that impact many Mississippians. In 2022, a tSBHP was incorporated into Mississippi public schools to address healthcare gaps for children grades K-12.

The Center for Telehealth (CFT) at the University of Mississippi Medical Center (UMMC) was awarded a grant from the Mississippi Department of Education to offer behavioral, urgent care, oral health education, and lifestyle and nutrition coaching services in K-12 public and charter schools across Mississippi. Since August 2022, these services provided by UMMC counselors and nurse practitioners have been made accessible for students at schools that opted into the program. Schools were equipped with digital stethoscopes, otoscopes, and tSBHP software, and school nurses received training to utilize this equipment. The program's implementation, along with the software, training, and healthcare visits, was provided at no cost to the schools or the families. Data from 24 months of tSBHP activities were recorded using the Epic Electronic Health Record and were analyzed for patient demographics, medical diagnoses, and prescriptions, with a focus on behavioral health visits.

From August 2022 to August 2024, 73 school districts encompassing 421 schools adopted these telehealth services. Of tSBHP participants, 63 out of 73 (86.30%) school districts are in rural and medically underserved communities, as designated by the Health Resources and Services Administration. During the study period, 5,012 visits were conducted, including 1,869 behavioral health and 3,143 urgent care visits. Among the 2,868 students who utilized the program, 1,501 (52.34%) were female and 1,367 (47.66%) were male. There were 1,872 diagnostic codes logged across behavioral care visits, classified using the DSM-5-TR as follows: anxiety disorders (564, 30.13%); depressive disorders (i.e., MDD, DMDD) (539, 28.79%); neurodevelopmental disorders (i.e., ADHD, ASD, specific learning disorder) (294, 15.71%); disruptive, trauma- and stressor-related disorders (i.e., PTSD, adjustment disorders) (217, 11.59%); impulse-control and conduct disorders (i.e., ODD) (99, 5.29%); and other conditions that did not fit a specific classification. Across these behavioral health visits, 492 medications were prescribed.

This study highlights the impact of Mississippi's school-based telehealth program on providing behavioral and urgent care services to students in K-12 public and charter

schools in a rural and medically underserved state. Overall, the findings underscore the progress made in implementing a tSBHP, which promotes a lifestyle for positive mental and physical health among Mississippi's students. Anxiety and depressive disorders comprised most visits, aligning with the regional prevalence of these conditions. These results demonstrate telehealth's effectiveness in addressing healthcare needs for this vulnerable population, ensuring students receive timely care that supports their overall health, well-being, and academic success.

07.26

11:25 COMPARISON OF COMPLICATION RATES FOR HEAD AND NECK RECONSTRUCTIVE SURGERY BETWEEN MEDICATION RELATED OSTEONECROSIS OF THE JAW, OSTEORADIONECROSIS, BENIGN LESIONS, AND MALIGNANT CANCERS (Med1 Student)

Edward Facundus, Austin Lignieres, Ron McCall, Kendall Pitre, Henry Taylor, John Phillips, Adam Fleming, Ashlie Elver, Benjamin McIntyre, Laura Humphries

University of Mississippi Medical Center, Jackson, MS

OBJECTIVES: This study investigates postoperative complication rates in head and neck (H&N) reconstruction across medication-related osteonecrosis of the jaw (MRONJ), osteoradionecrosis (ORN), benign lesions, and malignant cancers. Current literature shows that MRONJ and ORN are associated with more severe and chronic complications than benign lesions. MRONJ often involves poor bone healing, leading to issues like pathological fractures and intraoral bone exposure, significantly impacting quality of life. ORN, especially in segmental mandibulectomy cases, can result in severe pain, fractures, and skin fistulae, with preoperative drainage identified as a key risk factor. Malignant cancer reconstructive surgeries show high complication rates but generally have fewer chronic issues, with cancer recurrence being the main concern. **METHODS:** A retrospective chart review identified patients who underwent H&N reconstruction at a single institution from 2016 to 2024. Patients were categorized by disease type: Cancer, Benign Lesion, ORN, MRONJ, or other. Demographics, such as race, age, and social vulnerability index (SVI) quartile (1st being least vulnerable and 4th being most), and complication data were collected. Mean complication rates were calculated for total, within 30 days post-op, and beyond 30 days post-op. ANOVA and Post-hoc tests were used to assess significance ($p<0.05$). **RESULTS:** Of 121 patients, disease cohorts included: cancer (60.3%, n=73), benign lesions (20.7%, n=25), ORN (3.3%, n=4), and MRONJ (5.8%, n=7), plus 12 in other categories. Complications beyond 30 days by race were African Americans 36%, Caucasians 35%, Hispanic/Latino 0.0%, American Indians 50%, and Other 100%. Complication rates by SVI quartile were SVI 1 (39%), SVI 2 (36%), SVI 3 (18%), and SVI 4 (59%) ($p=0.014$). Significant differences were also found between SVI 3 and SVI 4 complication rates ($p=0.007$). **CONCLUSION:** While demographics and diagnosis did not show significant impact on post-op complications, SVI quartile did correlate with long-term complications. Patients who are most vulnerable (SVI 4), often facing poorer living conditions and limited healthcare access, showed higher complication rates beyond 30 days. SVI 3 patients, with similar healthcare and economic limitations, had fewer recorded complications, potentially due to loss to follow-up. Least vulnerable patients (SVI 1 and 2) showed similar complication rates. These findings emphasize the need to consider patient population factors in postoperative planning to optimize outcomes.

07.27

11:35 ASSOCIATION OF INSURANCE STATUS AND COMPLICATIONS RATES FOR PATIENTS UNDERGOING ONCOLOGIC HEAD AND NECK RECONSTRUCTION: A TERTIARY CENTER EXPERIENCE (Med1 Student)

Ron McCall, Ashlie Elver, Kendall Pitre, Edward Facundus, Henry Taylor, Adam Fleming, John Phillips, Benjamin McIntyre, Laura Humphries, University of Mississippi Medical Center, Jackson, MS

Background: Microsurgical free flaps are the gold standard for advanced oncologic head and neck (H&N) reconstruction. Although studies have identified patient-related factors as risks for complications, the role of different insurance plans with complications is unknown. This study aims to identify associations between insurance status and incidence of complications for microsurgical H&N reconstruction. Methods: Retrospective chart review was conducted, identifying patients with a diagnosis of oral cancer who underwent H&N microsurgical free flap reconstruction by one of two plastic surgeons at a single tertiary care center from 2016 to 2024. Patients were divided into cohorts by insurance type: government (Medicare and Medicaid), private, or self-pay/uninsured. Demographics, reconstructive, and complication details were collected. Complications were classified using the Clavien-Dindo Scale and separated into major (3b, 4a, 4b, 5) and minor complications (1, 2, 3a). Mean complication rates were calculated by patient for total, <=30 days postoperative, and >30 days postoperative. ANOVA and Post-Hoc Tukey Tests were used to assess the significance between groups ($p<0.05$). Results: Seventy-one patients underwent reconstruction after resection of malignant H&N cancers. Patients insurance cohorts were: government 56.34% (n=40), with Medicare 36.62% (n=26) and Medicaid 19.72% (n=14); private 29.58% (n=21); and self-pay/uninsured 14.08% (n=10). Major complications occurred in 46.48% of patients (n=33) while minor complications affected 57.75% (n=41) of patients. Global complications were 38.03% (n=27) and flap-related complications were 52.11% (n=37). Patients with government and private insurance had equivalent mean complications per patient <=30 days (1.05 vs. 0.95, $p=0.507$). Patients with private insurance demonstrated the

highest mean of total complications per patient (2.62 vs. 1.43, p=0.036), complications >30 days (1.67 vs. 0.38, p=0.002), and number of readmissions (1.38 vs. 0.43, p=0.030). Patients with private insurance experienced greater mean major complications per patient >30 days compared to those with government insurance (0.90 vs. 0.15, p=0.012). Conclusions: Our results demonstrated that patients who underwent microsurgical reconstruction for H&N cancer had a difference in complication rates per patient based on insurance status. Patients with either private or government insurance had no difference in complication rates per patient <=30 days. Interestingly, patients with private insurance had greater complications per patient compared to their government insurance counterparts >30 days. Patients with government insurance (elderly and low-income individuals) may have financial or other social barriers leading them to avoid follow-up and future expenses, thus potentially accounting for differences with private insurance. Additional research is necessary to uncover the discrepancy in complications >30 days for private and government insurance.

10:00-11:00- AJMAS Symposia Posters (High School)

Session II

Hall C

P7.39

IMPACT OF GENOMICS AND ENVIRONMENT ON HYPERCHOLESTEROLEMIA (High School)

Anik Picarsic, Sevanna McDaniel

K-12 Virtual Homeschool Program, Canton Mississippi

Background: Many common diseases result from interaction between a person's gene(s) and environment. One such disease is hypercholesterolemia in which high cholesterol circulates in the blood. I am the fourth generation of females on my mother's side with hypercholesterolemia. Cholesterol is a fat material found in all animal products such as meat. Cholesterol comes in three sizes, low, high, and very low density (http:/www.cdc.gov/cholesterol/facts.htm).
Hypercholesterolemia causes a buildup of plaque inside the arteries, causing life threatening conditions, such as heart attacks and stroke. High cholesterol is common in the United States, occurring in "about every two out of five Americans". A greater risk of having the disease comes from genetic mutations passed down from generation to generation. Environmental factors such as nutrition, chemicals, and social context effect a person's chance of developing the disease. The goal here is to investigate why some in spite of healthy diet and environment still suffer from hypercholesteremia. **Methods:** We reviewed the Pub med databases using words hypercholesterolemia, Genome, and Environment to understand causes of hypercholesterolemia. **Results:** The main genetic factors causing hypercholesteremia are inherited mutations in genes on chromosome 19. These mutations cause familial hypercholesterolemia (FH), a disorder that makes it harder for a person's body to remove low density lipoprotein (LDL) cholesterol from the bloodstream. One gene on chromosome 19, codes the LDL-receptor (LDLR) which provides instructions for making the LDL. Only 1 out of 250 people have the gene. In 1973, Noble recipients, Goldstein and Brown described the LDLR. Most FH is due to a mutation in the LDLR gene, that alters the way its receptors processes the LDL, so that it continues circulating throughout the bloodstream. Deposits of the LDL particles with calcium and clumped white blood cells cause a buildup of plaque in the walls of the arteries. Plaque buildup reduces blood flow to organs such as the heart and brain, leading to severe health problems. Environmental factors also contribute to this risk, especially, a diet high in saturated fat such as red meat, dairy products, and fried food. A person's weight and physical inactivity also effects high cholesterol. Exercise helps the body produce high density lipoprotein (HDL), which removes excess fat and other forms of cholesterol from the bloodstream. Smoking and a person's nicotine intake also raise cholesterol. Nicotine causes an increase in LDL, and plaque buildup, but lowers HDL in the blood. This combination can lead to a heart failure. Eliminating trans and saturated fats considerably improve cholesterol levels. Even with these changes in diet and activity, some people might not be able to maintain a healthy cholesterol due to other diseases or their genes. There are medications that help lower high cholesterol. One group of drugs is called statins, which act by reducing levels of fat in the body. Statins target the cholesterol produced in the liver and remove cholesterol that is already in the blood. **In conclusion**, genes, and environmental factors play a major part in disease development. This is the case with hypercholesterolemia.

P7.40

ECHOES OF RESILIENCE: UNDERSTANDING AND CONQUERING LARYNGEAL CANCER (High School)

Nicholas Pride[1], Blanca Diaz-Garcia[2], Michelle Tucci[3]

[1]Northwest Rankin High School, Flowood, MS, [2]University of Florida, Gainesville, FL, [3]University of Mississippi Medical Center (UMMC), Jackson, MS

This research study aims to enhance our understanding, prevention, diagnosis, and treatment of laryngeal cancer. We examined the significance of understanding prognosis of the disease, the primary risk factors contributing to it, the benefits of early detection, and various treatment options. Laryngeal cancer, a type of malignancy occurring within the tissues of the larynx or voice box, represents a significant health concern due to its impact on essential functions such as breathing, speaking, and swallowing. The clinical presentation often includes persistent hoarseness or changes in the voice, with about 90% of patients

experiencing this symptom. Difficulty swallowing and a lump in the neck are also common. Other symptoms may include a persistent cough, sore throat, ear pain, and unexplained weight loss. These symptoms can often be mistaken for less serious conditions, delaying diagnosis and treatment. Several risk factors are associated with the development of laryngeal cancer. Tobacco use is the most significant risk factor, contributing to about 75% of cases. Alcohol consumption, particularly when combined with smoking, further increases the risk, with studies indicating that heavy drinkers are six times more likely to develop the disease. Other factors include exposure to certain chemicals and substances such as asbestos and wood dust, as well as infection with the human papillomavirus (HPV), which is found in about 75% of laryngeal cancer cases. Research indicates that males are four times more prone to developing laryngeal cancer compared to females. This could be attributed to the observation that historically, men have participated in more excessive smoking and drinking compared to women. However, in recent years, these behaviors have become increasingly prevalent among women, elevating their risk of laryngeal cancer too. Diagnostic procedures typically involve laryngoscopy, with biopsy confirming the diagnosis in around 90% of suspected cases. Imaging studies such as CT scans, MRIs, and PET scans are also used to determine the extent of the disease and to guide treatment planning. Early diagnosis is crucial, as it significantly improves the prognosis. Treatment options for laryngeal cancer include surgery, radiation therapy, and chemotherapy. The choice of treatment depends on the stage and location of the cancer, as well as the patient's overall health. For early-stage laryngeal cancer, surgery or radiation therapy alone may be sufficient. In more advanced cases, a combination of treatments may be necessary. Surgical options range from a partial laryngectomy, which preserves some of the voice, to a total laryngectomy, which removes the entire larynx and requires the patient to breathe through a stoma, which is an opening in the neck. The prognosis for laryngeal cancer varies depending on the stage at diagnosis. The 5-year survival rate for localized laryngeal cancer is approximately 60-80%. However, if the cancer has spread to nearby tissues or lymph nodes, the 5-year survival rate drops to around 40-50%. Regular check-ups and awareness of the symptoms can lead to earlier diagnosis and better prognosis. Advances in treatment options continue to improve the quality of life and survival rates for patients with laryngeal cancer.

P7.41

PLATELET VERSUS FIBRIN CONTRIBUTIONS TO COAGULATION IN A RAT MODEL OF SEVERE PREECLAMPSIA (High School)

Ana Palei, Steven Everman, Matthew Kutcher, Vesper Johnson

University Of Mississippi Medical Center, Jackson, MS

Preeclampsia (PE) is a serious pregnancy complication, which currently lacks effective therapy. Placentalischemia is a key initiating event that triggers the release of anti-angiogenic factors into maternal circulation, namely soluble fms-like tyrosine kinase-1 (sFLT-1) and soluble endoglin (sEng). These placental factors cause systemic vascular dysfunction and ultimately hypertension and end-organ damage in PE. Furthermore, PE has beenassociated with placental thrombosis and increased risk for thrombotic events during and after pregnancy, being recognized as ahypercoagulable state. However, the mechanisms of hypercoagulability in PE remain to be fully elucidated. Previous studies have shown that, similar to patients with severe PE, chronic sFLT-1 and sEng infusion into pregnant rats promotes placental pathology, hypertension, and end-organ damage. Thus, we aimed todetermine the contributions of platelets versus fibrin to the coagulation process in this model of severe PE. Methods: 12-14-week-old Sprague-Dawley rats were either implanted intraperitoneally with an osmotic mini-pump containing sFLT-1 and another one loaded with sEng (4.7 and 7.0 µg/kg/day, respectively) or underwent a sham surgery on gestational day (GD)12(n=7-8/group), under anesthesia. On GD19, arterial blood was drawn into collection tubes with sodium citrate or sodium heparin to runviscoelastic assays to measure all phases of hemostasis using thethromboelastography (TEG) 6s Hemostasis Analyzer System.Citrated blood was used in global hemostasis with lysis assay to assess the relative contribution of platelets and fibrinogen to overall clot strength, whereas heparinized blood was utilized in platelet mapping assay to assess adenosine diphosphate (ADP)- as well as arachidonic acid (AA)-stimulated platelet clot strength. Results: sFLT-1/sEng-infused pregnant rats had decreased platelet cell count compared to sham pregnant rats (5.85±0.28 vs. 6.9 ±0.34 x 10^8 cells/mL; P=0.0274) on GD19. TEG-based citrated-kaolin (CK)and heparinized-kaolin heparinase (HKH) assays, which identify the hemostatic characteristics of blood in response to thrombin and kaolin, respectively, showed that maximal amplitude (MA) are similar in sFLT-1/sEng-infused pregnant rats and sham pregnant rats (74.30±0.66 vs. 74.50±1.55 mm and 75.61±0.76 vs. 76.42±1.02 mm, respectively; both P>0.05) on GD19. In the platelet-mapping TEG assay, reptilase and Factor XIII (activator F; ActF) are used to initiate fibrin-only clot formation, allowing the relative contribution of fibrin polymerization and platelet aggregation to total MA to be distinguished. ActF MA was lower in sFLT-1/sEng-infused pregnant rats than in sham pregnant rats (25.42±1.53 vs. 34.27±3.85 mm; P= 0.0426). Consequently, platelet contribution to HKH MA was higher in sFLT-1/sEng-infused pregnant rats compared to sham counterparts (66.17±1.98 vs. 55.49±4.50 %; P=0.0405). Finally, heparinized-ADP and -AA assays showed similar MA values between sFLT-1/sEng-infused pregnant rats and sham pregnant rats (40.13±4.89 vs. 46.76±5.06 mm and 73.45±0.77 vs.

73.52±0.62 mm, respectively; both P>0.05). Conclusion: These findings indicate that platelet hypercoagulability is a key contributor to blood clot formation in our model of severe PE, despite exhibiting reduced number of circulating platelets. Future studies will identify the mechanisms whereby sFLT-1/sEng induceplatelet hyperfunction in PE as well as investigate platelet-targeted therapies to ameliorate placental thromboinflammation and systemic vascular dysfunction in PE.

P7.42

APPLYING GEOSPATIAL ANALYSIS TO MODEL FUTURE CLIMATE-DRIVEN BACTERIAL GROWTH AND ANTIMICROBIAL RESISTANCE ON A GLOBAL SCALE (High School)

Pranav Reddy

St. Andrew's Episcopal School, Ridgeland, MS

INTRODUCTION: Climate change is causally linked to escalating global infections, emphasizing the need for predictive models to identify hot spots. As temperatures rise, bacterial growth and proliferation increase. Additionally, higher rates of horizontal gene transfer give rise to antimicrobial-resistant strains. **OBJECTIVES:** The initial objective is to demonstrate the relationship between temperature rise and bacterial growth while measuring antibacterial resistance to temperature rise. The final objective is to use ArcGIS, a geographic information system software, to create a predictive model of bacterial growth on a global scale. This model can be used to predict disease outbreaks in various world regions. **METHODOLOGY**: This study is divided into three parts. Part 1 consists of inoculating the K-12 strand of Escherichia coli on Mueller-Hinton Agar Plates and incubating at increasing temperatures from 37°C to 46°C with 3-degree intervals. E. coli was inoculated onto 6 agar plates in 4 tests over 24 hours. Growth rates were determined by measuring the percent surface area of bacterial growth. The trend was measured in natural logarithmic relations to exhibit percent growth. Part 2 involved determining the antimicrobial resistance rate: following the same method as part 1, at 24 hours, three plates were treated with the minimum inhibitory concentration of Amoxicillin at 2 µg/ml while three remained as controls, replicated for each experimental temperature. Antimicrobial resistance was determined by measuring colony size differences between the control and treatment groups at 24 hours post-treatment. Part 3 uses ArcGIS, a geographic information system software, to predict bacterial growth in 5-year intervals from 2030 to 2050. An accurate growth map is generated by inputting empirical (pressure, humidity, population density) and laboratory data. An antimicrobial resistance map was generated in the same 5-year intervals using the same methods from solely laboratory results. **RESULTS:** The bacterial growth rate demonstrated a negative parabolic relation with respect to temperature rise peaking around 40°C. Conversely, the antimicrobial resistance demonstrated a positive parabolic relationship to temperature rise, reaching the lowest antimicrobial resistance rate at approximately 40°C. The Krushal-Wallis test revealed differences in bacterial growth between 24- and 48-hour growth intervals, with the most significant difference at 40°C, indicating the maximum bacterial growth rate. The statistical test also showed significant growth differences between treatment and control plates at lower temperatures and fewer differences at higher temperatures, indicating that antimicrobial resistance is elevated at higher temperatures. **CONCLUSION:** This study concludes that bacterial growth peaks at 40°C then drops while the antibacterial resistance occurs at higher temperatures, likely due to increased horizontal gene transfer, despite suboptimal growth conditions. Data from this study is used to create predictive maps by integrating multiple factors, enabling predictive measures to study the pattern of bacterial growth and antibiotic resistance in various parts of the world with a rise in global temperatures. These global maps aid in predicting future epidemics, preventing their occurrence through preparation to counter antibiotic-resistant strains to minimize the outbreak's impact.

P7.43

LINEAR-ATTENUATION COEFFICIENTS OF VARIOUS SHIELDING MATERIALS

Niambi Houston[1], Trace Hood[1], Ryan Steed[1], Steve Adzanu[2], Jermiah Billa[3]

[1]Warren Central High School,Vicksburg, MS, [2]Hinds Community College- Vicksburg, [3]ALcorn State University

Shielding of radioactive sources such as X-rays and Gamma rays is an important sub-field of external dosimetry. Shielding process gets more complicated as radiation sources tend to emit a wide range of energies. The Linear-Attenuation Coefficient (LAC) of materials is one of the important physical properties commonly considered prior to choosing any material for shielding purposes. In this study, a simple experiment was performed to calculate LAC of three different materials (Lead, Copper, and Aluminum). Gamma spectrometric analyzes were performed on three materials using a 35% relative efficient high-purity germanium detector (HPGe) and Cs-137point source. The results obtained indicate that the LACs of the three materials considered in this research work are close to the standard LACs for the respective materials. However, it was noticed that these materials are not in the pure form and may be in the form alloys, which resulted in a deviation from the expected/standard values of LAC for the three materials considered in this study. As expected, lead is a better shielding material compared to the other two materials considered in this study.

P7.44

RADIOACTIVITY IN SELECTED FERTILIZERS AND THEIR RADIOLOGICAL HEALTH IMPLICATIONS

Rayshawn Clark[1], Jacob Kealhofer[1], Landon Hasty[1], Steve Adzanu[2], Jermiah Billa[3]

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Fertilizers are part of farming industry and they play a major role in improvement of plant growth and enhancement of crop yields. One of the essential elements, potassium, helps in root growth and drought resistance of plants. Depending on soils fertility, farmers tend to provide potassium in the form of potash fertilizer which is derived from potash rock cored from earth's crust. Rocks derived from the earth's crust consist of trace quantities of Naturally Occurring Radioactive Materials (NORM) and NORM concentrations significantly vary based on rock type, geographical location, and concentration of the rock. Potash is a commonly used fertilizer derived from potash rock and to increase concentration of potassium, manufacturers increase percentage of potash which can eventually enhance radioactive concentrations (specifically K-40) in fertilizers. To exactly estimate and experimentally verify the levels of radioactive K-40 in selected fertilizers (0-0-60), a study was performed on fertilizers available in local market. K- 40 was theoretically estimated by considering the half-life; molar mass; and decay constant while experimental studies were carried out by performing gamma-spectroscopy. Obtained results for radioactivity concentrations of K-40 from theoretical estimation and gamma spectroscopy are 15, 110 and 15, 162 Bq kg^{-1} respectively. Results suggest that both experimental and theoretical K-40 values are compatible. Further, obtained results are compared to average K-40 concentration in soils within the US. Lastly, radioactivity based radiological health hazard indicating parameters are computed. Results indicated that radiological health hazards to living organisms from potassium enhanced fertilizers considered in this study are significantly higher to the world-wide averages of health hazard indicating parameters. This study strongly suggests that it is imperative that stringent recommendations are developed in handling and usage of these radioactivity enhanced materials.

P7.45

K-40 RADIOACTIVITY IN WATER-SOFTENERS

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Water is one of the essential entities in human lives. In the U.S., citizens living in urban areas completely rely on city water, while a vast majority of rural Americans rely on ground water. Depending on the location, water sources may consist of salts and to remove salts present in water sources, consumers add water softeners prior to using water for various purposes. One of the southern states in the U.S., the state of Mississippi consists of ~52% of rural population and vastly relies on ground-based water systems. It is highly possible that citizens in these rural areas tend to use water softeners to reduce salts such as Calcium, Magnesium, and others. One of the prominently used water softeners, Potassium Chloride (KCl), consists of radioactive Potassium-40 and depending on the source of the potassium; water softeners consist of varied amounts of radioactive (K-40). In this context, a pilot study is proposed with a goal of theoretically estimating and experimentally measuring K-40 via the gamma spectroscopic analyses. Based on the obtained results, a statistical comparison of theoretical and experimental K-40 concentrations was performed using a one-tailed t-test at 95% confidence interval.

P7.46

DETECTION OF TOXIC METAL IONS USING CARBON NANODOTS

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Toxic heavy metal ions like Hg^{2+}, Pb^{2+}, and Cd^{2+}, which are often released into the environment by factories are dangerous pollutants that can negatively affect biodiversity as well as cause cancerous mutations in humans. The sensing of toxic metals from the environment is extremely important to save human lives. To tackle the above problem, Bismarck brown dye-based fluorescent carbon dots were used for the detection of toxic metal ions. The reported data shows a potential for Bismarck brown carbon dots to be used to detect the presence of toxic heavy metal pollutants in the environment.

P7.47

MULTIFOCAL PRIMARY DISEASE AND TUMOR REGRESSION IN HIGH-RISK NEUROBLASTOMA ZEBRAFISH MODEL

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Neuroblastoma **(NB)** is a cancer of the peripheral sympathetic nervous system **(PSNS)** -- responsible for 10% of childhood cancer deaths. NB is highly metastatic and 50% of patients are at High-Risk **(HR)**, which occurs when MYCN-amplification or metastatic disease is present at older than 18 months of age. MYCN-amplification is a genetic alteration that is a strong prognostic factor leading to poor outcomes and appears in 20% of all NB patients. A genetic study in human neuroblastoma patients identified that a change to a single nucleotide within LIM-domain-

only 1 **(LMO1)** gene, was permissive for tumor formation and metastasis. The typical site for primary disease in NB patients is the adrenal gland, however, tumors can form along the paraspinal ganglia (thorax, pelvis, or cervical areas). Our study utilizes NB zebrafish models that use the dopamine-beta-hydroxylase (**dbh**) promoter to drive the expression of MYCN or c-MYC within the PSNS and result in primary tumor formation exclusively from the adrenal gland. These MYCN_TT zebrafish are an aggressive zebrafish model of HR-NB that highly expresses MYCN that spontaneously metastasizes. We crossed MYCN_TT with dbh:LMO1 to discover the impact of LMO1 overexpression on tumor formation in MYCN_TT fish. After crossing the fish we examined their offspring for tumor formation, finding early tumor growth at 9 days post fertilization (**dpf**) in neuroblasts in the jaw region arising from the paraspinal ganglia. Tumors in the jaw persisted in 60% of MYCN_TT; LMO1 fish at 14dpf and leads to the formation of new primary tumors. While primary tumors derived from the interrenal gland (**IRG**) persisted in all MYCN_TT;LMO1 zebrafish, the jaw tumors began to regress as early as 5 weeks post-fertilization (**wpf**) and continued to regress over time. At 15wpf only 20% MYCN TT;LMO1 had a persisting jaw secondary tumor. Strikingly, 10-15% of jaw tumors go on to form massive tumors that invade nearby muscle and gill structures. Histological analysis of jaw tumors and IRG-derived tumors in MYCN_TT;LMO1 zebrafish demonstrated that both were composed of small, round, and undifferentiated neuroblasts (hallmarks of neuroblastoma). In addition, jaw tumors and IRG-derived tumors both stained positive for tyrosine hydroxylase a marker catecholamine synthesis in human NB. This study indicates that LMO1 overexpression is permissive of tumor formation outside of the IRG in the MYCN_TT zebrafish model. Despite identical genetic alterations in the MYCN_TT;LMO1 model, jaw tumors have a wide range of fates from unstable tumors that regress and disappear to giant and invasive tumors, whereas all IRG-derived tumors persist over time underscoring the influence of microenvironment. The MYCN_TT;LMO1 zebrafish is a novel model to study multifocal disease and what is needed for a tumor to be stable. By studying the mechanisms that drive tumor stability in HR-NB, we can identify new therapeutic strategies.

P7.48

THE CLIMATE IMPACTS OF OCEANS AND HUMAN ACTIVITY ON SURFACE TEMPERATURES AND PRECIPIATIONS OVER THE MISSISSIPPI REGION, USA

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In recent years, climate science has been interdisciplinary and very data intensive. It has included data revolving around hydrology, ecology, and ocean sciences. Coastal communities in the Southeast are already experiencing warmer temperatures and the impacts of sea level rise, including seawater flooding. Higher temperatures and greater demand for water will strain water resources in the Southeast. Incidences of extreme weather, increased temperatures, and flooding will impact on human health, infrastructure, and agriculture. Sea level rise is expected to contribute to increased hurricane activity and storm surge, and will increase the salinity of estuaries, coastal wetlands, tidal rivers, and swamps. The southeast of the United States is a unique region containing an attractive blend of wetlands, plateaus, and everything in between. The ecosystems and populations in this region are, among many others, experiencing the effects of global warming. These effects include rising sea levels, increasing average temperatures, droughts and floods. One specific example that correlates to these effects is heavy precipitation coming through the Gulf of Mexico due to increases in temperatures and sea level rise due to global warming. This research aims to examine climate variability-how yearly temperature and precipitation values compare with the long-term average-and its impact on Mississippi. The big climate data for the surface temperatures and precipitation for the period 1950-2023 for Mississippi region have been obtained from the National Weather Service, NOAA. Through our analysis, we have observed 2 to 3-month seasonal oscillation in precipitation and upward trends in temperatures within the region that directly correspond to human activity. If these trends continue, human health and agriculture in this region will steadily decline.

P7.49

IDENTIFICATION OF NOVEL GENES ENCODED BY MYCOBACTERIOPHAGE WATERFOUL TO INHIBIT GROWTH OF MYCOBACTERIUM SMEGMATIS

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Bacteriophages are viruses that kill bacteria and many of the genes that are encoded in phages are needed to be characterized for their function. It's important to identify genes that produce toxins that could kill human pathogenic bacteria such as mycobacterium tuberculosis, so that it is possible to treat diseases like tuberculosis. In this study, a plate-based cytotoxicity assay has been used to screen a diverse set of 94 Waterfoul gene products capable of inhibiting the growth of the host Mycobacterium smegmatis. Out of the 94 genes tested, 32 genes showed capability of inhibiting the growth of Mycobacterium smegmatis. These Waterfoul gene products were observed to confer potential anti-mycobacterial effects, making them interesting candidates for follow-up studies and could be

utilized in developing phages that could be used in phage therapies that could treat tuberculosis.

P7.50

COMPARING PLANTED SHORTLEAF AND LOBLOLLY PINE SEEDLING SURVIVAL IN CENTRAL MISSISSIPPI

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Historically, shortleaf pine ecosystems had much greater presence on the landscape in much of Mississippi. However, due to the active suppression of fire beginning in earnest around 100 years ago, and the planting of the more easily regenerated and faster growing loblolly pine after the virgin forest was cut, shortleaf pine now occupies a significantly lesser amount of acreage. However, due to poor pulpwood markets, and an inability for landowners to find loggers willing to harvest pulpwood aged and sized trees, pine plantations are now commonly established using lower planting densities. At these lower planting densities, an initial pulpwood-dominated first thinning is no longer a necessity. Thus, there is the potential for shortleaf pine to be more commonly planted due to its stem form and ability to produce more valuable sawlogs of high quality at these lower planting densities as compared to the currently more commonly planted loblolly.

A pine species trial comparing loblolly and shortleaf was established on nearly a 3-acre area in central Mississippi south of Crystal Springs on the Mississippi Agricultural and Forestry Experiment Station (MAFES) Truck Crops Branch Experiment Station. 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 on October 19th and 21st, 2022. The treatment consisted of 4-5 quarts per acre of Accord XRT II (50.2% ai glyphosate), along with Southern Ag methylated seed oil (MSO), applied using a cluster nozzle. Due to the harvesting of hay for many years, compaction occurred, and therefore 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. Seedlings obtained from the Pine Hill West Camden, AL nursery ($165.00 per thousand for container shortleaf and $75.00 for bareroot Elite loblolly) were hand planted deep in March of 2024. Shortleaf was planted during early March and loblolly was planted during mid to late March. An over-the-top of the seedlings first-year chemical herbaceous weed control treatment was conducted in late April of 2024. The treatment consisted of 4-oz Arsenal AC (BASF) product (2.0 oz a.i. imazapyr) per sprayed acre applied over the planted trees in an 8-foot band using a tractor. Percent survival, average groundline diameter, and average height of seedlings were measured during mid-June of 2024. Across both species, percent survival was 97% while groundline diameter averaged 5.16 mm and total height averaged 14.0 inches. The tallest and shortest seedlings had heights of 26.5 and 4.5 inches, respectively. Seedlings with groundline diameters of 12.93 and 1.18 mm were the largest and smallest, respectively.

P7.51

ENGINEERING PLASMID CONSTRUCTS TO STUDY SYNTAXIN-MEDIATED TNF SECRETION IN MAST CELLS THROUGH RESTRICTION CLONING

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This study focuses on performing restriction cloning to create a rescue construct plasmid that contains our desired proteins. Using plasmids pLVX-IRES-PuroR & pLVX-EGFP-IRES-NeoR, each containing a protein suspected to mediate tumor necrosis factor (TNF) secretion in mast cells, Syntaxin 3 and Syntaxin 11. TNF secretion is an inflammatory cytokine secreted by mast cells in response to pathogens and/or stressors to the immune system. Mast cells are a type of white blood cell that plays a vital role in human immunological response by guarding areas of the body easily exposed to foreign bodies like bacteria, allergens, viruses, and parasites. Restriction cloning is a process of deleting a particular sequence of DNA inside a plasmid. Using Polymerase Chain Reaction (PCR) we will install the desired protein sequence for both plasmids. We will use two restriction enzymes, EcoRI and BamHI to bind the plasmids together through “sticky ends”. After the proteins are successfully inserted back into the plasmids, they will be tested on their pertinent involvement in TNF secretion in mast cells.

P7.52

UNRAVELING THE ROLE OF CIRCULAR RNAs IN NEURONAL FUNCTION USING *Drosophila melanogaster*

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Circular RNAs (circRNAs) are a unique type of RNA abundant in the brain. They have a closed circular structure, making them resistant to exonuclease degradation. They are highly abundant in neural tissues and have importance in controlling gene expression. Even though it is known they are important for controlling gene activity, their function remains unknown. My research focuses on

understanding the role of circRNAs in neuronal function using Drosophila melanogaster as a model organism, which provides a robust genetic system to study neural processes. In my research, I am studying the role of circRNAs in the brain using fruit flies Drosophila melanogaster, which are great for studying how genes work. To do this, I use a system called elav-GAL4 to turn off certain genes involved in making and processing RNA. By stopping circRNAs from forming properly, I can see how this affects the way the flies behave and age. Additionally, quantitative PCR (qPCR) will be used to measure the expression of specific genes. These include mbl, a key regulator of circRNA biogenesis, and neuronal genes such as plexA, scro, and camKI, which play vital roles in axon guidance, synaptic function, and neuronal signaling. This research will help us learn more about how circRNAs work in the brain and how they might be linked to diseases like Alzheimer's or Parkinson's.

P7.53

piRNA BIOGENESIS IN CAPITELLA

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piRNAs, a class of small RNA, play a crucial role in gene silencing, particularly for genome defense against harmful transposons. It prevents the movement of transposable elements and thus piRNAs to genomic stability across various organisms. They are primarily expressed in gonads and have recently been found to be expressed in somatic tissues as well. piRNA biogenesis involves two cycles: phasing and pingpong cycle. The ping-pong cycle boosts piRNA levels and allows PIWI proteins (P-element-induced Wimp proteins) to cleave RNA, thereby sustaining this protective cycle. Although widely studied in drosophila, piRNA biogenesis is yet to be studied in annelids. To understand the biogenesis in Capitella, we aim to use immunoprecipitation from embryo extracts with PIWI1 and PIWI2 antibodies, followed by RNA extraction and sequencing. This approach will enable us to isolate and analyze piRNAsassociated with PIWI proteins specifically, offering insights into the piRNA profiles present during embryonic stages. Sequencing the immunoprecipitated RNA will allow us to identify the specific sequences and characteristics of piRNAs produced, understand the origin, and explore their role in transposon silencing and gene expression. This data will deepen our understanding of piRNA pathways and their regulation in Annelids

P7.54

THE SPREAD OF BLUES MUSIC USING GEO CODING AND LIDAR

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Studying the trends of Blues music and its evolution, personal preference often influences said trends and further strengthens it. Blues music plays not only a very pivotal part in culture, but in Music as a whole. People are aware that the genre has transported its embedded Southern roots to a National treasure. From a geographical standpoint it is incredible to collect the data and track the spread, creating an accurate map showing the large range it truly has. I have created a spreadsheet of where the artists are from, locations of the world that hold their top five in listening, and a chart of the 7 selected artists' concerts and biggest tours locations. With that being said, the data hasn't been quantified and not knowing how the music and artists have spread is the bigger investigation. The immense impact of the research is to spread the awareness of culture and see its spread through the people. To fully understand the influence, affects, and the way it is kept alive through the people many decades later with the use of the geographical mapping system and Lidar scanning. To assist further research, crowdsourcing concerts, tours, and trends of music industry data sources track how a selection of Southern born artists change through time, in addition to how they remained popular over time.

P7.55

CARDIOVASCULAR IMPACTS FOLLOWING INFLUENZA INFECTION

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Background: Influenza is a contagious respiratory virus that infects 41 million people and hospitalizes 700,000 each flu season. Recent studies have revealed a correlation between influenza and cardiovascular events. This finding suggests viral inflammation leads to an increased risk of heart attacks due to arterial inflammation and the destabilization of plaques. In a recent experiment, our laboratory detected a decrease in activity, blood pressure, and heart rate following the infection of influenza in naïve mice. Histological analyses indicated an increase in heart fibrosis and lung injury, with peak damage occurring at 9 dpi. **Objective:** The aim of this study is to confirm the finding of pathological effects despite the lack of virus within the heart. **Methods:** Mouse heart and lung tissues were harvested 1-,3-, 5-, and 9- days post-infection (dpi) from mice infected with PR8 or mock-infected with PBS. Hemagglutination assay (HA) was performed using a 2-fold serial dilution on supernatant collected from tissue homogenates and 0.5% turkey red blood cells (tRBC). Following the addition of tRBC, cell culture plates were incubated at 37ºC for 30 minutes to quantify viral titers based on the amount of agglutination observed. **Results:** Viral titers were detected within the lung but not the heart. **Conclusion:** The lack of virus within the heart suggest pathological effects are indirectly related to viral influenza infection. **Future Direction:** Investigate molecular

inflammatory markers and their effects on inflammation throughout influenza infection.

P7.56

STUDENT'S RESEARCH AND EXTENSION EXPERIENTIAL LEARNING IN CLIMATE SMART INTEGRATED PEST MANAGEMENT FOR UNDERSERVED COMMUNITIES

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Small farmers in the southern region of the U.S. face challenges in managing plant diseases, weeds, and insects in crops and forest ecosystems. Yield losses due to sub-tropical climate conditions, weather extremes (e.g., hurricanes, drought, tornados), and pest outbreaks have been substantial pests. As climate change continues to intensify and create new pest threats, it is critical that we train the next generation of plant health management scientist and professionals in how to respond and develop new farm and forest ecosystems management practices to mitigate the impacts of climate change on crop production. Underserved farmers and communities are especially vulnerable due to limited resources and lack of integrated pest management training in climate smart agriculture. To maintain our nation's global competitiveness in sustainable agriculture we need a diverse well-trained workforce. The overall objective of this project is to provide students with research and extension experiential learning opportunities in climate smart IPM practices. The small farm IPM interns engaged in firsthand research in the use of cover crops for carbon sequestration and soil health. Students planted and maintained research and extension demonstrations field plots in the use of flowering plants for pollinator health and biodiversity in crop production. Additionally, the small farm IPM interns conducted a plant pest survey of plant diseases and insect pests impacting small farms in Mississippi and Louisiana.

P7.57

HYPERSONIC COMBUSTION SCRAMJET COMPUTATION

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Hypersonic combustion scramjet computations are essential for advancing high-speed air-breathing propulsion systems, particularly for applications in space access, missile technology, and hypersonic flight. The primary objective is to identify the most effective computational methods for simulating scramjet engine performance at hypersonic speeds (Mach 5 and above). The key measurements in these simulations focus on airflow characteristics, combustion efficiency, pressure and temperature distributions, and heat transfer within the scramjet engine's compression and combustion chambers. Computational methods used include computational fluid dynamics (CFD) simulations to predict engine behavior under extreme conditions. However, computational costs remain high, and there is a need for more efficient algorithms for real-time design optimization. Our literature survey suggests that while significant progress has been made in modeling scramjet engines, further advancements in computational techniques are necessary to improve engine design and optimize performance for practical hypersonic applications and beyond. We will use what we have learned to improve future simulations.

P7.58

EXPLORING REZUROCK AS A POTENTIAL TGF-b RECEPTOR 1 INHIBITOR IN MACROPHAGE REGULATION

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Chronic rejection remains a significant challenge after solid organ transplantation (SOT). One of the main features of chronic rejection is macrophage-mediated graft tissue fibrosis. Migration, graft infiltration, and extensive proliferation of macrophages play a key role in pro-fibrosis events. Our studies have demonstrated that pharmacological inhibition of ROCK2 significantly impairs these macrophage functions, highlighting the therapeutic potential of kinase inhibitors in modulating immune responses. Rezurock (belumosudil), initially developed as a selective ROCK2 inhibitor, has been shown to interact with additional kinases, including Casein Kinase 2 (CK2). Given its high affinity for multiple kinases, questions about its selectivity and potential off-target effects have arisen. TGF-Beta Receptor 1 (TGFBR1) is a key regulator of macrophage behavior, influencing immune responses, inflammation, and fibrosis through the TGF-beta signaling pathway. Given its role in fibrosis, a crucial factor in chronic rejection, understanding whether Rezurock can engage with TGFBR1 provides new insights into its therapeutic scope. This study employed molecular docking, MM-GBSA refinement, and molecular dynamics simulations to evaluate the binding affinity of Rezurock with TGFBR1, ROCK2, and CK2. Structural alignment revealed moderate similarity among these kinases, with the highest conservation observed between ROCK2 and TGFBR1 (39%). While docking scores suggested moderate affinity of Rezurock toward TGFBR1, MM-GBSA calculations demonstrated even higher binding energy than its co-crystallized inhibitor, indicating strong

interactions. Molecular dynamics simulations further confirmed the stability of these complexes, supporting the potential repurposing of Rezurock for TGFBR1-associated pathways, including macrophage regulation in chronic rejection. Our findings suggest that Rezurock could influence macrophage-driven fibrosis and immune modulation via TGFBR1, potentially expanding its therapeutic applications beyond ROCK2 inhibition. However, its lack of strict selectivity indicates the need for further investigation into its mechanistic effects and potential synergy with other inhibitors, particularly in post-transplantation settings where macrophage modulation could mitigate chronic rejection.

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P7.59

STRUCTURE-BASED OPTIMIZATION OF siRNA FOR MOLECULAR DOCKING AND FRAGMENT SCREENING TARGETING TP53 GENE

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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 siRNA and its carrier. This study established a computational methodology for optimizing nanocarriers using a molecularly imprinted polymer approach. We evaluated different siRNA construction techniques using Schrodinger, AlphaFold, and SimRNA, highlighting structural discrepancies and the advantages and limitations of each method. Using two methodologies as benchmarks, we modeled five backbone modifications of TP53-targeting siRNA, incorporating 2'-OMe and 2'-F sugar modifications, phosphorothioate backbone modifications, and DNA substitutions based on clinically validated approaches. Each structure was optimized using the Schrodinger Software Package and subjected to 500 ns molecular dynamics (MD) simulations to refine and validate siRNA structures in a physiological environment. Minimized structures and the ten most populated MD trajectory clusters from each siRNA model were used as docking targets, resulting in 110 TP53 siRNA models for molecular docking. A library of 1065 RNA-binding fragments from ASINEX was screened via molecular docking to identify potent siRNA binders. An in-house Python pipeline was developed to analyze docking data and select the 100 top-scoring fragments across all models. These fragment-siRNA complexes were then subjected to MM-GBSA calculations for further evaluation. Our findings identified 10 highly promising fragments suitable for synthesizing molecularly imprinted polymers, offering novel strategies for stabilizing siRNA and targeted therapeutic applications. These results establish a foundation for the rational design of siRNA-targeting molecules, enhancing therapeutic potential in gene-silencing technologies.

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P7.60

THE ROLE OF ANGIOGENIC FACTORS IN CARDIAC ADAPTATION DURING NORMAL PREGNANCY

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Background: In normal pregnancies, the mother experiences cardiac adaptations that help bring blood (nutrition and oxygen) to the developing baby and placenta. Blood vessels are widened (vasorelaxation) to accommodate the blood volume expansion, resulting in lower blood pressure. This prompts the heart to work harder, pumping out more blood (stroke volume) and faster (heart rate). However, the mechanisms mediating changes in cardiac function and remodeling during pregnancy are unclear. Angiogenesis is the process of creation and modification of blood vessel networks. It is known that angiogenic factors, including angiopoietin-1 and vascular endothelial growth factor A (VEGF-A), are upregulated in the heart during stress, most of which comes from cardiomyocytes. Endothelial cells and fibroblasts directly respond to angiogenic factors that are secreted into the extracellular matrix, where they then affect ventricular angiogenesis and remodeling. Angiogenic factors also stimulate fibroblasts and endothelial cells to release different factors that secondarily support cardiomyocyte hypertrophy and adaptation to stress. Thus, this study aimed to test the hypothesis that angiopoietin-1 and VEGF-A are increased in normal pregnant rats compared to nonpregnant rats and are associated with markers of normal

cardiac function and remodeling. **Methods:** 12-16-week-old Wistar female rats were mated to generate timed-pregnancies. Animals with sperm on vaginal smears entered into the normal pregnant group (n=15), whereas those lacking sperm entered into the nonpregnant group (n=12). On gestational day (GD)19 or 19 days after unsuccessful mating, blood and heart samples were collected. Heart tissue was homogenized in radioimmuno-precipitation assay (RIPA) buffer with protease inhibitors, and then centrifuged at 14,000 g for 15 min at 4°C to obtain supernatant. Blood without and with anticoagulant (EDTA) was centrifuged at 2000 g for 15 min at 4° C for separation of serum and plasma, respectively. Enzyme-linked immunoassay (ELISA) was used to quantify angiopoietin-1, VEGF-A, matrix metalloproteinase (MMP)-2, activin A, troponin-1, and atrial (ANP) and brain (BNP) natriuretic peptides. **Results:** Levels of the angiogenesis markers angiopoetin-1 and VEGF-A were similar in heart and plasma samples of pregnant and nonpregnant rats (all P>0.05). While heart and serum levels of the tissue remodeling maker MMP-2 were higher in pregnant rats than in nonpregnant counterparts (8.8±0.8 vs. 6.0±1.0 and 361.8±19.8 vs. 196.1±30.6 ng/mL, respectively; P=0.0478 and P=0.0008); there were no statistically significant differences in heart and serum levels of the fibrotic marker activin A between groups (both P>0.05). Lastly, plasma concentrations of the cardiac stress marker troponin-1 were increased in pregnant rats compared to nonpregnant rats (215.5±54.1 vs. 44.1±25.7 pg/mL, respectively; P=0.0047), whereas heart ANP and BNP levels were similar between groups (both P>0.05). **Conclusion:** These findings indicate that, although angiogenic factors may not mediate the normal cardiac adaptations induced by pregnancy, MMP-2 participates in the process of cardiac tissue remodeling and increased circulating troponin-1 is a marker of physiological cardiac hypertrophy during gestation.

P7.61

LUTEOLIN AS PROPHYLAXIS AGAINST PREECLAMPSIA-RELATED COMPLICATIONS OF LOW BIRTH WEIGHT

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Introduction: Preeclampsia is a perilous complication of pregnancy diagnosed as new-onset hypertension with systemic vascular dysfunction during the latter half of pregnancy. With incidence of preeclampsia in the United States. Despite advances in understanding the pathogenesis of preeclampsia rising, early delivery is the only definitive treatment, underscoring the need for better treatment strategies. The preeclampsia cascade results in elevated maternal blood pressure, increased total peripheral resistance, and endothelial cell dysfunction, contributing to poor pregnancy outcomes such as fetal growth restriction and low birth weight. Existing treatments are limited, and there is a significant need to explore safe alternatives targeting preeclampsia's pathogenic mechanisms. Luteolin, a natural flavonoid with known anti-inflammatory and antioxidant properties, has shown promise in preclinical models. This study aims to investigate the therapeutic potential of luteolin in a genetic mouse model of spontaneous preeclampsia, blood pressure high (BPH/5) mouse. We hypothesized that luteolin administration during pregnancy attenuates hypertension and fetal growth restriction in BPH/5 dams. **Method:** Eight dams, approximately 12 weeks of age, from $\geq$ 3 breeding pairs of the UMMC-BPH/5 colony were used in this study. Mice were divided into the luteolin-treated group (80 mg/kg/day) (n=4) and a control group with a vehicle alone (0.25g of peanut butter) (n=4). A vaginal smear was obtained at gestational day zero (GD0). When sperm was detected in vaginal smears, the male sibling was removed. At GD18, animals were placed under isoflurane anesthesia for implantation with an indwelling corroded catheter and allowed to recover overnight. At GD19, conscious MAP was measured in restraint cages, dams proceeded to parturition, and biometric data were collected. To evaluate luteolin's efficacy, maternal blood pressure, fetal growth parameters, and live pup counts were assessed and analyzed using GraphPad Prism. **Results:** Our results demonstrate that luteolin administration significantly lowered blood pressure levels in hypertensive BPH/5 mice compared to untreated controls ($p<0.05$). Additionally, luteolin-treated dams exhibited more live pups, indicating improved fetal viability ($p<0.05$). While average pup birth weights were slightly reduced in luteolin-treated dams, individual pup growth metrics suggest the absence of pathological asymmetry, indicating that fetal development was not adversely affected. Individual pup birth weights and crown-rump length comparison show statistically significant differences between luteolin-treated and control groups ($p<0.05$). No significant differences were found in average pup birth weight, individual pup head: abdomen circumference, or individual pup abdomen circumference.**Conclusion:** These findings suggest that luteolin may serve as a promising agent for preeclampsia, offering maternal and fetal health benefits by mitigating hypertension and improving fetal survival. Luteolin administration led to lower blood pressure levels at the end of pregnancy compared to hypertensive blood pressures found in the BPH/5 mice control. Further research is warranted to elucidate its mechanisms of action and optimize dosing strategies for potential clinical applications. This study highlights the importance of natural compounds in advancing therapeutic options for pregnancy-related hypertensive disorders.

P7.62

MONOGENIC OBESITY IS ACCOMPANIED BY TRANSGENERATIONAL PROPAGATION OF PREGNANCY COMPLICATIONS

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Introduction: Obesity has emerged as a critical public health issue, linked to various chronic diseases, that has impact on human body systems. These include cardiometabolic dysfunction, diabetes, kidney disorders, and reproductive disparities. Obesity is caused by genetic predisposition and environmental exposure (high-energy diets, sedentary lifestyle). Monogenic obesity is a rare onset of obesity due to mutations in a single gene associated with the leptin-melanocortin receptor pathway, controlling food intake and energy expenditure. Yet epigenetics has increased our understanding of the interaction between the environment and gene expression toward the development of diseases. For instance, exposure to an obese environment during gestation may mediate intergenerational transmission (from a generation to the next one) of obesity via epigenetics. However, there are very few studies examining mechanisms of transgenerational transmission (across multiple generations) of obesity. Our earlier studies in first generations of female rats lacking an allele copy of the melanocortin-4 receptor gene in all cells of the body (MC4R heterozygous-deficient rats) overeat and develop obesity-induced hypertension during pregnancy. The present study investigates whether maternal body weight phenotypes and pregnancy complications, such as fetal demise or stillborn, are worsened over a large number of generations in our rat model of monogenic obesity. **Methods:** Over 35 generations (≥10 years) of MC4R heterozygous-deficient rats were bred and maintained at the University of Mississippi Medical Center to explore pregnancy complications and phenotype across generations induced by maternal obesity. Assessments were made on maternal body weight and litter size between initial generations (younger in the colony) verses later than thirty generations (older in the colony) of MC4R-heterozygous deficient dams. **Results**: We found that maternal obesity due to MC4R deficiency-induced increased food intake, contributes trans-generationally to adverse pregnancy outcomes. Independent of maternal body weight, litter sizes were significantly decreased in the thirtieth generation when compared with the first generation of MC4R heterozygous-deficient rats (p=0.0010). In addition, there was a trend for maternal body weight normalized by litter size to be higher in generation 30 than in generation 1 of MC4R heterozygous-deficient rats (p=0.2666). **Conclusions:** We demonstrated that MC4R heterozygous-deficient rats develop reduced litter size as generation number grows. These finding suggest an exacerbation of obesity-related pregnancy complications over generations, highlighting the transgenerational transmission of both genetic predisposition and environmental influences. This study lays the groundwork for future investigations focused on epigenetic mechanisms of obesity and metabolic disorders across generations. Furthermore, our animal model may be used to assess strategies to intervene in fetal complications induced by maternal obesity.

History and Philosophy of Science

Chair: Gregory Johnson
Mississippi State University
Co- Chair: Ian Dunkle
Mississippi State University
Co-Vice Chair: Robert Waltzer
Belhaven University
Co-Vice Chair: Paula Smithka
University of Southern Mississippi

Thursday, March 20, 2025
MORNING
Hall C Room 3

8:50 Welcome: Gregory Johnson

25th Anniversary of History & Philosophy of Science Division/Tribute to Ken Curry

O8.01

9:00 SPECIES PLURALISM AND THE LINGERING PROBLEMS OF TAXONOMIC CLASSIFICATION

Paula Smithka

University of Southern Mississippi, Hattiesburg, MS

As a result of the many species concepts that have been deployed over the years to delimit species taxa, many philosophers of science have argued for classificatory pluralism, that is that multiple classifications ought to coexist which are context- and researcher interest-dependent. Thus, there is no one definitive way of grouping organisms into species taxa on this view. Defenders of classificatory pluralism include John Dupré (1981, 1999 with some restrictions) and Philip Kitcher (1984), among others. Such classificatory pluralism, however, presents both theoretical and practical problems for scientists, e.g. exactly what is the role of taxonomy and taxonomists, and for policy-making constituents, such as those groups regulating various industries, e.g. timber, as well as for

conservation efforts since different sorting principles may be applied according to various motivating aims of classification (Cuypers & Reydon, 2023). Vincent Cuypers and Thomas A.C. Reydon (2023) claim that there is much disagreement and "heated debates" among taxonomists and Stijn Conix (2019) contends that "species classification is still in a state of disorder" and argues for a unitary scale of evolutionary independence. In their article, Cuypers and Reydon apply the Grounded Functionality Account (GFA), developed by Marc Ereshefsky and Reydon (2022, 2023), in order to account for how actual classification of kinds are used in sciences and other practices but also to "impose strong limits on classificatory pluralism." They give the examples of oaks, in particular Quercus robur, the pedunculate oak, and Quercus petraea, the sessile oak, as a case of problematic classification because they are sometimes lumped together and sometimes separated, depending upon context. For example, in regulating seed trade, they are split into two kinds, but in the timber trade, they are taken as one kind. Thereby demonstrating a debate regarding the motivating principles and the sorting principles. However, I don't see this as being a particular problem for taxonomy per se but rather a difference in the practical application of the taxonomic distinction. I argue taxonomic classification of biological species enjoys methodological primacy over any other ways of grouping organisms. This is not incompatible with the significance or utility of grouping organisms according to various interests or inquiries and taxonomic names are employed across various functional or historical biological investigations, as well as in practical applications. Furthermore, taxonomists take into account molecular, genetic, and developmental criteria in order to classify organisms, with descent is a central concern for taxonomists. This is why the homeostatic property cluster kind (HPCK) approach to species delimitation is particularly fecund. Conix's argument is for developing a useful measure of evolutionary independence even in the absence of a settled theoretical framework regarding species delimitation. I further suggest that the HPCK approach can provide the relevant and diverse data set that would be required for Conix's measure and question whether developing Conix's suggestion within the context of systems theory might be fruitful.

O8.02

9:30 OBJECTS IN THE SPECTRAL PRESHEAF: FROM RADICAL TO STRUCTURES-FIRST ONTIC STRUCTURAL REALISM

Armin Heydari

Department of Philosophy Harvard University, Cambridge, MA

Radical ontic structural realism asserts that only structures, and no objects, exist. Several authors have objected that (i) objectless structures are not intelligible (the conceptual challenge) and (ii) that objectless structures, even if they were intelligible, do not exist in the physical world (the physical challenge).

I submit two claims. First, under a narrow, set-theoretic notion of objects, the Kochen-Specker theorem in topos-theoretic models of quantum mechanics provides an example of an objectless structure that meets both the conceptual and the physical challenge. Notably, this improves upon a previously suggested example, due to Bain [1], which has been argued not to meet the physical challenge [2, 3]. Second, under a more adequate, categorical notion of objects, there are no objectless structures at all, and the Kochen-Specker theorem turns out to favour structures-first ontic structural realism instead: the view that, while objects exist, they are ontologically dependent on structures.

I defend my first claim as follows. First, I introduce the narrow, set-theoretic notion of objects as global elements in a category. Second, I present the spectral presheaf in topos-theoretic models of quantum mechanics and compare it to Bain's example of presheaves of Einstein algebras in algebraic models of general relativity. I demonstrate that both the spectral presheaf and the presheaves of Einstein algebras meet the conceptual challenge: both are intelligible even if they do not have objects in the narrow sense. Third, I argue that only the spectral presheaf answers the physical challenge. Our best scientific theories only imply that presheaves of Einstein algebras do not need to have objects in the narrow sense: they could possibly have no global elements. In contrast, our best scientific theories imply that the spectral presheaf does not have objects in the narrow sense: the Kochen-Specker Theorem states that the spectral presheaf does not have global elements. Insofar as the spectral presheaf describes a structure in the physical world, then, it is an objectless structure in the physical world—thereby meeting the physical challenge.

The defense of my second claim is as follows. First, I introduce a broader, categorical notion of objects as generalized elements and argue that this broader notion is more appropriate for structural realism. Second, I note that every structure has generalized elements, which means that, if we subscribe to the broader notion of objects as generalized elements, radical ontic structural realism is untenable. Finally, I conclude that a natural reinterpretation of the spectral presheaf supports structures-first ontic structural realism instead.

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10:00 Break

O8.03

10:15 A PROGRAM FOR FINDING FORGETTING

Gregory Johnson

Mississippi State University, Starkville, MS

Forgetting presents an interesting problem for cognitive psychology. When tracking the stimuli that individuals receive and the behavior that they produce, it is not possible to differentiate between memories that no longer exist and those that are merely inaccessible. Since it is known that some seemingly inaccessible memories can be retrieved with the proper cues, the default stance in cognitive psychology is that virtually all memories are permanent, although they may often be inaccessible (Atkinson & Shiffrin 1971; Davis 2007; Wixted 2007). The psychologist Michael Davis acknowledges that neurobiological investigations could, at least in principle, resolve the issue, but he sets a high bar: the memory can only be said to no longer exist when it can be shown that, for a neural system, "all of the cellular and molecular events that occur when a memory is formed return to their original state" (2007, p. 317).

Investigating the relevant neurobiology to determine if some memories no longer exist is a challenging task, but Davis's criterion is impractical. Here I outline a program for determining if forgetting does, in some cases, consist of the complete erasure of the memory. This program is laid out for *Drosophila* at the cellular level. For each type of proposed test, the issue is whether evidence of the memory trace exists at one point but then no longer does at a later point.

(1) First, we need a procedure that demonstrates behaviorally the retrieval of a previously inaccessible memory. In *Drosophila*, this can be accomplished with aversive olfactory conditioning followed several (or more) days later with a mild version of the unconditioned stimulus—which is insufficient on its own to produce new learning—paired with the conditioned stimulus and then followed by a test.

(2) The brain area for the storage of LTM can be identified with genetic tools that block cellular activity when the temperature in the flies' environment is raised. Evidence suggests that this is the KC-alpha-beta region of the mushroom body (Cervantes-Sandoval et al. 2013; Wang et al. 2023).

(3) Calcium imaging of the KC-alpha-beta while exposing flies to an odor that was previously paired with an aversive stimulus will, for a period, reveal neural activity indicating the presence of the memory trace—even when, behaviorally, the memory is inaccessible. If, later, calcium dynamics are the same when the fly is exposed to the paired and to the unpaired odor, then the memory trace no longer exists.

(4) Genetic tools are also used to drive cellular activity by increasing Ca^{2+} influx in specific brain areas when the temperature of the fruit flies' environment is raised. Using this intervention to excite cells in the KC-alpha-beta region of the mushroom body while testing the flies on the paired versus unpaired odors will demonstrate whether the memory for the paired odor is still retained.

Notably, this program doesn't address any molecular activity, which will have a role either maintaining memory traces or, eventually, excising them. The program does, however, establish a more reasonable standard than Davis's.

O8.04

10:45 THE SENSORY ONLOADING HYPOTHESIS

Benjamin Aguda, Britt Aguda

University of New Orleans, New Orleans, LA

We propose that it is possible to onload the visual sensory modality and achieve an expanded perceptual experience through sensory onloading. In sensory onloading we modify the incoming signal by adding an additional stream of sensory input. This added signal is from a perspective that we are normally forced to sample through bodily movements and shifts in attention. For example, in an exploratory exercise we added a visual signal from the rear (i.e. a backwards facing camera) directly to the normal forward oriented visual signal. The backwards oriented signal was presented in such a way that subjects did not require whole body movements or even shifts in attention in order to sample it. We suspect that subjects can eventually learn the regular relationships between their bodily movements and changes in the modified visual signal. If we are correct then it is possible to learn to see through modified signals and perceive more of the world as a result. We could see forward and backwards (for example) simultaneously without any shifts in attention! Our view follows the enactive sensorimotor account of perception introduced by O'Regan and Noe (2001). According to this view, we develop sensorimotor contingencies through our history of worldly interactions. These are learned regularities between how we move our bodies and how the sensory signal changes. For example, when driving in reverse using mirrors the sensorimotor contingencies are different than when driving forward. A sensorimotor contingency for driving forward is that as we pull the wheel right the sensory flow will shift to the left indicating that we are turning right. While driving in reverse using mirrors the opposite occurs and a rightward pull on the wheel will cause the sensory flow to shift right. This is a dramatic change, but we are able to learn the regularity and eventually even master it, which is useful for parallel parking. Importantly, no internal representations

are required in order to accomplish these tasks. Sensorimotor contingencies are instead a kind of embodied know-how. We hypothesize that we can learn sensorimotor contingencies for visual signals that are inaccessible to us without cutting edge technology. Evidence for our hypothesis can be found in historical sensory adaptation research such as Stratton (1896), which showed that is possible for subjects to adapt to even extreme sensory disorder. We have also conducted early experiments that provide initial support for our idea that it is possible to onload sensory modalities. The potential applications are vast, ranging from space exploration and military operations to competitive sports and gaming, where enhanced perception could redefine human performance.

11:15 Break/Lunch

Thursday, March 20, 2025
AFTERNOON
Hall C Room 3

O8.05

1:00 MORE ON "WHY IDIOSYNCRASY IN EXPLORATION MATTERS"

John Bickle

Philosophy and Religion, Mississippi State University, Advanced Biomedical Education, University of Mississippi Medical Center

I borrow part of my title from Ann-Sophie Barwich's (2021) paper, on 2004 Nobel Laureate Linda Buck's discoveries of odorant receptors, which turned out to constitute the largest metazoan gene families. Barwich argues that aspects of Buck's personality drove her novel experiment designs; so these factors should be added to current philosophy of science's list of recognized contextual features (e.g., social, historical, cultural contingencies) that affect scientific discovery. I provide further support for this conclusion with a study that uses methods similar to Barwich's—structured interviews with a major player in a recent episode of scientific progress—to show how the psychology of an "outsider" to neuroscience contributed to a major methodological advance. In this case, the outsider is UCLA scientist Alcino J. Silva, a human geneticist by academic training, and the major advance was the first published inclusion of gene targeting techniques into behavioral neuroscience. Silva's techniques were the precursors to CRISPR-cas9 gene editing technology, which continues to impact behavioral neuroscience to the present day.

O8.06

1:30 IDEALIZATION AND THE NORMATIVITY OF SCIENCE

Jiusi Guo

University of Illinois, Urbana-Champaign, Champaign, IL

The present paper explores the relationship between scientific inquiries and normativity. It has been a consensus among philosophers that scientific inquiries are descriptive rather than normative: When researchers carry out projects in disciplines like biology, mathematics, and physics, their goal is to provide a theory (or a cluster of theories) that solves some problem or explains some puzzling observation by describing how the world actually works rather than prescribing how the world should work. I find this consensus implausible. In this paper, I propose and argue that scientific inquiries have an inherent and ineliminable normative dimension. In other words, I defend the view that the consideration of how the world should work is constitutive of scientific inquiries.

I believe that scientific inquiries are normative because there is an inherent and ineliminable normative dimension in the scientific method, i.e., the method by which scientific inquiries are properly carried out. The normative dimension of the scientific method, as I take it, is idealization. Idealization refers to the practice of deliberately misrepresenting certain facts and intentionally including errors in the final product. One such example is the postulate of frictionless planes in classical mechanics. Idealization plays a critical role in contemporary research. Allow me to elaborate. In contemporary research, scientists rely heavily on computational modeling and computer simulations to make either predictions or explanations. However, when building their models, it is rarely the case that scientists would include all the variables in their models; rather, mediated by some auxiliary theories, scientists always build ideal models, where only some variables are modeled while the rest are ignored as either non-existent or irrelevant.

However, when employing such models in their inquiries, i.e., by building ideal models and only modeling certain variables as relevant to the phenomenon under investigation, scientists are imposing onto the world certain constraints and expecting certain observations to obtain once those constraints are met. In doing so, scientists are abstracting away from how the world actually works and concerning themselves how the world should work so that the problem driving their inquiries can be adequately addressed. As a result, at least in the modeling stage, scientists are leaving the descriptive domain and doing normative work. Scientific inquiries, then, have a distinctly normative dimension that is inherent in its methodology and cannot be reduced to some other factors.

2:00 Break

O8.07

2:15 THE EARLY DEVELOPMENT OF THE MISSISSIPPI GEOLOGICAL SURVEY

Renee Clary[1], David Dockery, III[2]

[1]Mississippi State University, Starkville, MS, [2]Mississippi Department of Environmental Quality, Jackson, MS

Established in 1850, the Mississippi Geological Survey preceded the United States Geological Survey by almost 3 decades. As the first State Geologist, University of Mississippi's John Millington (1779-1868) allocated field work to his assistant Oscar Lieber (1830-1862). Lieber, who resigned shortly after Millington released an error-filled 1852 report, is credited with publishing Mississippi's first geological map in 1854, after he resigned. Lieber's replacement, Benjamin L.C. Wailes (1797-1862), traveled over 7000 miles and collected thousands of specimens in his investigation of geology's influences on agriculture. Wailes left the survey when he was not promoted upon the retirement of the second State Geologist, John C. Keeney. The third State Geologist, Lewis Harper, likewise allocated field work to his Assistant Geologist, Eugene Hilgard (1833-1916). Harper's tenure as State Geologist was disastrous for the Mississippi Geological Survey: the survey was relocated to the penitentiary in Jackson, Harper's 1854 report was rife with errors, and the Legislature suspended the survey with Harper's resignation. However, a new phase for the Mississippi Geological Survey began when Hilgard returned to become the first active State Geologist, and the survey was reestablished in 1860. Although the survey languished during the Civil War (1861-1865), Hilgard managed to resume the Mississippi Geological Survey's activity soon after the war's conclusion. His 2-part Report on the Geology and Agriculture of the State of Mississippi's report became the definitive source of Mississippi Geology for the next half century.

O8.08

2:45 DESIGN BEHIND THE DESIGN; EXPLORING THE DEPTHS OF MUSCLE.

Robert Waltzer

Belhaven University, Jackson, MS

There is a depth of complexity in muscle involving levels of coordinated functioning that seems best explained by design. Beyond the process of contraction, calcium delivery, and electrical activation, which are generally known by biologists, there is much more about muscle. Additional topics include the structure of the Z disk, control systems in response to stress, the order and assembly of the parts, the extracellular matrix, and others. Foundational to each level of complexity are a series of interacting proteins whose properties are extremely sophisticated and go beyond just a link in a chain or cog in a machine. And over and above all levels are two additional systems. The first controls Gene Expression and makes sure that the right protein in the right form and the right amounts is made in the right location at the right time. The other is an energy supply and oxygen delivery system that ensures that sufficient energy is provided at the right place and at the right time. Likely there are many as yet unknown features of muscle cell function. What aspects of this point to design? First, it is integrated. All the parts work together both within levels and between levels. In addition, control systems, that is, systems which respond to a change in conditions and cause a correction to occur, demonstrate purposefulness and foresight. Foresight is also demonstrated in that these systems can assemble and do so in the right order. The argument for design may not be a type of logical or mathematical assertion that is constrained such that it leads to a single solution, although some do argue that. It can be characterized as a "reasonable" or "common sense" argument that could be understood by the "man on the street" in addition to the scholar. The limitation of design is the multiplication of explanatory entities such that it may violate Occam's razor. But the alternative, which is naturalism, can be said to be unsatisfying. To some extent naturalism also violates Occam's razor in that it attributes extraordinary powers of creation to a blind, unguided process, thereby making it a type of creator and thereby an explanatory entity. The only alternatives seem to be either a belief in design that multiplies entities that are possibly "unprovable", or a belief in naturalism which is an explanation that is inconsistent with its properties. I would suggest humility and open discussion on both sides in an effort to resolve the impasse.

THURSDAY, March 20, 2025

EVENING

4:00 DODGEN LECTURE /AWARDS CEREMONY

Hall B

5:00-7:00 GENERAL POSTER SESSION

(Immediately following Dodgen Event)

P8.01

EXPLORING ETHICAL CONCERNS WHEN FAITH-BASED HEALING PRACTICES COLLIDE WITH MEDICINE

Lillion Hamil[1], Kenneth R. Butler[2], Gary L. Hamil[1]

[1]Belhaven University, Jackson, MS, [2]University of Mississippi Medical Center, Jackson, MS

There is evidence of a positive relationship between health and spirituality, specifically linking psycho-socio-spiritual aspects to well-being. Despite this, medical providers do not frequently engage in discussions about spirituality, faith, religious beliefs, or practices with their patients. Faith-based medical practice focuses on treating illnesses through faith rather than traditional medical methods. In this approach, the healing process is often considered more significant than merely achieving a cure. However, ethical

challenges arise when religion intersects with medicine. This literature review will explore important ethical issues related to faith-based medical beliefs within healthcare. Addressing these challenges in a diverse society is crucial but complex. Key ethical principles involved in faith-based medical decision-making include autonomy, beneficence, nonmaleficence, and justice. Notable ethical conflicts exist, such as those between autonomy and beneficence, the risks of harm to vulnerable populations, public health concerns, resource allocation, and the need for informed consent. Furthermore, physicians often lack training in faith-based strategies for navigating these ethical dilemmas. Suggested strategies for addressing these issues include cultural competency training, mediation and negotiation, ethics committee consultations, and community engagement. Future research should focus on bioethics while considering the role of faith in medicine. Additionally, integrating faith-based forms of healing into the medical curriculum could foster greater interest, belief, and respect for these practices.

P8.02

BALANCING THE NEEDS OF ENDANGERED ANIMAL SPECIES AND HUMAN POPULATIONS: A BIOETHICAL PERSPECTIVE

Karleigh N. Butler[1], Gary L. Hamil[2], Kenneth R. Butler[3]

[1]Mississippi College, Clinton, Mississippi, [2]Belhaven University, Jackson, Mississippi, [3]University of Mississippi Medical Center, Jackson, Mississippi

The goal of this paper is to cultivate a discussion surrounding the competing needs of conserving endangered species, and the rapid increase of human development. Endangered species fulfill unique ecological niches within ecosystems, and therefore contribute to the overall stability of the environment. Human needs often conflict with conservation efforts. These needs include, but are not limited to: agricultural expansion, urban development, and resource extraction. The objectives of this paper are to explore the ethical principles involved in prioritizing endangered species preservation alongside human needs, analyze how these ethical considerations manifest in policy, conservation, and socioeconomic contexts, and present potential frameworks for balancing these competing priorities through ethical decision-making. Several bioethical theories that apply to this exploration, include: utilitarianism (maximizing overall benefits), deontology (duty to protect life), and environmental ethics (intrinsic value of nature). Several case studies will be used to demonstrate how these principles are applied and include conservation laws, indigenous rights, and economic incentives for preserving endangered species. An unbiased view of the major stakeholders, including conservationists, local communities, governments, and industries will be shared. Protecting endangered species is ethically important and directly benefits human needs by maintaining healthy ecosystems, clean air and water, potential sources of new medicines, and serving as indicators of environmental health. Ultimately, protecting endangered species contributes to human well-being and resilience. Neglecting their conservation can lead to significant negative impacts on human populations. Ethical considerations regarding conserving endangered species include animal rights, human-animal interactions, and ecological integrity. Furthermore, these considerations must be placed on future generations to emphasize the importance of biodiversity. Conversely, ethical considerations for balancing endangered species protection with human needs include: sustainable development, habitat protection, conservation education, and legislation.

END of Thursday's Program

Friday, March 21, 2025

MORNING

Hall C Room 3

O8.09

9:00

THE ABSURDITY OF PANNORMISM

Austin McGrath

Mississippi State University, Starkville, MS

Could a particle's motion be irreducibly (and non-instrumentally) bad, or good? There doesn't seem to be anything normative—anything that favors anything else—about this motion. For example, an electron moving from here to there seems completely anormative and insignificant. Recently, some have suggested that, to avoid emerging properties, if normative properties are basic—roughly, the view that they cannot be explained in non-normative terms—then atomic (and sub-atomic, and sub-sub-…) behavior (and atoms, and sub-atoms…) have basic normative properties. All the way down the levels of reality, normativity lurks similar to the way panpsychists think mentality lurks.

Eingar Duenger Bohn calls the resulting view pannormism, writing "[if a] seizure is bad, and the being of the epileptic seizure is grounded in the being of some […] neuron firings in the brain, […] then that sub-atomic behavior [grounding the firings] is bad […] and so on possibly ad infinitum..." He and others believe pannormism could be taken as a reductio against basic normativity. For example, Zach Blaesi is "inclined to believe" the view is surely "complete and utter woo-woo!"

In my paper, I explore whether pannormism should be thought of as a reductio against basic normativity. I conclude it isn't clear the view is absurd. This means believers in basic normativity who aren't error theorists shouldn't be as worried about their view implying pannormism as Bohn and Blaesi suggest they should. I sketch and question a few possible explanations of

pannormism's absurdity including: particles can't brutely be normative, normativity is sui generis, pannormism commits a category mistake, and pannormism implies the normative explains the non-normative. I think the best explanation is likely that particles and their motions, considered as such and in isolation, can't be normative (brutely or not)—they can't "count in favor". When we say a fact is normative, many will say this means the fact favors, or there is a reason for, an action or attitude. But, an electron, and its behavior, seem to never count in favor of, or be a reason for, anything.

Certainty in the anormativity of particles and their motions though, might lead to worse absurdities than pannormism. We can see this by flipping Bohn's argument on its head—begin with the anormativity of particles and their motions. Just as normativity trickles down in Bohn's argument, anormativity floats up in the flipped argument. With a bit of arguing we can see that antipannormism risks "(basic) evaluative nihilism": the view that nothing is (basically) good or bad. Surely though most of us are more certain that some things are basically good and bad than we are of atomic behavior not being so. For example, most of us are confident that a seizure is bad, and basically so: we do not simply mean it causes pain—we intend to say more by calling it bad, something like we have an objective normative reason to prevent it.

O8.10

9:30 RECOLLECTION AND THE POSSIBILITY OF SCIENTIFIC KNOWING IN PLATO'S MENO

Samuel Hage

Tulane University, New Orleans, LA

Long beloved by political theorists, and held up since antiquity as a canonical example of Socratic education, the Meno has more recently become the darling of contemporary scholars, who read in its latter sections a primitive articulation of the influential theories of knowledge that would come to dominate the history of modern epistemology. Socrates describes to Meno at the end of the dialogue the process by which our "true opinions" may be "tied down by means of calculation of cause (aitias logismos)" and so become knowledge (episteme). Because Socrates next claims that this description of episteme is the same phenomenon he and Meno described almost 20 pages earlier, in the dialogue's central section on recollection (anamnesis) and the geometry lesson with the slave boy, these commentators overwhelmingly interpret anamnesis as a depiction of just such a procedure of demonstrative reasoning, by which a learner's latent opinions are transformed into knowledge.

The myth of recollection—which says that all knowledge is already possessed, and merely rediscovered, by the immortal soul—is accordingly read as an answer to what has come to be called "Meno's paradox": inquiry into new subjects is impossible, because we can learn neither what we have already learned nor what we are as yet completely ignorant of. These commentators propose that in answering this paradox, Plato's Socrates thus puts forward his own definition of knowledge as a version of "justified true belief" or "understanding."

Such interpretations, however, are threatened by three grave textual problems. First, that Socrates' definition of episteme as true opinions plus "calculation of cause" does not in fact match any part of the earlier description of recollection, though he dubiously claims that it does. Second, that the myth of recollection and the long geometry demonstration aren't actually necessary in order to answer Meno's paradox, which could instead have been addressed simply by pointing out that we all begin with opinions about those things of which we lack complete knowledge. Third, and most profound, that "true opinion plus reasoning about causes" can never form an adequate definition of knowledge, since there is a certain type of knowledge—namely the indemonstrable first principles of mathematics and science—that does not admit of the kind of causal reasoning Socrates describes.

This paper argues that Socrates' myth of anamnesis is instead meant to address a different epistemological problem: the problem of comprehending those fundamental entities which form a basis for all our deductive reasoning. This view is supported not least by the fact that the geometry problem Socrates chooses to illustrate his epistemological point involves the special case of the triangle's incommensurable diagonal—an irrational magnitude that cannot ever be reached or proven by causal demonstration. If Plato cannot explain how knowledge is possible in cases such as this, he cannot explain the possibility of scientific knowing at all.

10:00 Break

O8.11

10:15 LANGUAGE AND METHODOLOGICAL LIMITS IN WITTGENSTEIN AND HAYEK

Jeffrey Colgan[1, 2], *David Ween*[1]

[1]*Tulane University, New Orleans, LA,* [2]*University of Iowa, Iowa City, IA*

Beyond their familial relation and shared origins in the grande bourgeoisie of fin de siècle Vienna, the intellectual connections between Friedrich Hayek and Ludwig Wittgenstein—two of the most influential thinkers of the 20th century—might appear tenuous. Hayek, whose work ranged from technical economic analyses to investigations of the linkages between economics, political thought, and scientific methodology, seems as if he would be uninterested in the unorthodox yet profound investigations into logic, mathematics, language, and mind undertaken by his older cousin Wittgenstein. However, Hayek claimed to have been deeply influenced by both the content and method of Wittgenstein's philosophical work. Hayek was an early reader of the original German edition of Wittgenstein's Tractatus Logico-Philosophicus (publish as

Logisch-Philosophische Abhandlung in 1921), and after Wittgenstein's death he began compiling materials for a biography of his relative. Though much scholarly attention has been directed to Wittgenstein and Hayek separately, very little has explored the influence of Wittgenstein on Hayek and how reading these two authors with and against each other might offer insights into their own works and the historical period out of which they originated?

This paper argues that Hayek and Wittgenstein can be read as participating in a shared dialogue about the limits of language and the far-reaching consequences of those limits. Wittgenstein's investigations into the limits of sense-full language serve as the provocation to which Hayek is responding, even if his own writings are primarily concerned with tracing out how these proposed limits affect the methodologies of the natural and social sciences. Section One locates these thinkers in the particular intellectual milieu of fin de siècle and early 20th century Vienna, highlighting the shared conditions, values, and worries that motivated their future work. Section Two treats some core concerns of Wittgenstein regarding the limits of sense-full language and how his investigations problematize certain methods in and values of the natural and social sciences. Section Three engages with the social scientific writings of Hayek, reframing his core commitments as claims about the limits of sense-full language and, thus, the limits of scientific methodologies. The paper concludes with some suggestions connecting the reception of Hayek's work with that of Wittgenstein.

O8.12

10:45 PREGNANCY, AGENCY, AND HEALTH

Ian Dunkle

University of Southern Mississippi, Hattiesburg, MS

In this paper, I apply my original theory of health to resolve ongoing debates in reproductive ethics. Consider the following, apparently inconsistent triad. (1) Healthcare (constitutively) aims at making a positive health-impact. (2) Fertility treatment and obstetric care aim to cause successful birth and thereby are healthcare.(3) Contraceptive care and abortions aim to prevent or end pregnancy and thereby are healthcare.

The aims of causing birth and of preventing or ending pregnancy are apparently contradictory. So, how can they both amount to making a positive health-impact?

Smajdor and Räsänen (2024) deny (2) partly in order to resolve this tension. But that may undermine the medical status of central aspects of obstetric medicine and, perhaps too, the moral injunction to support costly fertility treatment in society. A more traditional reaction to this triad is to deny (3). While some contraceptive and abortive care could count as healthcare through more convoluted analysis, this approach threatens the medical and moral status of preventing and ending pregnancy. Some philosophers of medicine abandon (1) (notably, Boorse 1977, 1997, 2014, 2024). But it is difficult to provide an alternative account of what therapeutic medicine does that still supports the moral case for healthcare's (limited) priority in considerations of distributing social goods.

In other work, I have developed an account of health with the aim of clarifying and defending (1) above. In this paper, I show that this view can also resolve this apparently inconsistent triad. My theory of health purports to meet clinical, rather than pathophysiological, needs; specifically my theory addresses the question of what, in the name of health, a healthcare-practitioner's duty of beneficence applies to. In brief, a state of good health consists, on this account, of those bodily and mental functional dispositions that constitute the individual's agency. Important to applying my account is a distinction between fundamental aspects of agency—those functional states that constitute the individual as an agent, including the abilities to survive, perceive, move, deliberate and form intentions, etc.—and the functional underpinnings of the individual's current (or recent) state of agency—consisting of her agential abilities at the degrees she possesses them.

After summarizing the mechanics of this theory, I apply it to (1)-(3). In outline, (1`) I present a normatively ordered analysis of the component aims of healthcare in terms of the healthcare practitioners' various duties with regard to the functional underpinnings of the patient's agency;(2) I argue that where the patient chooses parenthood, fertility treatment and those aspects of obstetric care directed toward successful birth can enhance reproductive functional disposition and thereby health; and(3) I argue that where the patient chooses to be sexually active and to avoid pregnancy, contraceptive treatment can prevent the loss of a variety of functional dispositions underpinning her agency.

A surprising, but not implausible, implication of this account is that healthcare practitioners' duties with respect to (3) will often be higher in normative priority than their duties with respect to (2).

11:15- Break/Lunch

Friday, March 21, 2025

AFTERNOON

Hall D Room 6

O8.13

1:00 THE PITFALLS OF PARADIGM ALLEGIANCE IN THE NUTRITION SCIENCES

Marie Bishop

University of Mississippi, University, MS

For the past 100 years, and certainly for much longer, there has been a raging national debate on what constitutes a "good" or "best" diet. Nutrition Science and Dietetics have long been associated with popular medicine in the United

States and can be found as a central focus in medical textbooks going back to the earliest days of the founding of the American Medical Association. Unfortunately, the US population is continuing to show signs of mal-nutrition and metabolic disease associated with poor diet, despite the average American having access to more food choices and consuming more calories than ever before. And, despite the ever-increasing access to knowledge via the internet, surveys show that the general population admits to feeling confused about what and how to eat for best health. This talk will review the multiple paradigm shifts in nutrition science over the past 100 years in the US and it will focus on how competing paradigms reveal underlying truths that tend to go unnoticed by both the general public and medical institutions. Lastly, this talk will address issues with modern medicine associated with paradigm allegiance that is in contrast to well-established best evidence in the research. The talk will be organized into two sections, with the first section focusing on the history of nutrition research and its implications on different sectors of society, including its effect on indigenous peoples. The second section will be a focus on the factors that drive paradigm shifts in nutrition science and how paradigm allegiance by medical professionals and institutions results in confusion of the public and perpetually poor outcomes in public health.

O8.14

1:30 ETHICAL CHALLENGES POSED BY THE PHARMACEUTICAL INDUSTRY POTENTIALLY INFLUENCING DIAGNOSIS AND TREATMENT RECOMMENDATIONS

Kenneth Butler[1], Gary Hamil[2]

[1]University of Mississippi Medical Center, Jackson, MS, [2]Belhaven University, Jackson, MS

The ethical challenges posed by pharmaceutical industry influence on diagnosis and treatment recommendations raise significant concerns. These concerns emerge from a complex interplay of economic, social, and professional factors, including the financial incentives provided to healthcare providers, the role of pharmaceutical representatives in shaping medical opinions, and the selective reporting of clinical trial results. A fundamental ethical issue is the potential compromise of patient autonomy and the undermining of the physician's duty to prioritize patient welfare, as prescribing practices may be swayed more by industry pressure than by patient-specific needs. The over-medicalization of certain conditions, driven by marketing strategies designed to expand diagnostic categories, leads to the inappropriate labeling of individuals as requiring medication, potentially causing harm rather than promoting wellness.

One area of concern is the provision of "educational" resources and continuing medical education (CME) opportunities funded by the pharmaceutical industry. While these programs claim to disseminate unbiased information, evidence suggests they often subtly promote the sponsor's drugs, thereby creating conflicts of interest for healthcare providers who rely on these resources for ongoing education. Similarly, direct-to-consumer advertising encourages patients to request specific medications, placing further pressure on clinicians to prescribe based on demand rather than clinical appropriateness.

Furthermore, the pharmaceutical industry's role in funding clinical trials introduces bias in the published outcomes, as studies with favorable results are more likely to be publicized, while unfavorable or inconclusive studies are often suppressed. This selective publication skews the evidence base, affecting both the guidelines used in clinical practice and the recommendations issued by influential health organizations. Such practices erode public trust in medical research, as patients become increasingly skeptical of industry motives and the validity of promoted therapies.

Addressing these ethical issues requires policy reforms and stricter regulations on industry interactions with healthcare providers. Transparency initiatives, such as disclosing financial relationships between doctors and drug manufacturers, along with enforcing stricter criteria for CME funding and independent review of clinical trials, are critical steps in mitigating undue influence. As healthcare providers navigate these ethical dilemmas, prioritizing informed, patient-centered care becomes essential to uphold trust and integrity within the healthcare system. In conclusion, the ethical problems associated with pharmaceutical industry influence highlight the need for a balanced approach that safeguards patient welfare, supports clinical integrity, and fosters a healthcare environment free from conflicts of interest.

2:00 Break

O8.15

2:15 EXPLORING ETHICAL CONCERNS WHEN FAITH-BASED HEALING PRACTICES COLLIDE WITH MEDICINE

Lillion Hamil[1], Kenneth R. Butler[2], Gary L. Hamil[1]

[1]Belhaven University, Jackson, MS, [2]University of Mississippi Medical Center, Jackson, MS

There is evidence of a positive relationship between health and spirituality, specifically linking psycho-socio-spiritual aspects to well-being. Despite this, medical providers do not frequently engage in discussions about spirituality, faith, religious beliefs, or practices with their patients. Faith-based medical practice focuses on treating illnesses through faith rather than traditional medical methods. In this approach, the healing process is often considered more significant than merely achieving a cure. However, ethical challenges arise when religion intersects with medicine. This literature review will explore important ethical issues related to faith-based medical beliefs within healthcare. Addressing these challenges in a diverse society is crucial but complex. Key ethical principles involved in faith-based

medical decision-making include autonomy, beneficence, nonmaleficence, and justice. Notable ethical conflicts exist, such as those between autonomy and beneficence, the risks of harm to vulnerable populations, public health concerns, resource allocation, and the need for informed consent. Furthermore, physicians often lack training in faith-based strategies for navigating these ethical dilemmas. Suggested strategies for addressing these issues include cultural competency training, mediation and negotiation, ethics committee consultations, and community engagement. Future research should focus on bioethics while considering the role of faith in medicine. Additionally, integrating faith-based forms of healing into the medical curriculum could foster greater interest, belief, and respect for these practices.

O8.16

2:45 BALANCING THE NEEDS OF ENDANGERED ANIMAL SPECIES AND HUMAN POPULATIONS: A BIOETHICAL PERSPECTIVE

Karleigh N. Butler[1], Gary L. Hamil[2], Kenneth R. Butler[3]

[1]Mississippi College, Clinton, Mississippi, [2]Belhaven University, Jackson, Mississippi, [3]University of Mississippi Medical Center, Jackson, Mississippi

The goal of this paper is to cultivate a discussion surrounding the competing needs of conserving endangered species, and the rapid increase of human development. Endangered species fulfill unique ecological niches within ecosystems, and therefore contribute to the overall stability of the environment. Human needs often conflict with conservation efforts. These needs include, but are not limited to: agricultural expansion, urban development, and resource extraction. The objectives of this paper are to explore the ethical principles involved in prioritizing endangered species preservation alongside human needs, analyze how these ethical considerations manifest in policy, conservation, and socioeconomic contexts, and present potential frameworks for balancing these competing priorities through ethical decision-making. Several bioethical theories that apply to this exploration, include: utilitarianism (maximizing overall benefits), deontology (duty to protect life), and environmental ethics (intrinsic value of nature). Several case studies will be used to demonstrate how these principles are applied and include conservation laws, indigenous rights, and economic incentives for preserving endangered species. An unbiased view of the major stakeholders, including conservationists, local communities, governments, and industries will be shared. Protecting endangered species is ethically important and directly benefits human needs by maintaining healthy ecosystems, clean air and water, potential sources of new medicines, and serving as indicators of environmental health. Ultimately, protecting endangered species contributes to human well-being and resilience. Neglecting their conservation can lead to significant negative impacts on human populations. Ethical considerations regarding conserving endangered species include animal rights, human-animal interactions, and ecological integrity. Furthermore, these considerations must be placed on future generations to emphasize the importance of biodiversity. Conversely, ethical considerations for balancing endangered species protection with human needs include: sustainable development, habitat protection, conservation education, and legislation.

3:15 Divisional Business Meeting

Marine and Atmospheric Sciences

Chair: Remata Reddy

Jackson State University

Vice-Chair: Francis Tuluri

Jackson State University

Co-Chair: Duanjun Lu

Jackson State University

Co-Chair: Courtney Roper

University of Mississippi

Thursday, March 20, 2025
AFTERNOON
Hall L Room 1

12:50 Welcome and Opening

1:00 Invited Keynote Talk

NATIONAL WEATHER SERVICE JACKSON MEETING THEIR MISSION BY UTILIZING NOAA STUDENT PROGRAMS AND LOCAL RESOURCES TO INCREASE STUDENT ENGAGEMENT AND RECRUITMENT FOR PREPARING THE NEXT GENERATION

Bill Parker and Latrice Maxie

NOAA National Weather Service, Jackson, MS

The National Oceanic and Atmospheric Administration (NOAA) sponsors a number of student programs that foster learning, promote science integrity, encourage relationship building and provide hands-on job training. NOAA opportunities include research and job training through the Cooperative Science Centers at Minority Serving Institutions. Others include scholarships for students pursuing degrees in NOAA mission-related areas of study through the Jose E. Serrano Educational Partnership Programs. The William P. Lapenta summer internship program also provides invaluable experience for undergraduate students. NOAA line offices are an integral part of NOAA opportunities and would not be successful without them. The mission of the National Weather Service

is to protect life and property, where the local forecast offices are striving to meet the mission by training the next generation of forecasters. Students are hosted at various NOAA line offices, like the National Weather Service Forecast Office (NWSFO) in Jackson where the staff helps students develop research projects. The office integrates students into office operations, where they get on the job training. Student engagement is an important part of NWSFO Jackson operations which includes the volunteer program, mentoring and teaching at local universities, in addition to hosting a number of students from Cooperative Science Centers and the Educational Partnership Program.

O9.01

1:30 PARTICULATE MATTER STUDIES IN THE PASO-JUAREZ REGION

Duanjun Lu[1], Rosa Fitzgerald[2]

[1]Jackson State University, Jackson, MS, [2]University of Texas in El Paso, El Pasco, TX

The air quality model study for particulate matters in the region of El Paso, TX aims to utilize the Comprehensive Air-quality Model with extensions (CAMx) model to investigate various sources and the deposition effect. The CAMx is a publicly available photochemical grid model that simulates air quality over various geographic scales. It treats a wide variety of inert and chemically active pollutants, including ozone, particulate matter, inorganic and organic PM2.5/PM10, and mercury. In the study, we will use PSAT technology within the model to investigate the relationship between various sources and receptors. The modeling studies were performed over a four-nested domain scheme with spatial resolution of 36-, 12-, 3-km and 1km respectively. A few historical cases of blowing dust plume originated in the Chihuahua Desert area surrounding El Paso Count were selected to conduct sensitive tests through a coupling modeling system including weather forecast model (WRF) and air quality model (CAMx). The goal of study aims to apply an Eulerian photochemical dispersion model, Comprehensive Air Quality Model with Extensions (CAMx), to simulate a few high Particulate Matter (PM) episodes occurring in the region of El Paso, TX/Ciudad Juarez, Mexico and to evaluate the impact of various anthropogenic/biogenic emissions and boundary/initial conditions on PM concentrations. We will conduct several sensitivity studies through air quality modeling system to investigate the inherent spatial and temporal PM variations.

O9.02

1:45 STATISTICAL ANALYSIS OF ENTERIC DISEASES AND WATER QUALITY PARAMETERS IN THE STATE OF MISSISSIPPI

Vijaya Shankar, Remata Reddy, Mehri Fadavi

Jackson State University, Jackson, MS

Water is one of the most precious natural resources for all living beings on the Earth. Sufficient quantity of quality water is very essential for a healthy living. According to the recent WHO report (February, 2016), an estimated 1.9 million people rely on water supplies that are contaminated with feces. Sustainable Environment for the future generation" is a vital ecological goal to be achieved on a macro scale across the globe. The quality of the drinking water which is characterized by the water quality parameters like BOD, DO, E. coli, TDS, TSS determine the cause of Enteric diseases. The focus is on the surface water in the State of Mississippi. Enteric diseases prevalent in the State for the period 2004-2014 is retrieved from the MS Department of Health data reports. Water quality parameters (physical, chemical, and biological) are retrieved from the Water Quality Portal service sponsored by the United States Geological Survey (USGS), the Environmental Protection Agency (EPA), and the National Water Quality Monitoring Council (NWQMC). The data is collected from NWIS (National Water Information System and STORET (the EPA Storage and Retrieval Data Ware house). Analysis covers seasonal variations, (summer/winter) covering River basins of the relevant counties in the Health district V. They are then statistically recorded and analyzed using SAS 9.4, and disease outbreaks for various years and various health districts and the correlation between the water quality parameters and the related enteric diseases for the various counties in the Health district 5, for different years and for summer and winter seasons are studied. There is a significant difference among the health districts 2 and 3, 7 and 3 6 and 3, 4 and 5 and 8 and 5 with regards to the Total Enteric diseases. Among the diseases, Salmonellosis, and Shigellosis showed significant difference over the years and over the health districts. Hepatitis A and Salmonellosis showed a significant variation over the years. The number of outbreaks of Hepatitis A is the highest in 2004 and that of Salmonellosis in 2011. Total enteric diseases showed the highest number in 2007. Regression correlation between the various enteric diseases and the water quality parameters are studied and there is a positive correlation between Salmonellosis with Alkalinity and Temperature parameters. It demands a speedy action of providing safe and clean drinking water. As the population of the United States and the world keeps growing, more pressure is put on our water resources.

O9.03

2:00 AIR-SEA INTERACTIONS, VERTICAL MOTIONS, HIGH WINDS, AND HEAVY PRECIPITATION ASSOCIATED WITH LAND FALLING TROPICAL STORM LEE OVER THE GULF OF MEXICO USING REMOTE SENSING AND SATELLITE DATA

Remata Reddy, Francis Tuluri

Jackson State University, Jackson, MS

Tropical Storm (TS) Lee formed on September 2, 2011, from a broad but disorganized tropical wave that entered Western Caribbean in late August. While the core of storm meandered inland on September 4 roughly 50 miles (80

km) southwest of Lafayette, LA, squalls impacted the Gulf Coast the day prior. On September 4th, T.S Lee pressure drops to 986 mob and begins to make landfall on Louisiana-Mississippi coast. On September 5th, Lee makes landfall. Lee's high moisture content and slow speed promoted 24-hour rainfall totals more than 5 inches (127 mm) to 11 inches (281 mm) in most locations over Gulf States. Finally, on September 6th, remnants of T.S Lee were absorbed by cold front. 93L interacts with an upper-level low pressure system and slowly intensifies, observed at 200 mb surface map. Strong upper-level winds from the northwest generated 30 knots of wind shear over 93L, keeping the heaviest thunderstorms disorganized. Alongside cold, dry air aloft**,** these mechanisms hampered 93L's intensification. Depression positioned south of high-pressure ridge provided weak steering currents. SSTs at 88°F (31.3°C) provided plenty of energy for heavy rain potential. Climatic conditions persist, albeit intensification upgrade towards tropical storm. Bulk of T.S Lee remained over prime Gulf waters as paradoxical situation occurred—though high pressure-ridge slowed systems movement allowing potential intensification, simultaneous influx of cold dry air from west quadrant (alongside moderate wind shear) diminished T.S Lee's intensification ability. Despite lacking wind/pressure intensity, T.S Lee absorbed large amounts of moisture, contributing to intense precipitation. We further investigated possible relationships between large-scale heat fluxes and intensity changes associated with the landfall of T.S Lee, and examining vertical motions associated with intensity change of T.S. Data on Convective Available Potential Energy (CAPEV), sea level pressure, and wind speed were obtained from Atmospheric Soundings and NOAA National Hurricane Center (NHC), respectively for period of August 25 to September 10, 2011. We developed an empirical model and C++ program to calculate surface potential temperatures and heat fluxes using above data. Vertical motions were computed using CAPEV values. Studies showed large-scale heat fluxes reached maximum (4500W/m2) with central pressure 988 mob. Convective Available Potential Energy (CAPEV) and vertical motions peaked during landfall. Large vertical atmospheric motions associated with land falling T.S Lee produced severe weather including thunderstorms, tornadoes and heavy precipitation.

O9.04

2:15 FLOOD ANALYSIS USING SATELLITE IMAGES IN A HEAVILY CLOUDED REGION

Raihan Uddin Ahmed, Md Mamunur Rashid

The University of Southern Mississippi, Ocean Springs, MS

Satellite images has become widely used for near real-time and fast flood mapping because of its strong independence from flooding processes and drivers. This makes it suitable for any type of flood, whether pluvial, fluvial, or compound flood. Nevertheless, mapping floods using satellite pictures is difficult because of the presence of cloud cover and shadows, particularly in areas experiencing frequent floods during monsoons characterized by large clouds, such as South Asian countries. Rapid flood identification is commonly achieved using optical radar images, such as Landsat, either alone or in conjunction with Synthetic Aperture Radar (SAR) photos, such as Sentinel-1, within the multisource flood mapping approach framework. Due to the presence of clouds and cloud shadows, these optical images are generally constrained to conveying flood inundation information. This study introduces a straightforward and efficient method for delineating floods using Sentinel-1 SAR data. The targeted pixels are identified by analyzing the backscatter values of seasonal water bodies. Synthetic Aperture Radar (SAR) satellite images are unaffected by clouds, making them well-suited for visually representing floods in heavily clouded regions. This approach utilizes the cloud-based computing capabilities of Google Earth Engine (GEE) to track the magnitude of flooding during the catastrophic flood in the northeastern region of Bangladesh in 2022. The results exhibit a level of comparability with the Global Flood Awareness System (GloFAS) and other commonly used approaches, such as the multisource flood mapping (MSFM) capability. In addition, our method produces flood maps equivalent to GloFAS in cases when MSFM inaccurately estimates flood extent because of cloud obstructions. Furthermore, the method is applied for mapping the flood extent for the monsoon months (May to October) from 2015 to 2023, thereby generating a probabilistic flood map. Two methods of delineating flood depth are devised using six different digital elevations. We assess the uncertainty associated with 6 different DEMs and 2 different methods. This work enhances the utilization of SAR images for rapid flood delineation, depth estimation, and risk assessment, enabling decision-makers and emergency responders to get precise information during a flooding event as well as future mitigation measures. This work also provides insight into the uncertainty associated with flood depth estimation.

O9.05

2:30 CROSS-VALIDATION OF AIR QULAITY AND ASTHMA PREVELENCE TRENDS (IN FULTON, GEORGIA), BY MACHINE LEARNING REGRESSION MODELING

Francis Tuluri, Remata Reddy, Shamari Johnson

Jackson State University, Jackson, MS

Study of air quality is of great importance in scientific literature because of its direct impact on public health particularly vulnerable populations. The association of air quality with health though complex, there has been growing interest to understand the influence of air quality on cardiovascular and respiratory diseases as in elevating asthma prevalence. For example, Georgia Department of Public Health showed that in 2018, the overall asthma prevalence among adult Georgians (age 18 years and older)

was 8.9%, and the overall asthma prevalence among children in Georgia aged 0-17 years was 7.6% with differences in asthma prevalence existed by demographic characteristics. A study on asthma exacerbation trends in a highly populated Fulton - a urban county in Georgia, for the period 2018-2019, showed that there is a significant contributing relationship between certain air pollutants (NO2, PM2.5, PM10, and pollen) and asthma ER visits in children. The present study is intended to apply machine learning regression modeling as a cross-validation of air pollutants linkage to asthma as reported by Ikhile, O et. al. In particular, the present study explores time series techniques of machine learning modeling to cross-validate the results obtained from the method of using traditional statistical tools and to examine the influence of air pollutants on public health. The air quality data is and asthma prevalence data is taken from taken from US Environmental Protection Agency (EPA), and the weather data is taken from Ikhile, O et. al. The historical data is analyzed using statistical tools of Python programming, and machine learning models, such linear regression and ARIMA with time lag are applied to obtain prediction and provide insights into the complex relationships between pollutants and atmospheric conditions. Using both traditional statistical analytics and machine learning models, this research aims to develop predictive tools for forecasting future air quality trends, which is critical for informed policy-making and environmental planning. Moreover, this work highlights the importance of considering machine learning modeling in air quality studies and sets the stage for further research into mitigation strategies aimed at reducing pollutant emissions and their effects on human health and the environment.

References

Ikhile, O et. al;
https://digitalcommons.georgiasouthern.edu/bee-facpubs/344/

O9.06

2:45 EVALUATING NATURE-BASED SOLUTIONS WITH FLOOD RISK MODELLING TO HELP IMPROVE GREEN URBAN DEVELOPMENT IN AN UNDER-RESOURCED COASTAL COMMUNITY

Md. Shahinur Rahman

The University of Southern Mississippi, Ocean Springs, MS

Coastal cities are at an increased risk from climate change that contributes to sea level rise and increasing extreme precipitation events resulting in compound flood events. To identify management strategies and address compound coastal floods, data and models integrating storm surge, rainfall, elevation, and other factors are needed.

Nature-based solutions (NBS) can complement traditional stormwater engineering solutions and help to reduce compound flooding risk while also improving environmental sustainability. Deciding on what NBS are appropriate requires the involvement of stakeholders including city officals, community representatives, and subject-matter experts. These stakeholders are essential for determining prior flood locations, mapping risk, and providing input on which NBS are suitable to integrate into their community. In addition, modelling of flood hazards by integrating various NBS options and evaluating their effectiveness on compound flood risk reduction is important to better communicate potential solutions back to the stakeholders.

Moss Point is an under-resourced city on the Mississippi Gulf Coast, where a study is combining flood-risk modelling with potential NBS solutions. We will conduct different stakeholder meetings to introduce and evaluate potential NBS solutions. Moreover, a suite of modeling tools that cover a wide range of hydrologic, hydraulic, and hydrodynamic parameters will be evaluated for their effectiveness in assessing and prioritizing different NBS options and their benefit to the community.

This study will provide valuable insight on the importance of stakeholder engagement in scientific research, how NBS integration can benefit flood risk reduction, and how green urban development can contribute to improving community resilience.

THURSDAY, March 20, 2025

EVENING

4:00 DODGEN LECTURE /AWARDS CEREMONY

Hall B

5:00-7:00 GENERAL POSTER SESSION
(Immediately following Dodgen Event)

P9.01

AIR - SEA INTERACTIONS, HEAT FLUXES, HIGH WINDS, HEAVY PRECIPITATION ASSOCIATED WITH HURRICANE HELENE

Natalie Courtney, Mia Robinson, Remata Reddy

Jackson State University, Jackson, MS

Hurricane Helene reached its peak strength as a category 4 hurricane, and then made landfall in Florida Big Bend, on Thursday, September 26th 2024, with torrential rain and peak winds up to 140 mph. Helene caused catastrophic damage to Florida's Big Bend as well as widespread devastation to the Gulf coast communities Helene was the first known Category 4 storm to hit Florida's Big Bend region since records began in 1851. Helene with speed, moving at 140 miles per hour with lowest pressure 938 mb, allowed to keep more strength as Helene moved inland. With an estimated 234 deaths and 113 billion in damage. Hurricane Helene also affected Georgia, North Carolina, South Carolina, Tennessee, and Virginia. We developed the predictive model by using the ideal gas law and bulk

model to calculate the large-scale heat fluxes associated with Hurricane Helene. Large-scale heat fluxes are the measurement of energy flow from the ocean to the atmosphere. We used NOAA Satellite, BUOY and RADAR data to collect wind speed, air temperature, and ocean temperature and precipitation. Our results show that Hurricane Helene reached maximum strength 1470 J heat fluxes, high winds maximum 140 mph and heavy precipitation variability during its path over the USA east coast. There is an inverse relationship between pressure and heat fluxes. This prediction serves as an early warning system for rapid changes of hurricane intensity.

P9.02

TACTICAL OCEAN FEATURES BY REMOTE SENSING THROUGH SWOT

Alyssa Silvas[1, 2], Christian Fuller[1, 2], David Guenaga[1, 2], Danielle Carpenter[1, 2], Gregg Jacobs[2, 3], Joseph D'Addezio[2, 3]

[1]Naval Oceanographic Office, [2]Stennis Space Center, MS, [3]Naval Research Laboratory

The Remote Sensing Branch of the Ocean Measurements Division in the Oceanographic Department of the Naval Oceanographic Office (NAVOCEANO) is responsible for providing a variety of near-real-time ocean measurements to the U.S. Navy, as well as other government agencies. The Surface Water and Ocean Topography (SWOT) satellite represents a significant advancement in ocean altimetry, designed to provide high-resolution measurements of sea surface height. Utilizing a Ka-band Radar Interferometer (KaRIn), SWOT employs both nadir and swath measurement techniques to capture comprehensive data on ocean dynamics. Nadir measurements deliver precise sea surface height data directly beneath the satellite's orbit with a 1-kilometer resolution, while swath measurements extend coverage to approximately 120 kilometers, enabling detailed mapping of ocean topography and surface features. This dual capability significantly enhances our understanding of ocean circulation, wave dynamics, and the interactions between the ocean and atmosphere. SWOT's capabilities are utilized by the scientists at the U.S. Naval Research Laboratory (NRL), the Altimetry Data Fusion Center (ADFC) team at NAVOCEANO, and customers such as Fleet Numerical Meteorology and Oceanography Center (FNMOC). NRL develops SWOT processing software, the ADFC team at NAVOCEANO make and distribute SWOT products, and FNMOC uses those SWOT products to improve ocean models.

P9.03

MAPPING FLOODING SCENARIOS OF HURRICANE KATRINA ON NEW ORLEANS

Harvana Laing, Duanjun Lu

Jackson State University, Jackson, MS

Hurricanes are one of nature's most powerful storms. They produce strong winds, storm surge flooding, and heavy rainfall that can lead to inland flooding, tornadoes, and rip currents. This project explores the impacts of Hurricane Katrina of 2005 on the New Orleans Area. In this work, ArcGIS Pro was used to look at the impacts and affects of hurricane Katrina specifically on the New Orleans area. The ArcGIS Pro was used to create a visual representation of the flooding and storm surge according to various scenario in order to bring forth awareness for those living in areas prune to hurricanes and those who are more vulnerable to hurricanes.

P9.04

CONSTRUCTING HEAT RESILIENCE INDEX IN ST. LOUIS, MO

Zion Murphy, Duanjun Lu

Jackson State University, Jackson, MS

The Urban Heat Island effect is the weather phenomena that cause the inner Urban parts of Cites to be warmer then the surrounding areas. This can cause extremely dangerous heat in the summer. Those who are most likely to fall victim to this phenomena include the elderly and low income citizens. The studied area is St. Louis, Mo. We will make the maps of a Heat Resilience Index for the City.

In this project, ArcGIS Pro is used to build a Heat Resilience Index using both demographic and satellite data. The Data is then used to determine areas who are at the greatest risk of dangerous conditions in the summer due to the urban heat island effect. The main objective is to determine areas in St. Louis who are most at risk during the summer and to determine who would most benefit from Heat mitigation methods such as tree planting. It is found that the City of St. Louis is in much greater need for Heat Migration strategies. Standard deviation and Percentage factors for the HRI where often maximized within the City. The socioeconomic data gathered from the 8 areas with the highest HRI can be extrapolated to the rest of the city. Socioeconomic factors such as High poverty rates and High spending of income on rent all combine to make the City of St. Louis very vulnerable during the summer months.

P9.05

REAL TIME OYSTER'S GAPING MEASUREMENT SYSTEM

Canhao Wang, MD Hasan, Temiloluwa Adesola, Kayla White, Abdulrhman Abdullah, Tatiyana Moore, Namarta Kumar, Mahlangu Nzunda, Kamal Ali, Brent Thoma, Ali Humos

Jackson State University, Jackson, MS

This study presents a real-time oyster gaping behavior monitoring system based on FFT and machine learning models, providing insights into spawning, feeding, and aging processes. The system uses ESP32 and AWS to enable high-frequency data collection and cloud storage. Experimental results demonstrate the system's

effectiveness in detecting critical physiological activities in oysters. This technology holds promising applications in aquaculture and ecological monitoring.

Analyzing oyster gaping behavior is essential for understanding oyster health, behavior, and environmental interactions. This study builds on current methods to develop a fully automated, real-time system for measuring oyster gape, with the goal of gaining insights into key physiological conditions such as spawning, feeding, and aging.

Our system combines HAL 2425 Hall Effect sensors paired with magnets and an ESP32 microcontroller to accurately measure the distance between each sensor and magnet attached to an oyster shell. Data is collected at 10 Hz and transmitted via Wi-Fi or cellular network to AWS cloud storage, supporting remote analysis and continuous monitoring. Integrating cloud computing into this setup reduces the need for constant laboratory presence by allowing remote access.

To ensure accuracy, each sensor undergoes a linearization process before deployment, converting ADC values into precise distance measurements that reflect oyster gape. This continuous data stream can then be processed through FFT to analyze power spectral density. Spectral analysis reveals notable power spikes in the 0.3-1.3 Hz range, signaling spawning events. Initial results suggest that applying a 0.1 dB threshold within this range provides reliable spawning detection. This dataset also supports machine learning models for predicting spawning, feeding, and other behavioral patterns.

This research introduces a scalable and innovative solution for real-time oyster gape monitoring, with applications in aquaculture management, ecological research, and marine biology. By combining sensor technology, microcontrollers, cloud computing, and AI, this system offers a solid foundation for advancing bivalve behavioral studies.

Oysters used in this research were sourced from the Mississippi Gulf, provided by the Gulf Coast Research Laboratory (GCRL), and monitored under controlled lab conditions optimized for growth and behavior observation. Data from this study will be made available through the MBRACE project data repository.

Disclaimer : This project was paid for [in part] with federal funding from the U.S. Department of the Treasury, the Mississippi Department of Environmental Quality, and the Mississippi Based RESTORE Act Center of Excellence under the Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States Act of 2012 (RESTORE Act). The statements, findings, conclusions, and recommendations are those of the author(s) and do not necessarily reflect the views of the Department of the Treasury, the Mississippi Department of Environmental Quality, or the Mississippi Based RESTORE Act Center of Excellence. Additional funding provided by the National Science Foundation under Award No. 2119878. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

P9.06

SMOKE AEROSOL IMPACT ON HAIL AND TORNADO THERMODYNAMICS

Danasia Sproles[1], Mayra Oyola Merced[2], Ruby Burgess[2]

[1]Jackson State University, Jackson, MS, [2]University of Wisconsin-Madison, Madison, WI

Wildfires are expected to increase in frequency and severity due to climate change, with significant implications for atmospheric conditions and weather systems in distant regions. Wildfire aerosols, composed of fine particulate matter, can absorb and scatter solar radiation, altering atmospheric stability and thermodynamics. This study examines the potential impact of wildfire smoke on weather conditions leading to severe weather events, particularly during tornado outbreaks. The April 2011 tornado outbreak in the United States, one of the most destructive on record, occurred alongside wildfire activity in South America, which transported smoke aerosols northward, affecting air quality and potentially atmospheric conditions in parts of the United States. By analyzing the distribution of these aerosols and their influence on atmospheric thermodynamics, particularly Convective Available Potential Energy (CAPE), we seek to understand how aerosol presence might have contributed to the intensity of the tornado outbreak. This research aims to explore the role of aerosol interactions in severe weather dynamics, specifically how changes in aerosol distribution can modify atmospheric stability, potentially amplifying conditions favorable for extreme weather events like tornadoes.

P9.07

THE CLIMATE IMPACTS OF OCEANS AND HUMAN ACTIVITY ON SURFACE TEMPERATURES AND PRECIPIATIONS OVER THE MISSISSIPPI REGION, USA

Reuben Paradeshi[1], Aashrita Cheruku[1], Avanthi Remata[1], Remata Reddy[2], Francis Tuluri[2]

[1]Clinton High School, Clinton, MS, [2]Jackson State University, Jackson, MS

In recent years, climate science has been interdisciplinary and very data intensive. It has included data revolving around hydrology, ecology, and ocean sciences. Coastal communities in the Southeast are already experiencing warmer temperatures and the impacts of sea level rise, including seawater flooding. Higher temperatures and greater demand for water will strain water resources in the Southeast. Incidences of extreme weather, increased temperatures, and flooding will impact on human health, infrastructure, and agriculture. Sea level rise is expected to contribute to increased hurricane activity and storm surge, and will increase the salinity of estuaries, coastal wetlands,

tidal rivers, and swamps. The southeast of the United States is a unique region containing an attractive blend of wetlands, plateaus, and everything in between. The ecosystems and populations in this region are, among many others, experiencing the effects of global warming. These effects include rising sea levels, increasing average temperatures, droughts and floods. One specific example that correlates to these effects is heavy precipitation coming through the Gulf of Mexico due to increases in temperatures and sea level rise due to global warming. This research aims to examine climate variability-how yearly temperature and precipitation values compare with the long-term average-and its impact on Mississippi. The big climate data for the surface temperatures and precipitation for the period 1950-2023 for Mississippi region have been obtained from the National Weather Service, NOAA. Through our analysis, we have observed 2 to 3-month seasonal oscillation in precipitation and upward trends in temperatures within the region that directly correspond to human activity. If these trends continue, human health and agriculture in this region will steadily decline.

P9.08

TROPICAL CYCLONES/HURRICANES: UNDERSTANDING, PREDICTION, AIR-SEA INTERACTIONS, HEAT FLUXES, HIGH WINDS, VERTICAL MOTIONS, HEAVY PRECIPITATION, HIGH IMPACTS AND RESILIENCE, USING SATELLITE, BUOY AND RADAR DATA

Mia Robinson[1], Latrice Maxie[2], Remata Reddy[1], Ramzi Kafoury[1]

[1]jackson State University Jackson, MS, [2]NOAA

The study investigates air-sea interactions, heat fluxes, high winds, precipitation variability, high impacts, and resilience associated with landfalling hurricane Harvey over the Gulf of Mexico using Satellite and RADAR data. We collected data for wind speed, air and ocean temperatures, air pressure, wind speed, and precipitation from RADAR, NOAA NDBC, and NASA. The study uses bulk and empirical models, such as the Hurricane Predictive Index (HPI), for better understanding and prediction of air-sea interactions associated with Hurricane Harvey. Hurricane Harvey was a category four storm that made landfall in Texas near the Gulf of Mexico on August 25, 2017. It created 180 billion dollars worth of property damage and caused a total of eighty-two fatalities. We used bulk models to calculate heat and moisture fluxes. We developed an empirical model, the Hurricane Predictive Index (HPI) to calculate and predict hurricane intensity of Harvey and a bulk model used to calculate vertical heat fluxes. Large-scale heat fluxes are the energy flow per unit area per unit of time. Hurricane Harvey was at its strongest point on 26 August 2017 with a low pressure of 938 mb and a wind speed of 150 miles/hour. The results show an inverse relationship between pressure and heat fluxes and 2-5-day oscillation in vertical heat fluxes. The air-sea interface was high at 7.1 0 C, with large atmospheric cooling, a larger precipitation variability, and an HPI of -24.97 associated with low pressure. The present study will form an early warning system to predict landfalling hurricanes associated with severe weather. In the future, we could use satellite data and empirical models to determine the severity, hurricane resilience, and tract of land-falling Atlantic Hurricanes.

END OF THURSDAY'S PROGRAM

Mathematics, Computer Sciences and Statistics

Co-Chair: Ping Zhang

Alcorn State University

Co-Chair: Jamil Ibrahim

Independent Scientist

Thursday, March 20, 2025
MORNING
Hall D Room 12

8:20 Welcome and Opening

O10.01

8:30 ALGORITHMS FOR SOLVING SUDOKU PUZZLES

Zheng Chen

Alcorn State University, Lorman, MS

The Sudoku puzzle is a popular combinatorial problem that requires the placement of digits in a 9x9 grid such that each number from 1 to 9 appears exactly once in every row, column, and 3x3 subgrid. Solving Sudoku can be approached using various algorithms, with backtracking being the most commonly used. In this presentation, we investigate an efficient algorithm for solving Sudoku puzzles, leveraging **Minimum Remaining Values (MRV)** and **weighted prioritization** based on the number of known values in each cell's row, column, and box.

The MRV heuristic, which selects the cell with the fewest legal values remaining, is widely used in constraint satisfaction problems as it can significantly reduce the search space by prioritizing the most constrained variables first (Kask, 2009). This, combined with a weighted selection strategy, improves the efficiency of the backtracking process. In our approach, we introduce a weighting mechanism that prioritizes cells based on the number of known values in their row, column, and 3x3 subgrid, aiming to solve the puzzle by focusing first on those areas that are most constrained. This weighting system enhances the MRV heuristic by directing the search

towards the more constrained regions, resulting in a more systematic exploration of the solution space.

To evaluate the effectiveness of this algorithm, we implement it in both **Octave** and **Python**, comparing the computational efficiency and performance across various Sudoku puzzle types. Through numerical experiments, we demonstrate that the combination of MRV and weighted prioritization significantly reduces the solving time, especially for puzzles with fewer initial clues.

By utilizing this advanced strategy, we provide new insights into how algorithmic improvements can optimize the solving process for combinatorial problems like Sudoku, making it not only a valuable approach for Sudoku but also applicable to broader constraint satisfaction problems.

O10.02

8:50 A STUDY ON HYBRID SORTING ALGORITHMS

Lixin Yu, Ping Zhang, Jermiah Billa, Jacoby Howard, Bhavya K. Purushothama, Pearl P. Kandikatla, Venkata S. Bandi

Alcorn State University, Lorman, MS

This study surveys the recent studies on hybrid sorting algorithms, with a focus on the threshold array size to switch the sorting algorithms. Previous studies reported that high performance sorting algorithms based on divide and conquer, such as mergesort and quicksort, may have a reduced efficiency with very small dataset. Even with large dataset, this category of sorting algorithm's efficiency will be affected by this limitation because the key of this category of sorting algorithms is to break a big dataset into smaller and smaller datasets to process. The inefficiency with small datasets will appear when the algorism sorts the smaller datasets broken from the big dataset. On the other hand, simple sorting algorithms such as bubble sort or insertion sort may have better performance with small dataset, even though their performance with bigger dataset is not desirable. The idea of hybrid sorting algorithm is to use more than one sorting algorithms in the process of sorting big dataset to avoid the deficiency of each category of sorting methods. Big dataset is processed using the more efficient divide and conquer sorting algorithm first, but the simple sorting algorithms will be used when the dataset is broken into small enough segment. This study does a time and space complexity study to verify the results from the literature study. The study also analyzes the optimum threshold size of the array to switch the sorting algorithms from divide and conquer to simple comparison-based sorting. Result of real sorting of large set of data will be presented to verify the correctness of the theoretical analysis.

O10.03

9:10 EVALUATING THE GHANAIAN HIGH SCHOOL STUDENTS' NON-PERFORMANCE IN MATHEMATICS IN GHANA

Kwasi Nimo Kwarteng[1], Clement Yeboah[2]

[1]Cranford Community College, Hounslow, UK, [2]The University of Southern Mississippi, Hattiesburg, MS

The purpose of this quantitative survey research was to explore the Ghanaian Senior High Schools Students' non-performance in Mathematics in Kumasi. The researchers employed purposive sampling technique to sample 20 teachers and 60 students from Kumasi Anglican and Adventist Senior High Schools for the study. The study was based on evaluating students' attitude toward mathematics and the influence of the teacher student's relationship on students' performance in mathematics. Questionnaire was chosen as a tool used to collect data from participants - teachers and students. The study results indicated that students' attitude toward mathematics was strongly influenced by teachers' relationship with them. The study highlighted the importance of adopting innovative teaching methods to make mathematics more engaging for students. Teachers can use technology and other creative approaches to make the subject matter more relatable to students, leading to better engagement and performance. Also, the study emphasized the need for personalized support to help students who are struggling with mathematics. Teachers can provide one-on-one tutoring or extra homework help to students who need it, improving their understanding and performance. Schools can provide additional resources to support mathematics education, such as after-school programs or math clubs. These programs can provide students with additional support and opportunities to practice and reinforce their math skills. The study highlights the importance of collaboration between teachers, schools, and parents to monitor students' progress and support their education. Parents can play a crucial role in creating a positive learning environment at home and support their children's academic success. By implementing the general solutions proposed in this study, we can improve students' math skills and support their academic success. Improved outcomes in mathematics can lead to better opportunities for students in higher education and the workforce. The study concluded that by addressing the possible causes of students' poor performance in mathematics and implementing general solutions to improve their performance, we can support their academic success and improve their future prospects.

O10.04

9:30 AUTOMATING VEHICLE DATA EXTRACTION: FROM IMAGES TO STRUCTURED TABLES

Puneeth Kumar Bolugallu Padmayya[1], Ping Zhang[2]

[1]Department of Institutional Research & Assessment,

Alcorn State University, Lorman, MS, [2]Department of Mathematics and Computer Science, Alcorn State University, Lorman, MS

In the age of data-driven decision-making, efficient access to information is crucial. Extracting structured data from unstructured sources, particularly from tabular data, enables valuable insights across various fields. This research addresses the specific challenge of transforming tabular data from vehicle images into structured formats, providing significant utility in applications such as license plate recognition and vehicle document digitization for fleet management and insurance.

We present an automated system for extracting and structuring vehicle-related image data. Our approach integrates image processing, Optical Character Recognition (OCR), and deep learning to identify, segment, and classify data fields from vehicle images. The process starts with image preprocessing to improve quality, followed by region detection to locate text and information areas. A Convolutional Neural Network (CNN) model is then used to extract relevant data, which is organized into structured tables through a post-processing module.

Experiments demonstrate high accuracy and efficiency across varying image conditions, validating the robustness of our approach. This system reduces manual effort, accelerates data processing, and enhances reliability. By automating the extraction of vehicle data from images, this research provides a scalable solution for data management, regulatory compliance, and operational improvements in automotive-related sectors.

O10.05

9:50 THEORY OF COMPUTATION IN AUTONOMOUS DRIVING SYSTEMS

Venkata Sri Sai Satya Varun Bandi

Department of Math and Computer Science Alcorn State University Lorman MS

Autonomous driving systems are transforming the transportation industry through sophisticated algorithms and computational models, enabling vehicles to operate independently of human control. At the heart of these systems lies the Theory of Computation, a field that provides crucial methodologies for processing input and producing real-time responses. Key concepts, including finite automata, formal languages, and Turing machines, are applied to create decision-making and path-planning algorithms essential for autonomous navigation.

Finite state machines play a critical role by modeling vehicle behaviors and interactions with other road users, ensuring safe and adaptive responses in dynamic environments. Additionally, graph theory and optimization techniques are integrated to facilitate efficient routing and effective obstacle avoidance, balancing the need for quick decisions with computational efficiency. This theoretical approach helps mitigate challenges like computational complexity and the demands of real-time processing, enhancing the reliability and safety of autonomous vehicles.

Applications of these systems are expansive, benefiting public transportation, logistics, and personal mobility, where the safety and consistency of autonomous systems are essential. Through the Theory of Computation, autonomous driving not only aims to improve traffic flow and reduce accident rates but also contributes to a broader vision of intelligent transportation systems. This ongoing development reflects a significant step forward in transportation technology, supporting a future where smart, self-sustained vehicles can improve quality of life by reducing congestion, minimizing environmental impact, and enhancing road safety in critical sectors.

O10.06

10:10 AI-DRIVEN ALUMNI ENGAGEMENT AND NETWORKING PLATFORM

Bhavya Kaanadaka Purushothama, Pearl Priyadarshini Kandikatla

Department of Math and Computer Science, Alcorn State University, Lorman, MS

The "AI-Driven Alumni Engagement and Networking Platform" is designed to foster valuable connections between students and alumni, creating opportunities for mentoring, career advice, and collaboration. This platform utilizes AI to match students with alumni based on shared interests, career paths, and geographic location, making networking more personalized and impactful. For example, a student interested in environmental policy might be matched with an alum working in that field, facilitating relevant guidance and professional growth.

Using AI algorithms that understand user preferences for building professional relationships, the platform tailors each match to enhance the quality of interactions and increase engagement. This personalized approach transforms traditional alumni networks into active communities where meaningful connections are prioritized. Beyond individual benefits, institutions gain insights into engagement trends, which helps them improve outreach and strengthen alumni relations. The platform's secure design and intuitive interface further supports users by making interactions easy, accessible, and trustworthy.

This project holds great research potential, especially in the development of AI models that understand and adapt to different networking preferences, thereby enhancing the value of each connection. By supporting a lifelong network that evolves with users' career paths and interests, this platform becomes a powerful tool for professional and personal growth. Ultimately, the AI-Driven Alumni Engagement and Networking Platform benefits students, alumni, and institutions, contributing to a more engaged and connected community.

10:30 BREAK

O10.07

10:40 EXPLORING ROAD NETWORK EFFICIENCY: SHORTEST PATHS AND GRAPH ANALYSIS WITH BFS AND A* ALGORITHMS

Xiuquan Wang, Brookins Mason

Department of Mathematics and Computer Science, Tougaloo College, Tougaloo, MS

This project focuses on network analysis of road networks across Texas, Pennsylvania, and California, using data from the Stanford Large Network Dataset Collection. In this road network, intersections and endpoints are represented as nodes, while roads connecting them are modeled as undirected edges. To analyze the network, we first apply Breadth-First Search (BFS) to create subgraphs, each containing 1000 nodes, for more manageable analysis. The A* algorithm is then employed to compute the shortest path between two randomly selected nodes within these subgraphs, optimizing for distance, time, and cost. Beyond finding optimal paths, this study delves into the structural properties of the subgraphs by comparing them with the original, full-sized road networks. We compute graph metrics such as degree distribution, centrality measures (including betweenness and closeness centrality), clustering coefficient, and average path length. These metrics allow us to evaluate the similarities and differences in structure between the original networks and their subsampled versions. Python libraries, including NetworkX, are utilized for both implementing the algorithms and conducting the network analysis. This research highlights the importance of network structure in road network analysis and the impact of subsampling on key graph characteristics, providing insights into both pathfinding efficiency and the underlying topology of large-scale road networks.

O10.08

11:10 EFFECT OF THE SPACING BETWEEN MVGS ON FLOW CONTROL

Shiming Yuan, Caixia Chen, Yonghua Yan

Jackson State University, Jackson, MS

A micro vortex generator (MVG) is a thin, passive control device used to manage supersonic boundary layer flow. Its vortex structures, especially the annular vortex, have been shown to effectively reduce shock-induced separation zones in supersonic flows. This study performed large eddy simulations (LES) of supersonic flow controlled by two MVGs arranged in parallel with varying spacings. The different spacings impacted the interaction of the vortex structures generated by the MVGs. Detailed three-dimensional flow field data, particularly the vortex structures generated by the two MVGs, was obtained through numerical simulation. The results indicate that the vortex structures generated by the two parallel MVGs have a significant mutual influence downstream, with extensive merging processes occurring in both the spanwise and streamwise vortices. As the flow progresses downstream, the vortex structures become more complex but are strengthened, enhancing their effectiveness in controlling the supersonic boundary layer.

O10.09

11:30 MACHINE LEARNING PREDICTION FOR THE TEMPORAL EVOLUTION OF THE VORTEX STRUCTURE IN HIGH-SPEED COMPLEX FLUID DYNAMICS

Caixia Chen, Yonghua Yan

Jackson State University, Jackson, MS

While machine learning has significantly advanced various scientific fields, predicting 3D complex flows remains challenging. In this study, we address this by leveraging high-fidelity numerical solutions from prior simulations. Our approach involves a machine learning-based method tailored for the 3D evolution of coherent vortex structures in high-speed flows. We employ advanced vortex identification techniques, Principal Component Analysis (PCA) to extract common spatial modes and their time coefficients. Deep learning-based time series models predict these coefficients, allowing us to reconstruct the temporal development of major coherent structures within complex fluid flows. Our predictions show strong consistency with numerical simulations, demonstrating the effectiveness of our approach in capturing intricate 3D flow dynamics.

11:50- 12:30 Divisional Meeting

1:30-2:30 Keynote

Title: ADVANCING BIOMEDICAL RESEARCH AND HEALTHCARE THROUGH ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Joe Zhang

School of Computing Sciences and Computer Engineering, University of Southern Mississippi, Hattiesburg, MS

O10.10

2:40 A HIGH ORDER COMPACT CORRECTION SCHEME FOR COMPUTATIONAL FLUID DYNAMICS

Yonghua Yan, Caixia Chen

Jackson State University, Jackson, MS

A new high-order correction technique is introduced to boost the accuracy of numerical simulations for high-speed flows. This method enhances the numerical flux function for derivatives through compact-based higher-order corrections. Despite the significant accuracy improvements, the additional computational cost of the new method is only slightly higher than that of the original WENO. When applied to lower-order schemes, the method also demonstrates its capability to enhance both accuracy and robustness. Numerical experiments show that it provides greater sharpness in capturing shock waves and

better precision in resolving small-scale structures under complex conditions.

O10.11

3:00 SIMULATION OF AN ANALOG CLOCK WITH PYTHON

Arqawan Noori

MCIS, Mississippi Valley State University, Itta Bena, MS

This project is a real-time visualization of an analog clock using the graphics capability of Python. The implementation includes a round-faced clock with hour, minute, and second hands to denote the time through smooth animations. Trigonometric functions are used to simulate the rotations of the hands, whose implementation has real-time updates on the basis of system time. The project incorporates a number of design elements related to basic programming concepts: rendering graphics, keeping time, and object-oriented design. This project can be served as both a functional watch and an educational example.

Thursday, March 20, 2025

EVENING

4:00 DODGEN LECTURE /AWARDS CEREMONY

Hall B

5:00-7:00 GENERAL POSTER SESSION

(Immediately following Dodgen Event)

Hall C

P10.01

SCAN STATISTICS ON NON-HOMOGENEOUS POISSON PROCESSES WITH APPLICATION IN COPY NUMBER VARIATIONS

Asanka Duwage[1], *Tung-Lung Wu*[1]

[1]*Mississippi State University, Starkville, MS*

This poster presents a distribution-free, data-driven method for detecting anomalies in Non-Homogeneous Poisson Processes (NHPP) using scan statistics in a two-sample testing framework. This method is applied to identify Copy Number Variations (CNVs) in cancer genomics. Our approach used a generalized extreme value theorem to estimate the significance level of locally normalized counts in moving windows, which are dependent sequences. This method avoids the need to assume a specific intensity function. Instead, it uses the extremes of the data selected from a given threshold to compute critical values, offering a computationally efficient solution. However, the locally normalized count satisfies the distributional mixing condition to use GEVD on dependent data. We explore multiple configurations of cluster locations and intensities, analyzing their effects on detection power and Type I error rates. Our results demonstrate the effectiveness of locally normalized count in handling non-stationary processes and improving anomaly detection reliability. The proposed method is characterized by its computational efficiency, robustness, and suitability for analyzing large-scale genomic data with inherent non-stationarity.

P10.02

CLUSTER DETECTION USING SCAN STATISTICS FOR HIGH DIMENSIONAL NONHOMOGENEOUS POISSON

Tung-Lung Wu

Mississippi State University, Starkville, MS

Cluster/anomaly detection for one or two-dimensional homogeneous Poisson processes has been widely studied. However, there is little work done for higher dimensional Poisson processes, especially nonhomogeneous Poisson processes. In this talk, we develop an algorithm to implement the scan statistics method for cluster detection when data are generated from high-dimensional nonhomogeneous Poisson processes. The idea is instead of working on the high-dimensional space, we detect clusters through one-dimensional projection.

P10.03

EXPLORING ROAD NETWORK EFFICIENCY: SHORTEST PATHS AND GRAPH ANALYSIS WITH BFS AND A* ALGORITHMS

Xiuquan Wang, Brookins Mason

Department of Mathematics and Computer Science, Tougaloo College, Tougaloo, MS

This project focuses on network analysis of road networks across Texas, Pennsylvania, and California, using data from the Stanford Large Network Dataset Collection. In this road network, intersections and endpoints are represented as nodes, while roads connecting them are modeled as undirected edges. To analyze the network, we first apply Breadth-First Search (BFS) to create subgraphs, each containing 1000 nodes, for more manageable analysis. The A* algorithm is then employed to compute the shortest path between two randomly selected nodes within these subgraphs, optimizing for distance, time, and cost. Beyond finding optimal paths, this study delves into the structural properties of the subgraphs by comparing them with the original, full-sized road networks. We compute graph metrics such as degree distribution, centrality measures (including betweenness and closeness centrality), clustering coefficient, and average path length. These metrics allow us to evaluate the similarities and differences in structure between the original networks and their subsampled versions. Python libraries, including NetworkX, are utilized for both implementing the algorithms and conducting the network analysis. This research highlights the importance of network structure in road network analysis and the impact of subsampling on key graph characteristics, providing insights into both pathfinding efficiency and the underlying topology of large-scale road networks.

P10.04

IDENTIFYING DEAD SPOTS AND IMPROVING WI-FI

Kiranmai Kondeti, Kwabena Agyepong, Pavan Gorthi, Manoj Bolugallu Padmayya, Jermiah Billa

Alcorn State University, Lorman, MS

As we migrate from a physical world to a digital world, signal transmission/processing is a vital element that can drastically impact our communication systems. Often, this becomes more complex when dealing with wireless communication systems. One of the major issues we deal with on a routine basis is the issue of dead spots within a Wi-Fi range. The Industrial Technology Department's Simmons Building is one of the critical hubs for Alcorn State University's technological activities and it was sighted for intermittent Wi-Fi coverage and dead spots. The focus of this effort is to identify these areas, analyze the root causes, and implement effective solutions to improve Wi-Fi coverage throughout the building. As part of this effort, a comprehensive site survey was conducted and areas with weak or limited Wi-Fi signals are identified, an evaluation of the existing Wi-Fi infrastructure was performed and lastly, an assessment of potential interference sources was conducted. After identifying the areas with weak/limited signal to maximize the existing coverage, an optimization of Wi-Fi network settings, adjustment of antenna placement/location, and deployment of additional access points were implemented to maximize coverage. Additionally, a robust monitoring system was implemented to track network performance, and effective troubleshooting procedures were developed/implemented to promptly address network problems. By addressing these Wi-Fi issues, this effort was able to address Wi-Fi coverage, enhance user experience, increase productivity, and future-proof the Wi-Fi infrastructure to accommodate future growth and technological advancements.

P10.05

UPGRADING OF COMPUTER LABS AND NETWORK SWITCHES

Samuel Bunga, Kwabena Agyepong, Pavan Gorthi, Manoj Bolugallu Padmayya, Jermiah Billa

Alcorn State University, Lorman, MS

Advances in technology need a continuous upgrade to any existing networking systems. One of the crucial hubs for University's academic and research activities, the Simmons Industrial Technology Building within Alcorn State University's Advanced Technologies Department is in dire need of a comprehensive infrastructure upgrade. A simple project was designed and tested as part of modernizing computer lab workstations and network switches that can enhance performance, security, and user experience within the department. Typically, computer lab upgrades involve three major steps- replacing obsolete workstations with high-performance systems, upgrading software for optimal performance and security, and implementing robust security measures. As part of the implementation of the proposed upgrades, aging switches were replaced with advanced switches that meet current day network demands/needs within the department, optimized the network traffic flow, and implemented few advanced security features. In addition, robust security measures were implemented to protect sensitive data to prevent unauthorized access. Results (assessment of implemented upgrades) indicated that, there is a significant enhancement in computing power and network speed, minimization of system failures & downtime, sensitive data was safeguarded, and future-proof the infrastructure to accommodate emerging technologies. Finally, it is anticipated that the performed upgrades within the infrastructure will be able to support the emerging technologies and future demands of this department.

P10.06

EFFICIENT PREDICTION OF SELF-REPORTED HEALTH RISK BEHAVIORS: INSIGHTS FROM BRFSS 2023

MD Mushfiqur Rahman

University of Mississippi Medical Center, Jackson, MS

312 - DETECTING AND CLASSIFYING COVID-19 FAKE NEWS USING MACHINE LEARNING TECHNIQUES

Jennifer Fleming[1], Xiuquan Wang[2]

[1]Department of Mathematics and Computer Science, Tougaloo College, Tougaloo MS, [2]Department of Mass Communication, Tougaloo College, Tougaloo, MS

This project investigates the application of machine learning techniques in text classification and fact-checking, focusing on detecting COVID-19-related fake news from social media platforms such as Twitter, Facebook, and Instagram. Leveraging a labeled dataset containing news articles categorized as "True" (genuine) or "False" (fake), the project transforms raw text data into meaningful numerical features using TF-IDF vectorization, optimizing feature extraction for classification tasks. A comparative analysis of four machine learning algorithms—Logistic Regression, Decision Tree Classifier, Gradient Boost Classifier, and Random Forest Classifier—highlights their effectiveness in classifying news authenticity. Logistic regression is specifically applied for binary classification tasks, while the F1 score is employed as a performance metric to achieve a balanced assessment of model precision and recall. The implementation of a decision tree classifier offers interpretable and effective models, and the optimization of the loss function ensures reduced prediction errors. This study demonstrates the critical role of artificial intelligence in fact-checking and detecting fake news, particularly in the context of COVID-19, showcasing its potential to address the challenges of misinformation and improve the credibility of digital information in the modern age.

P10.07

UNCOVERING TRANSCRIPTIONAL AND IMMUNE DYNAMICS IN COVID-19 USING PBMC scRNA-Seq

Dania Zein, Xiuquan Wang

Tougaloo College, Tougaloo, MS

Single-cell RNA sequencing (scRNA-seq) offers a high-resolution approach to analyzing individual cells, enabling the identification of cellular and molecular changes associated with various health conditions. This study leverages scRNA-seq to analyze peripheral blood mononuclear cells (PBMCs) from COVID-19 patients and healthy controls, focusing on distinguishing immune cell characteristics and transcriptional profiles. Using data from the GEO database (GSE149689), we processed 12,000 cells (1,500 cells per individual) from four COVID-19 patients and four healthy controls. Quality control measures, including mitochondrial and ribosomal gene filtering, doublet detection, and normalization, ensured a refined dataset of 7,431 high-quality cells and 18,863 genes. Dimensionality reduction and clustering techniques, such as PCA and t-SNE, were employed to explore transcriptional differences and identify distinct cell populations. Differential gene expression analysis was performed to highlight transcriptional changes associated with COVID-19. Future analyses will involve cell type prediction to classify immune subtypes and trajectory analysis to map dynamic changes in cell states. These findings aim to provide deeper insights into immune dysregulation and contribute to the development of therapeutic strategies for managing severe viral infections.

P10.08

LEVERAGING DATA SCIENCE TO COMBAT POVERTY IN THE MISSISSIPPI DELTA

Jasmine Stewart

Coahoma Community College, Clarksdale, MS

Historically, the Mississippi Delta has faced high levels of poverty due to economic stagnation, low educational attainment, and limited healthcare access. These challenges can be addressed through data science by analyzing socioeconomic trends, optimizing resource allocation, and designing targeted interventions in areas such as education, healthcare, and economic development. How can data science be used to analyze and address the root cause of poverty n the Mississippi delta, and what strategies can be developed to improve the region's socioeconomic conditions? I plan to conduct a quantitative data collection by using government and census data. By doing this, I can use available datasets, like the US Census Bureau's American Community Survey, that can provide detailed demographic and socioeconomic data (income, employment, education, etc.) for the delta region. I expect this research to identify key factors contributing to poverty in the Mississippi Delta, using data science to uncover patterns and trends in areas such as income disparity, education, and access to healthcare. It will provide policymakers and local organizations with actionable insights for developing targeted interventions, improving resource allocation, and addressing systemic uses of poverty. With the help of data analysis and local context, the research aims to provide a roadmap for reducing poverty in the Delta by providing sustainable solutions. This study matters because it uses data science to identify the root causes of poverty in the Mississippi Delta, providing evidence-based insights that can guide targeted interventions, improve resource allocation, and foster long-term economic and social development, while also contributing to the broader knowledge of using data-driven solutions to address poverty in rural, underserved regions.

P10.09

AI: APPLICATIONS, MODULES OF AI, ETHICAL CHALLENGES AND INTRODUCTION TO GAN

Laura Enosakhare, Eva Galvez-Vitervo, Samip Devkota, Trinav Dhakal

University of Southern Mississippi, Hattiesburg, MS

Artificial intelligence (AI) began when Alan Turing created the Turing test to measure computer intelligence. AI enables computers and machines to simulate human learning, comprehension, problem-solving, decision-making, creativity, and autonomy. In discussing artificial intelligence, one could view examples of implications in real-world scenarios. We are often surrounded by artificial intelligence, even if we do not know it. This can be seen in the everyday use of artificial intelligence, such as Siri, Alexa, and Google Assistant. These are tools that help people in their everyday lives. It helps many people navigate through their days. Artificial intelligence has helped tremendously in various fields by adding insight into real-life problems, saving both fields stress and time. The paper also discusses the value of agency and purpose in art and using AI in creative collaboration. Traditionally, people appreciate art by focusing on the artist's choices, intentions, and skills. i.e., their agency. These qualities affect how we see and value artworks, be it Picasso's cubist paintings or the cave arts. Although AI tools like DALL-E 2 and Midjourney cannot yet generate images worthy of overcoming the study results, they spark new forms of collaboration. Artists such as Mike Tyka and Pindar van Arman are already blending human creativity with machine capabilities. AI art has even gained recognition in the art market with Portrait of Edmond de Belamy, Portraits of Imaginary People, etc. However, AI's lack of agency, emotional depth, and abstract reasoning suggest that while it can assist in the creation, it cannot fully replicate the human experience of art. This paper explores the different modules of artificial intelligence, sometimes called the branches of artificial intelligence, and explains what these modules are and how they are applied in various technologies today. These modules include machine learning and its approaches, which are supervised, unsupervised, and reinforced learning. It also discusses

Computer Vision, Natural Language Processing (NLP), Neural Networks, Fuzzy Logic and Expert Systems. This paper also discusses major ethical issues associated with artificial intelligence, such as privacy, bias and its adverse effects, job displacement, and jobs in danger of being replaced. The paper goes in-depth about privacy and discusses data collection, issues with data collection, and real-life cases. It also discusses surveillance, its concerns, and real-life cases. The paper further discusses GANs (General Adversarial Networks). GANs are models of machine learning that use two neural networks: a generator (used to generate fake content) and a discriminator (used to distinguish the phony content made by the generator from the real one). With the help of these two networks, GANs produce very realistic content that is not real. It also discusses deepfakes being one of the most significant areas where GANs are used. Deepfakes are synthetic/fake media that can manipulate and change content like audio, video, and images. While the rise of deepfakes comes with its positives, it also has a lot of ethical concerns. So, as we move forward with AI, we must address these concerns.

P10.10

DECAL MANAGEMENT SYSTEM

Chante Ray

Mississippi Valley State University, Itta Bena, MS

This project introduces a decal management system designed to streamline the process of issuing decals by securely storing and managing user information. The system will collect, validate, and store user and vehicle details to ensure the accuracy of data needed for decal allocation. Additionally, users will have the ability to select the decal type suited to their needs. An interface will be developed to allow users to enter their information conveniently, with future functionality planned for enabling secure decal purchases directly through the system. This project addresses the challenges of creating a reliable, user-friendly solution for efficient decal management.

P10.11

PeerConnect

Teniola Oluwaseyitan

Mississippi Valley State University, Itta Bena, MS

PeerConnect is a tutoring platform to enhance academic support among students at Mississippi Valley State University. The app allows students to seamlessly switch between roles as tutors and learners, empowering them to either seek assistance in challenging subjects or offer their expertise in areas they excel. By enabling students to specify their academic strengths and areas for growth, PeerConnect provides a flexible, role-switching system that fosters a collaborative learning community. Some major features of PeerConnect includes user registration, session scheduling, and an intuitive search function to connect students with compatible study partners. Through PeerConnect, I aim to make academic support more accessible, promote peer-led learning, and strengthen student networks within the university, ultimately contributing to improved academic outcomes and a more connected campus community.

P10.12

SIMULATION OF AN ANALOG CLOCK WITH PYTHON

Arqawan Noori

MCIS, Mississippi Valley State University, Itta Bena, MS

This project is a real-time visualization of an analog clock using the graphics capability of Python. The implementation includes a round-faced clock with hour, minute, and second hands to denote the time through smooth animations. Trigonometric functions are used to simulate the rotations of the hands, whose implementation has real-time updates on the basis of system time. The project incorporates a number of design elements related to basic programming concepts: rendering graphics, keeping time, and object-oriented design. This project can be served as both a functional watch and an educational example.

P10.13

ADMIN BUDDY

Ayomide Olasupo

Mississippi Valley State University, Itta Bena, MS

This project aims to streamline and automate the data retrieval process for school administrators by developing an intelligent query system that utilizes natural language commands. Currently, administrative tasks like checking student balances or generating transcripts require navigating through multiple steps in a system called Banner. This solution eliminates the need for manual navigation by allowing admins to enter simple, intuitive prompts to retrieve specific student data. By leveraging natural language processing (NLP), the system interprets queries such as "Retrieve the balance for student 202005702" and retrieves the relevant information from the database. The project enhances administrative efficiency, reduces repetitive tasks, and provides a more user-friendly interface for managing student records.

P10.14

ANTIVIRUS SOFTWARE FOR EXECUTABLE APPLICATIONS

AbdulBaqiy Diyaolu

Mississippi Valley State University, Itta Bena, MS

In today's digital age, the proliferation of malware and viruses presents a significant threat to personal, corporate, and governmental data. Cybercriminals continually evolve their tactics to infiltrate systems, leading to data breaches, financial losses, and compromised privacy. This project aims to address these cybersecurity challenges by developing an antivirus web application designed to detect, quarantine, and clean infected files, offering a user-friendly platform for safeguarding against potential security threats. The significance of this project lies in its contribution to

enhancing data protection efforts in an increasingly connected world. As the volume of online data grows, securing it from malicious attacks has become more critical than ever. By integrating third-party APIs such as VirusTotal, this project bridges the gap between theoretical cybersecurity knowledge and practical, real-world application. Through this initiative, the project explores the intersection of web development, software engineering, and cybersecurity, providing valuable insights into effective malware detection and mitigation strategies.

P10.15

E-COMMERCE WEBSITE

Sofiyah Afolabi

Mississippi Valley State University, Itta Bena, MS

Many African food brands struggle to establish an effective online presence that serves both local customers and international markets. Currently, there is no centralized platform that allows African food brands to showcase their products, provide an easy shopping experience for local customers, and offer visibility for customers abroad who want authentic African food products.

The purpose of this project is to create a multi-brand e-commerce platform where African food brands can list their products, sell directly to customers in their local markets, and increase accessibility to customers abroad. This platform will address the need for these brands to expand their reach, improve customer experience, and offer a reliable solution for international customers seeking authentic products.

P10.16

BRIDGING THE GAP: AN ALUMNI, STUDENT AND PROFESSORS ENGAGEMENT PLATFORM FOR CAREER OPPORTUNITIES

Anthony Nwafor

Mississippi Valley State University, Itta Bena, MS

The transition from academia to the professional realm or vice versa can be a formidable challenge for students, alumni, and professors alike. Securing internships or jobs that align with career aspirations and fostering meaningful connections within professional networks can be particularly daunting. Recognizing these challenges, we propose an alumni engagement platform that assists seamless interactions between alumni, students, and professors, cultivating a supportive network that opens doors to a wide spectrum of professional opportunities.

The platform will incorporate a user-friendly interface, and a messaging system. These features empower alumni, students, and professors to navigate the job market effectively, fostering a culture of knowledge sharing and professional growth. To streamline the application process, the platform will incorporate a user-friendly interface that allows applicants to submit their resumes and cover letters directly to the provided application link posted by the opportunity poster. To foster effective communication between job seekers and employers, a private messaging system will be integrated, enabling direct and confidential exchanges. For opportunity posters, the platform will provide a dedicated dashboard to manage job postings, review or track applicants for the specific opportunity. By bridging the gap between these three key stakeholders, we aim to empower the next generation of professionals.

P10.17 - COMPARISON OF MACHINE LEARNING ALGORITHMS FOR SENTIMENT CLASSIFICATION

HuiRu Shih, Kelvin King

Jackson State University, Jackson, MS

Sentiment analysis, which focuses on understanding and evaluating the emotions conveyed in textual data, has numerous applications, such as analyzing customer feedback, conducting market research, and monitoring social media trends.

This study seeks to demonstrate the process of text classification for sentiment analysis and evaluate the performance of various classifiers, including Support Vector Machine, Decision Tree, Random Forest, Logistic Regression, K-Nearest Neighbors, Gradient Boosting, and Naïve Bayes.

The classifiers are trained on a preprocessed dataset using supervised learning models, which rely on labeled data. These models use feature vectors along with their corresponding labels to build predictive models. After training, the models are applied to a separate test dataset to predict labels. The predicted labels are then compared to the actual labels to assess performance based on metrics such as accuracy, precision, recall, and F1-score.

These metrics are essential for assessing the effectiveness of machine learning models. While accuracy provides an overall measure of model performance, precision, recall, and F1-score offer more nuanced insights, helping to better understand the model's strengths and weaknesses in specific areas.

The results show that Logistic Regression outperforms other classification algorithm in predicting sentiments, achieving the highest scores across all four-comparison metrics: accuracy, precision, recall, and F1-score.

Imbalanced data occurs when one or more classes in a dataset have significantly more examples than others, a common issue in machine learning that often leads to poor model performance. Our findings indicate that the Naïve Bayes algorithm is particularly sensitive to imbalanced datasets. In contrast, decision tree-based algorithms, such as Random Forests, tend to handle imbalanced data more effectively.

P10.18

ENHANCING PHONE CALL SECURITY THROUGH DIGITAL CERTIFICATES: A DEFENSE AGAINST SCAM CALLS AND SOCIAL ENGINEERING ATTACKS

Stephen St. Clair, Bilal Abu Bakr

Collin College, Frisco, TX

Scam callers have emerged as a significant security threat, leveraging evolving technologies like deepfakes to make their deceptions more convincing and sophisticated. These fraudulent calls affect not only individuals, often leading to financial loss but also serve as a medium for social engineering attacks on organizations. As scammers' methods grow more complex, even those who are generally cautious can fall victim, highlighting the need for improved phone call authentication methods.

We propose the implementation of digital certificates to verify the legitimacy of phone callers. In this model, callers would register their phone numbers with a trusted certificate authority responsible for verifying their identities. Even when a caller uses number masking, a legitimate service that hides the actual number for privacy purposes, the digital certificate would be tied to the original registered number rather than the masked number. This approach ensures that privacy is preserved while providing a reliable way to authenticate callers.

When making a call, the caller would send a digital certificate along with the call, allowing the recipient's device to validate it through the issuing authority. If the certificate cannot be authenticated, the recipient will be notified that the call is unauthenticated, enabling them to make informed decisions about whether to answer. Additionally, when a recipient blocks a number, the block would apply to the caller's registered number, even if the scammer attempts to call from a different masked or unmasked number in the future. This would reduce the chances of recipients being harassed by unwanted or fraudulent calls. Furthermore, should any caller misuse their certificate to engage in fraudulent activities, the certificate authority would have the capability to revoke the certificate upon verification of evidence, thereby preventing further abuses.

In conclusion, integrating digital certificates for phone calls offers a robust mechanism for verifying caller identities, greatly enhancing security in everyday communications. This approach protects individuals from falling prey to scams and serves as a critical defense against advanced social engineering attacks, including those employing deepfake technology. Implementing such a solution could significantly mitigate the risks associated with fraudulent calls and provide users with greater confidence in the authenticity of their communications.

P10.19

A DIRECT CONNECT APPROACH TO ENSURING THE SAFETY OF THE ELDERLY: ENHANCEMENTS TO THE PATIENT IDENTITY VERIFICATION SYSTEM

Terica Shepard, Bilal Abu Bakr

Collin College, Frisco, TX

In contemporary healthcare systems, the current reliance on outdated patient verification methods poses a significant risk of identity theft, especially among vulnerable elderly patients who are frequent targets of such malicious activities. This Abstract proposes a direct connect verification system, leveraging modern technology to safeguard patient identities, explicitly focusing on the elderly demographic.

Identity theft among seniors is a prevalent issue, with phishing attacks being a standard method to obtain personal information. Perpetrators often exploit patients' trust in healthcare personnel by falsely assuming their identities. Traditional verification processes need reciprocity, leaving patients unable to confirm the authenticity of healthcare providers.

The proposed DCVS addresses this challenge by introducing a specialized application designed for seamless deployment within healthcare facilities. Patients would input their personal information along with a fingerprint for robust authentication. Upon submission, the application would promptly send a text notification to the patient, providing an additional layer of verification. Additionally, patients will have the capability to independently verify the identity of the medical facility, significantly bolstering overall security measures.

Implementation of this innovative solutions involves modifying Electronic Health Record (EHR) to integrated a push verification field into the system, ensuring that any access or updates requests require additional confirmation. Access to this feature will be restricted to authorized personnel, subject to stringent authentication measures.

To utilize the DCVS, patients would be instructed to download the designated app, serving as a secure gateway for identity confirmation. Biometric authentication via fingerprint recognition adds an extra layer of security, ensuring that only authorized individuals have access to sensitive medical records. The app may also include functionality for designated patient healthcare givers.

This novel approach significantly the reliability, speed, and security of patient identification verification, thereby enhancing the integrity of healthcare records and the overall healthcare system. By adopting this state-of-the-art technology, healthcare facilities can effectively safeguard elderly patients from the persistent threat of identity theft.

P10.20

STRENGTHENING ONLINE SAFETY EFFICIENT LEARNING: MAKING USE OF SPACED REPETITION SYSTEMS FOR QUICK ADJUSTMENT

Takudzwanashe Simon Nyabadza, Bilal Abu Bakr

Collin College, Frisco, TX

The dynamic landscape of cybersecurity demands continual learning and adaptation by security practitioners. Traditional educational approaches often fail to facilitate deep understanding and retention, resulting in superficial knowledge acquisition and high rates of forgetting. This Abstract proposes the adoption of Spaced Repetition Systems (SRS) as a solution to enhance learning efficacy in cybersecurity.

Current methods of cybersecurity education often employ a "firehose" approach, overwhelming students with information without promoting higher-order thinking. Consequently, students may achieve passing grades without truly comprehending the material. The well-documented Ebbinghaus curve illustrates the rapid decay of memory retention over time, highlighting the inefficiencies of conventional study techniques.

In contrast, SRS leverages the spacing effect to optimize memory retention and recall. By reinforcing neural pathways through strategically spaced repetitions, SRS mitigates the effects of forgetting, enabling practitioners to access information more fluidly. This fluid access to memory enhances problem-solving skills and fosters creativity, crucial attributes in the ever-evolving field of cybersecurity.

The effectiveness of SRS lies in its ability to strengthen neural connections, thereby reducing the likelihood of forgetting and facilitating rapid learning. Adapting and applying information swiftly is paramount in a domain where knowledge can quickly become outdated. By embracing SRS, security practitioners can enhance their learning efficiency, stay abreast of emerging threats, and effectively safeguard digital assets in an increasingly volatile cyberspace.

P10.21

SECURING QUICK RESPONSE CODES: A PLEA FOR PRE-INSTALLED SECURITY MEASURES

Valentin Constantino Rivadeo, Bilal Abu Bakr

Collin College, Frisco, TX

The prevalence of Quick Response (QR) codes in everyday life has introduced a new avenue for cyber threats, with hackers exploiting their convenience to disseminate malicious content undetected. This Abstract underscores the inherent dangers of QR codes, as hackers can surreptitiously manipulate them to distribute malicious applications, phishing websites, malware, and other cyber threats.

We propose directly integrating a robust security measure into mobile devices to mitigate these risks. Specifically, we advocate for implementing a built-in application or software capable of scrutinizing the legitimacy of QR codes before users engage with them. This proposed solution involves a systematic verification process wherein the domain and HTTPS certificate associated with the QR code are meticulously examined to ascertain their authenticity.

Upon scanning a QR code, the integrated security feature would promptly analyze its underlying components. If the domain and HTTPS certificate are validated as secure, the user will receive a notification confirming the safety of the QR code. Subsequently, the user can proceed confidently, assured of the legitimacy of the linked content.

Conversely, if the analysis identifies suspicious elements within the QR code, the user would be promptly alerted to the potential risks. In such instances, the integrated security feature would notify the user of the detected malicious content, clearly indicating the associated hazards. Users choose to proceed at their own risk or avoid further interaction with the QR code presented to them.

The proposed solution enhances QR code security, safeguarding users and promoting a safer digital environment.

P10.22

HOW TO USE SEGMENTED EMAIL IDS TO PREVENT SOCIAL ENGINEERING IN BUSINESS EMAILS

Diego Trujano, Bilal Abu Bakr

Collin College, Frisco, TX

Social engineering through emails poses a significant threat to businesses worldwide, with the potential for unauthorized access to sensitive company information. Despite efforts to educate users on social engineering, targeted phishing and whaling attacks persist, often exploiting vulnerabilities like CVE-2023-35636 and CVE-2023-36761. However, traditional methods like password spraying remain effective in gaining unauthorized access to business emails. To address this issue, this Abstract proposes a novel solution involving the implementation of separate public and private email IDs within organizations.

The proposed solution involves configuring the email server to redirect external communications to public mailbox IDs and internal communications to private mailbox IDs. Users would have two distinct mailboxes associated with each ID, with the public mailbox featuring customizable security settings like whitelists for trusted addresses. Each ID would also have its unique set of credentials, enhancing security. When sending emails, both IDs are sent to the server, which then determines the appropriate mailbox to use.

To deter social engineering attacks, internal email addresses are randomly generated and linked to user names by the server. This randomization makes it challenging for

attackers to target specific individuals within the organization. External emails sent to internal IDs are quarantined and logged by the server, with mechanisms in place to alert administrators of potential threats.

Overall, this proposal introduces email segmentation to mitigate the risks associated with social engineering and data exfiltration. Segregating public and private email IDs reduces the impact of phishing attacks, enhancing business communication security.

P10.23

AI-POWERED LANGUAGE MODELS AND DATA SECURITY FOR BUSINESSES: AN ARGUMENT FOR AI-POWERED INPUT MONITORING

Noah Pennington, Nadia Bilal

Collin College, Frisco, TX

Artificial intelligence (AI), especially language models, has become integral to daily interactions. Language models, exemplified by models like ChatGPT, offer users the ability to input queries akin to traditional search engines. However, what sets Language models apart is their capability to provide concise and human-like responses. While this technology enables users to accomplish tasks such as writing and coding within seconds, it raises concerns due to collecting sensitive information.

Language models accumulate account-level data and conversation history, including email addresses, devices, IP addresses, locations, and any public or private information used in Language model prompts. Corporate employees often input sensitive data, including medical and financial information, into Language models to expedite tasks, sometimes bypassing safety measures.

This Abstract proposes a solution to address the potential risks of using Language models: implementing third-party or in-house software to monitor employee inputs into language-based AI models. The proposed solution involves the creation of a monitoring portal connected to the AI chatbot, enabling employers to oversee the inputted information. The portal's intelligent filtering system can flag abnormalities or keywords, allowing businesses to maintain a streamlined workflow while safeguarding sensitive data.

Implementing a preemptive monitoring solution enhances data security for enterprises. Integrating an intelligent filter linked to a language model reduces vulnerabilities, empowering employees to use technology confidently. This approach strengthens the monitoring tool, offering enhanced protection against breaches and fostering a secure environment. It boosts confidence in data confidentiality for employers and employees, establishing trust in information security.

P10.24

An AI-POWERED BEHAVIORAL MONITORING SYSTEM FOR IMPROVING NETWORK SECURITY: A MACHINE LEARNING METHOD FOR IDENTIFYING INTRUDERS

Bader Dawood, Bilal Abu Bakr

Collin College, Frisco, TX

As cyber threats become increasingly sophisticated, protecting networks and systems from unauthorized access is more critical than ever. Password cracking is among the most common and effective methods for breaching secure environments, which can lead to catastrophic consequences such as data theft or unauthorized sharing. Financial institutions, government agencies, and other high-security environments are especially vulnerable, making robust security measures essential. Traditional security protocols, such as password authentication and firewalls, are often insufficient to defend against determined attackers. This Abstract proposes an innovative solution to enhance network security by integrating Artificial Intelligence (AI) tools that continuously monitor and analyze user behavior to detect potential intrusions.

The proposed system's core concept is deploying an AI-driven tool designed to observe legitimate users within the network, learn their typical behaviors, and establish a baseline of normal activities. This behavioral profiling enables the system to identify deviations from the established pattern, such as unauthorized actions or movements within the network. When an anomaly is detected, the AI system alerts security teams in real-time, allowing immediate intervention.

This AI-based security solution offers numerous advantages over traditional security mechanisms. Unlike static systems, the AI model adapts continuously to the changing behavior of users, creating a dynamic security environment that can detect even the most subtle intrusions. Moreover, by monitoring user inputs and their movements within the system, the tool provides a comprehensive view of user activities, making it easier to identify malicious actions.

Integrating Artificial Intelligence into network defense represents a significant leap forward in the fight against cybercrime. This AI-driven system can substantially reduce the risk of data breaches and unauthorized access to sensitive information by offering advanced threat detection and response capabilities. This Abstract will explore the potential benefits, challenges, and implementation strategies for incorporating AI-based tools into security infrastructures, particularly in high-stakes environments such as financial institutions and government organizations. Ultimately, this proactive approach to security presents a promising solution to safeguard critical data against increasingly sophisticated cyber threats.

END of Thursday's Program

Friday, March 21, 2025

MORNING

Hall D Room

8:20 Welcome

O10.12

8:30 L-SYSTEMS AND FRACTALS

Eyimofe Ajagunna, Bakri Diyaolu

Mississippi Valley State University, Itta Bena, MS

Lindenmayer systems (L-systems) are a mathematical formalism originally developed to model the growth processes of plants and organisms. It was introduced by biologist Aristid Lindenmayer in 1968. L-systems use a recursive set of rules to generate complex structures from simple initial conditions, making them a popular framework for simulating natural patterns. L-systems are defined by an alphabet of symbols, a set of production rules, an initial axiom (or starting string), and iteration. Through parameter adjustments, L-systems can produce various geometric shapes, from simple curves to complex networks, making them highly flexible for different modelling purposes. The simplicity and power of L-systems have expanded their use beyond biology into fields like computer graphics, architecture, and art. In the context of fractals, L-systems allow for an efficient and visually rich representation of nature's intricate, repeating designs, bridging mathematics and aesthetic expression.

O10.13

8:50 ADVANCED APPLICATION OF MACHINE LEARNING SOLUTIONS USING GPUS AND TPUS IN RESEARCH AT INDUSTRY SCALE

Paromita Chakrabarti[1, 2], Saikat Mukherjee[2], Amitabh Biswas[2, 3]

[1]Nvidia, [2]ServiceNow, [3]Mariposa Digital

This research explores the potential of advanced machine learning algorithms and applications of GPUs and TPUs to significantly improve research performance and efficiency using very large datasets at industry scale. The focus has been on developing practical applications and solutions directly applicable to the business with a large scale data.

The experiments undertaken in the context of IT Service Management demonstrate the impact of manual versus automated routing on Mean Time to Repair / Resolution (MTTR) within IT service management. By analyzing large datasets of service tickets, the study compares MTTR outcomes under both manual and automated routing processes, including predictions made by a machine learning model. The analysis shows that automated routing, especially when enhanced by machine learning, reduces MTTR by nearly 89%, showcasing its potential to significantly enhance service efficiency.

Efficient IT service management is critical for maintaining operational continuity and user satisfaction. One of the key metrics in this domain is Mean Time to Resolution (MTTR), which measures the average time taken to resolve a ticket. Traditionally, tickets are routed manually by service desk agents, but recent advances in machine learning have enabled automated routing, promising faster and more accurate ticket assignments.

Manual routing of tickets can lead to delays due to human error, misjudgment, or inefficiencies. Automated routing, particularly with the aid of machine learning models, has the potential to reduce these delays, thereby lowering MTTR and improving overall service efficiency.

O10.14

9:10 INVESTIGATION OF A SHARP-INTERFACE LATTICE BOLTZMANN METHOD FOR HIGH DENSITY RATIO MULTI-COMPONENT FLOWS

Paris Smith, Caixia Chen

Jackson State University, Jackson, MS

This study advanced the sharp interface lattice Boltzmann method for simulating free surface and multi-component flows. Unlike the currently used diffusion-based method, the sharp interface approach more effectively manages various complex interfaces between multiple components and offers higher numerical stability. The study simulated a two-component fluid system, consisting of water and air, with an interface density ratio of 1000:1. The enhanced sharp interface method produced both qualitative and quantitative results. Additionally, it simulated different water droplet collisions under varying parameters. These simulations provide clear insights into flow characteristics and are valuable for understanding complex multiphase flows.

O10.15

9:30 EXPLORATION AND EVALUATION OF CLASSIFICATION MODELS TO PREDICT SURVIVAL IN HEART FAILURE

Sachin Karki, Yufeng Zheng

University of Mississippi Medical Center, Jackson, MS

Cardiovascular disease (CVD) affects nearly 18 million people globally, according to the World Health Organization, with heart failure being one of its most serious complications. Although biostatistical methods and machine learning approaches have been used to study this scenario, most of the study remains inapplicable in clinical settings due to the structure of the study and the bandwidth required to adopt those approaches. The objective of the study is to explore and explain different classification techniques that provide a closer look at simple machine learning algorithms through supervised learning and binary classification models. The findings might help to provide an explainable approach to researchers and physicians. In our experiments, the heart failure dataset consisting of clinical records of 299 patients with 13 clinical features was used and the classification results were reported using the k-fold cross-validation method due to the small dataset. Our study fully explored and compared eight different

classification models: Random Forest, Support Vector Machines (SVM), K-Nearest Neighbor (KNN), Gradient Boosting, Linear Regression, Logistic Regression, XGBoost, and LightBGM. The experimental results showed that Random Forest, XGBoost, and LightBGM can predict the diagnosis of heart failure with 100% accuracy. Our study concluded that the supervised learning approach and classification algorithms can predict whether a heart failure patient will survive or not.

O10.16

9:50 APPLYING EFFECTIVE AND EFFICIENT APPROACHES TO IMPROVE CLINICAL COMPETENCE IN STUDENTS AND ENSURE HIGH-QUALITY PATIENT CARE

Jamil Ibrahim[1], Ibrahim J Ibrahim[2], Saja Ibrahim[3], Hidaya Ibrahim[4], Waseem Ibrahim[2]

[1]University of Mississippi Medical Center, Jackson, MS, [2]Arab American University, School of Dentistry, Jenin, Palestine, [3]University of Jordan Medical School, Amman, Jordan, [4]Al-Najah University, School of Pharmacy, Nablus, Palestine

To improve clinical competence in students and ensure high-quality patient care, effective approaches include: incorporating simulation-based learning, utilizing problem-based learning methodologies, providing frequent and specific feedback, fostering a supportive clinical environment, promoting active learning through case studies and real-world scenarios, emphasizing evidence-based practice, and integrating technology to enhance practice and assessment; all while tailoring learning experiences to individual student needs and regularly evaluating their progress. The aim of this study was to determine the effect of mini-Clinical Evaluation Exercise in improving students' performance on core clinical skills at an academic health center in the southeastern region of the United States in the School of Medicine. This repeated measure study sought to find out if Medical students' scores improved after utilizing mini-CEX. A total of 489 students participated in this study. The pre-test group consisted of 360 medical students assessed in various clinical settings with a diverse set of patients. The post-test group consisted of 129 Medical students assessed. Students were evaluated on their interpersonal skills, data gathering skills, physical exam skills, counseling skills, and patient overall satisfaction with student performance. 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 incorporating Mini-CEX as part of the educational process can have positive effects on medical students' learning and performance in their clinical rotations.

O10.17

10:10 OBSERVATIONAL STUDY DESIGNS BASED ON ESTIMATED PROPENSITY SCORES FOR CREATING COVARIATE BALANCE AMONG TREATMENT GROUPS

Jamil Ibrahim, PhD[1], Saja Ibrahim[2], Waseem Ibrahim[3], Ibrahim J Ibrahim[3], Hidaya Ibrahim[4]

[1]University of Mississippi Medical Center, Jackson, MS, [2]University of Jordan Medical School, [3]Arab American University, School of Dentistry, Jenin, Palestine;, [4]Al-Najah University, School of Pharmacy, Nablus, Palestine

The aim of this presentation is to demonstrate the application of propensity score analysis as a tool for analyzing observational data. In this demonstration, We will explain how, when and why propensity scores (PS) are used and then we will discuss some important practical issues in using them in observational studies. The propensity scores allow one to design and analyze an observational (nonrandomized) study so that it imitates some of the particular characteristics of a randomized group design. In randomized controlled trials, all subjects in a two-group RCT share the equal chance like 50% of being assigned to receive one study treatment while the other will receive another treatment such as a placebo or the standard of care. In order to partially emulate this feature of the RCT in a non-interventional dataset, we are able to use the baseline patient characteristics to calculate the PS. Following calculation of the PS, we are then able to compare patients with similar PS. The propensity score is a balancing score: conditional on the propensity score, the distribution of observed baseline covariates will be similar between treated and untreated subjects. Various propensity score methods will be explained: matching on the propensity score, stratification on the propensity score, inverse probability of treatment weighting using the propensity score, and covariate adjustment using the propensity score. This oral presentation walks you through an example how propensity scores are created and how propensity score matching is used to balance covariates between treated and untreated observations. The presenters will provide you with the tools necessary to begin answering some of your own research questions using propensity scores. SAS, SPSS and R will be utilized for this presentation.

O10.17

10:30 AI AT THE CROSSROADS: TACKLING ETHICAL DILEMMAS, LEGAL CHALLENGES, AND SOCIETAL IMPACTS

Munteeq Manzoor, Hosameldin Darwish, Lee Dempsey, Malik Ahmad

University of Southern Mississippi, Hattiesburg, MS

AI has gained popularity over the past few years and is being applied in various fields worldwide. AI technology stimulates decision-making, machine autonomy, and human learning. At the current level, AI can understand

human language and real-world objects, allowing it to perform tasks like driving cars and generating output from a prompt entered by a human. It can learn using algorithms without explicit programming, called machine learning algorithms. The AI can also implement deep learning, which uses multiple layers of machine learning using neural networks for complex tasks like language processing or image recognition. In this paper, we will cover the future of AI in various fields, such as autonomous vehicles, job disruption, AI in academic and artistic use, regulation, data privacy, and more. AI is going to contribute to accelerated innovation in society. The increase in the use of AI in various sectors will displace manual labor as it will be used to automate routine tasks, causing a potential loss of entry-level jobs. However, AI will bring multiple jobs worldwide, like data scientists, AI ethicists, and machine learning engineers. International laws like the EU AI Act, national rules in the USA and China, provincial laws, and industry-specific laws are being established to regulate AI. Just like the era of the moon race, this world is experiencing a new revolutionary era of race to regulate and govern AI. The EU AI Act laid out threat level assessment for the upcoming AI. It categorized the threat into four levels ranging from acceptable to unacceptable ai. In China, the social credit system is part of the society that uses AI to decide human behavior and award them accordingly, which is deemed inappropriate in the EU AI Act. The advancement of AI needs regulatory guidance, which is why the whole world is trying to regulate AI for human rights. AI in the USA is being used to automate vehicles. Using advanced technologies like LIDAR, sensors, cameras, and complex machine learning algorithms, the cars are deemed reliable to be driven in over 25 states across the USA. 2 major companies offering driverless car services are leading the race, GM's Cruise and Google's Waymo. While autonomous vehicles are responsible for reducing human error, they also bring new and unseen safety risks to society. People don't like to lose their jobs, especially not to a piece of metal. AI has expanded to nearly all the fields around the globe. Students are using AI to cheat, but AI, being imperfect, outputs answers which may be grammatically correct but are off-topic. AI is used to create complex art that lakes human emotions and creativity. These models are trained on copyrighted artwork, which questions the ethical use of AI. Moreover, AI is used to remove vocals from videos or songs; again, copyright work is being used without consent. AI in the future and can potentially replace teachers and artists, but still, in this era, handmade biscuits are considered more prevalent than those made using a machine in a factory.

O10.18

10:50 EXPLAINABILITY IN MULTI AGENT REINFORCEMENT LEARNING

Indu Shukla, Salhi Abderahim

[1]US Army Engineer Research and Development Center (ERDC)

This study focuses on advancing Multi-Agent Reinforcement Learning (MARL) by exploring environments where multiple agents interact in both cooperative and competitive scenarios. The complexity of these interactions is enhanced through existing MARL scenarios to provide a robust testing framework. Explainability techniques are employed to make agent interactions transparent, policy visualization methods, including heatmaps and decision trees, are applied to illustrate agent behavior across the state space.

Neuroscience

Chair: Harry Pantazopoulos

University of Mississippi Medical Center

Co-Chair: Barbara Gisabella

University of Mississippi Medical Center

Thursday, March 20, 2025

MORNING

Hall D Room 7

8:15 Welcome and Opening

O11.01

8:30 ELUCIDATING THE ROLE OF CANNABICHROMENE IN MITIGATING CISPLATIN-INDUCED NEUROPATHIC PAIN: INSIGHTS INTO BEHAVIORAL AND CELLULAR MECHANISMS

Miguel De Leon[1], Anna Weimer[1], Waseem Gul[2], Mahmoud ElSohly[2], Nicole Ashpole[1]

[1]University of Mississippi, Oxford, MS, [2]Eli Laboratories, Oxford, MS

Chemotherapy-induced peripheral neuropathy (CIPN) is a debilitating adverse symptom experienced in over 60% of patients receiving chemotherapy treatment. Unfortunately, current therapeutic strategies require long-term treatment with limited efficacy, often requiring opioid-based medications. To mitigate adverse effects of current therapeutics, studies suggest cannabis-based medicines to alleviate neuroinflammation and related pain. Multiple studies have explored delta^9-tetrahydrocannabinol and synthetic cannabinoids, however, an ideal cannabinoid candidate for drug development would be devoid of psychoactive effects. Our current study evaluates the effectiveness of cannabichromene (CBC), shown to have anti-inflammatory properties and devoid of psychoactive effects, on alleviating cisplatin-induced neuropathic pain by assessing both behavioral responses to pain and the underlying cellular and molecular mechanisms by which CBC enacts its effects.

To assess the efficacy of CBC against CIPN, mice were subjected to a cisplatin (2.3 mg/kg; 6 total injections)

protocol. Following the administration protocols, single doses of CBC were administered 30 minutes prior to CIPN assessment. Mechanical sensitivity was assessed using an electronic Von Frey (eVF) to measure changes in response to mechanical stimulation of the hind paw at various stages (e.g., pre-chemotherapy, post-chemotherapy, and with treatment onboard). To determine the duration of relief of CBC against CIPN pain, mechanical sensitivity was assessed at 30 min, 4, 24, and 72 hrs. Utilizing IHC, tissue sections were stained with relevant antibodies to assess intraepidermal nerve fiber (IENF) density and inflammatory responses in dorsal root ganglion neurons (DRGs).

Acute administration of CBC in both male and female mice ablated the allodynia associated with cisplatin-induced neuropathy. When examining the duration of relief, we see that CBC maintains its protective properties in male mice for up to 24 hours. As it relates to IENF density, male mice treated with CBC did not show any significant differences in IENF density when compared to vehicle male mice. Evaluations of IENF density in female mice and cisplatin-naïve mice are undergoing.

These data indicate that CBC can delay the onset of cisplatin-induced neuropathic pain, suggesting its potential as a novel therapeutic for alleviating CIPN. Further studies will explore CBC's efficacy against other chemotherapies, such as oxaliplatin and vincristine, and examine its cellular and molecular effects on intraepidermal nerve fibers and spinal cords. Additionally, the research will elucidate the effects of repeated dosing, sex-specific differences, and the optimal therapeutic window for CBC.

O11.02

8:50 FLOW CYTOMETRIC ANALYSIS OF HYPOTHALAMIC ARCUATE NUCLEUS NEURONS

Madison Hamby, Eva Bengten, Elizabeth Barr, Emily Hildebrandt, Heather Drummond

University of Mississippi Medical Center, Jackson, MS

Flow cytometry is a method commonly used to detect, identify, and count specific cell types based on extracellular and intracellular markers. While flow cytometry has been used to assess global changes in cortical neurons, the approach has not been used to study hypothalamic arcuate neurons: a heterogenous population of neurons that integrates signals from the body to maintain energy homeostasis. Here, we present an approach adapted from Martin et al. (PMID: 28135061) to identify and characterize global changes in hypothalamic arcuate neuron populations using flow cytometry. Using our method, hypothalamic arcuate regions were dissected from mice (n=4-6), fixed in 4% formaldehyde for 3 hours, rinsed, minced, then digested in Accutase for 1 hour at room temperature with gentle rocking. To dissociate cells, the partially digested cell suspension was passed 12 times serially through 18, 21, 23, and 25 1.5-inch gauge syringes. Between trituration steps, the cell suspension was allowed to settle for 5 minutes, and the supernatant was collected. Following, supernatant samples were pooled and centrifuged at 1000g for 2 minutes. Samples were then stained with markers for select hypothalamic arcuate neuron populations expressing leptin receptor (LepR), glucagon-like peptide receptor 1 (GLPR1), proopiomelanocortin (POMC), and agouti-related peptide (AgRP). We used antigen blockade, multiple antibodies, or knockout animals where available to assess labeling validity. Samples were analyzed using a Symphony A3 Cell Analyzer (BD Biosciences). We compared the percent of LepR, GLPR1, AgRP, and POMC positive neurons to the HypoMap RNA single nucleotide sequencing data set (PMID: 36266547) and found similar representation of hypothalamic neuron populations. For example, we found that 26, 3, 13, and 22% of cells express AgRP, GLPR1, LepR, and POMC, respectively, by FACS analysis, and in HypoMap, 24, 6, 9, and 29% of arcuate nucleus neurons express AgRP, GLPR1, LepR, and POMC transcripts. In addition, we obtained similar results in the hypothalamic preparation using a Cytek Amnis ImageStream MK II and were able to confirm cell type based on microscopic morphology. Our findings suggest flow cytometry may be a feasible approach to assess global population changes in hypothalamic neurons. Further studies are needed to validate more antibodies for neurons and specific subpopulations. Research reported in this publication was supported by the NIH P30GM149404, P20GM104357, P20GM121334, and R01DK137167 (HD).

O11.03

9:10 ELASTIN-LIKE POLYPEPTIDE DELIVERY OF an NF-kB INHIBITOR FOR TREATMENT OF JUVENILE TBI COMPLICATED BY HIGH-FAT DIET CONSUMPTION

Jacob Haskell[1], Allie Smith[1], Ian McGee[1], Komal Beeton[1], John Aaron Howell[2], Bernadette Grayson[1], Gene L. Bidwell[1]

[1]University of Mississippi Medical Center, Jackson, MS, [2]University of Florida, Gainsville, FL

Traumatic brain injury (TBI) involves a primary, force-induced injury to the brain followed by a poorly understood and treatment-resistant period of secondary injury. Secondary injury is characterized by prolonged neuroinflammation, blood-brain barrier dysfunction, and cell death. Juveniles are at increased risk for TBI due to participation in recreational activities, exposure to parental abuse, and, in very young children, vulnerabilities of the skull to external damage. Compounding on this increased TBI risk, juveniles in modern industrialized countries frequently consume a diet high in saturated fats and refined sugars, which constitutes a separate and preexisting challenge to central nervous system integrity prior to the onset of a TBI. Nuclear factor kappa B (NF-kB) is a transcription factor that regulates multiple proinflammatory genes. NF-kB activity has been implicated in adverse inflammatory states when

upregulated following TBI. Inhibition of NF-kB is thus a promising therapeutic strategy for TBI, as it will induce the downregulation of multiple inflammatory factors, each associated with worse TBI outcomes. We recently developed a novel polypeptide biologic, SynB1-ELP-p50i, consisting of an elastin-like polypeptide (ELP) delivered inhibitor of NF-kB (p50i) and the cell-penetrating peptide SynB1. ELPs are non-immunogenic, thermally responsive polypeptides derived from human tropoelastin that can stabilize small peptides in circulation and assist with localization of peptide therapeutics. The goal of the current study was to determine the effects of mild TBI (mTBI) in juvenile rats consuming a normal or high-fat diet and to examine the biodistribution, pharmacokinetics, and therapeutic efficacy SynB1-ELP-p50i. Mitigation of the effects of mTBI was assessed behaviorally and with RT-qPCR analysis of neuroinflammatory factors post-TBI. For the biodistribution and pharmacokinetic experiments, male Long Evans rats were assigned to either chow (CH) or high-fat (HF) diet groups at post-natal day 20 (PND20) and a sham (SHAM) injury or mTBI was induced at PND30 using the closed-head impact model of engineered rotational acceleration (CHIMERA) device. Ninety minutes following injury, subjects were administered 50 mg/kg of rhodamine-labeled SynB1-ELP-p50i. Increased SynB1-ELP-p50i concentration was detected at brain impact foci in mTBI versus SHAM subjects ($p(injury) < 0.05$), and relative fluorescence was greater at impact foci in HF-mTBI versus CH-mTBI subjects ($p(diet) < 0.01$). To assess the potential therapeutic efficacy of SynB1-ELP-p50i, a separate group of CH and HF diet subjects were treated with SynB1-ELP-p50i or vehicle following receipt of a mTBI. Cognitive assessments were performed using the Morris water maze (MWM) 3- and 24-hours post-injury. All TBI subjects performed poorly in the MWM probe test 3 hours post-injury, $p < 0.05$. Additionally, only vehicle-treated HF-mTBI subjects performed significantly worse in the MWM platform-switching task, a test of spatial learning, 24 hours post-injury ($p > 0.05$). This effect was not observed in HF-mTBI subjects treated with SynB1-ELP-p50i. Alterations in neuroinflammatory signaling were not detected 3 days post-TBI between groups. Inhibition of NF-kB represents a viable therapeutic strategy for mTBI, and studies are ongoing to further assess the efficacy of SynB1-ELP-p50i as an acutely administered treatment to reduce or inhibit the development of secondary injury in juvenile TBI patients.

O11.04

9:30 ALTERED DIURNAL EXPRESSION OF NEUROTRANSMITTERS IN THE PARAVENTRICULAR NUCLEUS OF SUBJECTS WITH BIPOLAR DISORDER

Daniel T. Trussell, Obie Allen IV, Kayla Ryan, Lamiorkor A. Lawson, Barbara Gisabella, Harry Pantazopoulos

[1]Department of Psychiatry and Human Behavior, University of Mississippi Medical Center, Jackson, MS

Rationale: A growing number of studies indicate circadian rhythm alterations are a key feature of Bipolar Disorder (BD) that impact symptom severity and treatment response. Our previous study demonstrated that levels of the anxiolytic transmitter somatostatin (SST) decrease in the morning in the amygdala of subjects with BD, coinciding with increased morning severity of anxiety and depression. Circadian rhythms and stress response are regulated by the hypothalamus through the paraventricular nucleus (PVN). Rodent models have shown that shorter or longer days can cause neurons in the PVN to switch their neurotransmitter from SST to dopamine and in turn alter expression of the stress signaling transmitter corticotropin releasing hormone (CRH), resulting in increased anxiety and depression. Our recent study identified altered levels of SST, CRH, and clock molecules in serum samples from subjects with BD. In the current study, we tested the hypothesis that expression of SST/TH neurons is altered in the PVN of subjects with BD, with corresponding changes in CRH expression. Furthermore, we used time of death of each subject to test the hypothesis that diurnal rhythms of SST/dopamine and CRH expression are altered in the PVN of subjects with BD. M**ethods:** We conducted multiplex immunofluorescence for SST, CRH, and tyrosine hydroxylase (TH) as a marker for dopamine on a cohort of human hypothalamus samples from 40 control subjects and 40 subjects with BD. Samples were analyzed using stereology-based computer assisted microscopy. Densities of single, double, and triple-labeled neurons were analyzed together with potential confounding factors using stepwise linear regression analysis of covariance. Time of death of each subject was used to analyze diurnal rhythms of outcome measures. **Results:** Our findings thus far, representing 25% of our cohort, reveal lower densities of CRH neurons ($p<0.04$), SST neurons ($p<0.02$) and TH neurons (0.04) in subjects with BD. Furthermore, diurnal expression rhythms are altered in subjects with BD, with densities of CRH, SST, and TH neurons significantly lower in the day compared to control subjects. PVN neurons co-expressing SST and TH have been reported to inhibit CRH neurons through D2 and SST2 receptors. We observed significantly greater densities of SST-TH neurons in control subjects with a time of death during the night. In comparison, subjects with BD displayed significantly greater densities of SST-TH neurons, and did not display lower density during the day. CRH-SST neurons were also significantly decreased in subjects with BD ($p<0.05$). **Conclusions:** Our findings indicate that co-expression of SST with TH in the PVN decreases during the day in the human PVN, resulting in decreased inhibition of CRH allowing for the morning increase in CRH expression. In comparison, in subjects with BD, SST-TH expression fails to decrease during the day, resulting in lower daytime levels of CRH. Furthermore, we observed CRH neurons with SST labeling representing SST terminals onto CRH neurons. These CRH-SST neurons were significantly decreased in subjects with BD, providing further insight

into the neurocircuitry alterations underling the diurnal CRH decrease in BD and guide development of chronotherapies for BD.

O11.05

9:50 HIPPOCAMPAL GROWTH HORMONE REGULATES CONTEXTUAL FEAR MEMORY: IMPLICATIONS FOR BIPOLAR DISORDER

Samuel Asplund, Harry Pantazopoulos, Barbara Gisabella

University of Mississippi Medical Center, Jackson, MS

Background: Synaptic deficits and memory dysfunction are widely implicated in subjects with stress associated disorders including mood disorders and post-traumatic stress disorder, yet the underlying cause remains unknown, limiting development of therapeutic strategies. Previous work suggest that growth hormone (GH) plays a key role in regulating synapses in response to stress. In rodents, chronic stress results in increased GH levels in the amygdala and decreased levels in the hippocampus. We previously reported that viral vector mediated increases of GH in the rodent amygdala strengthens contextual fear memory by increasing dendritic spines and predisposing neurons to participate in encoding fear memory. Despite the evidence that GH may mediate synaptic changes in mood disorders, there is currently a lack of evidence regarding whether hippocampal GH is involved in synaptic deficits in subjects with mood disorders. We used viral vector mediated genetic manipulation to test the hypothesis that hippocampal GH is involved in regulating contextual fear memory. Furthermore, we used human postmortem hippocampus samples from subjects with Bipolar Disorder (BD) and matched Control subjects to test the hypothesis that GH is decreased in the hippocampus in subjects with BD.

Methods: Viral vectors were injected into the hippocampus of C57Bl6/J mice to upregulate or downregulate GH expression (n=6/group). Scrambled RNA vectors were injected in control animals (n=6). Animals were tested for auditory cued and contextual fear memory. Western blot analysis was performed on hippocampus samples from a cohort of 20 control subjects and 20 subjects with BD to examine growth hormone protein expression. Stepwise linear regression analysis of covariance (ANCOVAs) was used to test for the main effect of diagnosis group and potential effects of co-variates including, age, sex, postmortem interval, suicide, psychosis, ethanol, cocaine, or tobacco use, and exposure to psychotropic medications.

Results: Viral vector knockdown of GH expression in the hippocampus significantly decreased contextual fear memory ($p<0.03$). Furthermore, mice with viral vector hippocampal GH upregulation displayed greater response to auditory cue fear memory ($p<0.001$). In subjects with BD, we detected significantly decreased hippocampal GH protein levels compared to matched control subjects (ANCOVA, $F = -2.50$, $p <0.01$, $n=20$ per group), when psychosis was included as a co-variate. Presence or absence of psychosis had a significant effect on GH expression ($p<0.008$), with higher GH expression in subjects with psychosis.

Conclusions Our findings demonstrate that hippocampal GH expression is necessary for contextual fear memory, and increased GH expression enhances response to auditory cued fear memory. Decreased GH expression in subjects with BD suggests that GH may represent a promising therapeutic target for synaptic deficits in this disorder.

O11.06

10:10 157 - EVOLUTION OF BRAIN CIS-REGULATORY ELEMENTS AND VARIANTS ASSOCIATED WITH PSYCHIATRIC DISORDERS ACROSS PRIMATES: A COMPARATIVE GENOMIC ANALYSIS

Youness Touissi[1], Eric J. Vallender[2]

[1]Program in Neuroscience, University of Mississippi Medical Center, Jackson, MS, [2]Departement of Psychiatry, University of Mississippi Medical Center, Jackson, MS

The evolution of the human brain involved structural and functional changes that resulted in unique cognitive abilities relative to other primates. These evolutionary changes have been hypothesized to influence vulnerability to certain psychiatric disorders, most 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 majority of psychiatric disorder-associated single nucleotide variation (SNVs) are found within non-coding and regulatory regions, suggesting that gene regulation may have contributed to both derived cognitive traits and associated psychiatric vulnerability. However, how these regulatory elements evolved and differ across primates remains poorly understood. This study investigated the molecular evolution of adult and fetal brain-specific cis-regulatory elements (b-CREs) and the conservation of variants associated with psychiatric disorders across primate species.

b-CREs in humans were identified from the PsychENCODE database and orthologous regions were identified from whole genome sequences from fifty additional primate species using the blastN algorithm. Orthologous sequences were aligned using the MAFFT algorithm and analyzed using PAML baseml package to calculate evolutionary rates along the human lineage. Variants associated with psychiatric disorders within regulatory regions were identified and mapped to orthologous positions in marmoset and rhesus macaque genomes using the liftOver tool. Cross-species comparison of minor allele frequencies evaluated evolutionary conservation and correlation patterns within each psychiatric disorder studied.

These analyses revealed distinct evolutionary patterns across b-CREs in the human lineage as well as varying

degrees of conservation for psychiatric disorder-associated variants between humans, marmosets and rhesus macaques. These comparative genomic analyses highlighted the key roles that regulatory regions may have played in human brain evolution and suggest avenues for future exploration of the molecular underpinnings of human brain development. Altogether, these findings contribute to our understanding of how regulatory changes during human evolution may have shaped both human neural traits and susceptibility to psychiatric disorders.

O11.07

10:30 BLOOD BIOMARKERS ASSOCIATED WITH TRANSCRANIAL MAGNETIC STIMULATION EVOKED POTENTIALS AS A QUANTITATIVE DIAGNOSTIC TOOL FOR PSYCHIATRIC DISORDERS

Kayla Ryan[1], Obie Allen IV[1], Barbara Gisabella[1, 2], Matej Markota[3], Harry Pantazopoulos[1, 2]

[1]Department of Psychiatry and Human Behavior, University of Mississippi Medical Center, Jackson, MS, [2]Program in Neuroscience, University of Mississippi Medical Center, Jackson, MS, [3]Department of Psychiatry and Psychology, Mayo Clinic, Rochester, MN

Rationale: The current lack of biomarkers for schizophrenia (SZ) represents a challenge for distinguishing patients with SZ from other related psychiatric disorders and predicting treatment response. Transcranial magnetic stimulation evoked potentials (TEPs) have emerged as a promising non-invasive tool to assess neural dysfunction that may serve as a diagnostic tool. Furthermore, various molecular factors, including transcription factors (TFs), immune signaling molecules, and extracellular matrix molecules (ECM), are consistently implicated in the postmortem brains of individuals with schizophrenia (SZ) and represent potential blood biomarkers. For example, MEF2C is implicated as a genetic factor for SZ and is involved in B-cell proliferation and perineuronal net development. Matrix metalloproteases (MMPs) regulate the stability of perineuronal nets, structures that are consistently reported to be decreased in the brains of people with SZ but not people with MDD. We tested the hypothesis that blood-based biomarkers and TEPs can distinguish patients with SZ from patients with MDD as a psychiatric control group. By investigating their correlation with TEP abnormalities, we aim to gain insights into the neurobiological mechanisms underlying SZ and develop quantitative diagnostic tools for psychosis research and clinical care. **Methods**: Whole blood samples were collected from seven psychiatric control subjects with MDD and seven subjects with SZ. ELISA assays were performed for eleven biomarkers, including transcription factors (MEF2C, BCL6, AICDA, TCF3), cytokines (IL-10), cell surface markers/receptors (MS4A1, FCGR3A, RAGE), matrix metalloproteinases (MMP16, MMP9), and growth factors (TGFB1). Protein concentrations were quantified following the manufacturer's protocol for each assay. Multivariate statistical methods were employed to assess correlations between biomarkers and to compare biomarker levels between SZ and control groups. **Results**: We observed significantly lower protein levels for MEF2C ($p=0.04$) and IL-10 ($p=0.03$), in subjects with SZ compared to control subjects. Furthermore, MEF2C displayed a strong positive correlation with IL-10 ($R^2 = 0.545$, $p < 0.003$). No significant differences were observed for any of the other proteins measured. Ongoing analysis will explore the relationships between protein levels, TEP measures, and clinical measures. Furthermore, unbiased RNA sequencing is being conducted to investigate broader molecular pathways associated with TEPs and clinical factors. **Conclusions**: Significantly reduced MEF2C and IL-10 levels in SZ subjects suggest that dysregulated molecular pathways related to genetic factors influencing b-cell development, neuroimmune signaling, and perineuronal net maturation may serve as blood biomarkers for SZ. MEF2C genetic mutations have been associated with SZ, and MEF2C is involved in regulating B-cell development, perineuronal net maturation, and neuroimmune signaling, with its dysregulation linked to cognitive deficits associated with SZ. Similarly, IL-10 regulates the immune response and neuronal health. Altered IL-10 expression has been associated with cognitive impairments and increased neuroinflammation in SZ. Our observed positive correlation of MEF2C with IL10 supports previous reports that the MEF2 family influences IL-10 expression. Lower MEF2C and IL-10 levels, along with their correlation, provide insight into molecular pathways that may distinguish patients with SZ. Ongoing studies will examine the association of these markers with clinical factors and treatment response.

O11.08

10:50 DIRECT DORSAL HIPPOCAMPUS TO PRELIMBIC CORTEX PROJECTIONS DRIVE COCAINE EXTINCTION RESISTANCE IN FEMALE RATS

Savanna Julian, Ariel Cox, Amy S. Kohtz

Department of Psychiatry, Division of Neurobiology and Human Behavior, University of Mississippi Medical Center, Jackson, MS,

Background: Extensive research shows clear sex differences in the progression of substance use disorders. Women tend to develop these disorders faster, escalate use more quickly, need treatment sooner, and experience shorter periods of abstinence. We and others have observed similar patterns in rodents, with female rats exhibiting stronger cocaine-seeking behaviors at the start of abstinence (extinction day 1, ED1) and showing greater persistence than males. Our previous studies highlighted the dorsal hippocampus's key role in recent cocaine memories, influencing these sex differences in context-driven seeking behavior. Recent studies suggest that hippocampal projections to the prelimbic cortex (PL) are

involved in memory strengthening, while those to the infralimbic cortex (IL) facilitate memory weakening. We hypothesize that on ED1, sex differences in the strength of these projections lead to enhanced memory strengthening in females, resulting in greater cocaine-seeking behavior, and memory weakening in males, promoting extinction. **Methods:** We first examined Fos+ neuron expression in the dorsal hippocampus, prelimbic, and infralimbic cortex on extinction day 1 to determine sex differences in neural activity. In a separate group of rats, we implanted retrogradely-transported mCherry-hM3Dq-DREADDSs or mCherry-hM4Di-DREADDS viruses to the PL or IL and guide cannula to the dorsal hippocampus. We infused CNO (1mM) 10m before testing in ED1 to determine the effects of exciting or inhibiting the dorsal hippocampus - PL or IL pathways on ED1 cocaine seeking behaviors and cocaine-seeking persistence. **Results:** Female rats showed greater Fos+ neuron reactivity in dorsal hippocampus (dHPC) and PL cortex during ED1 that correlated to greater ED1 cocaine seeking. Males showed greater IL cortex activity on ED1 that predicted decreased cocaine-seeking behavior. These findings support the hypotheses that dHPC signaling to different regions of the mPFC (medial prefrontal cortex) has different specific effects to promote or attenuate contextual cocaine seeking. In female rats, we show that activating dHPC to PL projections increased cocaine-seeking behaviors long-term but had minimal effects on retrieval of cocaine memories. Activation of dHPC to IL decreased cocaine-seeking behaviors persistently in females. **Conclusions:** Going forward, we hypothesize that reactivating the females during ED1 strengthens contextual memories of drug-seeking behavior. Oppositely, reactivating males during ED1 facilitates extinction of drug-seeking behavior shown by the presence of IL projections, however, future experiments will further investigate these effects in males. Overall, we aim to understand how sex differences in cortical activity drive continuous cocaine-seeking behavior, as insights into dHPC downstream pathways are essential for developing sex-specific therapies.

O11.09

11:10 KCNT1 (SLACK): A KEY DRIVER OF COCAINE-SEEKING BEHAVIOR IN FEMALE RATS ON DAY 1 OF EXTINCTION

Ariel Cox[1], Joshua Zhao[2], Leonard Kaczmarek[3], Amy Kohtz, Ph.D.

[1]University of Mississippi Medical Center, Jackson, MS, [2]. Rutgers Robert Wood Johnson Medical School, New Brunswick, NJ, [3]Yale School of Medicine, New Haven, CT

The inability to maintain abstinence is a hallmark of addiction, 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 cocaine dependence 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. Inhibition of KCNT1 by PRX20 increased cocaine-seeking behavior on ED1, while agonism of KCNT1 with Niclosamide decreased cocaine-seeking behavior on ED1 specifically in females. 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 to ASK.

O11.10

11:30 ADDICTION AS A DISEASE: INCREASED NORMALIZATION OF ADDICTIVE BEHAVIORS AND PERCEPTIONS TOWARDS SUBSTANCE USE

Aditi Rudrashetty[1, 2]

[1]University of Mississippi Medical Center, [2]University of South Carolina - Columbia

This research will explore the neurological background of addiction as a disease and how the exacerbation of external factors has contributed to negative perceptions towards addiction. The external factors are (a) the COVID-19 pandemic and (b) the contemporary experiences of a college student. These negative perceptions can lead to stigma, reluctance to seek help, and misguided legal and policy responses, hindering effective support and recovery for individuals. A study of this issue is important because there is continued normalization of prescribed and non-prescribed substance use leading to the development of addiction. Surveys and interviews were conducted with college students to get firsthand accounts of their perceptions and experiences with addiction. These findings have helped illustrate (1) how COVID-19 and different experiences have brought addiction to people who may not

have ever had an addiction in the first place and (2) how to promote development for different treatments. With this information, a sensitivity training presentation geared towards first responders and other healthcare professionals has been developed with information on how to approach those with substance use disorders. The next step is implementing policy changes and reaching out to local policymakers, addiction treatment centers, and hospitals to conduct in-person discussions on furthering research, treatments, and regulations.

12:00 Lunch

Thursday, March 20, 20254
AFTERNOON
Hall D Room 7

1:00 Divisional Business Meeting

O11.11

1:30 BIRDIE SEE, BIRDIE DO? ESTABLISHING AN EVOLUTIONARY CONTEXT FOR THE ROLE OF THE CEREBELLUM IN COGNITIVE TASKS AND OBSERVATIONAL LEARNING

Lainy Day

[1]University of Mississippi, Department of Biology, Interdisciplinary Neuroscience Minor, University, MS

The role of the avian cerebellum in cognition is a shockingly understudied. A prominent role of the cerebellum in procedural learning has been recognized in humans and rodents for decades along with the recognition of a role of the cerebellum in observational learning as one part of the mirror system. Astonishingly, only a handful of studies outside of my lab has experimentally tested cerebellar function in cognition in birds, and all of these studies were in relation to song. A few recent studies appear to have stumbled upon correlates of cognitive task with CB morphology in poultry birds but causal underpinnings of these associations have not been examined. A few labs have performed functional studies on the more traditional role of the CB in motor coordination mostly concentrating on the vestibular system, gaze, and flight. In my lab, we have demonstrated a clear connection between the complexity of species specific mating displays and the evolution of the cerebellar hypertrophy in bowerbirds and in manakins. We infer that demands for procedural learning of motoric display elements and sonations co-evolves with cerebellar morphology. We have additionally demonstrated specializations in the cerebellum that suggest steroid hormone regulation of cerebellar-related seasonal mating displays in bowerbirds and manakins. Further, we have shown a proximate role of T-arom-E2 mediated neuroprotection after cerebellar lesions in zebra finches and demonstrated that interfering with E2 mediated repair causes behavioral deficits in learning spatial tasks. I am have developed a project that builds on this groundwork in my lab to test whether the cerebellum is critical for avian cognition and that the role of the cerebellum in observational learning seen in humans and rodents is conserved in songbirds, specifically the zebra finch, but only in domains relevant to their behavioral ecology. I will discuss preliminary results and proposed experiments to test three specific hypotheses. Hypothesis 1: **The avian cerebellum shares with mammals a role in learning and performing appropriate timing and sequencing of cognitive tasks.** Cerebellar interference will impair timing and sequencing in learned song, and cause deficits in procedural aspects of fear conditioning and spatial learning but not in recall of previously conditioned fear stimuli our cognitive maps. Immediate early genes will show differential cerebellar expression patterns during learning and performance of song, fear conditioning, and spatial learning/memory. Hypothesis 2: **Behavioral ecology predicts tasks learned by observation in songbirds.** I will confirm observational learning occurs for song, and mate quality bias in zebra finches and predict zebra finches will show a savings in fear conditioning after observing peers, but will not perform mate choice copying or learn a spatial task via observation. Hypothesis 3: **The avian cerebellum plays a conserved role in observational learning of tasks relevant to species' behavioral ecology.** Cerebellar interference will disrupt observational learning of song, fear conditioning, and mate choice copying.

O11.12

1:50 WRESTLING WITH NEURODEGENERATION: SUMOylation IN BRAINS OVEREXPRESSING ATAXIN-1 IN *Drosophila melanogaster*

Sydney "Syd" Davis[1, 2, 3], Madelyn Hunter[1, 2, 3], Aswathy Rai[2], Natraj Krishnan[1, 2]

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Spinocerebellar ataxia type 1 (SCA1) is a dominantly inherited progressive neurodegenerative disease that results in atrophy of cerebellar Purkinje cells. SCA1 is caused by the expansion of a CAG trinucleotide repeat tract in the ataxin-1 gene, resulting in an abnormally long polyglutamine tract within the protein. Interestingly, over-expression of non-pathogenic Atx-1 causes neuronal degeneration if expressed at sufficiently high levels in either mice or Drosophila. In SCA1, accumulation of mutant polyQ ataxin-1into nuclear inclusions is a hallmark of the disease. Protein modification by small polypeptides is an important mechanism for regulating protein events such as trafficking, aggregation and degradation. Ubiquitin is one such attachment. SUMO (small ubiquitin-like modifier) is a member of the ubiquitin family of proteins. SUMO targets include proteins involved in numerous roles including trafficking, transcriptional regulation, degradation etc. A role for SUMOylation in the

pathogenesis of neurodegenerative diseases and associated SUMOylated proteins include Huntington's disease (huntingtin), Parkinson's disease (tau, α-synuclein, DJ-1, Alzheimers disease (tau, APP), spinocerebellar ataxia 1 (ataxin-1) among others. An unresolved question is: What is the precise role of SUMOylation in the disease process? Alternatively, does an increase or decrease of SUMoylation impact disease pathology? To answer this question, the initial steps in the SUMOylation pathway were investigated in Drosophila melanogaster over-expressing atx-1 in the CNS. The expression of genes encoding two subunits of the Sumo activating enzyme (E1) heterodimer complex - Aos-1 (activator of Sumo) and Uba2 (ubiquitin activator) as well as Sumo (dSmt3) were studied. Results demonstrated that, in general, atx-1 overexpressing flies have heightened oxidative stress (protein carbonylation and lipid peroxidation) coupled to neurodegeneration in comparison to age-matched 30 day old control flies. Both Aos1 and Uba2 expression levels were marked enhanced in 30 day old flies with atx-1 -oex compared to age-matched controls. These results point to a role for SUMOylation in the disease progression.

O11.13

2:10 GENDER DIFFERENCES IN SLEEP PATTERNS: INSIGHTS FROM A DROSOPHILA MODEL OF SPINOCEREBELLAR ATAXIA TYPE 1

Madelyn Hunter, Syd Davis, Emma Palmer, Natraj Krishnan

Mississippi State University, Starkville, MS

Disruptions of circadian rhythms and sleep cycles are common neurodegenerative diseases and occur at multiple levels. Accumulating evidence reveals a bidirectional relationship between disruptions of circadian rhythms, sleep cycles and neurodegenerative diseases. Circadian disruption and sleep disorders aggravate neuro-degeneration and neurodegenerative diseases can in turn disrupt circadian rhythms and sleep. Importantly, many of the traits linked to mammalian sleep are also seen in *Drosophila melanogaster*, making an excellent model for investigating the genetics of this crucial process. One such similarity is the presence of sexually dimorphic sleep patterns, with males showing more mid-day sleep ('siesta') than females. In this study, we generated a Drosophila model of Spinocerebellar ataxia type 1 (SCA1) using the bipartite GAL4/UAS system where we drove the expression of the mutated human Ataxin with 82Q (polyglutamine tract) in the nervous system of flies using the neuron specific GAL4 driver, elav-GAL4. We investigated the gender differences in sleep-wake cycles in this Drosophila model of SCA1. Circadian rhythms in sleep-wake cycles as well as locomotor rhythms was studied in a Drosophila Activity Monitor and the data generated was subject to analysis using Sleepmat (v2022.2). Our results on sleep analysis, circadian analysis, anticipatory behavior and eduction indicate a distinct disruption of sleep-wake cycles in males compared to females in the SCA1 model compared to parallel controls. In parallel, the circadian expression of core clock genes period, timeless, clock and cycle were documented in males and females. Core clock gene expression was markedly dampened in males compared to females in SCA1 flies. Taken together, these findings provide valuable insights into the pathogenesis of this neurodegenerative disease and suggest a promising role of circadian-based interventions.

Thursday, March 20, 2025

EVENING

4:00 DODGEN LECTURE /AWARDS CEREMONY

Hall B

5:00-7:00 GENERAL POSTER SESSION

(Immediately following Dodgen Event)

Hall C

P11.01

ANALYZING THE NEUROPROTECTIVE EFFECTS OF PHYTOESTROGENS AND AROMATASE ON MALE ZEBRA FINCH CEREBELLUM POST-LESION

Anthony Irovic, Lainy Day

University of Mississippi, University, MS

Estradiol (E_2) plays an important role in neuroplasticity, and can be enzymatically derived from testosterone via aromatase (AROM) at the site of neural injury. However, E_2 alters testicular function and increases stroke and cancer risk in women. Phytoestrogens, like Genistein (GEN), are plant derived compounds that have a similar chemical structure and some E_2-like effects, but may not have the negative effects of E_2. To determine if GEN has similar benefits to E_2 in neuroprotection without impacts on testicular function we are using cerebellar injury in zebra finch males as a model. The cerebellum has high levels of estrogen receptor beta (ERβ) for which GEN has higher affinity than ERα. The zebra finch brain is highly plastic, and the cerebellum has low AROM constitutively, which is upregulated post-lesion thereby isolating the effects of injury-induced and experimentally-manipulated AROM. To test the effect of E_2 and GEN on neuroprotection, adult male zebra finches were implanted with silastic rope implants containing either GEN, E_2, or an empty implant (CON). Twelve days post-implantation, we used stereotaxic surgery to produce a unilateral puncture lesion (21g) to the cerebellum during which we injected either saline (SAL) or letrozole (LET), an AROM inhibitor, at the lesion site. Systemically manipulating estrogens and locally altering AROM produced six treatments: GEN+SAL, E_2+SAL, GEN+LET, E_2+LET, CON+SAL,

and CON+LET. Prior to brain study, birds were weighed on post-implant-day 0, 5, 12, and 14 and testes were weighed and processed for hematoxylin/eosin. Even though testes have ERα and ERβ, we found that E_2, decreased testis mass and altered spermatogenesis compared to CON and GEN and that weight loss typical of handling stress, was seen only in CON and E2 birds, but not in GEN birds. Seventy-two hours following surgery, the birds were sacrificed and their brains were extracted, cut at 30 µm on a cryostat, and slide mounted. Fluoro-JadeB (FJ) was used to stain degeneration cells. The lesion path is made evident by absence of cells, disruption of cell layers, or altered cell morphology, with FJ positive cells extending around the lesion site indicating the extent of secondary degeneration. The lesion+FJ-positive cell area is being quantified with Stereologer (SRC, Tampa, FL) using the Cavalier point-counting method to estimate volumes. If GEN and E_2 are similarly neuroprotective while local AROM inhibition impairs neuroprotection, lesion sizes should be smallest in GEN+SAL and E_2+SAL, larger in GEN+LET and E_2+LET followed by CON+SAL, and largest in CON+LET group where post-lesion AROM upregulation is hindered. If AROM has independent effects outside of E_2 synthesize, the CON+SAL birds might have lesions similar in size to any of the estrogen treated groups. If our findings support that GEN is an effective substitute for E_2, this would provide compelling evidence for the therapeutic potential of phytoestrogens as neuroprotective agents. Using the zebra finch model, such findings could pave the way for future research and phytoestrogen treatments designed to combat brain injury and neurodegeneration without compromising reproductive health.

P11.02

THE EFFECT OF PHYTOESTROGEN, ESTRADIOL, AND AROMATASE ON POST-LESION CEREBELLAR NEUROPROTECTION IN MALE ZEBRA FINCHES

Grace Thompson, Lainy Day

University of Mississippi, University, MS

When brain cells are injured, apoptotic signals cause secondary degeneration. Glia cell aromatase (AROM) upregulation post-injury increases estradiol (E_2) via synthesis from testosterone and limits apoptosis. E_2 can increase cancer risk and reduce male fertility. Genistein (GEN), a phytoestrogen, may be neuroprotective without the harmful effects of E_2 as GEN has a stronger affinity for estrogen beta receptors (ERβ) rather than alpha receptors (ERα), which play a role in cancer. To test if GEN and E_2 are similarly neuroprotective, we used male cerebellar-lesioned zebra finches, as finch cerebellum has high neuroplasticity and ERβ with little constitutive AROM. We implanted silastic ropes subdermally into adult males (E_2-500ug, GEN-1000ug, or silastic (CON)) for 12 days preceding stereotaxic surgery to produce a 21g cerebellar puncture lesion, injecting 50µg of 1% letrozole/saline, an AROM inhibitor, (LET) or saline (SAL) at the lesion site. This created six groups (n=7/group) with systemic estrogen and local AROM treatments: E_2+LET, E_2+SAL, GEN+LET, GEN+S, CON+LET, and CON+SAL. Prior to brain study, birds were weighed and implant retention was checked on day 0, 5, 12, and 14. Testes were weighed at sacrifice, sliced, and stained with hematoxylin/eosin. E_2 reduced testis mass and decreased spermatozoa compared to CON and GEN, which did not differ and E_2 and CONs, but not GEN birds, displayed the reduced body mass typical with experimental handling, possibly due to lipogenic effects of GEN. Seventy-two hours following lesion, plasma was collected via venipuncture, birds were sacrificed, brains removed, cut at 30um in the cryostat, and slide-mounted. We labeled apoptotic cells with Terminal Deoxynucleotidyl Transferase dUTP Nick End Labeling (TUNEL). We used Cavalieri point-counting in Stereologer (SRC, Tampa, FL) to estimate the volume of apoptotic cells within the lesion path. Preliminary results with n=3-4/group showed large within group variation and we found reproducing measurements difficult. To better capture lesion path volume, characterized by absent or distorted cell layers, and the secondary wave of apoptotic cells, we are now estimating the lesion path volume and the more circumscribed area of TUNEL-positive cells within and adjacent to the lesion path. We will use high-performance liquid chromatography to quantify circulating levels of E_2 and GEN, and exclude subjects that had replaced or lost implants that do not fall within the range of their treatment group. If GEN and E_2 are similarly neuroprotective while local AROM inhibition impairs neuroprotection, lesion sizes should be smallest in GEN+SAL and E_2+SAL, larger in GEN+LET and E_2+LET followed by CON+SAL, and largest in CON+LET group where AROM is inhibited. If AROM acts independently of E_2 synthesis, the CON+SAL lesions may be similarly sized to estrogen-treated groups. Given lack of testicular harm in this zebra finch cerebellum model, despite negative impacts of GEN on testes in other species, if E_2 and GEN provide similar neuroprotection, the mechanisms underlying our result profile should be further studied. Additionally, behavioral consequences and cancer-related impacts in females should be studied to determine if our results have practical implications for phytoestrogen use both after neurotrauma and as dietary protection against neurodegeneration.

P11.03

ALTERATIONS IN THE INFLAMMATORY HOMEOSTASIS OF AGING-RELATED CARDIAC DYSFUNCTION AND ALZHEIMER'S DISEASES

Shuli Huang, Jeremiah Nunez, Dai Lan Toresco, Changhong Wen, Lily Slotabec, Hao Wang, Haibei Zhang, Nadiyeh Rouhi, Michael I. Adenawoola, Ji Li

University of Mississippi Medical Center, Jackson, MS

Alzheimer's disease (AD) is well-known among the elderly and has a profound impact on both patients and their families. Increasing research indicates that Alzheimer's is

a systemic disease, with a strong connection to cardiovascular disease. They share common genetic factors, such as mutations in the presenilins (PS1 and PS2) and the apolipoprotein E (APOE). Cardiovascular conditions can lead to reduced cerebral blood flow (CBF) and increased oxidative stress. These factors contribute to the accumulation of Aβ plaques and the formation of abnormal tau protein tangles, which are both key pathological features of AD. Additionally, Aβ deposits and abnormal protein responses have been observed in cardiomyocytes as well as in peripheral tissues. The toxic Aβ deposition intensify damage to the microvascular structure, associating with the blood-brain barrier (BBB) disruption and the initiation of neuroinflammation.

The interaction between Age-related cardiovascular dysfunction and cerebral pathologies is mediated by the structural and functional alterations in blood vessels, which are associated with diseases like heart failure and atherosclerosis. As these diseases progress, significant microvascular damages and hemodynamic changes occur, leading to reductions in cerebrospinal fluid volume, white matter hyperintensities (WMH), BBB disruption, cerebral microbleeds (CMBs), neurovascular dysfunction, oxidative stress, neuroinflammation, and neuronal apoptosis. These processes impair Aβ clearance and facilitate Aβ and tau pathological accumulation, ultimately contributing to neurodegenerative changes and the onset of AD.

Given the increasing prevalence of aging populations worldwide, a deeper understanding of the interaction between cardiovascular dysfunction and AD is essential for developing targeted prevention and intervention strategies in the early stages of disease. The connection between the cardiovascular and central nervous systems offers novel avenues for dementia research. For instance, cardioprotective agents such as β-blockers, angiotensin-converting enzyme inhibitors, sartans, and aldosterone receptor antagonists may offer neuroprotective effects in AD. Additionally, metformin, which protect against microvascular damage, may help preserve both cardiovascular and cognitive function in individuals with coexisting CVD and cognitive impairment. In this paper, I review the main mechanisms linking AD and cardiac dysfunction to enhance our understanding of these conditions. Ultimately, insights into the brain-heart axis may help us develop effective treatment strategies in the future.

P11.04

NEUROPHYSIOLOGICAL SIGNATURES OF PERCEIVED CONTROL IN THE HUMAN BRAIN: AN ELECTROENCEPHALOGRAPHY STUDY

Benjamin Achord[1], Megan Staehling[1], Linan Huang[2], David Harrison[2], Dwight Waddell[3], Alberto Del Arco[1]

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Perceived control refers to our ability to exert control over the environment. Operationally, it is the belief that our actions will produce expected outcomes. By using the opportunity for choice to create the illusion of control, previous studies have shown that perceived control shapes how the brain processes motivational stimuli (i.e., reward, punishment) and therefore guides decision-making behavior. Moreover, studies have shown that the absence of perceived control is associated with anxiety. Yet it is still unclear how the brain processes perceived control. The current research utilizes electroencephalography (EEG) to identify neurophysiological correlates of perceived control in the human brain. We recruited male and female college students (18-35 years old) and developed a within subject's experimental design for this purpose. Participants performed a Choice task that consisted of 300 trials divided into 6 blocks where they had the opportunity to choose between gaining or losing money according to specific cues shown on a computer screen. Critically, there were three types of trials indicated by specific cues that differed in how much control participants had over their choice's outcome (i.e., high, low and uncertain). EEG was recorded by using an AntiChamp head cap (Brain Products) with 64 electrodes placed according to the 10-20 system. Event-related potentials (ERPs) time locked to trial cues and feedback presentation were analyzed for each participant during the Choice task. Participant's reaction times were also assessed. Ongoing analysis is evaluating whether ERPs significantly predict the type of trial according to perceived control. Note: First three authors made the same contribution.

P11.05

EFFECTS OF ONE SINGLE INJECTION OF PSILOCYBIN ON VALUE-BASED DECISION-MAKING BEHAVIOR AND BRAIN EXTRACELLULAR MATRIX IN RATS

Jenna Houff[1], Andrew Williams[1], Harry Pantazopoulos[2], Barbara Gisabella[2], Alberto Del Arco[1, 2]

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Clinical trials suggest that one single dose of the psychedelic drug psilocybin produces rapid and long-term therapeutic benefits in psychiatric disorders. Choice impulsivity is a value-based decision-making bias and one of the most reliable behavioral features that anticipates the transition to substance abuse. Recent studies from our group identified high and low impulsive rats according to their basal levels of choice impulsivity and suggest a key role of extracellular matrix (ECM) molecules in the regulation of brain circuits involved in psychiatric disorders. Here, based on these studies, we investigated whether one single injection of psilocybin modulates

choice impulsivity and ECM brain markers. Male Long Evans rats (n= 18; 3 months of age) were trained in a delay discounting task (DDT). This task involves a decision-making process in which the subjective value of a reward decreases as the delay in receiving it increases. Rats first learned to discriminate between a large-reward lever (LR) and a small-reward lever (SR) associated with a cue light. Pressing the LR delivered 3 sugar pellets while pressing the SR delivered 1 sugar pellet. The DDT consisted of three blocks of 20 trials each (60 trials total per session). 10 trials of each block were free choice trials in which both levers were active, and animals had to make a choice between the LR and the SR. The three blocks were different in the delay to receive the large reward after pressing the LR: 1 s (block 1), 10 s (block 2) and 20 s (block 3). After stable performance, rats were injected with psilocybin (1 mg/kg, i.p.) or vehicle. Two days after the injection, DDT was assessed and rats were euthanized, and their brains extracted for immunohistochemistry-microscopy analysis. Brain slices were labeled with wisteria floribunda agglutinin lectin to quantify the number of perineuronal nets (PNNs) and with antibodies for c-fos, as a marker of neuronal activity. Ongoing analysis is evaluating whether psilocybin significantly modulates DDT performance and the number of PNNs in the brain. We expect to find that psilocybin decreases choice impulsivity and the number of PNNs. These results would support a role of psilocybin modulating the brain reward system at both behavioral and molecular levels. Note: First two authors made the same contribution.

P11.06

INNOVATIVE HYDROGEL COMPOSITES FOR BONE REMODELING AND NEURONAL ASSESSMENT FOLLOWING CRANIOFACIAL DEFECTS IN ADOLESCENT RATS

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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. This study aimed to assess the healing and resorption rates of cranial defects with resorbable biopolymer composites, and evaluate the potential for inflammation-mediated changes in neurobehaviors and healing in juvenile rats. Four experimental groups of Sprague-Dawley adolescent rats were used in a 5-mm central critical-sized cranial defect model: (1) sham-operated, (2) empty defect, (3) autologous bone placement, and (4) hydrogel composite placement. Neurobehavioral assessment was determined biweekly, and characterization of bone remodeling performance was determined at the 8-week endpoint. Our data show that the empty defect group exhibited decreased short-term memory two, four, and six weeks after surgery, and the autograft (bone placement) group only decreased short-term memory two and four weeks followed by recovery six weeks post-surgery, but the hydrogel composite group showed no decreases in short-term memory two, four, and six weeks after surgery. In addition, bone remodeling results, as determined by dual-energy X-ray absorptiometry (DEXA) scan, showed that the 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-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, NIH grant NIH/NIGMS P20GM103476-Institutional Development Award (IDeA), and Newborn Medicine Funds from the Department of Pediatrics, University of Mississippi Medical Center).

P11.07

OPTIMIZING SEMIOPEN CATHETER SHUNT DESIGNS FOR HYDROCEPHALUS TREATMENT

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Brain shunts are a common and effective treatment for hydrocephalus, a condition characterized by an abnormal buildup of cerebrospinal fluid (CSF) in the brain. Hydrocephalus affects individuals of all ages but is most prevalent in pediatric and elderly populations. Shunts function by diverting excess CSF to other parts of the body, alleviating pressure on the brain. Despite their widespread use, shunts remain one of the most failure-prone medical devices. Alarmingly, about 50% of new shunts fail within two years of implantation in pediatric patients, necessitating frequent revisions and posing significant risks to patient health.

The primary causes of shunt failure include mechanical malfunction, infection, and obstruction due to the accumulation of cells, calcification, proteins, and other debris. Stagnation zones of low shear stress within the catheter have been identified as a major contributor to shunt obstruction. These zones promote the buildup of particulate matter, which obstructs fluid flow and ultimately renders the shunt ineffective. Current shunt designs, predominantly closed-end systems, are particularly susceptible to such complications.

To address this issue, open-end shunt designs have been proposed as a potential improvement. Open-end shunts are theorized to reduce stagnation zones and improve shear stress distribution, thereby mitigating the risk of obstruction caused by cell accumulation. However, the open-end design introduces new challenges. The open tip may act as a suction point, potentially pulling brain tissue, CSF debris, or ventricle wall material into the catheter.

This risk is exacerbated if the catheter shifts or is positioned too close to the ventricle walls. Concerns include localized tissue damage, bleeding, or intraventricular hemorrhage, all of which may counteract the intended benefits and lead to further obstruction or complications.

This study aims to explore innovative geometries of open-end catheter shunts using Computational Fluid Dynamics (CFD) simulations to address these challenges. CFD modeling will enable the analysis of fluid dynamics, including shear stress distribution, flow patterns, and pressure gradients, across different shunt geometries. The study's objectives are twofold: (1) to identify shunt designs that enhance fluid flow and eliminate stagnation zones and (2) to minimize the risk of tissue siphoning and localized damage by optimizing pressure gradients.

Novel semi-open shunt designs will be evaluated and compared with an optimized design from our previous work. Each design will be assessed for its ability to maintain proper flow dynamics, prevent cell obstruction, and ensure safety by mitigating tissue damage risks. The ultimate goal is to identify a semi-open shunt design that achieves optimal fluid dynamics, effectively prevents cell obstruction, and minimizes adverse effects on surrounding tissues. Through this approach, we aim to contribute to the development of safer, more reliable shunt systems for hydrocephalus treatment, improving patient outcomes and reducing the frequency of surgical revisions.

P11.08

NOVEL CANNABICHROMENE DERIVATIVES EFFECTIVELY REDUCE PAIN IN MICE

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Pain is the primary cause of disability in the United States, with current pharmacotherapies heavily reliant on opioids, which are associated with significant risks of addiction, tolerance, and overdose. As a result, non-addictive pain management strategies are needed to reduce opioid use and the associated public health burden. Many studies suggest cannabinoid-based therapies could be effective, as over 60% of medical marijuana users report experiencing pain relief from Cannabis sativa L. While most studies examine the effects of Δ9-tetrahydrocannabinol (Δ9-THC), the therapeutic potential of Δ9-THC is limited due to its psychoactive effects and potential abuse liability. Therefore, a cannabinoid devoid of these limitations would be a better therapeutic candidate. Cannabichromene (CBC), a minor cannabinoid found in cannabis, has been shown to have non-psychoactive and anti-inflammatory effects in animals, leading our team to develop novel derivatives of CBC that could enhance bioavailability and therapeutic potential. The current study evaluates the effectiveness of a novel CBC derivative, CBC-Val-HS, compared to the naturally occurring CBC against multiple pain modalities.

A pharmacokinetic study was conducted to evaluate the bioavailability of CBC and CBC-Val-HS (10mg/kg, i.v., p.o.), with blood concentrations measured at varying timepoints (e.g., 30 min, 60 min, 2 hrs). To compare the efficacy of CBC and CBC-Val-HS against inflammatory pain, an abdominal writhing assay was performed. Male and female C57Bl/6J mice were administered increasing doses of CBC or CBC-Val-HS (0.1mg/kg- 50mg/kg, i.p.) 30 minutes prior to administration of 0.7% acetic acid (i.p.), and the number of abdominal writhes associated with inflammatory pain were measured for 30 minutes. The two stereoisomers of CBC-Val-HS were separately assessed within this assay (10mg/kg, i.p.) and further evaluated for anti-nociceptive effects using a hotplate assay (10mg/kg, i.p.), in which paw removal latency was measured. To assess potential abuse liability, CBC-Val-HS was tested in a conditioned place preference assay (10mg/kg, i.p.).

Both IV and oral administration of CBC-Val-HS showed greater bioavailability compared to CBC. Administration of CBC and CBC-Val-HS decreased the number of abdominal writhes in a dose-dependent manner, with 10mg/kg or higher fully blocking inflammatory writhing. While one stereoisomer showed greater efficacy against inflammatory pain, both stereoisomers increased paw removal latency with no significant difference between them. After conditioning, no preference for the drug-paired chamber was seen with CBC or CBC-Val-HS. Together, these findings indicate that CBC-Val-HS can attenuate inflammatory and thermal pain as effectively as CBC. Importantly, CBC-Val-HS has greater bioavailability than CBC and lacks abuse potential, suggesting greater therapeutic and commercialization potential.

P11.09

THE EFFECT OF REPEATED EXPOSURE TO THE PERIPHERAL DRUG PYRIDOSTIGMINE BROMIDE ON BEHAVIOR PERFORMANCE AND CELLULAR EXCITATION IN THE BRAIN OF ADULT RATS

Noah A. Martin, Hayden M. Anderson, Sarah K. Broadaway, Caroline E. Carroll, Janice E. Chambers, Katrina M. Jackman, Kendall N. McKinnon, Edward C. Meek, Angela K. Ross, Cameron G. Whitmore, Shirley X. Guo-Ross, Russell L. Carr

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Pyridostigmine bromide (PB) is a nerve agent prophylactic used to protect warfighters against organophosphate (OP) chemical warfare agents. OPs inhibit brain acetylcholinesterase (AChE), which leads to the buildup of acetylcholine. This can lead to a disruption of autonomic processes inducing a cholinergic crisis, causing respiratory failure, seizures, and death. The nerve agents also inhibit peripheral AChE which provides some protection by reducing the amount of nerve agent free in the blood that can reach the brain. However, once the peripheral AChE is saturated, the remaining active nerve agent can reach the ultimate target, the brain. PB functions as a prophylactic by inhibiting ~30% of the peripheral AChE. However, this PB-induced inhibition of AChE is temporary with recovery of activity occurring after a short time. Following a nerve agent exposure, the rapid recovery of the PB-inhibited AChE opens up new binding sites for the nerve agent so

less agent is available in the blood to reach the brain. This decrease in nerve agent reaching the target allows sufficient cholinergic function to be restored which decreases the likelihood of the nerve agent inducing death. However, the effect of PB itself on nervous system function is not clear. PB does not cross the blood-brain barrier. Thus, it cannot directly act on the brain. However, daily dosing with PB may indirectly affect the brain due to repeated inhibition of peripheral AChE that persistently increases cholinergic activity and signaling from the periphery. The aim of this study was to determine if repeated daily PB treatment alters behaviors focusing on anxiety, memory, and anhedonia/depression. Male and female rats (n=12) were administered either vehicle or PB orally for 21 days. Behavioral testing was conducted on days 14-19. The "elevated plus maze" was used to test for anxiety, the "novel object" test was used to assess cognition and spatial memory, the "open field" test was used to analyze thigmotaxis and anxiety, and the "sucrose preference test" was used to measure anhedonia/depression. Treatment did not affect performance in the elevated plus maze, sucrose preference test, or novel object test. In the open field test, activity levels were not affected. However, female PB-treated rats entered and spent more time in the center of the maze than did the female controls. This may suggest a subtle reduction of anxiety levels in females but not males. An additional cohort of non-behavioral rats (n=5) was treated similarly with PB and cellular excitation was measured in the amygdala on days 4, 7, and 14 using BDNF gene expression as a marker. The behavioral cohort was used to determine BDNF gene expression on day 21. BDNF expression was initially significantly decreased on day 4 in the PB group but increased over time such that expression was significantly increased in the PB group on day 21 in both sexes. These data suggest that repeated PB treatment increases the level of cellular excitation in the brain despite not being able to cross the blood-brain barrier and induces subtle sex-specific effects on anxiety-like behavior.

P11.10

POPPING THE HOOD ON CIPN: ASSESSING THE CELLULAR EFFECTS OF CBC ON CIPN

Anna Weimer[1], Miguel De Leon[1], Mahmoud ElSohly[1, 2], Nicole Ashpole[1], Waseem Gul[2]

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Chemotherapy is the predominant treatment for use in a variety of cancers, but throughout its history of use in patients, many side effects have been reported. One of the most common of these side effects is Chemotherapy-Induced Peripheral Neuropathy (CIPN). This adverse side effect subjects an estimated 60% of patients to pain that is experienced for months or even years following chemotherapy. This sensory symptomology is due to the upregulation of ion channels such as TRPV1 in the dorsal root ganglia of patients, which leads to the release of TNF-α, causing inflammation. These changes manifest in the Intraepidermal Nerve Fibers (IENF) of patients, where the chemotherapy damages these nociceptors, leading to an overall reduction in density. Current therapeutics, historically limited to opioids or other such analgesic drugs are associated with additional adverse effects, most notably the potential for abuse. Therefore, there is a necessity to develop more effective treatments, with fewer risks associated.

In recent years, one drug class that has emerged as a useful alternative to these is cannabinoids. Our previous research has shown that cannabichromene (CBC), a minor phytocannabinoid, is capable of alleviating multiple types of pain, while also being devoid of the psychoactive properties seen in other cannabinoids, as well as the abuse potential seen in opioids. Given these properties, it was a suitable candidate for its assessment against CIPN. We found that through the utilization of CIPN mouse models, CBC was able to attenuate the associated mechanical sensitivity caused by cisplatin (i.e., mice treated with CBC were less sensitive to mechanical stimulation). While this data provided insightful behavioral outcomes, the cellular and molecular mechanisms for this mitigation of CIPN are unexplored.

As a result, the present study aims to elucidate the specific mechanisms through which CBC mitigates CIPN. Hind paws and spinal cords were collected from 6-8-week-old male and female C57BL/6J mice treated with either cisplatin (2.3 mg/kg, 6 doses) and vehicle, or cisplatin and CBC (25 mg/kg, single dose). Immunohistochemistry staining protocols were utilized to determine intraepidermal nerve fiber (IENF) density by staining for PGP 9.5 in the hind paws. These protocols were also used to stain the DRGs and spinal cord sections for astrocyte activation using GFAP and microglial activation using Iba1.

The acute administration of CBC in male mice that were treated with cisplatin chemotherapy did not show any significant differences in IENF density. Ongoing work is aimed at determining if there are any sex differences in terms of IENF density as well as comparing the IENF densities of these cisplatin-treated mice to cisplatin naive mice. Additionally, due to the effects of cannabinoids on inflammatory pathways, we expect CBC to cause a reduction in the amount of GFAP expression when compared to the cisplatin-only mice, as well as a similar decrease in Iba1 expression, showing a decrease in microglial activation. These results would show the effectiveness of CBC as a treatment for CIPN, as it would show that CBC counteracts the injury to the neuronal cells caused by cisplatin.

P11.11

THE IMPACT OF AN ACUTE NERVE AGENT SURROGATE EXPOSURE ON NEUROLOGICAL MARKER EXPRESSION IN THE BRAIN OF JUVENILE RATS

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Nerve agents are organophosphates that include compounds such as soman, sarin, tabun, and VX. Some of these agents have been used in warfare against military personnel and, tragically, have also been weaponized by terrorists against civilian populations. In military combat, these agents are delivered with precision, leading to concentrated, localized exposure to high levels of agent. In contrast, terrorist attacks often result in less targeted dissemination that would cause widespread exposure to levels that would more than likely be sublethal. The civilian population involved would be comprised of individuals of many different ages and, frequently, the majority of these are children. Unfortunately, much of the existing research on nerve agent exposures has focused on lethal dosages in adult animal models, and these studies frequently are accompanied by the co-administration of therapeutics against OP-induced lethality (i.e., atropine and 2-PAM). This has created a knowledge gap about the effects of exposure on the younger population especially with respect to sub-lethal exposures. This project was designed to investigate the effects of a high sublethal acute exposure of juvenile rats to the NIMP (nitrophenyl isopropyl methylphosphonate), a surrogate for the nerve agent sarin. Sixteen-day-old rats were given subcutaneous injections of either a control substance (Multisol) or 0.175 mg/kg of NIMP. All of the rats exposed to NIMP displayed seizure-like episodes. Brain samples were collected at 4 hours, 1 day, and 4 days post-exposure and RT-PCR was performed. At the 4-hour mark, there was a significant rise in the expression of c-fos and BDNF, signaling increased cellular excitation. By the next day, markers associated with key brain cells, including GFAP (astrocytes), IBA-1 (microglia/macrophages), SB100 (a marker of general cellular damage), and TMEM (microglia) were noticeably reduced. The decline in expression of GFAP, IBA-1, and SB100 levels persisted through day 4. These findings indicate that sub-lethal nerve agent exposure in young subjects can lead to prolonged disruptions in the brain, including a reduction in population of cells vital for normal neurological function

P11.12

GRAPHEME COLOR SYNESTHESIA IS ASSOCIATED WITH ENHANCED WORKING MEMORY TO GRAPHEMES (BUT NOT COLORS) THAT IS SUPPORTED BY ENHANCED ACTIVITY IN THE SUPRAMARGINAL GYRUS AND DECREASED ACTIVITY IN THE PRIMARY VISUAL CORTEX

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Grapheme-Color Synesthesia (GC-S) is a condition where individuals perceive color when viewing non-colored graphemes. Previous work has shown that synesthetes have enhanced working memory for abstract concepts (such as words); however, it is unclear if this advantage arises from synesthetic association itself. This study investigated whether synesthetes have improved working memory efficiency to graphemes compared to nonsynesthetes, but not to simple visual stimuli such as color. Ten synesthetes and sixteen nonsynesthetes performed a working memory task consisting of 4, 6, 8, and 10 items per trial, with items consisting of either color swatches or non-colored graphemes, while brain activity was recorded using functional near-infrared spectroscopy (fNIRS). As expected, performance decreased for both groups as the number of items increased, but significant differences emerged on the most demanding trials (8 or 10 items per trial). On those trials, synesthetes and nonsynesthetes performed similarly on color trials, but synesthetes maintained accuracy on grapheme trials while nonsynesthetes' accuracy significantly decreased. Neuroimaging showed that synesthetes, relative to nonsynesthetes, had increased brain activity in the associative visual cortex during color trials. On grapheme trials, synesthetes, relative to nonsynesthetes, had increased brain activity in Brodmann Area 40 (supramarginal gyrus) as well as decreased activity in the visual cortex. These findings show that synesthetes have differential processing of color and grapheme stimuli, and that the synesthetic experience may enhance the efficiency of working memory for the synesthetic stimuli.

P11.13

THE EFFECTS OF THERAPEUTIC NASAL SPRAY ON BEHAVIOR OF RATS WITH TRAUMATIC BRAIN INJURY

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Traumatic brain injury (TBI), caused by excess amounts of force hitting the skull, can lead to short term and chronic

health effects. Damages from such an injury result from both the primary impact, as well as inflammation that occurs as a result of a secondary immune response. Our laboratory has been working to develop a novel nasal therapeutic that can aid in reducing such immune effects and inflammatory processes. Previously, our research demonstrated that repeated administration of our novel therapeutic reduced the level of neuronal damage as measured days after impact. However, a major factor in the severity of the chronic negative consequences is the quality and rapidity of the treatment received. The goal of this study was to determine the effectiveness of a single administration of the therapeutic nasal spray in reducing the adverse consequences of TBI. A weight drop device was used to induce TBI, delivering various impact levels (1.0, 1.5, 2.0, and 2.5 Joules) to adult male rats. Motor activity was measured at 4 hours post-impact using an open field test. The rats subjected to the lowest impact level had reduced activity but with increasing impact levels, the rats exhibited increasing levels of activity. As expected, control animals exhibited a normal pattern of habituation or a steady decrease in activity over time. However, the patterns of habituation in the impacted groups were flatter with differences present between different levels of impact. When the intranasal spray was administered a control rat, the pattern of habituation was slightly altered. However, when administered to rats subjected to an impact level of 2.0J (1-hour post-impact), the therapeutic greatly improved the behavioral performance as compared to rats receiving the impact level of 2.0J alone. This aforementioned data demonstrates that rapid administration of this therapeutic following brain injury can reduce the behavioral changes that result from TBI.

P11.14

SESTRIN 2 MODULATES MICROGLIAL POPULATION AND BLOOD BRAIN BARRIER INTEGRITY IN ALZHEIMER'S DISEASE

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Introduction: Sestrin 2 (Sesn2) is a stress response protein that is downregulated with age. Alzheimer's Disease (AD) is an age-related, neurodegenerative disease where incidences increase with age. Thus, age-related Sesn2 could serve as a pharmacological target for ameliorating AD pathology. **Hypothesis:** Sesn2 as a scaffold protein alters microglial population and phenotype to restore the blood brain barrier (BBB) integrity in AD. **Methods:** Young (3-5 months) / aged (21-24 months) C57BL/6J wild type (WT), young (3-5 months) Sesn2 KO (global Sesn2 knockout), and 5xFAD (3 months and 6 months) whole mice brains were used for fluorescent in-situ hybridization (FISH) and immunohistochemistry (IHC) to observe mRNA levels of Sesn2 and cerebral cell types. Tail vein injection and subsequent perfusion of FITC-dextran and Evan's Blue was used to monitor BBB stability. Immunoblotting was used to measure proteins. **Results:** 5xFAD brains showed increased microglial activation and Sesn2 mRNA when compared to young/aged WT, and Sesn2 KO brains. BBB integrity was compromised in 5xFAD brains versus young/aged WT, and Sesn2 KO brains. Immunoblotting showed increased apoptotic and oxidative stress proteins, and decreased autophagic proteins in 5xFAD brains versus young/aged WT, and Sesn2 KO brains. **Conclusion:** Age-related Sesn2 modulates microglial population in AD. Microglial population modulates apoptotic, oxidative stress, and autophagic proteins that may compromise BBB integrity in AD.

P11.15

THE BIASED KAPPA OPIOID AGONIST, TRIAZOLE 1.1, INCREASES THE INFLAMMATORY ANTINOCICEPTIVE EFFECTS AND REDUCES THE RESPIRATORY-DEPRESSANT EFFECTS OF OXYCODONE IN RATS

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Mu opioid receptor (MOR) agonists (e.g., oxycodone) are used to attenuate pain in clinical practice. However, harmful side effects like respiratory depression limit the safety and therapeutic windows for these compounds. The biased kappa opioid receptor (KOR) agonist, triazole 1.1, has been shown to reduce the reinforcing effects and enhance the thermal antinociceptive effects of oxycodone without producing side effects that are typical of prototypical KOR agonists in rodents. However, it remains to be determined if triazole 1.1 can A) modulate the antinociceptive effects of oxycodone in more translational models of pain (e.g., inflammation), and B) modulate the respiratory depressant effects of oxycodone. The current study investigated the effects of triazole 1.1 on oxycodone-induced antinociception in an inflammatory model of pain and on oxycodone-induced respiratory depression using whole body plethysmography (WBP). Both studies used separate cohorts of 8 Sprague-Dawley rats (4 females and 4 males per cohort), and drugs for all tests were administered intravenously through chronic indwelling femoral or jugular catheters. For the antinociception study, inflammation was induced by injection of complete Freund's adjuvant into the right hind paw, and antinociception was measured with a von Frey apparatus. Oxycodone (0.032-1.0 mg/kg), triazole 1.1 (0.32-10.0 mg/kg), and combinations of the two were tested in separate cohorts of subjects, and drugs were administered as pretreatments prior to testing with the von Frey. For the

respiration study, one cohort of rats received injections of oxycodone (0.1-1.0), triazole 1.1 (1.0 mg/kg), and combinations of oxycodone with triazole 1.1 prior to testing in whole body plethysmography. Oxycodone and triazole 1.1 produced significant dose-dependent antinociception, and combining triazole 1.1 with oxycodone potentiated oxycodone's antinociceptive effect. Oxycodone, but not triazole 1.1, produced dose-dependent respiratory depression. Combining triazole 1.1 with oxycodone reduced oxycodone's potency to produce respiratory depression. These findings suggest that a combination of oxycodone and triazole 1.1 may enhance clinically therapeutic effects and reduce adverse effects like respiratory depression. Combining oxycodone with molecules of the triazole 1.1 series is a promising trajectory for developing safer opioid therapeutics for pain.

P11.16

REDUCED ASIC2a EXPRESSION IS ASSOCIATED WITH CEREBRAL HYPOPERFUSION IN THE PREFRONTAL CORTEX AND OLFACTORY AREA OF AGING MICE

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Acid sensing ion channels (ASICs) are proton-gated ion channels expressed in neural and peripheral tissue that are activated by drops in extracellular pH. Previous studies have shown that reduced expression of ASIC2a is implicated in seizure-susceptibility and severity in preclinical models of eclampsia. The specific mechanisms underlying this effect are not fully elucidated. Furthermore, ASIC2a plays a key role in vascular function, partly mediating vascular myogenic tone. The current study aims at investigating the effects of reduced ASIC2a expression and sex on baseline cerebral perfusion and cerebral edema.

Methods: Male and female wild-type (WT) and heterozygous (HET, knock-down) ASIC2a mice between 12-14 months of age were used in this study. All female mice were nulliparous. Mice were anesthetized using isoflurane and cerebral perfusion was measured using Laser Speckle Imager. To measure cerebral perfusion, a differential perfusion tool was used to assess baseline perfusion for predefined brain regions. Brain water content was also calculated as the percentage of dry weight to wet weight ratio and compared between WT and HET mice.

Results: There was no significant difference in regional brain water content between the genotypes. There was a significant main effect of sex on baseline perfusion of the left parietal cortex ($p=0.03$), right parietal cortex ($p=0.04$), olfactory area ($p=0.024$), and whole brain ($p=0.02$), with males having lower perfusion. There was a main effect of genotype on perfusion of the left prefrontal cortex ($p=0.006$) and olfactory area ($p=0.002$), with HET having reduced perfusion. Interestingly, significant reduction in perfusion occurred in the olfactory area in HET males compared to WT males ($p=0.011$) and significant reductions in left prefrontal cortex in male HET compared to male WT ($p=0.004$) and female HET mice ($p=0.038$).

Discussion: Given the role of the prefrontal cortex in decision-making, the reduced perfusion to this region observed in this study coupled with the reduced perfusion to the olfactory lobe in heterozygous mice could be indicative of a function of ASIC2a in coupling sensory information with cognitive responses. This finding is preliminary and requires further study with larger sample sizes and methods to investigate neurovascular coupling mechanisms. The finding of reduced cerebral blood flow is consistent with clinical and preclinical studies. The lack of difference in brain water content suggests that ASIC2a might not be involved in mediating cerebral edema in nulliparous aging mice and male mice. Future studies will determine the effects of multiparity on cerebral perfusion and brain water content in response to reduced ASIC2a.

P11.17

GESTATIONAL EXPOSURE TO CHLORPYRIFOS AND ITS ROLE IN AUTISM-LIKE BEHAVIORS: EXAMINING SEX DIFFERENCES AND NEUROCHEMICAL PATHWAYS

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Chlorpyrifos (CPF) is an organophosphate insecticide primarily used in agriculture to control pests. Although its residential use has been largely restricted due to health concerns, no ban currently exists on its continued use. Previous studies show that CPF exposure affects anxiety and compulsive behaviors, such as aggression, stereotypies, and ritualistic actions, and can produce cognitive disruption in humans. High doses often amplify these behaviors, while low doses produce mixed effects. Animal studies recapitulate these effects, and studies in both humans and rodents reveal that male offspring are more sensitive to gestational toxicant exposure (e.g., CPF), displaying greater phenotypic effects than female offspring. These anxiety and compulsive behaviors align with certain symptoms of autism spectrum disorder (ASD), suggesting that gestational toxicant exposure, and possibly CPF or other organophosphates, may contribute to the etiology of autism-like spectrum disorders. Herein, we aimed to investigate the effects of gestational CPF exposure on ASD-like symptomatology. Pregnant female Sprague-Dawley rats were exposed to 6mg/kg/day, PO CPF or safflower oil vehicle daily from gestational day 6-20. The offspring, raised to adulthood, were tested for ASD-like behaviors. Herein, we employed the marble burying (MBB) test, as it is widely used to assess anxiety- and compulsive-like behaviors in rodents. Compared to vehicle-treated rats, CPF-treated rats engaged in equivalent bouts of MBB but spent less time per bout and buried more marbles. This suggests that CPF exposure may enhance

burying efficiency. More notably, the effects were more pronounced in the CPF-treated male rats than in the females. Since anxiety, stress, and marble-burying behavior are influenced by norepinephrine (NE) signaling, future research will examine the effects of NE antagonists (e.g., propranolol, methylphenidate) on MBB and/or Fos+ neuron reactivity in MBB-relevant regions, such as the locus coeruleus and amygdala, that drive these effects. The significance of this research lies in its exploration of CPF's potential contribution to autism-like behaviors and its neurotoxic effects. The study also highlights the male susceptibility to CPF exposure, reflecting the higher prevalence of ASD diagnoses in males. By examining the specific brain pathways and neurochemical signaling involved, this research lays the groundwork for future studies on pharmacological interventions and treatments of ASD.

P11.18

INTRAUTERINE GROWTH RESTRICTION ENHANCES SUSCEPTIBILITY TO ISCHEMIC STROKE- INDUCED BRAIN INJURY, INFLAMMATION, AND NEUROLOGICAL DYSFUNCTION IN ADULT RATS

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Epidemiological and experimental studies suggest that intrauterine growth restriction (IUGR) increases the risk of developing diseases later in life. However, susceptibility to ischemic brain injury in IUGR individuals is poorly understood. This study tested whether maternal inflammation or IUGR rats have greater ischemic brain injury compared to control rats. IUGR was induced in the rat offspring by using a reduced uterine perfusion pressure (RUPP) procedure during late gestation. At 5 months, middle cerebral artery occlusion (MCAO) was performed on the IUGR and control animals to induce stroke. Motor and sensory skills were tested 24 hours after the procedure, followed by euthanasia to collect brain tissue to assess the damage. Our results showed that the offspring of dams exposed to RUPP showed significant hypomotor activity and hyperalgesia with brain size alteration, as indicated by the reduction of total brain, cortical, and hippocampal volume, along with the dilation of ventricles compared to the control offspring. RUPP-induced IUGR rats showed greater motor and sensory deficits compared to control rats as assessed with the modified neurological severity score after the MCAO procedure. RUPP-induced IUGR also increased adult susceptibility to ischemic brain injury, including increases in brain damage volume and degenerating neurons (Jade C+), and the impairment of dendrites (MAP2+) and myelin (RIP+). These results suggest that RUPP-induced brain dysfunction in rats may enhance adult susceptibility to ischemic brain injury. Our model may be useful for studying mechanisms involved in ischemic brain injury and developing potential therapeutic strategies. (Supported by NIH grant NIH/NIGMS P20GM103476-Institutional Development Award (IDeA), NIH-NIGMS-P20GM121334-MSCEPR-COBRE, and Newborn Medicine Funds from the Department of Pediatrics, University of Mississippi Medical Center)

P11.19

CLOCKING OUT: DISRUPTIONS TO CIRCADIAN RHYTHMS AND SLEEP-WAKE CYCLES IN *Drosophila melanogaster* Due TO LOSS OF QUEUOSINE tRNA MODIFICATION

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A fundamental molecule for protein synthesis, the tRNA is subject to regulation at multiple levels including transcription, transcript processing, localization and ribonucleoside base modification. Post-transcriptional modification of tRNA occurs at a number of base and sugar positions and influences specific anticodon - codon interactions and regulates the fidelity of translation. These modifications result in a rich structural diversity of tRNA of which over 100 modified nucleosides have been characterized. Queuosine (Q), a complex hypermodified base modification of guanosine is found at position 34 of the GUN anticodons of four tRNA species (tRNA)Tyr, Asn, Asp, His. Q has been found to exist in the tRNA of most organisms studied to date. In animal cells, changes in the abundance of Q correlate with diverse phenomena including alterations in stress tolerance, cell proliferation, and tumor growth, but the precise role of Q remains unknown. The enzyme responsible for modification of Q-tRNA is tRNA-guanine transglycosylase (TGTase) that catalyzes replacement of G34 by Q. Drosophila melanogaster TGTs are composed of a catalytic subunit (QTRT1) and a homologous accessory subunit (QTRTD1) that complex to catalyze Q insertion into target tRNAs. The working hypothesis is that knocking down the tgt gene, its accessory subunit, or the potential Q-salvage protein DUF2419 (NP_611573.1) will result in reduced levels of Q-tRNA. Drosophila fly lines with UAS-RNAi constructs for QTRT1, QTRTD1, and DUF2419 were crossed to the Ubi-GAL4 driver, so that F1 progenies had knock down of these specific genes. Circadian rhythms in sleep-wake cycles was studied in a Drosophila Activity Monitor and the data generated was subjected to analysis using Sleepmat (v2022.2). Our results on sleep analysis, circadian analysis, anticipatory behavior and eduction indicate a distinct disruption of sleep-wake cycles with lack of Q-tRNA compared to parallel controls. Coupled to this, we also document a significant decline in dopaminergic neurons and dopamine levels in flies with lack of Q-tRNA. These results are strongly indicative of a role for Q-tRNA in the formation of tyrosine, a precursor for dopamine

which also participates in arousal and circadian rhythms of sleep. Based on this, we hypothesize that Q-tRNA is required for proper function of clock neurons and removing Q-tRNA may lead to aberrant clock neural behavior or circuitry formation/maintenance and disruption of sleep-wake rhythms.

P11.20

ACTIVATED PROTEIN C ADMINISTRATION MITIGATES PATHOGENESIS OF ALZHEIMER'S DISEASE IN 5xFAD MOUSE MODEL

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Introduction: Alzheimer's Disease (AD) is a progressive neurodegenerative disorder characterized by cognitive decline, memory impairment, and neuroinflammation. The causes of these classical hallmarks are centered around misfolded amyloid beta (Ab) proteins or hyperphosphorylated tau proteins leading to increased intracellular damage and instability, while also gravely impacting the tissue structure and blood-brain barrier (BBB) vasculature. These deleterious aspects of the disease are generally due to increased BACE1 activity (Ab deposition) or increased glycogen synthase-3 beta activity (tau hyperphosphorylation). Here, we identify activated protein C (APC), a serum protease with cytoprotective and anticoagulant properties, as a potential therapeutic target for patients with AD. APC is known to promote the stability of endothelial barriers, so we ask if APC is able to stabilize the BBB to promote the efficacious removal of Ab and tau loads. The reduction of pathogenic deposition can further stabilize the brain via energy metabolism and the reduction of inflammation. **Methods.** To answer these questions, we utilized 3-month-old C57BL6/J wild-type (WT) mice, EPCR^R84A mice which lack the ability to convert protein C (PC) into APC, and 5xFAD, a model of AD, mice. Ab, tau, and BBB proteins were monitored via immunoblotting. Mitochondrial oxidative phosphorylation (OXPHOS) was measured via Seahorse Real-Time Cell Metabolic Analyzer and mitochondrial reactive oxygen species (ROS) were measured via MitoSox ROS staining. Neurovascular proteins were measured by cytokine array and immunoblotting. Cognitive functions were determined by the Radial Arm Water Maze. **Hypothesis.** APC administration reduces pathological load of AD by reducing Ab, tau, and inflammation. **Results.** Western blotting demonstrates that APC-depleted mice have increased amyloid beta deposition in both the hippocampus and cortex. Moreover, there is a detectable increase in phosphorylated tau proteins and GSK3B activity. Interestingly, BBB tight junction and cell adhesion molecules also appeared to be lower, while potential transporters of Ab are elevated. Furthermore, JNK and NF-kB pathways appeared hyperactive. Impaired APC-signaling also shows OXPHOS capacity was significantly depleted in both hippocampus and cortex. Surprisingly, APC-depleted mice exhibited impaired cognition compared to WT. Within the 5xFAD mice, BBB proteins were decreased compared to WT and APC treatment rescued this depletion. Moreover, JNK and NF-kB showed greater phosphorylation, with APC reducing their activity levels. Mitochondrial analysis demonstrates that 5xFAD mice have reduced mitochondrial function and increased ROS production compared to WT with APC restoring both electron transport function and reducing ROS accumulation. **Conclusion.** APC-depletion led to significant changes in overall brain homeostasis. These changes include the deposition of AD-specific pathogenic markers, increased neuroinflammation, mitochondrial dysfunction, and cognitive impairment similar to that of AD. Administration of daily APC led to decreases in Ab and tau loads, decreased inflammatory signals, increased mitochondrial function, and increased cognition in a mouse model of AD.

P11.21

THE DUAL OREXIN RECEPTOR ANTAGONIST DORA-22 BLOCKS THE SLEEP-DISRUPTING EFFECTS OF METHAMPHETAMINE IN FEMALE RHESUS MONKEYS

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Background: Methamphetamine use is associated with numerous adverse health outcomes, including disturbed sleep. The orexin system has been implicated as a mechanism underlying methamphetamine-induced sleep disruptions. The aim of the present study was to investigate the effects of a novel dual orexin receptor antagonist (DORA), DORA-22, on sleep, alone and after acute methamphetamine administration on actigraphy-based sleep parameters in female rhesus monkeys. **Methods:** Actigraphy-based sleep measures were obtained in female rhesus monkeys (n=5) under baseline and acute test conditions. Saline or methamphetamine (0.3 mg/kg) were administered at 10h, followed by evening (16h30) oral treatments with vehicle or DORA-22 (3 - 30 mg/kg, p.o.). **Results:** Methamphetamine induced significant disruptions in actigraphy-based sleep parameters, decreasing sleep efficiency and increasing sleep latency and sleep fragmentation. Treatment with DORA-22 dose-dependently improved all actigraphy-based sleep parameters in monkeys treated with methamphetamine. Additionally, DORA-22 promoted sleep in the absence of methamphetamine, significantly improving actigraphy-based sleep fragmentation in a dose-dependent manner. C**onclusions:** Our findings suggest that DORAs may be an effective option for treating sleep disruptions observed in individuals who use methamphetamine.

P11.22

MU OPIOID RECEPTOR GENOTYPE-DEPENDENT OPIOID-ETHANOL INTERACTIONS IN MALE RHESUS MONKEYS

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Opiate and alcohol addictions separately are widespread public health problems that are associated with individual differences in opioid neurotransmission. A single nucleotide polymorphism, A118G, in the human mu opioid receptor gene (OPRM1) may change the way in which the endogenous opioid system mediates reward via the mesolimbic circuitry. The 118G variant is linked to higher levels of alcohol-induced euphoria and an increased risk of opiate and alcohol addiction when compared to the A118 variant. A similar polymorphism in rhesus monkeys (C77G) mirrors the human mutation and its corresponding physiological and behavioral phenotypes. There is growing evidence that opioids frequently are co-abused with alcohol and that this polydrug abuse can increase lethality of the individual drugs, as well as decrease the effectiveness of opioid maintenance therapy. However, the extent to which OPRM1 genotype influences the drug interaction remains unknown. In the present study, male rhesus monkeys genotyped for the C77G polymorphism (N's: 4 C/C; 4 G/G) were given limited, daily, concurrent access to 4% w/v ethanol solution and water under a fixed-ratio schedule. Once daily ethanol intake was stable, monkeys received pretreatments of saline, fentanyl (0.001-0.01 mg/kg), buprenorphine (0.003-0.1 mg/kg), morphine (0.03-0.3 mg/kg) or oxycodone (0.03-0.3 mg/kg) prior to the session. Compared to vehicle (saline), the opioids failed to enhance ethanol drinking in C/C animals and even suppressed intake at their highest doses. In G/G animals, all of the opioids except fentanyl enhanced ethanol consumption. The results indicate a clear effect of genotype in that C/C animals were more sensitive to the suppressing effects of opioids compared to G/G animals. To the extent that the decreases reflect non-specific behavioral effects, this result suggests that these drug combinations would have more severe side effects in A118-carrying humans. Quantitative observation studies in the monkeys support this supposition. In the G/G animals, the results indicate a clear augmenting effect of the opioid on ethanol consumption. To the extent that reinforcing effects reflect abuse potential, this result suggests that 118G carriers may be more vulnerable to this form of polydrug abuse. Supported by: AA029023

P11.23

MACHINE LEARNING-BASED PATTERN ANALYSIS OF NEONATAL BRAIN INFLAMMATION INVOLVEMENT IN HOMEOSTATIC RESPONSES TO SLEEP DISTURBANCES AND ADHD-LIKE BEHAVIORS IN ADOLESCENT RATS

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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 aimed to examine whether machine learning-based pattern analysis identified sleep patterns associated with ADHD in juvenile rats exposed to perinatal inflammation and sleep disruptions. Intraperitoneal injections of lipopolysaccharide (LPS) (2 mg/kg) or saline were administered on postnatal day 5 (P5) to Sprague-Dawley male rat pups, followed by behavioral testing at P35, implantation of 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) were included in this study: 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. 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 applied to analyze the feature interaction patterns among the collected high-dimensional sleep data. Our approaches identified relative theta and spindle power as features significantly associated with ADHD and perinatal inflammation in this experimental model of sleep disruption. These results suggest that machine learning-based analysis could serve as a strong tool in identifying neurodevelopmental disorders utilizing sleep data in subjects exposed to perinatal inflammation and sleep disruptions. In addition, these results could help in developing new treatments for sleep disorders associated with ADHD.

P11.24

PRENATAL METHAMPHETAMINE EXPOSURE AFFECTS LOCOMOTOR ACTIVITY AND BLOOD PRESSURE IN ADULT OFFSPRING

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Methamphetamine (Meth) use during pregnancy is a global health issue. While negative effects of Meth, including effects on the cardiovascular system, are well studied for adults, there is limited knowledge on the impact of prenatal Meth exposure. The current study examined the effects of prenatal Meth exposure on aged male and female offspring

on Meth sensitivity, and blood pressure (BP) before and after chronic angiotensin II (AngII) treatment compared to control offspring. To model prenatal Meth exposure, female rats were implanted with jugular vein catheters and trained to self-administer Meth i.v. (FR3, 0.05 mg/kg/infusion). Sham females served as controls. When stable levels of self-administration were reached, females were mated. Daily self-administration sessions continued until litters were born. All offspring were aged to 15+ months before potential differences in Meth sensitivity were evaluated. Meth sensitivity was assessed by measuring Meth-induced locomotor activity in all offspring. Meth was administered subcutaneously at various doses (saline, 1.0, and 3.2 mg/kg), and activity was measured for 90 mins. To assess cardiovascular function, BP baselines were recorded via the tail-cuff method. Afterwards, osmotic mini pumps were implanted in all offspring, releasing 50 ng/kg of AngII per day for 10 days. BP was assessed again after the AngII treatment, and comparisons between baseline BP and BP post-AngII were analyzed. Meth administration dose-dependently induced hyperlocomotion in all animals. However, there were sex- and prenatal exposure-dependent differences in the observed effects. Meth-exposed female offspring showed reduced Meth-induced locomotor activity compared to controls at 1.0 mg/kg, but increased locomotor activity after 3.2 mg/kg Meth, due to reduced stereotypic behavior. In males, there was no difference at 1 mg/kg, but as with females, Meth-exposed males showed higher levels of locomotion than their sham counterparts after the higher Meth dose. For BP assessment, AngII induced a significant raise in BP in sham control offspring, but this rise was not observed in Meth-exposed male and female offspring. In addition, Meth-exposed females had higher baseline BP, but lower post-AngII BP compared to their sham-exposed counterparts. These findings suggest that prenatal exposure to Meth alters Meth sensitivity and impacts cardiovascular function in offspring in the long term.

P11.25

OXYTOCIN STRIKES BACK: COMBATING COCAINE'S HORMONAL DISRUPTION IN FEMALE RATS

Carlee Cockrell[1, 2], Ariel Cox[1], Amy Kohtz[1]

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Cocaine use disorder (CUD) remains a significant mental health issue, displaying notable gender disparities. Clinical evidence indicates that women have a greater susceptibility to CUD; however, comprehensive mechanistic studies are scarce. Prior research suggests that this heightened vulnerability in females may be attributed to the endocrine-disrupting properties of cocaine, particularly its effects on estrous and menstrual cycles. Studies also propose that oxytocin (OXT) may mitigate these effects, though the duration of these effects remains to be established. Our principal objective was to examine the interactions between OXT and ovarian hormones during both acute and chronic exposure to cocaine, aiming to assess OXT's efficiency as a therapeutic agent. In the acute study, our lab utilized intact females in proestrus and diestrus, along with ovariectomized female rats receiving hormone replacement (progesterone (4mg/kg, SC, 4hr) or safflower oil) co-administered with oxytocin (0.3mg/kg, IP, 30m) or saline, and cocaine (10mg/kg, IP) or saline. Blood samples were analyzed using an enzyme immunosorbent assay (ELISA) to quantify circulating levels of estradiol, oxytocin, corticosterone, and progesterone. In examining the effects of chronic cocaine exposure, our lab employed intact cycling females, administering either vehicle or cocaine daily for the duration of six weeks. Daily sampling was executed via vaginal lavage. Beginning in the second week, females received co-administration of OXT (0.3mg/kg, IP, 30m) or saline every 10 days to examine the impacts on the estrous cycle. Tail-vein blood draws were conducted, and another ELISA was employed to evaluate the within-subject circulating levels of ovarian hormones, OXT, and corticosterone. Our preliminary findings indicated a significant interaction among OXT, cycle phase, and cocaine, modulating circulating progesterone levels in intact rats. Acute cocaine intensifies the effects on progesterone, estradiol, and corticosterone, which were mitigated in the presence of OXT. The levels of circulating OXT significantly predicted progesterone (R^2=0.40), highlighting a strong correlation between OXT and progesterone. In contrast, our chronic observations identified a notable interaction affecting progesterone levels, stemming from the interplay among OXT, cycle phase, and cocaine. Chronic exposure to cocaine resulted in a reduction of progesterone and corticosterone levels, accompanied by an elevation in estradiol levels. Nevertheless, the administration of exogenous OXT reinstated the levels of progesterone and estradiol, thereby stabilizing the estrous cycle to its pre-cocaine exposure state. OXT alleviated the hormonal imbalances caused by cocaine, particularly impacting levels of progesterone, estradiol, and corticosterone, and modified the duration of the cycle phases. OXT serves as a safeguard against the hormonal disturbances induced by cocaine, thereby mitigating its impact on the instability of the estrous cycle. Consequently, we infer that OXT shields against the endocrine-disrupting effects of cocaine, reducing its prolonged consequences.

P11.26

53 - MEASURING TEST ANXIOUS STUDENTS' PUPIL RESPONSE TO POSITIVE AND NEGATIVE FEEDBACK

Amy Snyder, Erick Bourassa

Mississippi College, Clinton MS

The blue-box stress test (BBST) was developed and validated in the Bourassa lab for identifying students with and without test anxiety. The underlying assumption of the BBST is that test anxious students (but not non-test anxious

students) will deploy more attentional resources to the performance indicator when being given negative feedback than the actual task, causing a decrease in actual performance. However, there is only indirect (EEG) data supporting this assumption. The present study used pupil tracking to confirm this underlying assumption of the BBST as well as determine if the attentional bias towards the performance indicator (the region of interest, ROI) is due to hypervigilance towards, or failure to disengage attention from, the ROI. The results show that overall, BBST score did not correlate with the duration participants gazed at the ROI (with either good or bad feedback), nor did the BBST correlate with the latency to look at the ROI. However, the ratio of duration and (1/latency), when being given bad feedback relative to good feedback, significantly correlated with BBST score ($r = -0.277$, $p = 0.0025$). Because the ratio of duration to (1/latency) significantly correlated with BBST, but neither the duration or latency alone did, this suggests that students with test anxiety either have hypervigilance towards the ROI or actively avoid the ROI. This is consistent with the hypervigilance-avoidance model of attentional bias in anxiety, further supporting the BBST as a valid tool to measure test anxiety.

P11.27

MULTIPARITY IS ASSOCIATED WITH INCREASED REGIONAL CEREBRAL PERFUSION IN MICE

Reina Hartfield[1, 2], Qingmei Shao[3], Chauncey Darden[3], Junie Warrington[3]

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Pregnancy is associated with significant modifications and adaptations within the cardiovascular system. The long-term effects of these changes, especially in relation to multiparity (>1 pregnancies), are largely unexplored. A public health study showed that multiparity (>5 deliveries) is associated with decreased hippocampal volume and worse memory. Other studies point to varied cardiovascular risks that are dependent on the number of deliveries. The underlying mechanisms remain to be fully understood. The goal of this study is to investigate the chronic effects of parity on cerebrovascular health. To explore this, we used SMA-GFP mice (n=27), examining cerebrovascular function by comparing multiparous (n=4) and nulliparous (n=13) female mice. Mice were weighed and under isoflurane anesthesia, cerebral perfusion was measured using Laser Speckle Imager. Brain, heart, and kidney weight were recorded. Using PimSoft software, regions of interest were drawn to measure perfusion in the Superior Sagittal Sinus, Left Parietal Cortex, Right Parietal Cortex, Transverse Sinus, Cerebellum, Prefrontal Cortex, Olfactory area, and whole brain and perfusion was normalized by the area for each region of interest. Differences between groups were assessed using Unpaired T-tests and values are presented as Mean ± Standard Deviation. Multiparous females had 4±1 litters (range = 3-6) and were 61±50 days from their last delivery. Multiparous females had increased body weight ($p=0.021$), heart weight ($p<0.001$), left kidney weight ($p=0.031$), and hematocrit (0.017) compared to nulliparous females. There was no significant difference in brain weight, heart rate, oxygen saturation, or right kidney weights between groups ($p>0.05$). The perfusion data revealed that parity significantly influences cranial regions. In female multiparous mice, the right parietal cortex ($p<0.001$), the whole brain ($p=0.059$), and the olfactory area ($p=0.005$) had higher cerebral perfusion rates in comparison to nulliparous females. There were no significant changes in other brain regions in relation to parity ($p>0.05$). Our finding that multiparous females showed higher perfusion in the right parietal cortex and olfactory area support the hypothesis that multiparity-induced hyperperfusion may be due to increased blood pressure. Whether there are any direct relationships to cognitive function will be tested in future studies. These results shed light on how reproductive history may predispose individuals to vascular and neurological changes. Further studies will increase our sample size and determine whether changes in blood pressure may contribute to the increased cerebral perfusion observed with multiparity.

P11.28

ALTERED DIURNAL EXPRESSION OF NEUROTRANSMITTERS IN THE PARAVENTRICULAR NUCLEUS OF SUBJECTS WITH BIPOLAR DISORDER

Daniel T. Trussell, Obie Allen IV, Kayla Ryan, Lamiorkor A. Lawson, Barbara Gisabella, Harry Pantazopoulos

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Rationale: A growing number of studies indicate circadian rhythm alterations are a key feature of Bipolar Disorder (BD) that impact symptom severity and treatment response. Our previous study demonstrated that levels of the anxiolytic transmitter somatostatin (SST) decrease in the morning in the amygdala of subjects with BD, coinciding with increased morning severity of anxiety and depression. Circadian rhythms and stress response are regulated by the hypothalamus through the paraventricular nucleus (PVN). Rodent models have shown that shorter or longer days can cause neurons in the PVN to switch their neurotransmitter from SST to dopamine and in turn alter expression of the stress signaling transmitter corticotropin releasing hormone (CRH), resulting in increased anxiety and depression. Our recent study identified altered levels of SST, CRH, and clock molecules in serum samples from subjects with BD. In the current study, we tested the hypothesis that expression of SST/TH neurons is altered in the PVN of subjects with BD, with corresponding changes in CRH expression. Furthermore, we used time of death of each subject to test the hypothesis that diurnal rhythms of SST/dopamine and CRH expression are altered in the PVN

of subjects with BD. M**ethods:** We conducted multiplex immunofluorescence for SST, CRH, and tyrosine hydroxylase (TH) as a marker for dopamine on a cohort of human hypothalamus samples from 40 control subjects and 40 subjects with BD. Samples were analyzed using stereology-based computer assisted microscopy. Densities of single, double, and triple-labeled neurons were analyzed together with potential confounding factors using stepwise linear regression analysis of covariance. Time of death of each subject was used to analyze diurnal rhythms of outcome measures. **Results:** Our findings thus far, representing 25% of our cohort, reveal lower densities of CRH neurons ($p<0.04$), SST neurons ($p<0.02$) and TH neurons (0.04) in subjects with BD. Furthermore, diurnal expression rhythms are altered in subjects with BD, with densities of CRH, SST, and TH neurons significantly lower in the day compared to control subjects. PVN neurons co-expressing SST and TH have been reported to inhibit CRH neurons through D2 and SST2 receptors. We observed significantly greater densities of SST-TH neurons in control subjects with a time of death during the night. In comparison, subjects with BD displayed significantly greater densities of SST-TH neurons, and did not display lower density during the day. CRH-SST neurons were also significantly decreased in subjects with BD ($p<0.05$). **Conclusions:** Our findings indicate that co-expression of SST with TH in the PVN decreases during the day in the human PVN, resulting in decreased inhibition of CRH allowing for the morning increase in CRH expression. In comparison, in subjects with BD, SST-TH expression fails to decrease during the day, resulting in lower daytime levels of CRH. Furthermore, we observed CRH neurons with SST labeling representing SST terminals onto CRH neurons. These CRH-SST neurons were significantly decreased in subjects with BD, providing further insight into the neurocircuitry alterations underling the diurnal CRH decrease in BD and guide development of chronotherapies for BD.

END OF THURSDAY'S PROGRAM

Friday, March 21, 2025
MORNING
Hall D Room

8:45 Welcome and Opening

O11.14

9:00 EXPOSURE TO SEIZURE AND REDUCED UTERINE PERFUSION PRESSURE LEAD TO IMPAIRED MITOCHONDRIAL FUNCTION, DECISION MAKING, AND CEREBRAL PERFUSION AT 2 MONTHS POSTPARTUM IN C57BL/6 MICE

Chauncey J. Darden, Simranjit Kaur, Qingmei Shao, Karen Saffold, Maria Jones-Muhammad, Tyranny Pryor, Ngoc H. Hoang, Kristin S. Edwards, Junie P. Warrington

[1]University of Mississippi Medical Center, Jackson, MS

Introduction: Vascular dementia (VaD) is the number two cause of dementia-related deaths. Slow thinking and impaired decision-making are early symptoms of VaD, preceding memory impairment, which are activities controlled by the prefrontal cortex. Overall, the incidence of dementia is higher in women, but the cause(s) are still unclear. One potential link is exposure to hypertensive disorders of pregnancy such as preeclampsia and eclampsia (PE/E). PE/E is a multi-organ disorder categorized by new onset hypertension after 20 weeks of gestation, and sometimes postpartum. Left untreated, PE can progress to life-threatening eclampsia, characterized by new-onset seizures. PE/E is thought to occur due to reduced utero-placental perfusion (RUPP) and systemic endothelial activation. Studies show that women with a history of PE/E have a higher risk of VaD; however, the mechanisms are still unclear. Mitochondria, the key regulators of cellular health and signaling, have been linked to the pathophysiology of PE/E, with dysfunctional mitochondria reported in the placenta and kidneys. The effects of PE/E on cerebral mitochondrial function have not been well studied. **Hypothesis:** We hypothesize that exposure to RUPP and seizures lead to dysfunctional mitochondria in the prefrontal cortex resulting in postpartum cognitive impairment and cerebral hypoperfusion. **Method:** To test this, pregnant C57BL/6 mice underwent sham or RUPP surgeries at gestational day (GD) 13.5 followed by injections of pentylenetetrazol (PTZ, 40mg/kg), a seizure inducing GABA receptor antagonist, at GD 18.5 to mimic both PE/E conditions. All mice were allowed to deliver naturally. At 2 months postpartum, we measured spatial cognition and executive decision making using the Barnes maze. We further measured cerebral perfusion in the prefrontal cortex using Laser Speckle Imaging. Mitochondrial respiratory chain function in frozen prefrontal cortex was measured using the Jasco UV-Vis Spectrophotometer and the Oroboros O2k FluoRespirometer. **Results:** Mice exposed to RUPP+PTZ showed modest learning impairments, taking the longest time to navigate to the escape box on day one of training compared to Sham-PTZ ($p=0.014$). RUPP+PTZ mice chose a direct search strategy 17% of the time on Day 1 ($p<0.05$) compared to 55% in Sham-PTZ. There was a significant decrease in prefrontal cortex perfusion in RUPP+PTZ exposed mice compared to both RUPP-PTZ ($p=0.001$) and Sham+PTZ animals ($p=0.016$). Animals exposed to PTZ also had altered respiratory complex I, III, and IV activity with animals exposed to Sham +PTZ having a significant increase in NADH oxidation compared to Sham-PTZ ($p=0.047$) and RUPP+PTZ ($p=0.012$). Cytochrome C reduction and oxygen consumption rate was also significantly higher in RUPP+PTZ animals compared to Sham+PTZ ($p=0.028$ and $p=0.045$, respectively). **Conclusion:** Together these results support the hypothesis that PE/E-like conditions result in cerebral mitochondrial dysfunction, hypoperfusion of the prefrontal cortex, along

with modest impaired spatial navigation on the Barnes maze at two months postpartum. Ongoing studies will assess changes in the morphology of mitochondria in different brain regions and changes in vascular-specific mitochondria postpartum.

O11.15

9:20 MOUSE OFFSPRING EXPOSED TO PREECLAMPSIA/ECLAMPSIA-LIKE SYMPTOMS EXHIBIT CHANGES IN REGIONAL CEREBRAL PERFUSION AND MODEST LEARNING IMPAIRMENT AT 2 MONTHS OF AGE

Karen Saffold, Andrea Tall, Qingmei Shao, Maria Jones-Muhammad, Kennedi Stancil, Tyranny Pryor, Junie Warrington

The University of Mississippi Medical Center, Jackson, MS

Children born to mothers with preeclampsia, a hypertensive pregnancy disorder, or eclampsia, new-onset seizures during pregnancy, are more likely to develop learning and memory deficits and are more susceptible to neurovascular diseases compared to those born from normal pregnancies. The contributing mechanisms are unknown. The objective of this study was to determine whether mice exposed to reduced uteroplacental perfusion (RUPP), to mimic preeclampsia with or without pentylenetetrazol (PTZ) injection (to induce seizures and model eclampsia), results in regional cerebral perfusion changes and learning impairments at 2 months of age. On gestational day (GD) 13.5, pregnant C57BL/6 mice underwent sham or RUPP surgery followed by injection or no treatment with PTZ (40 mg/kg) on GD 18.5. At 2 months of age, mice were trained to navigate the Barnes maze over 4 trials per day for 4 days. Memory was assessed on the 5th day through a probe trial. Under isoflurane anesthesia, cerebral perfusion was measured using Laser Speckle Imaging, and averaged to obtain mean data per sex, per litter (n = 3-6 per group). Perfusion data were normalized to the area of each region of interest. Cerebral perfusion and organ weight data were analyzed using Two-Way ANOVA while 3-Way ANOVA was used for the Barnes maze data analysis. Exposure to RUPP ($p=0.013$) and seizures ($p=0.057$) led to higher number of errors over the training days, with offspring exposed to RUPP-PTZ making a significantly higher number of errors ($p<0.05$) compared to the other groups on acquisition day one. There was also a reduction in cerebral perfusion in offspring exposed indirectly to RUPP specifically of the right parietal cortex ($p=0.013$), superior sagittal sinus ($p=0.003$), cerebellum ($p=0.003$) and whole brain ($p=0.021$). We also observed an overall significant reduction in perfusion, after indirect PTZ exposure, in the right parietal cortex ($p=0.002$), transverse sinus ($p=0.003$), and cerebellum ($p<0.001$); and increase in prefrontal cortex perfusion ($p=0.001$). Further observation showed an overall difference in hematocrit ($p=0.001$), oxygen saturation ($p<0.001$), and cerebellum water content ($p=0.007$) after indirect PTZ exposure. There was no difference in perfusion of the left parietal cortex, body weight, organ weight (except brain, where RUPP exposure led to overall increased brain weight; $p=0.030$). Together, our results are consistent with the hypothesis that exposure to preeclampsia/eclampsia conditions leads to modest learning impairments, changes in cerebrovascular function, with a net reduction in perfusion in exposed offspring. Whether this occurs along with a reduction in capillary density in cognitive centers of the brain or is exacerbated with age are areas of active investigation. Future studies will also assess whether there are sex differences in cerebral perfusion and cognitive function in offspring exposed to RUPP and/or seizures during pregnancy.

O11.16

9:40 INTRANASAL INSULIN PROTECTS AGAINST HYPOXIA-ISCHEMIA-INDUCED BRAIN DAMAGE, INFLAMMATION, AND SENSORIMOTOR DYSFUNCTION IN P5 NEONATAL RATS

Madison Klim[1], Carolyn K Glendye[1], Jonathan W Lee[1], Elizabeth L White[1], Valerie V Quach[2], Nilesh Dankhara[1], Silu Lu[3], Shuying Lin[4], Norma B Ojeda[5], Yi Pang[1], Abhay J Bhatt[1], Lir-Wan Fan[1]

[1]Department of Pediatrics, Division of Newborn Medicine, University of Mississippi Medical Center, Jackson, MS, [2]John Sealy School of Medicine, University of Texas Medical Branch, Galveston, TX, [3]Department of Neurology, University of Mississippi Medical Center, Jackson, MS, [4]Department of Physical Therapy, University of Mississippi Medical Center, Jackson, MS, [5]Department of Advanced Biomedical Education, University of Mississippi Medical Center, Jackson, MS

Currently, as only supportive therapy is available for premature infants (less than 36 weeks gestation) with hypoxic-ischemic encephalopathy (HIE), there is an urgent need for effective therapies to improve outcomes of premature infants with HIE. Our previous studies in P10 neonatal rats showed that intranasal insulin (InInsulin) administration provides neuroprotection against hypoxia-ischemia (HI)-induced brain injury —a finding that holds promise for full-term human infants. The objective of the present study is to examine whether a novel therapy, InInsulin, protects against brain injury, inflammation, and sensorimotor behavioral dysfunction following HI in P5 rats, which corresponds to the brain developmental stage of premature infants. P5 Sprague-Dawley rat pups were randomly divided into four groups. Pups either had HI by permanent ligation of the right carotid artery followed by 90 min of hypoxia or Sham surgery followed by room air. Immediately after HI or Sham, rat pups were administered Insulin (25 μg/5μl) or an equivalent volume of the vehicle in each nare. Sensorimotor neurobehavioral tests and brain injury were determined on P6. InInsulin attenuated HI-induced sensorimotor dysfunction at P6 (n=12/sex/group, $p<0.05$). InInsulin reduced HI-induced inflammation by decreasing elevated serum IL-1β, IL-6, and TNFα levels,

and ipsilateral brain IL-1β levels and Iba1+ microglia numbers (n=6/sex/group, p<0.05). InInsulin also reduced HI-induced brain injury, including a reduction in ipsilateral brain volume and white matter Olg2+ oligodendrocyte numbers and NeuN+ mature neuronal cell loss, and increased cleaved caspase 3+ and Fluoro-Jade C+ neurons in the P6 rats (n=6/sex/group, p<0.05). No sex-specific response was noted. These findings indicate that InInsulin is neuroprotective against P5 HI-induced brain injury, brain inflammation, and sensorimotor neurobehavioral disturbances in neonatal rats. Our results provide strong evidence in support of InInuslin as a non-invasive therapy to improve outcomes of premature newborns with HIE. (Supported by the Intradepartmental Discovery Opportunity Grant (IDOG) and Newborn Medicine Funds from the Department of Pediatrics, University of Mississippi Medical Center, NIH grant NIH/NINDS R01NS080844, and MSCEPR (COBRE) P20GM121334.)

O11.17

10:00 IMPACT OF DEVELOPMENTAL CHLORPYRIFOS EXPOSURE ON COGNITIVE PERFORMANCE AND DECISION MAKING IN RATS

Beau Miller[1], Julia Janknecht[2], Ariel Cox[1], Melanie Berry[1], Amy Kohtz[1]

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Chlorpyrifos (CPF) is an organophosphate which has been classified to be a moderately toxic agent. As a pesticide taking off en masse since 1965, CPF was most notably used to treat around 50 different species of nut, fruit, vegetable, and cereal crops. Despite evidence suggesting significant health risks, a federal ban by the Environmental Protection Agency on the usage of CPF did not occur until 2021, and the long-term effects of extended exposure remain unknown. Although biochemical studies on the effects of CPF are widespread, behavioral testing remains sparse and lacks depth; however, human studies indicate developmental CPF exposure is involved in cognitive deficits and the etiology of attention deficit hyperactivity disorder (ADHD). Here, we tested the effects of subthreshold (non-detectable in fetal tissue) exposure to CPF on rats during development and observed decision making and cognitive performance in a go/no-go (GNG) sucrose reward task. Pregnant Sprague-Dawley rats were given 6mg/kg/day CPF or safflower oil vehicle administered on wafer cookies (readily eaten) daily during gestational day (GD) 6-20. Offspring were raised to adulthood (post-natal day 55) before CPF and vehicle rats were trained to first self-administer sucrose. Then, the rats would be trained to forgo trial learning, and to finally perform the go/no-go testing. Results indicated developmental CPF exposure negatively impacted cognitive performance in the GNG task, particularly in male offspring. Norepinephrine (NE) receptors and transporters are typically involved in decision making behavior and ADHD pathophysiology, including the GNG tasks. Therefore, we tested male and female CPF-exposed rats for the therapeutic potential of NE receptor antagonists (α2; yohimbine and β; propranolol) or NET/DAT transport inhibitors (e.g. methylphenidate) to attenuate CPF-induced dysfunction. Results revealed developmental exposure to CPF adversely affected cognitive performance more in male rats than female rats during GNG tasks. Methylphenidate improved performance in only the male rats with CPF exposure but impaired both male and female vehicle rats. The propranolol impaired performance in both control and exposed rats, regardless of gender, while yohimbine improved the performance in all CPF exposed rats. Thus, CPF exposure may contribute to the etiology of ADHD-phenotypes, and effects to perturb cognitive performance may be more prevalent in male offspring.

O11.18

10:20 EARLY-LIFE SLEEP DISRUPTION ALTERS DENSITIES OF PERINEURONAL NETS AND OXYTOCIN NEURONS IN THE PARAVENTRICULAR NUCLEUS OF ADULT PRAIRIE VOLES

Jobin Babu[1], Landry Smith[1], Carolyn Jones-Tinsley[2], Noah E. P. Milman[2], Lindsay Rexrode[1], Joshua Hartley[1], Barbara Gisabella[1], Miranda M. Lim[2], Harry Pantazopoulos[1]

[1]University of Mississippi Medical Center, Jackson, MS, [2]Oregon Health and Science University, Portland, OR

Background: Autism Spectrum Disorders (ASD) affects 1 in 59 children and is four times more likely in males. Diagnosis typically occurs before age 3, the critical period for early brain development. Children spend more time in REM sleep, essential in shaping neuronal circuitry. Several studies suggest that children with early-life sleep disruption (ELSD) are more likely to develop ASD. However, little is known about how ELSD contributes to neuropathological changes in ASD. Previous animal studies from our group demonstrated that ELSD resulted in impaired social behaviors in adult prairie voles, including reduced partner preference in this typically monogamous species. Our recent study identified alterations of extracellular matrix molecules (ECMs) in the brains of children with ASD. ECM molecules are critically involved in neurodevelopment. Perineuronal nets (PNNs) are ECM structures composed of chondroitin sulfate proteoglycans (CSPGs) involved in neuronal maturation and synaptic plasticity implicated in neurodevelopmental disorders. PNNs are present in the paraventricular nucleus (PVN), a region synthesizing oxytocin, a neurotransmitter that promotes social behaviors. We tested the hypothesis that ELSD results in alterations in PNNs in the PVN of adult voles and is associated with altered numbers of oxytocin neurons. **Methods:** Immunohistochemistry for wisteria floribunda agglutinin (WFA) and immunofluorescence for WFA, oxytocin, and nestin was conducted on fixed free floating serial sections containing the PVN from male and

female adult voles with ELSD (n=8) and controls (n=6). Stereology-based microscopy was used to quantify numerical densities of PNNs and co-localization of PNNs and WFA+ neurons with oxytocin neurons and nestin cells as a marker for immature neurons. **Results:** Densities of WFA+ PNNs and intracellular WFA-labeled neurons were increased in male voles with ELSD ($p<0.05$). Male voles with ELSD displayed decreased densities of oxytocin+ neurons ($p<0.04$) and increased densities of oxytocin+ neurons co-labeled with nestin ($p<0.04$). **Conclusion:** Our data suggest that ELSD contributes to altered PVN neurodevelopment. Increased PNN densities indicate restricted PVN synaptic plasticity. Furthermore, decreased oxytocin neurons and increased co-expression with nestin indicate impaired oxytocin neuron maturation in ELSD voles. Our findings provide evidence for how ELSD may contribute to male-specific alterations in social behavior, including reduced partner preference behavior**.** Ongoing studies will examine the impact of ELSD on additional molecules implicated in our human postmortem ASD studies.

Funding: Supported by the Inflammation Healing Foundation (to HP), 1P20GM144041-01A1 (to BG), 1R01MH131592-01A1 (to MML)

10:40 KEYNOTE SPEAKER

Title: Sex Differences in Dorsal Hippocampus Adrenergic Signaling: Insights into Context-Induced Relapse

Dr. Amy Kohtz

University of Mississippi Medicine

School of Medicine, Department of Psychiatry

11:30 Neuroscience Division Awards Ceremony

12:00 MAS General Session
Scholars Program
Hall B

Friday, March 20, 2025
AFTERNOON
Hall D Room
2:00-5:00
Mississippi INBRE Data Science Workshop

Physics and Engineering

Chair: Pradip Biswas

Tougaloo College

Co-Vice Chair: Katja Biswas

University of Southern Mississippi

Co-Vice Chair: Anuradha Gupta

University of Mississippi

Co-Vice Chair: Yuanyuan Duan

University of Mississippi Medical Center

Thursday, March 20, 2025
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 A COMPARATIVE STUDY OF SPIN GLASSES DESCRIBED via ISING MODEL AND RUDERMAN-KITTEL-KASUYA-YOSIDA (RKKY) INTERACTION ON SNUB SQUARE ARCHIMEDEAN LATTICE

Sk Rahat Bin Salam, Katja Biswas

School of Mathematics and Natural Sciences, The University of Southern Mississippi, Hattiesburg, MS

The Ruderman-Kittel-Kasuya-Yosida (RKKY) interaction is an oscillatory, long-range indirect exchange interaction causing alternating ferromagnetic and antiferromagnetic alignments of magnetic moments. This work investigates the RKKY interaction in a spin glass system confined to a snub square Archimedean lattice. In this talk, we will emphasize its impacts on the potential energy landscape, magnetic ordering, thermodynamic properties and transition pathways. Disconnectivity graphs will be used to describe the energy landscape of the system. They display the stable and metastable states of the energy landscape together with the required increase of energy for transition between minima. The results will be compared with the results of the Ising model with randomly generated interactions for the same lattice, emphasizing their differences and similarities.

O12.02

8:45 FINDING THE GROUND STATE ENERGY OF SPIN MODELS ON A SNUB ARCHIMEDEAN LATTICE USING SIMULATED ANNEALING

Saranga Raut, Katja Biswas

University of Southern Mississippi, Hattiesburg, MS

In this study, we obtain the time to solution (TTS) of spin models on a Snub Archimedean lattice using the simulated annealing optimization procedure. Our models consists of

36 spins, and are represented by an Ising type Hamiltonian with bond strengths randomly drawn from the ranges {+/-1}, {+/-1,+/-2} and {+/-1,+/-2,+/-3}. We investigate the effects that local funnels have on ground state optimization. Simulated annealing is an optimization procedure that uses the physical principle of cooling combined with a Monte Carlo simulation technique to find the lowest energy state of a system. Through iterative optimization, we determine an optimal Monte Carlo step count and cooling rate, ensuring stability and reliability in our TTS calculations. By combining our results with results obtained concerning the energy landscape of these systems, we are able to estimate the influence of local funnels on the efficiency and applicability of the simulated annealing algorithm. We compare the TTS of systems with a high occurrence of local funnels to those with a low occurrence of local funnels. We also investigate the differences in the TTS for two different initial conditions of the simulated annealing procedure, namely starting from random initializations and from initializations confined to local funnels. This allows for conclusions concerning the effects of local funnels on the TTS and can help to interpret results obtained for systems for which the energy landscape is not known.

O12.03

9:00 EFFECT OF THE ANTI-FERROMAGNETIC TO FERROMAGNETIC BOND RATIO ON THE ENERGY LANDSCAPES OF SPIN GLASSES ON SQUARE AND TRIANGULAR LATTICES

Roshan Giri, Katja Biswas

School of Mathematics and Natural Sciences, The University of Southern Mississippi, Hattiesburg, MS

In this work, we study energy landscapes of square and triangular lattices for 36-spin randomly generated spin glasses with periodic boundary conditions and Ising type interaction. The bond strengths between the individual spins are selected randomly from the distributions {-1,+1}, {-2, -1, +1, +2} and {-3, -2, -1, +1, +2, +3}, and the effects of varying the ratio of anti-ferromagnetic bonds to ferromagnetic bonds is investigated. We represent the energy landscape in terms of augmented disconnectivity graphs which use the categorization of the minima structures specific to discrete spin systems, namely regular minima, type-1 dales, type-2 dales, and type-3 dales. Additionally to effects on the disconnectivity graphs, we compare the effects of the different ratios in the distributions of bonds on the occurrence, size and distribution of the types of minima highlighting their differences and similarities.

O12.04

9:15 COMPACT TENSION TESTING: OPTIMIZING DESIGN & LOAD FOR CERAMICS

Riya Titus[1], Kartikeya Singh Jodha[1], Alvaro Della Bona[2], Paula Benetti[2], Susana M. Salazar Marocho[1], Yuanyuan Duan[1], Jason A. Griggs[1]

[1]University of Mississippi Medical Center, Jackson, MS, [2]University of Passo Fundo, Brazil

Purpose/Aim: This study aims to develop a robust fracture toughness test for advanced ceramics. Current methods (ASTM C1421) proposed for ceramic materials have limitations, as shown in Table 1. We propose adapting the Compact Tension (CT) method for metallic materials (ASTM E399). **Materials and Methods:** Thirty compact tension (CT) specimens were fabricated from dental zirconia-based ceramic (IPS e.max ZirCAD) and tested using the MTS hydraulic loading machine. Specimen designs were created by orthogonal array around the current standard design parameters. One design was converted into .stl file and milled using the PrograMill PM7. After sintering, notches were created in twenty specimens using a diamond disc in an Accutom-50 cutting machine, with a pre-crack attempt made on one specimen. Ten specimens had notches created and pre-cracks sharpened pre-sintering and before testing in the MTS hydraulic load frames. Seven specimens failed during pre-crack creation using the Bose Dynamic Mechanical Analysis machine. Two specimens were discarded due to faults in creation or testing processes. The remaining twenty-one specimens proceeded to tension testing. Specimen dimensions were documented using a Keyence VHX digital microscope. The specimens underwent one of four tension testing modes until fracture: (i) manually controlled force increments (n=13), (ii) programmed force control at 1 N/s (n=4), (iii) programmed fatigue cycling between 10N and 100N (n=2), and (iv) increments at 0.001mm/min (n=2). Critical flaw size was measured to calculate fracture toughness. **Results:** Thirteen specimens successfully fractured through the notch. Six of the thirteen tested with manually controlled force increments gave fracture toughness values higher than expected (~ 7.13 $MPa(m)^{-1/2}$). The remaining seven failed from the bottom side gripping hole. Three of the four specimens tested with programmed force control gave a K_{Ic} value of ~ 4.64 $MPa(m)^{-1/2}$. One specimen failed through the bottom side gripping hole. Two specimens subjected to the programmed fatigue cycling gave a K_{Ic} value of ~ 2.45 $MPa(m)^{-1/2}$. The two specimens tested with 0.001 mm/min displacement control and sharpened pre-cracks gave a K_{Ic} value of ~ 5.22 $MPa(m)^{-1/2}$. Main challenges included inadequate notch size, location, and inclination, uneven distances from gripping holes, asymmetric loading due to tight fixture grips, and blunt pre-cracks. Digital-aided microscopy was used to create centered notches of lengths $\geq$ 4 mm, adjusted grips for better alignment, and sharpened the pre-crack.**Conclusions:** Specimens tested using the displacement-controlled increments of 0.001 mm/min with sharpened pre-cracks resulted in the most precise and accurate results. Our methodology shows that the CT testing can be further optimized to enhance the reliability and accuracy of fracture toughness testing for stiff ceramic materials.

9:30 Group Discussion and Coffee Break

9:45-10:45 Computational Physics; Chair: Pradip K. Biswas

O12.05

9:45 UPDATING COMPUTATIONAL METHODS IN COVARIANT DENSITY FUNCTIONAL THEORY TO FORTRAN 95 STANDARDS

Ali Dalbah, Anatoli Afanasjev, Bernard Osei

Mississippi State University, Starkville, MS

This work presents a comprehensive rewrite to the Fortran 95 standard of the computational codes for the calculations in the framework of covariant density functional theory. The computer code using spherical symmetry was updated: its key advancements include new abilities of the code to handle very large fermionic and bosonic bases consisting of up to ~120 bosonic and ~68 fermionic shells and the calculations of infinite basis corrections to binding energies. In addition, an update to the Fortran 95 standard of the axial relativistic Hartree-Bogoliubov code for the calculations of quadruple deformed atomic nuclei is in progress. the results of numerical tests and the calculations for physical observables of interest will be presented.

O12.06

10:00 IMPROVEMENT OF GLOBAL BINDING ENERGY CALCULATIONS IN COVARIANT DENSITY FUNCTIONAL THEORY

Bernard Osei, Anatoli Afanasjev, Ali Dalbah

Mississippi State University, Starkville, MS

The aim of this work is to further improve the calculation of binding energies across the nuclear chart for even-even nuclei in the framework of covariant density functional theory. This was done via various corrections in the fitting protocol of covariant energy density functionals (CEDFs). First, total electron binding energies were taken into account in the conversion of experimental atomic binding energies into nuclear ones. Second, infinite bases correction in the fermionic and bosonic (mesonic) sectors were incorporated as well. The density dependent meson exchange class of the CEDFs showed the most pronounced improvement in the calculation of binding and nucleon separation energies.

O12.06

10:15 TOPOLOGICAL CHARACTERIZATION OF 3D DISORDERED STRUCTURES USING VORONOI-VOLUME ANALYSIS

Anwaoy Pandit, Parthapratim Biswas

School of Mathematics and Natural Sciences, The University of Southern Mississippi, Hattiesburg, MS

This study investigates the structural properties of amorphous silicon (a-Si) through Voronoi volume analysis. Amorphous silicon is characterized by a lack of long-range ordering and significant topological disorder, which affect its atomic structure and properties. We employ a Monte Carlo approach to estimate Voronoi volumes by generating uniformly distributed random points within a sphere around each atom, stabilizing the volume values with higher point counts. The distribution of Voronoi volumes reveals an approximately Gaussian profile that becomes smoother with increasing model size, indicating stability in larger a-Si systems.

Our results indicate a relationship between Voronoi volume and bond angles, with a trend of decreasing Voronoi volume as the average bond angle approaches the ideal tetrahedral angle of 109°, suggesting a correlation between local atomic arrangements and the atomic-packing density. Additionally, we analyze the influence of maximum and minimum bond angles and bond lengths on Voronoi volumes, observing fluctuations that are more pronounced in smaller models, likely due to statistical variations.

O12.07

10:30 ENERGY LANDSCAPES OF SPIN SYSTEMS ON DICE LATTICE

Anil Katwal, Katja Biswas

University of Southern Mississippi, Hattiesburg, MS

In this study, we use augmented disconnectivity graphs to explore the energy landscape of small Ising-type spin systems confined to a two-dimensional Dice lattice. We will compare three models that differ in the range of the bonds between individual spins, namely {+/-1}, {+/-1,+/-2}, and {+/-1,+/-2,+/-3}. The augmented disconnectivity graphs are visualization techniques that provide insight into the hierarchical structure of minima, categorizing them into distinct types: regular minima, type-1 dales, type-2 dales, and type-3 dales. The dales represent extended structures of the landscape that can be traversed without an increase in energy. They provide deeper insights into the system's local and ground-state minima. Additionally, to the disconnectivity graphs, WE will discuss the distribution of the types of minima, their average sizes for the respective energy levels, barrier heights, and thermodynamic properties. The disconnectivity graphs for each model have distinctive features that give valuable insight into their complexity concerning state transitions and difficulties that optimization procedures could face.

10:45 Group Discussion and Coffee Break

11:00-11:30 Artificial Intelligence/Machine Learning Chair: Umar Iqbal

O12.08

11:00 AI-ASSISTED DESIGN OPTIMIZATION OF CUSTOM IMPLANT-ABUTMENTS

Ulysses Lenz[1], Laura Alberto[2], Jason Griggs[2], Alvaro Della Bona[1]

[1]Post-Graduation Program in Dentistry, University of Passo Fundo, Passo Fundo, Brazil, [2]Department of

Biomedical Materials Science, University of Mississippi Medical Center, Jackson, USA

Purpose: To evaluate the mechanical behavior of dental implant abutments designed using conventional multidimensional design optimization versus those designed using artificial intelligence (AI) in tandem with a genetic algorithm (GA). **Methods and Materials:** A Morse-tapered dental implant, an anatomical abutment, and an abutment screw were subjected to a microcomputed tomography (micro-CT), and the digital replicas were reconstructed using a greyscale thresholding tool (Simpleware, Synopsis). A cone beam computed tomography (CBCT) of a pilot patient was conducted, and software for guided surgery planning (CoDiagnositiX, Straumann) was used to place the implant-abutment assembly in the upper central incisor. Nine inner array parameters (related to the implant design) and eight outer array parameters (patient anatomical measurements) were measured using micro-CT and CBCT data, respectively. The reference abutment was constructed in Solidworks using a reverse engineering technique, and the dimensions were systematically changed according to a Taguchi orthogonal array using design of experiments software (DOE++, Reliasoft), which increased or decreased the reference parameters' dimensions by 20%. The 36 resultant models were digitally assembled, and the load was applied in a finite element analysis (FEA) simulation in ABAQUS (D'assault Systèmes), using the fatigue test geometry specified in the ISO 14801 standard. Fe-safe (D'assault Systèmes) was used to estimate the fatigue limits of the different abutment designs, and the most impactful parameters were determined in DOE++. The results were used to train an artificial neural network to predict the fatigue limits of intermediate designs, and a genetic algorithm was used to evolve the design with the highest predicted fatigue limit. **Results:** The fatigue limit for the commercially available abutment was 140 N. The fatigue limit increased to 174 N using conventional design optimization software. The design predicted by ANN + GA resulted in a custom abutment with 181 N fatigue limit (29% increase). **Conclusions:** This innovative method allows one optimize and personalize the design of dental implant abutments using patient-related data and has potential to improve the fatigue life of implant rehabilitations.

O12.09

11:15 POTENTIAL USE CASES FOR AI IN THE DEVELOPMENT OF LABORATORY CONTROL SOFTWARE

Tyler Reese, Maximilian Alberth, Eva Chalona, Sallie Ann Schmidt

University of Southern Mississippi, Hattiesburg, MS

The existence and availability of various "AI" tools have become so ubiquitous that avoiding or preventing their use is, at best, becoming increasingly impractical and, at worst, dismissing a powerful tool that could potentially be utilized to improve various processes in the scientific research setting. One specific case that has been encountered is that of tasking a student who currently has minimal software writing experience with developing software to interface with various laboratory instruments.

Conventionally, once familiarity with the equipment involved was established, this would have started with an introduction to the basic syntax and structure of a suitable programing language. However, this student determined an appropriate AI tool and then spent their energy on clearly articulating the desired behaviors of the control software (arguably a step that would already be included in the software development process when following best practices). They then successfully leveraged the generative capabilities of the AI tool, tasking it with producing a python script that could perform the required tasks.

This presentation will discuss the prompt written & the generated python script, some potential performance limitations of this approach (readability, flexibility, extensibility, etc.), similarities & differences between the generated code and code written entirely "by-hand," and how this approach could potentially be more proactively incorporated into workflows in the context of an academic research lab for rapid prototyping of various software tasks, especially in the case of students with a reasonable technical understanding of the problem but, as of yet, still lacking code writing experience.

11:30 KEYNOTE—Dr. Umar Iqbal
Moderator: Jason Griggs

Title: AI-DRIVEN INNOVATIONS IN STEM EDUCATION: PERSONALIZATION, ENGAGEMENT, AND SCALABILITY

Umar Iqbal[1], Gerardo Gomez[2], Areejah Umar[3]

[1]Illinois State University, Normal, IL, [2]Mississippi Gulf Coast Community College, Perkinston, MS, [3]University of Mississippi Medical Center, Jackson, MS

This paper explores the transformative impact of advanced artificial intelligence (AI) on STEM education, focusing on innovative teaching methodologies and personalized learning. AI tools such as adaptive learning platforms, real-time analytics, and intelligent tutors revolutionize instruction by customizing content, offering instant feedback, and fostering inclusivity. Predictive analytics enable proactive interventions for at-risk students, enhancing outcomes through data-driven decisions. The study also examines hybrid teaching models, gamified assessments, and AR-assisted labs as cornerstones of modernized curricula.

AI's influence extends beyond STEM, transforming medical, engineering, and language education fields. In medical education, AI-powered simulations and virtual patients enable hands-on training in realistic environments, enhancing diagnostic and procedural skills while reducing

reliance on live patient interactions. Engineering education benefits from AI-enhanced design tools, virtual prototyping, and intelligent tutoring systems that provide tailored guidance in complex technical subjects. In language education, AI-driven natural language processing tools facilitate real-time language translation, pronunciation correction, and adaptive learning experiences tailored to individual linguistic abilities.

Addressing ethical concerns like bias and privacy, the paper proposes strategies for transparent AI governance. Integrating interdisciplinary AI courses and generative AI tools outlines a comprehensive roadmap for scaling education across disciplines, ensuring accessibility, inclusivity, and relevance in the AI-driven era.

12:00-1:00 LUNCH & BUSINESS MEETING

Thursday, March 20, 2025
AFTERNOON
Hall D Room 6

1:00-1:45 Lightning Session by Poster Presenters

Moderators: James Stephen, Umar Iqbal, Pradip Biswas, Jason Griggs, Yuanyuan Duan

L.01
ENHANCING IR PHOTODETECTION IN 2D-2D HETEROSTRUCTURE- BASED WSe2/PdSe2 FIELD-EFFECT TRANSISTORS

Nivetha Murugesan[1], Roshan Padhan[1], Shan Yang[1], Sujit A Kadam[1], Anirudha V. Sumant[2], Ralu Divan[2], Nihar R Pradhan[2]

[1]Jackson State University, Jackson, MS, [2]Argonne National Laboratory, Lemont, IL

L.02
FABRICATION AND CHARACTERIZATION OF PLGA/HYDROXYAPATITE COMPOSITE MICROFIBERS FOR BONE TISSUE ENGINEERING AND IMPLANT COATING APPLICATIONS

A M UB Mahfuz, Yuanyuan Duan

University of Mississippi Medical Center, Jackson, MS

L.03
DEVELOPMENT OF AN AZIMUTH AND ALTITUDE DUAL AXIS SOLAR-TRACKING SYSTEM.

Tevin King, Mohammed Elmellouki
Mississippi Valley State University

L.04
DEVELOPING A FUNCTIONAL AND ERGONOMIC AIRCRAFT CONTROL STICK

Calvin King, Mohammed Elmellouki
Mississippi Valley State University, Itta Bena, MS

L.05
WILDFIRE DETECTION USING SMALL, LOW-COST TOOLS

Angie Carraway[1], Samuel Swanner[1], Kaitlyn Hebig[1], Alondra Arreola-Espino[1], Keith Koenig[2]
[1]Meridian Community College, Meridian, MS, [2]Mississippi State University, Starkville, MS

L.06
A SPECTROSCOPIC SURVEY OF SUPER-EARTHS

Luke Brust, Olayinka Oyewole, Christopher Sirola
University of Southern Mississippi, Hattiesburg, MS

L.07
SURFACE ENHANCED RAMAN SPECTROSCOPY DRIVEN LABEL FREE RAPID IDENTIFICATION OF RESIDUAL DITHIOCARBAMATE FUNGICIDE FROM FARM SOIL

Edwina Brown, Triand McCoy, Anant Singh
Alcorn State University, Lorman, MS

L.08
In-Situ NANOSCOPY OF R. solanacearum genomic DNA USING PLASMONIC NANOPARTICLE ANTENNA

Triand McCoy, Edwina Brown, Anant Singh
Alcorn State University, Lorman, MS

L.09
IONOSPHERIC AND METEOROLOGICAL RESPONSE TO TOTAL SOLAR ECLIPSES

Basudev Ghimire[1], Pritesh Thakur[1, 2], Sampada Wagle[1, 3]
[1]St. Xavier's College, Maitighar, Kathmandu, Nepal, [2]The University of Southern Mississippi, Hattiesburg, MS, [3]Tufts University, Boston. MA

L.10
NOW YOU SEE ME WASH

Davon Mims, Mohammed Elmellouki

Mississippi Valley State University, Itta Bena, MS

L.11
OPTICAL AND FERROMAGNETIC PROPERTIES OF MAGNETICALLY UNDOPED AMORPHOUS INGAZNO SPUTTERED THIN FILMS

M. A. Ebdah[1], M. E. Kordesch[2], A. K. Singh[1], W. M. Jadwisienczak[3], A. Ibdah[4]

[1]Department of Chemistry & Physics, Alcorn State University, Lorman, MS 39096, USA, [2]Department of Physics and Astronomy, Ohio University, Athens, OH 45701, U.S.A, [3]School of Electrical Engineering and Computer Science, Ohio University, Athens OH 45701, U.S.A., [4]Center for Photovoltaics Innovation and Commercialization, Department of Physics and Astronomy, University of Toledo, Toledo, OH 43606, USA

L.12
HYPERSONIC COMBUSTION SCRAMJET COMPUTATION

Riyaz Mathews,[1,2] Shanti Bhushan[1]
[1,2]Starkville High School, Starkville, MS, [2]High Computation Performance Center, Mississippi State

University, Starkville, MS

1:45-2:00 Group Discussion and Coffee/Break

2:00-2:45

Artificial Intelligence/Machine learning;

Chair: Umar Iqbal

O12.10

2:00 RADAR AND LIDAR SYSTEMS COMPARISON FOR AUTONOMOUS SYSTEMS APPLICATIONS AND EFFECTIVENESS EVALUATION USING OPEN-SOURCE DATASETS

Jerrick Dubose[1, 2], Liliana Barrios[1, 2], Eric Nkurunziza[1, 2]

[1]Department of Electrical and Computer Engineering, [2]Mississippi State University, Starkville, MS

LIDAR (Light detection and ranging) and RADAR (radio detection and ranging) systems are used to detect objects in vicinity. In both systems, nearby objects are detected using the time difference of emitted and reflected waves. However, the type of wave used in each system leads to differences in accuracy, reliability, and challenges. Sufficient quality and volume of data is required to provide reliable insight for sensor selection for autonomous systems applications. Based on wave characteristics in systems, more accuracy is expected for LIDAR while longer range is expected for RADAR. The initial analysis of open-source datasets shows that LIDAR point clouds include more details while RADAR point clouds include details with larger values as expected for range and accuracy. Both systems use similar principles but provide various advantages based on the type of wave used. For many applications, both systems are combined to utilize the capabilities from both systems. The analysis carried out in this paper compares RADAR and LIDAR systems for their use in autonomous systems and evaluates their effectiveness based on open-source datasets. Using comparable datasets, the effectiveness of each sensor is analyzed, and a comparison is performed where possible. Each system's performance is investigated in terms of maximum distance, resolution, and weather effects. Various programming environments including MATLAB are used to read details from datasets in various scenes for the sensors and perform the evaluation based on the aforesaid criteria. Plots based on point clouds are then illustrated and descriptions for the evaluation are provided.

O12.11

2:15 TUNE INTO GJ 105.5: GAUSSIAN PROCESS MODEL TO RECOVER PLANET AROUND AN ACTIVE STAR

Claire Geneser

Mississippi State University, Starkville, MS

Exoplanet candidates identified by the Transiting Exoplanet Survey Satellite (TESS) often require 50 or more follow-up observations before determining a mass measurement. This requires the use of specially designed echelle spectrographs from which we are able to retrieve precise radial velocity (PRV) measurements. The number of observations surges when measuring PRVs in the presence of strong stellar variability. This pertains to most observations of planets around adolescent or young K dwarf stars. Our candidate, TOI-2443 b, is a sub-Neptune mass planet with an orbital period of 15.669$\pm$0.002 days and a radius of 2.69$\pm$0.55 Rearth in orbit around a relatively adolescent star which exhibits stellar variability of nearly 15 m/s. We collected PRV measurements with the infrared iSHELL spectrograph on the 3m NASA/IRTF telescope, the optical NEID spectrograph on the WIYN 3.5m telescope at Kitt Peak National Observatory and the optical APF telescope at Lick Observatory. The PRV time series is modeled with a chromatic Gaussian Process (GP) which fits the stellar activity as a function of wavelength for each spectrograph. Combining PRV measurements at visible and near-infrared wavelengths reduces the impact of star spots or other sources of stellar variability on the time series which can be misinterpreted as a planetary signal. In this presentation, we review preliminary results of TOI-2443 b and we demonstrate how the GP model accounts for stellar activity. Through use of multiple spectrographs, strict observing cadence and innovative data analysis, we can better model the star in order to recover the planet induced RV. As our community continues the study of exoplanet characteristics from all demographics, we must be prepared to characterize young and active stars.

O12.12

2:30 PREDICTION OF UCS VALUES USING BASIC GEOTECHNICAL SOIL PARAMETERS VIA REGRESSION & MACHINE LEARNING APPROACHES

Mudhaffer Alqudah, Haitham Saleh, Hakan Yasarer, Ahmed Al-Ostaz, Yacoub "Jacob" Najjar

University of Mississippi, Oxford, MS

Unconfined Compressive Strength (UCS) test is a widely used laboratory procedure to assess the undrained shear strength of soil. However, conventional lab testing is time-consuming, costly, and labor-intensive. In this study, 38 soil samples were prepared and tested. The geotechnical properties and strength parameters of each soil mixture were determined through several laboratory experiments, including Atterberg limits, particle size distribution, water content, bulk density (using the Harvard miniature compaction apparatus), and Unconfined Compressive Strength (UCS). A total of 152 lab results were utilized to train models for predicting UCS values using basic soil parameters. The models used include multi-linear regression (MLR), multi-nonlinear regression (MNLR), and machine learning approach including a backpropagation Artificial Neural Networks (ANN), Gradient Boosting (GB), Random Forest (RF), Support Vector (SV), and K-Nearest Neighbor (KNN). The goal

was to relate the dependent variable (UCS) to the independent basic geotechnical parameters (predictors). Results showed that the best model for predicting UCS values based on soil parameters is the ANN-based model, with an R^2 of 83%, Root Mean Squared Error (RMSE) of 1.11, and a Mean Absolute Relative Error (MARE) of 0.42, followed by RF, GB, SV, KNN, MLR, and MNLR.

Thursday, March 20, 2025
EVENING

4:00 DODGEN LECTURE /AWARDS CEREMONY
Hall B

5:00-7:00 GENERAL POSTER SESSION
(Immediately following Dodgen Event)
Hall C

P12.01

ENHANCING IR PHOTODETECTION IN 2D-2D HETEROSTRUCTURE- BASED WSe2/PdSe2 FIELD-EFFECT TRANSISTORS

Nivetha Murugesan[1], Roshan Padhan[1], Shan Yang[1], Sujit A Kadam[1], Anirudha V. Sumant[2], Ralu Divan[2], Nihar R Pradhan[2]

[1]Jackson State University, Jackson, MS, [2]Argonne National Laboratory, Lemont, IL

Two-dimensional (2D) materials have garnered significant attention for their unique electronic, optical, and mechanical properties, making them prime candidates for next-generation electronic and optoelectronic devices. Among these, Tungsten diselenide (WSe_2), a p-type semiconducting transition metal dichalcogenide (TMD), has shown great promise for infrared (IR) photodetection due to its direct bandgap of 1.6 eV in single atomic layer and a strong light-matter interaction. [1] However, the practical implementation of TMDs material-based photo transistors (PTs) faces persistent challenges at IR range due to the band edge absorption. Most of these materials photosensitivity limited to the UV and visible range. To explore the possibility of these materials photodetection application in IR or far IR range, we extended a heterostructure geometry of PT using WSe_2 a visible absorbing material stacked with an extremely low band gap (~ 0.2eV) IR absorbing material $PdSe_2$ to enhance the photoresponsivity. $PdSe_2$ can absorb the IR photons and transferred to the WSe_2 layers where the photo generated carriers can be trapped at the interface of $PdSe_2$ and WSe_2 by applied gate voltage to tune the carrier transport. The synergistic interaction between the bandgap properties of $PdSe_2$ and WSe_2 in this device highlights a promising pathway for developing high-performance IR-sensitive devices.

P12.02

FABRICATION AND CHARACTERIZATION OF PLGA/HYDROXYAPATITE COMPOSITE MICROFIBERS FOR BONE TISSUE ENGINEERING AND IMPLANT COATING APPLICATIONS

A M UB Mahfuz, Yuanyuan Duan

University of Mississippi Medical Center, Jackson, MS

Poly(lactic-co-glycolic acid) (PLGA) is a biodegradable polymer with a wide range of applications, especially in tissue scaffold preparation and drug delivery. It has been shown that the addition of hydroxyapatite in synthetic tissue scaffolds enhances osteoblast adhesion and proliferation. Electrospinning is a facile and cost-effective technique for micro and nanofiber preparation. In this study, we have successfully fabricated composite fibers composed of PLGA and hydroxyapatite (HA) using the electrospinning technique. The aim was to create an effective coating on orthopedic and dental implants to facilitate osseointegration. The prepared PLGA/hydroxyapatite fibers can also be used as a scaffold for osteoblast cell culture. Moreover, various osteoblast growth factors like BMP, FGFs, etc., can also be loaded as cargoes in these fibers. **Materials and Methods:** 7% w/v PLGA (lactic acid : glycolic acid = 75:25) was dissolved in HFIP. 1% w/v nanohydroxyapatite (nHA) was added to this solution. The solution was shaken with the help of a bench rocker for 4 hours. By this time, PLGA dissolved and created a homogenous solution. nHA was finely dispersed in this homogenous solution. This solution was loaded in a 10 ml syringe with a 23G needle for electrospinning. The applied voltage for electrospinning was 17 KV. The solution was ejected through the needle at a rate of 0.8 ml/hr, and the electrospinning product was collected on an aluminum collector present at a 10 cm distance. Electrospinning was conducted at room temperature and humidity. **Results:** After electrospinning for 15 minutes, the deposit on the aluminum foil was collected for characterization under a Scanning Electron Microscope (SEM). Mostly fine fibers with few particles were observed. With the help of ImageJ software, the diameter of the fibers was measured. The calculated mean fiber diameter was 0.87978 ± 0.1634 μm. Energy Dispersive X-ray Spectroscopy (EDS) was conducted to prove the presence of nHA in the fabricated fibers. EDS mapping of the desired element (calcium) confirmed the distribution of nHA in the fibers. **Conclusion:** Our method successfully created electrospun PLGA-nHA composite fibers that can be utilized for coating on different implants where osseointegration is necessary. Moreover, the fabricated fibrous structure can also be used for bone tissue engineering applications.

P12.03

DEVELOPMENT OF AN AZIMUTH AND ALTITUDE DUAL AXIS SOLAR-TRACKING SYSTEM.

Tevin King, Mohammed Elmellouki

Mississippi Valley State University

The increasing global power demand has necessitated the exploration of alternative energy sources beyond fossil fuels. Among renewable options, solar photovoltaic technology stands out as a promising solution. However, the efficiency of solar panels is hampered by the continuous change in the sun's relative angle to the Earth, reducing their power output [1]. The current study addresses this challenge by developing an azimuth and altitude dual-axis tracking system. Solar tracking systems can significantly enhance photovoltaic panel efficiency by following the sun's movement throughout the day. Despite the potential of solar energy, current photovoltaic systems face drawbacks such as high costs compared to fossil fuels, low efficiency, and intermittency [2]. The proposed dual-axis tracking system aims to maximize sunlight exposure by adjusting solar panels based on the sun's position, thereby optimizing energy capture and addressing some of these limitations [3]. This research contributes to the ongoing efforts to improve renewable energy technologies, particularly in the realm of solar power generation. By focusing on enhancing the efficiency of solar panels through advanced tracking systems, this project seeks to make solar energy a more viable and competitive alternative to traditional fossil fuel-based power generation.

References:

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[2] Nadia, A. R., Isa, N. A. M., & Desa, M. K. M. (2018). Advances in solar photovoltaic tracking systems: A review. Renewable and sustainable energy reviews, 82, 2548-2569.

[3] Kuttybay, N., Mekhilef, S., Koshkarbay, N., Saymbetov, A., Nurgaliyev, M., Dosymbetova, G., ... & Bolatbek, A. (2024). Assessment of solar tracking systems: A comprehensive review. Sustainable Energy Technologies and Assessments, 68, 103879.

P12.04

DEVELOPING A FUNCTIONAL AND ERGONOMIC AIRCRAFT CONTROL STICK

Calvin King, Mohammed Elmellouki

Mississippi Valley State University, Itta Bena, MS

The aircraft control stick is an essential component of flight control systems, enabling pilots to manage the aircraft's direction and altitude (Tomczyk, 2011). It interfaces with the aircraft's flight control system, which is divided into primary and secondary components (Federal Aviation Administration, 2023). The design of this component is crucial as it directly impacts the pilot's comfort, efficiency, and safety (Landis and Aiken, 1982). In the past, the flight control sticks were fabricated from ductile materials resulting in a higher cost and longer manufacturing time. However, with the rising demand for aircraft components, companies seek faster, cheaper, and more reliable solutions to match the rising demand. The senior project aims to address the challenges related to efficiency, comfort, and safety in aircraft operation, with a focus on potential cost reduction by developing a functional and ergonomic aircraft control stick for a small cargo airplane. The new model will be designed, prototyped, and manufactured using 3D printing technology to demonstrate potential reductions in manufacturing challenges. The outcome of this senior project aims to contribute to ongoing efforts to enhance pilot experience and improve efficiency and cost-effectiveness in the small cargo aircraft sector.

P12.05

WILDFIRE DETECTION USING SMALL, LOW-COST TOOLS

Angie Carraway[1], Samuel Swanner[1], Kaitlyn Hebig[1], Alondra Arreola-Espino[1], Keith Koenig[2]

[1]Meridian Community College, Meridian, MS, [2]Mississippi State University, Starkville, MS

Meridian Community College students, in collaboration with research groups at Mississippi State University and The University of Mississippi, are working to develop small, low-cost systems based on consumer-grade components for use in detecting wildfires and other environmental hazards. Various student researchers have assisted in system development, obtained measurements with these systems, and performed spectrometric testing on environmental samples to provide a bank of foundational data before scaling up the systems. The results to date are promising. Data indicate that these small, low-cost tools can be scaled successfully for use in small and large applications and by individuals and governmental, educational, and private entities.

Acknowledgement: Meridian Community College student researchers are/were Caleb Clearman, Joy St. Clair, Henry Zheng, Dylan Williams, Isaac James, Will McCullough, Thiago Martins-Fasano, Emily Sherman, Samuel Swanner, Alondra Arreole-Espino, and Kaitlyn Hebig.

P12.06

A SPECTROSCOPIC SURVEY OF SUPER-EARTHS

Luke Brust, Olayinka Oyewole, Christopher Sirola

University of Southern Mississippi, Hattiesburg, MS

Despite having discovered several thousand exoplanets, the exact nature of the majority of them remains mysterious. One can only make educated guesses based on the planet's mass and orbit, but further details will remain unknown unless one can measure the composition of the planet's atmosphere. Thanks to recent innovations in space telescopes, this ancient dream is now a reality. We use research procedures similar to those of Tsiaras et al., who studied atmospheres of gas giants. Their methods can be used to analyze the atmospheres of super-earths. This thesis research project uses spectroscopic data from the Hubble Space Telescope's Wide Field Camera 3 (WFC3)

to generate absorption spectra for the super-earths 55 Cancri e, GJ 1132 b, GJ 1214 b. HD 149026 b, and Kepler 9 d. The raw data from WFC3 is processed using Dr. Tsiaras's program Iraclis to generate the absorption spectra of each planet, and their respective atmospheres are modeled using the Bayesian retrieval network, τ -REx 3. The goal is to perform a wide survey of super-earths that orbit close to their respective stars, thus identifying trends in their atmospheric compositions.

P12.07

SURFACE ENHANCED RAMAN SPECTROSCOPY DRIVEN LABEL FREE RAPID IDENTIFICATION OF RESIDUAL DITHIOCARBAMATE FUNGICIDE FROM FARM SOIL

Edwina Brown, Triand McCoy, Anant Singh

Alcorn State University, Lorman, MS

Dithiocarbamate (Thiram) is a non-systemic fungicide used to prevent crop damage in the field and to protect harvested crop such as strawberries, apples, corn, potato from deterioration in field, storage or transport. The residual fungicides remaining in fruits and vegetables may do harm to human health if they are taken without notice by the consumers. It is also reported that long time thiram accumulation in the body may cause a verity of diseases and even affects the neurological development of children. Transpiration is the process by which water evaporates from different parts of the plant, which results in more water being drawn up from the root that results systematic transport of fungicides in to the vascular system of the plant, vegetables and fruit. The EPA have set maximum concentration limit (MCL) of < 1 ng mL^{-1} for pollutants present in water. Therefore, it is important to develop methods and tools for the rapid detection of residual Dithiocarbamate fungicide in fruits and vegetables, which are highly demanded in the current market. Recently, Nanostructures based biosensors have gained very high popularity due to their excellent applications in nearly all the fields of science and technology. The use of nanoparticles in the design of biosensors is usually done to fill the gap between converter and the bioreceptor, which is at the nanoscale. Due to biocompatibility, lack of toxicity and ability to generate high surface plasmon, gold nanostructures have greatest ability to address the problem to control fungicide translocation in the agricultural product. In this work we demonstrate the ability to use a solution based, direct readout surface enhanced Raman spectroscopy (SERS) method as a quantitative tool for the detection of ultra-low level of thiram. Thiram has a disulfide bond which spontaneously breaks upon exposure to the gold nanoparticle and binds to the nanoparticle through the Au-S which is the gold thiolate and Au-amino bond. We observed strong SERS peaks when the thiram is bound to the gold nanostructure. The strongest peak at 1380 cm^{-1} which is the CN stretching mode and symmetric CH_3 deformation mode was used for monitoring the SERS intensity as a function of the thiram concentration from the farm soil. The asymmetric CH_3 deformation mode occurs at 1446 cm^{-1}. The S=CS deformation and the CSS deformation occurs at 339 cm^{-1} confirms the SERS finger print of thiram fungicide. It is observed that using larger surface irregularities of nanostructures results ultra-high enhancements in SERS fingerprint of thiram and higher limit of detection LOD (9.78 ± 1.6 Nm) of thiram compared to using smooth surface gold nanostructure. The lower limit of detection observed through the rough surface nanostructure could be attributed to the higher LSPR enhancement and the lightning rod effect, surface plasmon λ_{max} being in much greater resonance to the laser excitation wavelength, and more surface sites for thiram to bind as a result higher contributions in the SERS intensities from the electromagnetic enhancement effect.

P12.08

In-Situ NANOSCOPY OF *R. solanacearum* genomic DNA USING PLASMONIC NANOPARTICLE ANTENNA

Triand McCoy, Edwina Brown, Anant Singh

[1]Alcorn State University, Lorman, MS

Ralstonia solanacearum causes wilt and ranked second among the top ten most economically important soil born pathogenic bacteria effects over 250 plant species worldwide. *Ralstonia solanacearum* is a soil-borne phytopathogenic bacterium that can survive in the soil for a long time. The wilting is caused by blockage of the xylem vessels due to excessive multiplication of bacteria and production of exopolysaccharide. Timely and accurate detection of this pathogen is pivotal to implementing effective disease management strategies and preventing crop losses. Several analytical methods including isolation on selective media, serological methods and pathogenicity tests on host plants have been used for early identification of *R. solanacearum*, but they are frequently inappropriate in terms of specificity, sensitivity, and speed. Surface Enhanced Raman Spectroscopy (SERS) is a technique used to identify pathogens by analyzing their unique molecular vibrational signature. This method directly analyzes the intrinsic Raman signal from the pathogen's cellular components without need of additional label, making it a simpler and faster approach however, low concentration of pathogens can be susceptible to matrix interference as a result poor accuracy, low sensitivity and selectivity. This study presents the design of localized surface plasmon (LSPR) of metal nanoparticle based nanoscopic surface enhanced Raman spectroscopic (SERS) biosensing ruler for the selective and sensitive identification of *Ralstonia solanacearum* bacterium from the form soil. Nanoparticles (AuNPs) have been extensively used as a sensing material for the detections due to their unique optical properties and the simplicity of modifying their surface. This study demonstrates the modification of nano-structure with different strain of 3′thioleted single strand oligonucleotides with 5′Rh6G dye (rohadamine 6G) genomic sequence extracted from potato pathogen *R. solanacearum*. In

presence of complementary strand, hybridization results a ridged bio-functional and Raman active nano-antenna specific to R.solanacearum genomic DNA. Strong plasmonic electric field generated by nanoparticle antenna can be tuned by changing the number of adjacent base pair which is about 3.4 Å ensures desired Surface Enhanced Raman signal from the 5′Rh6G dye (rohadamine 6G) nanoprobe. In experiment we observed, this nano-probe assay can be performed with the use of readily available filter paper with high reproducibility, sensitivity and specificity. A detailed experiment design, synthesis mechanism, and strategies will be discussed.

P12.09

IONOSPHERIC AND METEOROLOGICAL RESPONSE TO TOTAL SOLAR ECLIPSES

Basudev Ghimire[1], Pritesh Thakur[1, 2], Sampada Wagle[1, 3]

[1]St. Xavier's College, Maitighar, Kathmandu, Nepal, [2]The University of Southern Mississippi, Hattiesburg, MS, [3]Tufts University, Boston. MA

Studies concerning solar eclipses have been rising significantly, yet, different circumstances during their occurrence provide uniqueness to every study. This paper studies the ionospheric and meteorological response to the total solar eclipses of August 21, 2017, March 20, 2015 and August 1, 2008. The ionospheric total electron content (TEC) was calculated from the signals beamed by the dual-frequency Global Positioning System (GPS) satellites and accessed from University NAVSTAR Consortium (UNAVCO) data archive. Similarly, the data of meteorological parameters were accessed from the historical climate archive of respective countries. The TEC drop of ∼2-7 TECU with a lag of ∼15-30 min is observed at varying latitudes which correspond with the findings of numerous past research. We analyzed the data of 15 stations under ∼100% obscuration to rule out the varying effects of different obscuration rates. Yet, given the turbulent nature of climate, we found varying changes at observed locations. A good relationship, however, was observed in 8 of the stations, where temperature drop ranged from 0.4 °C to 6.11 °C, and rise in relative humidity ranged from 0 to ∼77%. Wind speed has shown the most turbulent behavior. Their change was largely impacted by the eclipse on 5 of the stations, while the local factor was dominant on the others. In spite of this, the stations under observation showed distinct responses to the ionospheric change during the total solar eclipses, thus demonstrating the relation of meteorological parameters with eclipses.

P12.10

NOW YOU SEE ME WASH

Davon Mims, Mohammed Elmellouki

Mississippi Valley State University, Itta Bena, MS

Manually washing a vehicle can be hazardous, inefficient, and time-consuming due to the need for proper equipment, as well as the proper skill required to effectively clean a vehicle without causing damage to the vehicle's surface. The primary aim of this project is to create and implement a PLC-controlled conveyor belt system that is user-friendly and requires minimal human intervention, thereby enhancing operational convenience. In today's continuously growing fast-paced economy, automating vehicle cleaning is crucial to reduce manual oversight and labor costs. The resulting system offers but is not limited to several key benefits: reduced human involvement, consistent cleaning quality, increased operational efficiency, and enhanced reliability. This automated conveyor belt system represents a significant advancement in vehicle cleaning technology, effectively addressing industry challenges while maintaining high-quality results.

Keywords: Programmable Logic Controller (PLC), conveyor belt, & cleaning

P12.11

OPTICAL AND FERROMAGNETIC PROPERTIES OF MAGNETICALLY UNDOPED AMORPHOUS INGAZNO SPUTTERED THIN FILMS

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Amorphous indium gallium zinc oxide (a-InαGaβZnγOδ) thin films have been widely implemented in nano-scale device applications due to their promising optoelectronic and flexibility properties. In addition, a-InαGaβZnγOδ has demonstrated its ability to maintain amorphous structure at room temperature during device fabrication without any external cooling to the deposition substrate. Herein, we report on the optical and observed ferromagnetic properties of a-InαGaβZnγOδ at room temperature. The films were deposited using reactive magnetron sputtering onto crystalline silicon (c-Si) and fused silica (quartz) substrates at room temperature. X-ray photoelectron spectroscopy (XPS) and X-ray diffraction (XRD) were used to determine the at. % of elemental composition, and the film structure, respectively. For optical characterization, spectroscopic ellipsometry (SE), Transmission & reflection (TR) spectroscopy, and Photoluminescence (PL) measurements were all conducted at room temperature. The XRD spectra confirmed that the deposited films are amorphous, and the XPS spectra revealed that they are non-stoichiometric with a shortage of oxygen at. % in the films, which causes the formation of oxygen defective vacancies. Accordingly, the PL measurements revealed a strong wide emission region below the bandgap, in agreement with the formation of oxygen defect vacancies. The SE spectra for the film deposited onto c-Si were combined with the transmission and reflection spectra measured for the film deposited onto

quartz in a single multi-samples analysis assuming the same optical functions of the a-InαGaβZnγOδ layer in the two samples and allowing the film thickness to slightly vary as a fitting parameter to accommodate for slight thickness variation between the two film samples. The optical response of a-InαGaβZnγOδ thin films was parameterized using Tauc-Lorentz (TL) model in a multilayered structure considering the film thickness and surface roughness of the top layer. To attain high quality fitting of the optical model to the experimentally measured spectra, the fitting was achieved by minimizing the mean squared error (MSE) using the Levenberg-Marquardt nonlinear regression algorithm. The optical functions were extracted, and the obtained band gap of ~ 3.85 eV was in agreement with the PL measurement. Magnetic studies were carried out using Quantum Design MPMS Superconducting Quantum Interface Device (SQUID) Magnetometer to further characterize the effect of the oxygen vacancies. The magnetic measurements clearly detected the presence and effect of oxygen-induced ferromagnetic interaction. The contrast between the zero field cooled and field cooled measurements of the temperature dependence of magnetization confirms the existence of ferromagnetic (FM) interaction in the films down from 1.8 K and up to above room temperature. The FM interaction was further confirmed by the magnetic hysteresis measurements conducted at room temperature. Furthermore, magnetic anisotropy is observed via an obvious contrast between the in-plane and out-of-plane magnetization vs. field measurements, which indicates that the induced spins have a high out-of-plane anisotropy, with an easy magnetic plane located in the plane parallel to the film surface. In conclusion, we explored the optical properties of a-InαGaβZnγOδ deposited using the magnetron sputtering, and discovered a new FM interaction for the first time in a-InαGaβZnγOδ thin films.

P12.12

HYPERSONIC COMBUSTION SCRAMJET COMPUTATION

Riyaz Mathews,[1,2] Shanti Bhushan[1]

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Hypersonic combustion scramjet computations are essential for advancing high-speed air-breathing propulsion systems, particularly for applications in space access, missile technology, and hypersonic flight. The primary objective is to identify the most effective computational methods for simulating scramjet engine performance at hypersonic speeds (Mach 5 and above). The key measurements in these simulations focus on airflow characteristics, combustion efficiency, pressure and temperature distributions, and heat transfer within the scramjet engine's compression and combustion chambers. Computational methods used include computational fluid dynamics (CFD) simulations to predict engine behavior under extreme onditions. However, computational costs remain high, and there is a need for more efficient algorithms for real-time design optimization. Our literature survey suggests that while significant progress has been made in modeling scramjet engines, further advancements in computational techniques are necessary to improve engine design and optimize performance for practical hypersonic applications and beyond. We will use what we have learned to improve future simulations.

END OF THURSDAY'S PROGRAM

Friday, March 21, 2025
MORNING
Hall D Room 6

9:00-9:45 Spectroscopy & Radiation Physics;
Chair: Yuanyuan Duan

O12.13

9:00 INVESTIGATING THE EFFECTS OF WATER VAPOR IN AIR RADIOLYSIS

Isabella Kirksey, Chris Winstead

University of Southern Mississippi, Hattiesburg, MS

Current radiation detection systems have a major downfall of having to be within range of the radiation. One goal of this research is to build a database of reactions and concentrations of species that occur from the energy deposited into the air around a radiation source. This could be insight into other detection schemes. Our previous kinetics models do not include water vapor in the reaction database. The addition of water vapor into the model allows the investigation of its effects on the resulting chemical products. It is hypothesized that aerosols form in the air around a radiation source due to the number of ions present. in addition, the concentration of species is expected to change with respect to the dry air results, as there are more species and pathways present for reactions. These product concentrations and differences will be presented. Model validation efforts via spectroscopy measurements will also be discussed.

O12.14

9:15 THE EFFECTS OF CHAMBER MATERIALS ON OZONE STABILITY

Eva Chalona, Maximilian Alberth, Sallie Ann Schmidt, Tyler Reese

University of Southern Mississippi, Hattiesburg, MS

In the presence of ionizing radiation, new molecules and ions are created in air in proximity to the radiation source. Ozone is among the resulting molecules in the vicinity of alpha particle sources, so measurement of ozone production through absorption spectroscopy can serve as a potential method of radiation detection. This approach has previously been demonstrated in a laboratory setting via Cavity Ringdown Spectroscopy to detect the effects of a

Po-210 alpha source on air contained within an 18" stainless steel spherical chamber. A recent publication by Hecht, et al. discussed their research efforts to specifically characterize the ozone yield of these alpha sources. Their experiment utilized a small cylindrical Teflon vessel and an ozone analyzer.

Between these two methods, there was a large difference in the quantity of ozone detected. It is hypothesized that the difference in chamber material contributes to this difference. To more accurately compare our data, draw conclusions as to why this may be, and quantify the extent to which this contributes to the difference, we chose to isolate the vessel material as a variable in the stability of ozone. A Mercury lamp was used as the source of ozone production to allow for controlling the amount of ozone present over a wide range, and then the behavior was observed and detected in a controlled environment over different periods of time. This is to observe the effects of vessel material on ozone degradation. The first vessel is a re-creation of the Teflon chamber used by Hecht, and the second vessel is a stainless-steel version of the same dimensions. Comparisons between ozone lifetime and stability will be presented along with our process.

O12.15

9:30 COMPREHENSIVE REVIEW OF SPECTROSCOPIC ELLIPSOMETRY: OPTICAL, STRUCTURAL, ELECTRICAL CHARACTERIZATION, AND ADVANCED MODELING TECHNIQUES

M. A. Ebdah[1], M. E. Kordesch[2], A. K. Singh[1], W. M. Jadwisienczak[3], M. F. Khan[1], A. Ibdah[4]

[1]Department 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 Photovoltaics Innovation and Commercialization, Department of Physics and Astronomy, University of Toledo, Toledo, OH

Spectroscopic ellipsometry (SE) is one of the most accurate optical techniques for probing thin film thickness and dielectric functions by measuring the change in light polarization upon reflection off a thin film or a multilayered nanostructure surface. In ellipsometry, the Fresnel reflection coefficients r_s and r_p connect the incident and reflected s and p components of a polarized light beam electric field via Maxwell's equations within the framework of the optical-model-based scatter matrix method (SMM), which enables accurate determination of the optical, structural, and electrical properties of thin films, nanostructures, as well as interface, and which provides a rigorous computational framework for analyzing nano-scale multilayered, isotropic, and anisotropic systems. The combined experimental and optical modeling capability in SE, in addition to the non-destructive nature of the technique makes it indispensable for applications in semiconductors, nanostructures, and advanced optoelectronics. By employing optical model parametrization, the energy dependence of optical functions for the index of refraction and extinction coefficient can be accurately extracted, as well as the semiconductor bandgap, which determine the optoelectronic response of the material of interest including the band structure induced interband-transitions. In addition, SE provides a valuable insight into structural properties such as surface roughness, porosity, crystallinity, phase composition, and interface quality. With the extension of SE capability in the NIR spectral region, probing the electrical properties is attainable by employing the free carrier dielectric Drude model, which provides significantly interesting electrical characterizations such as free carrier plasma frequency, scattering time, electrical resistivity, conductivity, frequency-dependent dielectric function of free carriers, carrier concentration, mobility, and Drude damping. Moreover, SE measurements can be performed as temperature-dependent technique, enabling the study of thermal effects on material properties, including phase and structural transitions, and temperature-induced changes in optical and electrical properties. Optical models such as the Tauc-Lorentz and Cody-Lorentz are effective in describing amorphous and disordered semiconductors, while for crystalline semiconductors, advanced models incorporating critical point analysis and excitonic effects provide accurate determination of interband transitions, whereas the harmonic oscillator model is useful for materials exhibiting strong phonon resonances, such as polar semiconductors. Such versatile capabilities combined into one technique makes SE a unique probing technique for a wide range of applications spanning transparent conductive oxides, semiconductors, nanostructured thin films, quantum and nanoparticles, solar cells, and dielectric stacks for photonic and optoelectronic devices. Furthermore, emerging new technologies such as artificial intelligence (AI) and the integration of machine learning (ML) algorithms with SE significantly enhance model parametrization and automate data analysis, which promise accelerating the discovery and optimization of new novel materials and optical structures. This review explores the versatility of SE as a comprehensive tool for characterizing optical, structural, and electrical properties, with integrating optical modeling via advanced computational techniques such as the SMM to provide a robust framework for advancing materials science and technology.

9:45 Group Discussion and Coffee Break

10:00 KEYNOTE—Dr. Yuanyuan Duan

University of Mississippi Medical Center

Title: BIOMECHANICAL EVALUATION OF ZYGOMATIC IMPLANTS: 3D MODELING AND FINITE ELEMENT ANALYSIS

Moderator: Shuang Tu

Over the past several decades, zygomatic implants have been gaining popularity for the rehabilitation of severely atrophic maxillae due to their advantages, such as reduced patient morbidity, lower cost, and shorter delays between anatomical reconstruction and functional rehabilitation. However, the unique geometric configurations and loading conditions of zygomatic implants present significant biomechanical challenges. Although some studies have been done in this field, there remains a very limited understanding of the biomechanical behavior of zygomatic implants and corresponding prostheses. In addition, there is also a lack of suitable testing standards for zygomatic implants because the current dental implant testing standards are designed for conventional dental implants without consideration for zygomatic implants and corresponding prostheses. This presentation will summarize our efforts over the past several years in using advanced engineering tools, such as high-resolution imaging techniques, three-dimensional computer modeling, finite element analysis, and fatigue lifetime predictions, to address these gaps and provide a more in-depth and systematic understanding of the biomechanical behavior of zygomatic implants. Our findings also lay a foundation for more effective treatment planning and improved outcomes for patients with severe maxillary atrophy. Future work will focus on conducting in vitro fatigue testing of zygomatic implants, zygomatic implant design optimization, and simulating complex patient-specific scenarios.

10:30- 11:15 Computational/Particle Physics;

Chair: M. A. Ebdah

O12.16

10:30 DEVELOPMENT OF AN IN-HOUSE SOFTWARE SUITE FOR NUMERICAL FLOW SIMULATIONS

Shuang Tu

Jackson State University, Jackson, MS

Over the past two decades, our team has focused on the research and development of accurate, efficient, and robust Computational Fluid Dynamics (CFD) flow solvers, culminating in a comprehensive in-house software suite for scientific computing. This suite is designed to address a wide array of fluid dynamics and heat transfer problems, including scalar advection-diffusion, compressible aerodynamic and incompressible hydrodynamic flows, immiscible two-fluid free-surface flows, shallow water dynamics, heat transfer in fluids, magnetohydrodynamics (MHD), and interactions between space charge distribution and electric fields in Liquid Argon Time Projection Chamber (LArTPC) particle detectors.

The solvers leverage parallelization through mesh partitioning and the Message Passing Interface (MPI), enabling large-scale 3D simulations on massively distributed parallel systems. These tools are essential in industries such as aerospace, automotive, and naval engineering, supporting the design and analysis of fluid and heat transfer systems.

Our numerical solvers are based on three major methodologies: **Cell-centered finite volume (FV) framework**: This foundational method is employed for solving transport equations, including compressible flows. The solver integrates the Jacobian-free Generalized Minimal RESidual (GMRES) method for linear system solutions and utilizes a matrix-free LU-SGS preconditioner. Vectorization techniques, such as face coloring and truncated Neumann expansions, optimize performance. This framework supports the implementation of new numerical schemes to enhance existing solvers or address emerging challenges. **Hybrid FV and finite element (FE) framework**: This innovative approach combines FV for incompressible flow simulations and FE for solving electrostatic interactions in particle detectors. The incompressible flow solver uses a fractional step method, combining cell-centered FV for momentum equations with a node-based FE method to solve the Poisson equation for pressure correction. For LArTPC simulations, this methodology solves the ion transport equation and the electric potential equation to model the dynamic interaction between space charge distributions and electric fields. **Space-time Riemann-solver-free discontinuous Galerkin (DG-CVS) framework**: As our most recent development, this solver integrates the strengths of the space-time Conservation Element/Solution Element (CE/SE) method and the DG method. By constructing a staggered space-time mesh and utilizing high-order space-time DG basis polynomials, the solver enforces flux conservation without requiring Riemann solvers. It is capable of solving a wide range of conservation laws, including compressible Euler, shallow water, level set, and MHD equations, as well as diffusion problems, all without specialized treatment. This suite of solvers offers a versatile and efficient toolset for tackling a broad spectrum of scientific and engineering problems, with applications ranging from fluid dynamics to particle physics.

O12.17

10:45 CALIBRATING NEUTRINO DETECTION AND TRANSVERSE MASS FOR FUTURE W BOSON REVELATIONS IN pp and PbPb COLLISIONS

Raven Lee

Tougaloo College, Jackson, MS

CMS plans to take roughly a week of 5.36 TeV pp data at the end of 2024 at relatively low pileup values. This project will evaluate the missing transverse energy (MET) resolution in simulated samples of 5.36 TeV pp collisions in preparation for collecting these data. The results will be compared to the MET resolution of simulated lead-lead (PbPb) collision datasets. The resolution is expected to be

significantly poorer in PbPb collisions, so strategies to optimize the MET performance will be explored if time allows. These studies will be of relevance for potential measurements of the W boson mass using 5.36 TeV pp data and future high-energy physics programs in the HL-LHC era where detector occupancies are expected approach those of heavy-ion collisions. The project will also be of great interest for key measurements of W boson production in PbPb collisions in Run 3.

O12.18

11:00 ON FEYNMAN DIAGRAMS AND CAUSAL MODELS

Christopher Weaver

University of Illinois at Urbana-Champaign, Urbana-Champaign, IL

In the spirit of what I maintain was Richard Feynman's original intent behind the invention of Feynman diagrams for quantum electrodynamics (QED) in the late 1940s, I argue that at least some Feynman diagrams in the practice of QED, quantum chromodynamics(QCD), the quantum theory of the weak interaction, and electroweak theory (EWT) are used by quantum field theorists, not merely as bookkeeping devices or calculation helps, but as ways of graphically depicting certain scattering/interaction processes. I show that (a) the interactive phenomena in question are undoubtedly causal, that (b) these diagrams include explicit representations of such causal interactions, that (c) Feynman diagrams bear a remarkable similarity to directed graphs in the causal modeling literature, that (d) the associated mathematical formalism that is very precisely encoded by Feynman diagrams bears an uncanny resemblance to the structural equations of causal models, and (e) that (given some qualifications) that formalism can be plausibly understood as mathematical machinery that causally models in the way discussed by Pearl (2009) and many others. One crucial upshot of my reasoning is that the epistemology of our best quantum field theory is in important ways a causal epistemology.

11:15 Group Discussion and Coffee Break

11:30 Awards Ceremony and Concluding Remarks

Psychology and Social Sciences

Chair:Justin Kelly

Belhaven University

Co-Chair: Terry Drake

Mississippi College

Thursday, March 20, 2025

MORNING

Hall D Room 5

8:50 Welcome

O13.-01

9:00 WHY ARE AFRICAN AMERICAN ADULTS WITH DEPRESSION LESS LIKELY TO SEEK MENTAL HEALTH SERVICES?

Jerlisa Winston

Tougaloo College, Tougaloo, MS

Depression is a disease that straddles all genders, ethnicities, races, and walks of life. Studies have shown that of the roughly 18 million Americans who struggle with mood disorders, approximately ten million of these individuals suffer from major or clinical depression. Of these ten million individuals, roughly two-thirds go without treatment (Bailey et al, 2019). According to Bailey (2019), the differences between African Americans and Caucasians lies in the fact that the chronicity of disease was higher for African Americans (56%) than it was for Caucasian patients (38%). And while minority populations are less likely to suffer from acute episodes of major depressive disorder (MDD) than Caucasians, they are more likely to suffer from prolonged, chronic, and severely debilitating depression with heavy consequences on their level of daily functioning" (Bailey, et al. 2019). This study discussed CDC databases from the years 2017-2020. This research addressed the barriers that prevent African Americans from seeking help and will justify the need for more resources and routine evaluations of depression and other mental health illnesses. After analyzing variables, such as health insurance and hospital utilization & access to care, I believe African Americans have several barriers, including financial, cultural, and environmental that prevents them from seeking mental health treatment.

O13.02

9:20 GENETIC PREDISPOSITION AND CHILDHOOD TRAUMA ON SUBSTANCE USE DISORDER

Anna Quaka

Mississippi College, Clinton, MS

The causes of addiction is a widely researched topic and in these studies, trauma and genetic predisposition have been looked at thoroughly. However, there is a lack of research on which of those two causes plays a larger role in the

presence of addiction. The purpose of this study was to evaluate if childhood trauma or genetic predisposition has a greater impact on whether an individual develops substance use disorder. To assess this research, a sample of 91 individuals across multiple states and various ages who have a diagnosis of substance use disorder were surveyed using Google Forms. It was hypothesized that individuals who do not have a genetic predisposition to substance use disorder but present with childhood abuse will be more likely to have substance use disorder. Additionally, individuals who present with childhood sexual abuse will be the most likely to have substance use disorder. Finally, individuals who have a genetic predisposition and no childhood abuse will be least likely to have substance use disorder.

O13.03

9:40 EQUITY IN DISASTER RELIEF: A STUDENT-LED STUDY

Sydney Hilliard

Tougaloo College, Jackson, MS

This research explores disparities in disaster relief, focusing on equity-based solutions inspired by Executive Orders 13985 (Advancing Racial Equity and Support for Underserved Communities Through the Federal Government) and 14091 (Further Advancing Racial Equity and Support for Underserved Communities Through the Federal Government), as well as Congressman Bennie G. Thompson's Federal Emergency Management Advancement of Equity Act (H.R. 5775). Objectives: The research aimed to: 1. Methods Analyze equity provisions in federal disaster policies. 2. Assess FEMA's equity-focused initiatives. The study involved analyzing key federal initiatives, including: Executive Orders 13985 and 14091: These orders mandate that federal agencies develop Equity Action Plans, prioritize outreach to underserved populations, and evaluate resource allocation to advance fairness (Executive Order 13985, 2021; Executive Order 14091, 2023). • H.R. 5775: This legislation proposes creating an equity steering group within FEMA, expanding data collection practices, and embedding equity into disaster declaration criteria (Federal emergency Management Advancement of Equity Act, 2023). FEMA's ongoing equity strategies, such as its community engagement efforts and revised disaster declaration processes, were also examined (Equity Action Plan, 2023). Findings 1. 2. 3. Systemic Inequities and Reports of Disparities: Reports show that racial minorities, rural areas, and low-income communities face disproportionate challenges in disaster recovery, including delays in assistance and limited access to resources (Federal disaster relief and inequities, 2023; Executive Order 13985, 2021). These systemic barriers perpetuate long-term vulnerabilities in affected communities. Community Engagement: Both executive orders emphasize the need for federal agencies to engage directly with underserved communities to identify needs and reduce participation barriers. FEMA's initial steps include partnerships with local organizations to address these concerns (Executive Order 13985, 2021; Executive Order 14091, 2023; Equity Action Plan, 2023). Congressional and FEMA Actions: H.R. 5775 proposes institutionalizing equity through an equity steering group and enhanced demographic data collection to monitor disparities in disaster relief (Federal Emergency Management Advancement of Equity Act, 2023). FEMA has aligned with these goals by revising its disaster declaration processes to include equity criteria, ensuring resources reach the most vulnerable populations (Equity Action Plan, 2023). Conclusion. Reports of inequities in disaster relief highlight the need for systemic changes (Federal disaster relief and inequities, 2023). Executive Orders 13985 and 14091 address these issues through federal mandates for equity, while FEMA's ongoing efforts and Congressman Thompson's H.R. 5775 aim to institutionalize equity-focused practices. The outcomes of these initiatives remain uncertain due to their recent implementation.

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O13.04

10:00 THE IMPACT OF SELF-HARMFUL BEHAVIOR OF DISABLED CHILDREN ON PARENTAL BURNOUT

Aspen Powell

Belhaven University, Jackson, MS

The study of parental burnout has recently become an area of interest for psychology researchers. Of the many factors affecting parental burnout, self-harmful behavior in disabled children has yet to be considered. The purpose of this study is to investigate the impact of self-harmful behavior of disabled children on parental burnout. Researchers will gather results from parents of disabled children across Central, Eastern, and Western America. A survey consisting of the Parental Burnout Assessment (PBA), the Modified Barthel Index (Modified BI), and the Behavior Problems Inventory (BPI) will be sent to parents via email. A multiple regression analysis will be used to analyze the data obtained from the research. The study will be completed prior to the conference.

O13.05

10:20 IMPACT OF PARENTING STYLES ON DISPOSITIONAL GRATITUDE

Lily Grace

Belhaven University, Jackson, MS

This research examines the relationship between parenting style and dispositional gratitude in adults. Dispositional gratitude is a generalized tendency to recognize and respond with grateful emotion to the roles of other people's benevolence in the positive experiences and outcomes that one obtains (McCullough et al., 2002). The study explores how different parenting styles—authoritative, authoritarian, permissive, and neglectful—affect the development of this trait. Utilizing two established psychometric tools, the Gratitude Questionnaire-6 (GQ-6) and the Parental Authority Questionnaire (PAQ), this study collects data from a sample of about 100 participants. The GQ-6 measures the dispositional gratitude of participants, while the PAQ assesses the perceived parenting style of their caregivers. The research tests the hypothesis that authoritative parenting, characterized by warmth, support, and firm boundaries, will positively correlate with higher levels of dispositional gratitude. In contrast, authoritarian and neglectful parenting styles are hypothesized to have a negative impact on gratitude development, while permissive parenting may show mixed effects. Results from this study will provide insights into how early parenting influences the development of gratitude and offer implications for parenting interventions aimed at fostering positive emotional traits in children. The findings will also contribute to the broader understanding of the role of parenting in emotional and social development.

O13.06

10:40 CORRELATION BETWEEN GOAL ORIENTATION AND SELF-ESTEEM

Anissa Mohler

Belhaven University, Jackson, MS

While research on collegiate dancers is growing, much has not been researched with this population, especially regarding motivation. This study aims to see if there is a correlation between a dancer's goal orientation, using Achievement Goal Theory, and their self-esteem levels. College dance majors will be asked to take the Achievement Goal Questionnaire and the Rosenberg Self-Esteem Scale. The Achievement Goal Questionnaire measures motivation levels in four areas: mastery-approach, performance-approach, mastery-avoidance, and performance-avoidance. The Rosenberg Self-Esteem Scale measures self-esteem levels. Based on current research, it is hypothesized that a mastery-approach goal orientation will be the most strongly correlated with higher levels of self-esteem.

O13.07

11:00 THE IMPACT OF SLEEP QUALITY AND PERCEIVED STRESS ON PERCEIVED ACADEMIC PERFORMANCE

Jamie Garcia

Belhaven University, Jackson, MS

The purpose of this study is to determine the impact of sleep quality and perceived stress on perceived academic performance in college students. The researcher hypothesizes that sleep quality will not significantly impact perceived academic performance, and the researcher hypothesizes that perceived stress will impact perceived academic performance. Additionally, the study will determine if there is a correlation between sleep quality and perceived stress. The hypothesis is that there will be a negative correlation between sleep quality and perceived stress.

O13.08

11:20 EXPLORING DIVERSITY, EQUITY, AND INCLUSION IN DISASTER MANAGEMENT EDUCATION: A PSYCHOLOGICAL PERSPECTIVE

Mickkalee Kimble-Lane , Mei-Lei Lane, , Shaila Khan

Tougaloo College, Tougaloo MS

This study investigates how social disparities and exclusion heighten vulnerability among minority groups and the importance of addressing social equity for well-planned disaster management efforts. It explores the integration of Diversity, Equity, and Inclusion (DEI) within disaster management education programs, focusing on the cognitive, emotional, and social aspects of the curricula. It examines how inclusive educational practices impact psychological outcomes, including barriers to inclusivity, the benefits of diverse learning environments, and the cognitive processes vital for effective disaster response. The research posits that understanding the psychological dynamics of inclusive learning can improve disaster management outcomes, particularly in fostering students' ability to collaborate, make decisions under stress, and engage with diverse populations during crises. It also highlights psychological barriers to implementing DEI principles, such as implicit biases, emotional stress, and cognitive dissonance. These barriers can impact disaster response strategies, perpetuating social inequalities or overlooking the unique needs of marginalized communities. While disaster management programs typically focus on technical skills like infrastructure resilience and crisis response, psychological factors like stress management, decision-making under pressure, and emotional resilience are often underemphasized. These are crucial in real-world disaster settings, where decision-making under stress can determine success or failure. Although some programs address psychological elements related to leadership in high-stress environments, trauma recovery, and mental

health for responders, broader psychological concerns such as emotional resilience and inclusion are seldom explored comprehensively. In particular, the emotional toll of disaster response and issues of belonging, which affect cognitive performance, are rarely incorporated unless discussed in disaster psychology or public health courses. This lack of focus on DEI principles in disaster management education may leave professionals ill-prepared to navigate complex social dynamics in disaster situations, where understanding cultural, racial, and socioeconomic differences is vital. The study suggests that universities should prioritize creating psychologically safe learning environments. This involves fostering open dialogue about the emotional toll of disaster response, supporting mental health resilience, and addressing the psychological challenges inherent in disaster management. Including these elements can enhance students' learning experiences and better equip them to respond to the diverse needs of affected communities. Integrating DEI principles and implicit bias training would also prepare students to address social dynamics and cultural differences in disaster situations. Data for this study were collected from disaster management programs at universities across the United States. Two researchers focused on gathering data from the East Coast, West Coast, and Midwest, compiling program names, curricula, syllabi, and faculty profiles. The researchers identified programs like the University of California's "Disaster Preparedness and Response Program" and Harvard's "Disaster Management and Public Health Program," which explicitly include DEI components. The study also assessed the presence of topics like mental health resilience, bias training, and trauma recovery in these programs. Moving forward, the study will explore how DEI principles are applied in classroom settings and their impact on student learning outcomes. Additionally, it will assess whether incorporating psychological components enhances emotional resilience and decision-making skills in real-world disaster scenarios, ultimately preparing more well-rounded professionals for the challenges of disaster response.

Thursday, March 20, 2025

AFTERNOON

Hall D Room 5

O13.09

1:00 CONVERSATIONS ON THE CURRENT STATE OF HEAT AWARENESS IN JACKSON, MISSISSIPPI: EXPLORING HEAT VULNERABILITY IN THE "CITY WITH SOUL"

MaKenna Collins[1, 2]

[1]*Jackson State University, Jackson, MS,* [2]*NOAA EPP/MSI UG Scholar 2023*

Extreme heat is the leading cause of weather-related deaths in the United States, and conditions in Jackson Mississippi make residents more vulnerable to the impacts of extreme heat. Understanding the effects of extreme heat requires taking a look beyond meteorological data and toward the historical and socioeconomic data that shapes the "City with Soul" today. Jackson's roots are planted deeply in early America with Native American displacement and continued to grow during the Civil Rights Era and beyond. This study aims to analyze the interconnectivity of historical, social, and environmental factors in the case of extreme heat in Jackson, Mississippi. Through qualitative research methods, including interviews with Jacksonians aged 60 and above and respected city leaders, we identified key themes and insights that we hope will inform official heat mitigation and preparedness plans to protect residents' lives and property. Our results indicate the need for further education on extreme heat, equitable resource allocation, and increased city support during extreme heat events. Integrating these findings into official practices ensures that recommendations are accurately tailored for Jackson residents, ensuring a safer future.

O13.10

1:20 ACCEPTABILITY AND SATISFACTION OF SOCIAL SUPPORT INTERVENTIONS FROM PERSPECTIVES OF MOTHERS WITH POSTPARTUM DEPRESSION: A META-AGGREGATIVE SYSTEMATIC LITERATURE REVIEW

Abigail Gamble, PhD[1, 2, 3], *Torrey Robinson, M.S.,CCC-SLP*[2, 3], *Rebekah N. Andrew Ayyasamy, M.S.*[1], *Sydney Morris-Hill, M.S.*[2]

[1]*University of Mississippi Medical Center, Jackson, MS,* [2]*Emory University,* [5]*Atlanta, GA*

Submitting at a later date (Dec-January).

O13.11

1:40 THE ASSOCIATIONS BETWEEN DAILY AVERAGE SCREEN TIME WITH POOR MENTAL HEALTH AND SELF-REPORTED DEPRESSION AMONG AFRICAN AMERICAN COLLEGE STUDENTS, CROSS SECTIONAL STUDY: 2023-2024

Dinan Noor, Precious Edet, Azad Bhuiyan

[1]*Jackson State University, Jackson, MS,* [2]*University of Mississippi, Oxford, MS*

Background: The prevalence of screen time has surged dramatically in the 21st century, becoming a central aspect of daily life for both work and leisure. This trend has been further accelerated by the COVID-19 pandemic, with recreational screen time among adolescents in the United States skyrocketing by 102%, reaching an average of 7.7 hours per day - equivalent to a full-time job. Screen time-based sedentary behavior has been linked to numerous physical health risks, including cardiovascular disease, obesity, and diabetes. Moreover, it has been associated with mental health issues such as sleep disorders, anxiety, and depression. Depression becomes a significant health

issue in the United States as it is related to many physical health risks. Over 20% of US adults experience mental illness, with 12.5% reporting mental health conditions and 5.0% specifically experiencing depression. In 2019, nearly one-fifth of adults sought mental health treatment. The economic impact is substantial, with serious mental illnesses costing the nation $192.2 billion annually in lost earnings. Given these concerns, this study aims to investigate the relationship between daily average screen time and self-reported depression among African American college students. This research will contribute novel insights to the field, as no similar studies have been conducted to date, according to our knowledge. **Methods:** A cross-sectional study was designed and applied. Data were collected in 2024, targeting African American students who attended Jackson State University. The survey tool was adopted from the Youth Risk Behavior Surveillance System conducted by the CDC. Descriptive statistics Correlational analysis and Chi-square tests were performed. The Odds Ratio with 95% Confidence Interval were reported in this study. **Results:** A total of 430 African American college students, with 74.4% females, participated in our study. Additionally, 83.1% students answered that their daily average screen time was 3 to 5 hours or more. 47.2% responded they were depressed at in the last 12 months and 63.3% said they had poor mental health in last 30 days. Students who had screen time 5 hours or more, 70.6% of those reported poor mental health in last 30 days (p =.08) and 53.4% of those reported depression in last 12 months (p = .11). The Odds ratio for poor mental health was 1.67 (95% CI: 0.97-1.20) who had screen time more than 5 hours. **Conclusion:** The finding indicates the high prevalence of poor mental health and self-reported depression among Black college students. More than 80% students had screen time daily more than 5 hours. Although many studies suggest the impact of screen time on mental health, there was no significant associations of screen time with poor mental health and depression among African American students. Association of poor mental health and screen time is needs to be explored further considering other covariates to see the racial variation.

THURSDAY, March 20, 2025

EVENING

4:00 DODGEN LECTURE /AWARDS CEREMONY

Hall B

5:00-7:00 GENERAL POSTER SESSION

(Immediately following Dodgen Event)

P13.01

LEARNERS' PERSPECTIVES ON MENTORING, OCCUPATIONAL READINESS, AND ENGAGEMENT

Muhammad Riaz

Alcorn State University, Lorman, MS

This paper explored students' perspectives on the interconnectedness of mentoring, job readiness, and engagement, emphasizing the transformative impact of educational experiences at college. The lack of concerted educational experiences focused on the futuristic success of students is of the highest priority. The survey focused on identifying gaps in coordination, skill development needed for the job market, and resourcefulness to overcome the challenges. Twenty-four students participated in the survey. The researcher concurrently discussed and held focus interviews with students to corroborate the ideas to conclude. A mixed-method research design was used. The data were analyzed using SPSS and MaxQDA, quantitative and qualitative respectively. The results include academic integrity maintained, mentoring provided, preferred in-person coaching, contact by email preferred, preferred personal schedule, checking their emails daily, work better done in lecture classes, courses prepared for the work world, program learning achieved in college, communication challenges, lack of monetary support, willingness to support family caregivers and fellow at college—training on engaging students in community initiatives recommended through connections.

P13.02

THE IMPACT OF SELF-HARMFUL BEHAVIOR OF DISABLED CHILDREN ON PARENTAL BURNOUT

Aspen Powell

Belhaven University, Jackson, MS

The study of parental burnout has recently become an area of interest for psychology researchers. Of the many factors affecting parental burnout, self-harmful behavior in disabled children has yet to be considered. The purpose of this study is to investigate the impact of self-harmful behavior of disabled children on parental burnout. Researchers will gather results from parents of disabled children across Central, Eastern, and Western America. A survey consisting of the Parental Burnout Assessment (PBA), the Modified Barthel Index (Modified BI), and the Behavior Problems Inventory (BPI) will be sent to parents via email. A multiple regression analysis will be used to analyze the data obtained from the research. The study will be completed prior to the conference.

P13.03

IMPACT OF PARENTING STYLES ON DISPOSITIONAL GRATITUDE

Lily Grace

Belhaven University, Jackson, MS

This research examines the relationship between parenting

style and dispositional gratitude in adults. Dispositional gratitude is a generalized tendency to recognize and respond with grateful emotion to the roles of other people's benevolence in the positive experiences and outcomes that one obtains (McCullough et al., 2002). The study explores how different parenting styles—authoritative, authoritarian, permissive, and neglectful—affect the development of this trait. Utilizing two established psychometric tools, the Gratitude Questionnaire-6 (GQ-6) and the Parental Authority Questionnaire (PAQ), this study collects data from a sample of about 100 participants. The GQ-6 measures the dispositional gratitude of participants, while the PAQ assesses the perceived parenting style of their caregivers. The research tests the hypothesis that authoritative parenting, characterized by warmth, support, and firm boundaries, will positively correlate with higher levels of dispositional gratitude. In contrast, authoritarian and neglectful parenting styles are hypothesized to have a negative impact on gratitude development, while permissive parenting may show mixed effects. Results from this study will provide insights into how early parenting influences the development of gratitude and offer implications for parenting interventions aimed at fostering positive emotional traits in children. The findings will also contribute to the broader understanding of the role of parenting in emotional and social development.

P13.04

CORRELATION BETWEEN GOAL ORIENTATION AND SELF-ESTEEM

Anissa Mohler

Belhaven University, Jackson, MS

While research on collegiate dancers is growing, much has not been researched with this population, especially regarding motivation. This study aims to see if there is a correlation between a dancer's goal orientation, using Achievement Goal Theory, and their self-esteem levels. College dance majors will be asked to take the Achievement Goal Questionnaire and the Rosenberg Self-Esteem Scale. The Achievement Goal Questionnaire measures motivation levels in four areas: mastery-approach, performance-approach, mastery-avoidance, and performance-avoidance. The Rosenberg Self-Esteem Scale measures self-esteem levels. Based on current research, it is hypothesized that a mastery-approach goal orientation will be the most strongly correlated with higher levels of self-esteem.

P13.05

THE IMPACT OF SLEEP QUALITY AND PERCEIVED STRESS ON PERCEIVED ACADEMIC PERFORMANCE

Jamie Garcia

Belhaven University, Jackson, MS

The purpose of this study is to determine the impact of sleep quality and perceived stress on perceived academic performance in college students. The researcher hypothesizes that sleep quality will not significantly impact perceived academic performance, and the researcher hypothesizes that perceived stress will impact perceived academic performance. Additionally, the study will determine if there is a correlation between sleep quality and perceived stress. The hypothesis is that there will be a negative correlation between sleep quality and perceived stress.

P13.06

THE ASSOCIATIONS BETWEEN DAILY AVERAGE SCREEN TIME WITH POOR MENTAL HEALTH AND SELF-REPORTED DEPRESSION AMONG AFRICAN AMERICAN COLLEGE STUDENTS, CROSS SECTIONAL STUDY: 2023-2024

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the last 12 months and 63.3% said they had poor mental health in last 30 days. Students who had screen time 5 hours or more, 70.6% of those reported poor mental health in last 30 days (p =.08) and 53.4% of those reported depression in last 12 months (p = .11). The Odds ratio for poor mental health was 1.67 (95% CI: 0.97-1.20) who had screen time more than 5 hours. **Conclusion:** The finding indicates the high prevalence of poor mental health and self-reported depression among Black college students. More than 80% students had screen time daily more than 5 hours. Although many studies suggest the impact of screen time on mental health, there was no significant associations of screen time with poor mental health and depression among African American students. Association of poor mental health and screen time is needs to be explored further considering other covariates to see the racial variation.

P13.07

GENETIC PREDISPOSITION AND CHILDHOOD TRAUMA ON SUBSTANCE USE DISORDER

Anna Quaka

Mississippi College, Clinton, MS

The causes of addiction is a widely researched topic and in these studies, trauma and genetic predisposition have been looked at thoroughly. However, there is a lack of research on which of those two causes plays a larger role in the presence of addiction. The purpose of this study was to evaluate if childhood trauma or genetic predisposition has a greater impact on whether an individual develops substance use disorder. To assess this research, a sample of 91 individuals across multiple states and various ages who have a diagnosis of substance use disorder were surveyed using Google Forms. It was hypothesized that individuals who do not have a genetic predisposition to substance use disorder but present with childhood abuse will be more likely to have substance use disorder. Additionally, individuals who present with childhood sexual abuse will be the most likely to have substance use disorder. Finally, individuals who have a genetic predisposition and no childhood abuse will be least likely to have substance use disorder.

P13.08

HOW COVID-19 AFFECTED PHYSICAL ACTIVITY AND THEREFORE MENTAL HEALTH

Lauren Pope

Mississippi College, Clinton, MS

Mental health during the COVID-19 pandemic has been researched and studied thoroughly. There is little to no research on the topic of physical activity being diminished due to COVID-19 and stay-at-home orders during that time. The purpose of this study is to closely examine the coping strategy of physical activity on individuals' mental health, and how COVID-19 eliminated the use of exercise as a coping mechanism. Specifically, the study will test the hypothesis that physical activity has a strong correlation with positive mental well-being, as well as the hypothesis that diminished physical activity has a strong correlation with COVID-19. To assess this research, a convenience sample of at least 50 undergraduate students at Mississippi College will complete surveys online using a Google Survey format. It is hypothesized that individuals who maintained physical activity during COVID-19 will have better mental health and experience less loneliness throughout the pandemic. In contrast, it is also hypothesized that those who experienced little to no physical activity during the pandemic also experienced decreased mental well-being and felt increased loneliness. A T-Test of "before COVID-19" and "after COVID-19" will be used to test the hypotheses.

P13.08

HOW SOCIAL CLASS AFFECTS STUDENT PERFORMANCE

Tralicia Willingham

Mississippi College, Clinton, MS

Education, a cornerstone of modern society, plays a pivotal role in shaping the future of youth. However, resources for education are unevenly distributed across social classes, resulting in disparities that hinder access to quality education for certain segments of the population. This study delves into the repercussions of social class on student success, emphasizing academic achievement, and shedding light on factors such as school administration, environment, and societal norms. The paper reviews existing literature, exploring the intersection of social class and education. It looks into how professionals in psychology, teaching, and policymaking can contribute to mitigating social class disparities in education. The racial dimension of these disparities is examined as well, emphasizing the need for a more nuanced approach that considers minorities' circumstances and emotions in the learning environment. Examining internal and external influences on student performance, the study draws on research comparing siblings from different social classes to discern whether genetics or societal standing plays a more significant role. The role of technology, particularly the internet, is explored in a longitudinal study, providing insights into its impact on student attention and performance. The paper extends its focus to higher education and employability, discussing class divisions in universities and the employment outcomes of graduates based on their socio-economic backgrounds. The proposed research methodology involves participants from diverse educational backgrounds, employing surveys and questionnaires to gauge the impact of social class on academic performance. The study aims to use descriptive statistics and cross-sectional analysis to reveal patterns and disparities in GPA, income, and career paths across different social classes.

P13.09

A MIXED EFFECTS MODEL ANALYSIS OF ETHNICITY AND GENDER ON NCAA GRADUATION SUCCESS RATE

Huang Chia Hung, Tung Lung Wu

Mississippi State University, Starkville, MS

This study aims to investigate the impact of ethnicity and gender on the NCAA Graduation Success Rate (GSR) using data from 148 schools between 1995 and 2011. After data cleaning and organization, a mixed effects model was employed to analyze the main effects of ethnicity and gender, with African Americans (AA) as the reference group, and comparisons made against Hispanic (HAP), other ethnicities (OTH), and White (WHT) students. The results reveal significant effects of both ethnicity and gender on GSR. Specifically, Hispanic, other ethnic, and White students showed higher GSRs compared to African American students, and female students had significantly higher GSRs than their male counterparts. Furthermore, the random effects of annual variation did not show significant impact, indicating that fluctuations across years did not drastically affect GSR for different ethnic and gender groups. These findings highlight the role of ethnic and gender disparities in academic achievement and provide valuable empirical support for future higher education policy development. This study suggests that future research should explore other potential factors, such as institutional resources and academic support services for student-athletes, that may further influence GSR. Additionally, future studies can examine the long-term impact of yearly variations on GSR across different ethnic and gender groups, incorporating more layered data for analysis.

P13.10

EXAMINING THE ROLE OF GENDER AND SOCIAL SUPPORT IN DISORDERED EATING AMONG BARIATRIC PATIENTS: A MODERATION ANALYSIS

Anna Papillion, McCall Schruff, John Young

The University of Mississippi, Oxford, MS

Introduction: Approximately 42.4% of individuals are affected by obesity, which is often related to their eating behaviors. Understanding how psychosocial factors, such as gender, social support, and emotional well-being, are associated with disordered eating is essential for effectively addressing this pressing health crisis. Disordered eating behaviors and attitudes cover a spectrum of issues, such as preoccupations with weight and body shape, episodes of overeating, purging, and restrictive dieting (1). The frequency and intensity of these behaviors may differ as a function of the type of disordered eating, and in some cases greatly increase the risk of negative health outcomes such as obesity (a condition shaped by both genetic and environmental factors, such as social support (2)). While previous studies have primarily focused on disordered eating in women due to the higher prevalence of eating disorder pathology in this population, there remains a gap in the literature regarding eating pathology among men, which is vital for future treatment approaches (3). Furthermore, limited research has explored whether social support can buffer against disordered eating, particularly in terms of differential effects by gender. This study examines the associations between gender, social support, and their interaction may be related to disordered eating. **Method:** The study sample consisted of 373 patients (M BMI = 46.80; SD = 8.20) from the Bariatric Clinic at North Mississippi Medical Center who were referred for pre-surgical psychological evaluations, where they completed standardized measures of social support (4) and eating patterns (Eating Disorder Examination (EDE-Q;[5]). The sample was predominantly female (83.1%) with a mean age of 43.01 years (SD = 11.70). All data were collected via EMR. A moderation analysis using PROCESS (6) was conducted to determine the capability of gender, social support, and their interaction to predict eating attitudes and behaviors. **Results:** Patients' gender, social support, and eating attitudes and behaviors were not significantly correlated ($p = .07$). Similarly, the moderation analysis was non-significant, suggesting no significant relationships between gender ($p = .10$), social support, or their interaction in predicting eating attitudes and behaviors. **Discussion:** Results indicate neither gender nor perceived social support was significantly associated with disordered eating behaviors, and no significant moderation was found when considering the interaction between predictors. Although there can be many reasons for null results, the lack of association between social support and outcome was contrary to expectations. If replicated, this could indicate that social support does not play as primary a role in prevention of severe obesity as previously thought. Further assessment of social support and individual perception of its potential positive effects in this population may thus be warranted. Additionally, it should be noted that participants in the current study might not have responded entirely truthfully, given that they may have been biased due to the fact that evaluation was a component of determining their surgical readiness. Future research could address these limitations by using longitudinal designs to assess how shifts in social support over time influence disordered eating, and whether these patterns are different by gender.

P13.11

AN ANALYSIS OF SMALL BUSINESS RECOVERY FOLLOWING A NATURAL DISASTER

Kristen Hobson, Adarius Hyde, Sydnee Thompson, Larry Barker

Tougaloo College, Tougaloo, MS

The state of Mississippi which has a population of 2.9 million residents and is located in the southern region of the United States which is prone for natural disasters. Since

the 1980s the state has witnessed on average 2 natural disasters a year including hurricane Katrina in 2005, and Ida in 2001 costing $150 billion, and $75 billion, respectively. The natural disasters have had an immediate and prolonged effect on the state's economy, especially its small business community.

The purpose of this mixed methods research study is to analyze the social economic recovery of small businesses following a large-scale disaster. The study will analyze several critical social and economic factors relating to the success of a small business leading to and following a large-scale disaster. The target population consists of small businesses located in the Mississippi Gulf Coast Region and other disaster areas, with a special focus on minority owned establishments. Small businesses are considered the life blood of a community and central to the national economy. However, small businesses are more vulnerable to failure following a large-scale disaster, especially those owned by minorities. Consequently, this study will help to provide valuable information on small business recovery which will assist policy makers with pre and post assistance dissemination and ultimately with the mitigation of small business failures.

P13.12

THE ACCEPTABILITY AND SATISFACTION OF SOCIAL SUPPORT INTERVENTIONS FROM PERSPECTIVES OF MOTHERS WITH POSTPARTUM DEPRESSION: A META-AGGREGATIVE SYSTEMATIC LITERATURE REVIEW

Torrey Robinson[1], Sydney Morris-Hill[2], Rebekah Andrew-Ayyasamy[1], Abigail Gamble[1],

[1]John D. Bower School of Population Health, University of Mississippi Medical Center, Jackson, MS, Rollins School of Public Health, Emory University, Atlanta, GA

Background: Perinatal mood and anxiety disorders are among the leading causes of maternal mortality, namely untreated postpartum depression (PPD). PPD can last up to one year after childbirth and affects 20% of women who give birth in the United States. If left untreated, PPD can have significant impacts on maternal and infant health and well-being. Social support is an intervention strategy that has been shown to reduce PPD symptoms. Social support is defined by the American Psychological Association as the provision of assistance or comfort to others, typically to help them cope with biological, psychological, and social stressors. Studies of the effectiveness of social support interventions have been synthesized in the scientific literature; however, synthesis of women's perspectives of acceptability and satisfaction with social support interventions have not been conducted. Understanding these preferences will inform intervention development and may increase participation and improve maternal mental health outcomes. **Purpose:** This meta-aggregative systematic review examined the acceptance and satisfaction of social support interventions from the perspectives of women experiencing PPD.

Methods: This review utilized the Joanna Briggs Institute (JBI) meta-aggregation method to synthesize qualitative evidence by systematically identifying, appraising, and extracting findings from published literature. A systematic search of PubMed, Ebsco, and PsycINFO was conducted, including only studies published in English between January 2000 and December 2023. A librarian at the University of Mississippi Medical Center was consulted to develop targeted search terms. Studies of pregnant or postpartum women of any age, race, or ethnicity were included. Interventions of any type using single or multicomponent approaches were eligible. Primary outcomes included qualitative themes extracted verbatim from published manuscripts and synthesized into statements best representing the data. Included studies were critically appraised by two independent reviewers for methodological quality using the standard JBI Critical Appraisal Checklist for Qualitative Research.

Results: From this systematic search, 2,492 articles were identified. The titles and abstracts of 1,669 deduplicated records were screened. The full text was reviewed for 25 records, resulting in 5 studies in the final meta-aggregation. Studies included participants (n=298) in pregnancy and postpartum and were conducted in Canada (n=2), Singapore (n=1), Chile (n=1), and China (n=1). All interventions were delivered using eHealth modalities; 2 interventions were multicomponent, and 3 were single component. No intervention exposure went beyond 12 weeks postpartum. Qualitative data were ascertained using open-ended survey responses (n=221) and interviewing (n=77). A total of 18 themes and 23 sub-themes were extracted and synthesized into 5 themes: 1) eHealth social support interventions are accessible and acceptable to women with PPD. 2) Interventionists with empathetic qualities increase participants' satisfaction. 3) eHealth interventions enhancing social integration through a community of parents are favored. 4) Participants are highly satisfied with interventions that improve maternal self-efficacy and emotional coping responses. 5) Structural and interpersonal barriers to engagement reduce accessibility and satisfaction.

Conclusion: eHealth social support interventions are accessible and acceptable to women with PPD. Empathetic interpersonal connections and a sense of community increased participants' satisfaction. Future social support interventions should extend beyond 12 weeks postpartum. To increase participant engagement, expectations for communication with interventionists should be established and include trained interventionists with shared lived experiences. Future studies should explore tailoring interventions to individualized maternal needs, addressing barriers to engagement, and evaluating the long-term effectiveness of mitigating PPD.

P13.13

LONELINESS AS A MODERATOR: SUGAR-SWEETENED BEVERAGE (SSB) AND MENTAL HEALTH DISPARITIES ACROSS RACIAL GROUPS

Khadiza Akter, Ibtesham Ahmed, Melinda Slay, Rubaiya Zannat

The University of Southern Mississippi, Hattiesburg, MS

Sugar-sweetened beverages (SSB) have been shown to impact physical health negatively, contributing to weight gain and increasing the likelihood of developing type 2 diabetes (T2D), cardiovascular disease (CVD), and certain types of cancer (Malik & Hu,2019). Although previous studies have looked at the relationship between sugar-sweetened beverages (SSB) and mental health, they have not adequately considered factors such as loneliness that might influence the impact of SSB consumption. Furthermore, there has been little attention given to mental health disparities in these relationships. This study aims to investigate the relationship between SSB consumption and mental health, with a specific focus on how loneliness influences this relationship across different racial groups. This quantitative study includes 150 participants from diverse racial backgrounds residing in the United States. Data will be collected through the online survey, where participants will report their typical intake of SSB, perceived loneliness, and mental health symptoms over the past month. Multiple moderated regression analyses, independent sample t-tests, and one-way ANOVA will be employed to test the hypotheses. Predicted results suggest that the minority population will report a more significant negative impact of sugar-sweetened beverage (SSB) consumption on mental health compared to the white population. Furthermore, this negative impact is expected to be exacerbated when participants report higher levels of loneliness. Interestingly, it is also anticipated that loneliness may influence the influence of the effect of SSB consumption on mental health, even in cases of low consumption. The results of this study will provide valuable insights into how dietary habits, particularly the consumption of sugar-sweetened beverages (SSB), affect mental health in socially isolated situations. This research will highlight how minority populations are disproportionately impacted by SSB consumption due to their unique social and cultural experiences of loneliness, helping to identify health disparities. Additionally, the findings may inform public health strategies aimed at reducing these disparities and contribute to the development of culturally sensitive interventions that address social, emotional, and dietary factors in promoting mental health and improving overall well-being across diverse populations.

P13.14

THE EFFECTS ON EMOTIONAL REGULATION SKILLS ON COLLEGE STUDENTS' COPING MECHANISMS

Sydney L. Hilliard and Shaila Khan

Tougaloo College, Tougaloo, MS

The study aimed to determine the relationship between emotional regulation and coping skills of undergraduate college students. Studies have been conducted to reveal how emotional regulation impacts young adult college students (Midkiff et al., 2018). Emotional regulation plays a major role in the wellbeing of students' mental health. Moreover, students are faced with life stressors in various forms such as academically, socially, emotionally, mentally, etc. (Rufino et al., 2022). The present study hypothesized that college students who have higher emotional regulation skills will also have effective coping mechanisms compared to those who have lower emotional regulation skills. At a private four-year historically black institution, eighty (80) African American undergraduate students were recruited via social media invitation. They took part in a survey that considered questions pertaining to emotional regulation skills and coping mechanisms as they continue to navigate through difficult situations that may arise. Participants completed demographics, Brief-Coping Orientation to Problems Experience Inventory (BRIEF-COPE) and the Emotional Regulation Questionnaire (ERQ). To test the hypothesis, a correlation coefficient was conducted, and the hypothesis was confirmed. Based on the results of this research, it is important for scholars to become educated on the importance of knowing how to effectively use emotional intelligence within their day-to-day obstacles to cope with challenges.

END OF THURSDAY'S PROGRAM

Friday, March 21, 2025
MORNING
Hall D Room 11

8:50 Welcome

O13.12

9:00 LANDSCAPES OF POWER: THE CONTESTED ROLE OF SPANISH IN THE LINGUISTIC LANDSCAPE OF PASCAGOULA, MS.

Epiphany Hobbs, Kendallyn White, Tom Lewis

Tougaloo College, Tougaloo, MS

This paper presents the results of an analysis of the role of Spanish in the linguistic landscape (Landry & Bourhis 1997) of Pascagoula, MS, a coastal city of approximately 21,500 people on the Mississippi Gulf Coast. We define

linguistic landscape as "writing on display in the public sphere" (Coulmas 2009) and explore visible language within the city, focusing on public signs in commercial spaces. Initial analysis suggests two important observations. First, official communicative signage in Spanish is extremely limited in Pascagoula. Second, visible Spanish is primarily constrained to the economically down-trodden areas of the city. Together, these observations highlight the ways that the linguistic landscape functions to reflect and reproduce negative ideologies about the symbolic value of the Spanish language and Latinx people.

Pascagoula was chosen as the site of this research based on a highly salient shift in its demographic composition. According to census data approximately 3.89% of the population identified as Hispanic or Latino in 2000. By 2020 that figure had increased to 14.78%, which is substantially higher than the statewide figure of 3.55%. Data was collected in late 2024 and early 2025 by a three-person research team. Researchers explored commercial areas of the city, photographing Spanish signage. We used the Lingscape app to tag the signs geographically and categorize them for further analysis. We then analyzed signs in terms of several common linguistic landscaping analytical mechanisms, including top-down vs. bottom-up and communicative vs. emblematic in order to generate quantitative insights into rates of occurrence, geographic distribution, and functional nature of Spanish language signage. We supplemented the quantitative analysis with a qualitative analysis that provides insights into how the current linguistic landscape reflects and reproduces problematic ideologies related to both the Spanish language and Latinx people.

This paper contributes to a relative dearth of attention to Spanish in linguistic landscape research (Franco Rodríguez 2018) and provides needed sociolinguistic attention to Spanish speaking communities outside of large urban centers. It contributes to our understanding of how major coastal disasters impact the demographic realities of communities, which has important implications for policy and planning. Furthermore, as Gorter (2013) argues, linguistic landscapes reflect the relative power and status of linguistic codes, and, therefore, speakers of these codes. Thus, the analysis of linguistic landscapes will continue to be a crucial component in the ongoing movement within sociolinguistics to refocus on not just describing language use in underprivileged or minoritized communities, but on the power hierarchies and ideologies that function to constrain minority language use (see Baugh 2018, M.C. Lewis 2018, Rosa, 2019, inter alia). Linguistic landscape research, in particular research focused on how linguistic landscapes reflect and reproduce power and privilege hierarchies, is a critical tool that deserves increased attention as the field progresses into the twenty-first century.

O13.13

9:30 SOMETHING OLD, SOMETHING NEW: THE LEGAL LANDSCAPE FOR PROSECUTION OF AI GENERATED CHILD SEXUAL ABUSE MATERIAL OFFENSES

Brenda Rowe

University of Southern Mississippi, Hattiesburg, MS

Rapid advancements in artificial intelligence technology have outpaced the existing legal framework's ability to address the harms such technology can inflict. Generative artificial intelligence can be used to alter images of real, identifiable children to depict them engaging in sexual activity. This technology can also generate images of fictional children engaging in pornographic acts, which predators can disseminate to minors to facilitate grooming. As the technology has advanced, it has become increasingly challenging for law enforcement officers to identify which child sexual abuse images represent identifiable children that need to be saved, which can undermine efforts to expeditiously rescue exploited children. In the United States, prosecutors are using existing child pornography and obscenity laws to charge offenders producing such artificial intelligence generated child sexual abuse material. However, such prosecutions are not without their challenges, as the production of images of non-identifiable children often does not fall within the scope of child pornography laws. Production of such images is better addressed by bringing charges under obscenity laws, although these cases can be subject to claims of First Amendment violations. State legislatures are increasingly recognizing the need for new state laws that address this pernicious problem. The present study collects and analyzes recent state legislation that attempts to address the problem of artificial intelligence generated child sexual abuse material. Common features of such legislation are identified and unique approaches are highlighted. Applicable state laws in Mississippi are examined to shed light on the legal landscape within the state. The challenges of prosecution in states that have not yet enacted legislation to address this issue are discussed. The need for comprehensive federal legislation is assessed.

O13.14

10:00 MULTI-GENERATIONAL PERSPECTIVES ON AGING IN HOME: CHALLENGES, PROSPECTS, AND SCOPE

Muhammad Riaz

Alcorn State University, Lorman, MS

This study investigated multigenerational perspectives on socially embedded older adults' home aging experiences to identify challenges, opportunities, and prospects for underserved and under-resourced communities. Many (twelve) participants, mostly older adults (female) aged 65 and over, and parents participated in this study in southwest rural Mississippi. The participants belonged to the silent generation, baby Boomers, and Generation X in this study.

The participants were provided information, skills, and mentoring to fill out the survey. The mixed method research design was used to understand socially embedded phenomena. The data were analyzed using SPSS and MaxQDA, quantitative and qualitative respectively. The results included; those involved in caregiving responsibilities, married women associated with caregiving, African American women, living in their homes, not many caregivers available, granddaughters viewed as prospective caregivers, opted aging in home preferred, quality of life good to excellent rated, more help in home chores like food preparation expressed, wised to learn about computer, felt confident to age in home, felt contented with life, have good family relationships, felt secure at home, asked for medication training to caregivers, vision problems, walking and chair yoga practiced often, the integrity of responses average, taller toilets needed to aging in-home—the training on mentoring on medication, hose chores, and making more caregivers force.

O13.15

10:30 AN EXPLORATORY STUDY OF THE RELATIONSHIPS OF NEIGHBORHOOD DISADVANTAGE AND PRESCRIPTION OF OPIOIDS WITH OPIOID ABUSE

Xiaoli Su, Jaegoo Lee

Jackson State University, Jackson, MS

Opioid abuse has become an epidemic across the country in recent decades (DEA, 2021). Researchers have found that the amounts of prescribed opioids given to a population is related to their opioid abuse (e.g., Powell, Pacula, & Taylor, 2020). In addition, evidence has suggested that the distribution of prescribed opioids may be linked to neighborhood disadvantages (e.g., Boardman, et al., 2001, Confer, Kuhl, & Boman, 2023). Using the AllofUs data (N=825), we examined the relationships among neighborhood disadvantage, the amounts of six major types of prescribed opioids (oxycodone, morphine, hydromorphone, fentanyl, tramadol, hydrocodone), and opioid abuse (including misuse of prescribed opioid and the use of street opioids). To test the relationships, we conducted a series of correlation and logistic regression analyses. We found that the amount (mgs) of prescribed hydrocodone significantly contributed to the misuse of prescribed opioids. This effect remained significant even after controlling individual characteristics such as gender, age, race, education, income, marital status, employment status, health conditions and neighborhood disadvantage. Our analysis results showed that neighborhood disadvantage was not significantly related to the amount (mgs) of prescribed opioids. No significant relationship between the amounts of prescribed opioids and the use of street opioids was found due to a very small sample size. The limitations of this study and directions of future research are discussed. **Acknowledgement**: We gratefully acknowledge *All of Us* participants for their contributions, without whom this research would not have been possible. We also thank the National Institutes of Health's *All of Us* Research Program for making available the participant data [and/or samples and/or cohort] examined in this study.

11:00 Divisional Business Meeting

Science Education

Chair: Christopher Jurgenson

Delta State University

Co-Chair: Sarah Lalk

Mississippi State University

Vice-Chair: Christa Haney

Mississippi State University

Thursday, March 20, 2025
MORNING
Hall D Room 8

8:30 Welcome

8:45 Divisional Business Meeting

O14.01

9:00 EXPERIENTIAL LEARNING IN ENVIRONMENTAL SCIENCE: TEACHING STRATEGIES FOR BOTH ONLINE AND ON CAMPUS

Christa Haney, Sarah Lalk

Mississippi State University, Starkville, MS

This presentation will examine teaching strategies to incorporate local data & research, citizen science and student interactions in online and on campus environmental science courses. These are ideal ways to increase student understanding of complex geoscience processes while enhancing student engagement. Teaching activities include formal and informal learning opportunities for students that are integrated into course assignments. Such explorations also increase the relevance and investment for students in their local communities. This presentation will explore strategies that teachers can use in both online and classroom to encourage students to collect and analyze geoscience data to deepen understanding of environmental processes. Positive student feedback and a reported increase in engagement and relevance of course material was found when students conducted local research and collected geoscience data.

O14.02

9:20 USE THE INTERACTIVE LECTURE AS AN EFFECTIVE INSTRUCTIONAL PROCEDURE

Johnny Mattox

Blue Mountain Christian University, Blue Mountain, MS

The interactive lecture has been shown to be an effective method for instruction in courses taught in the Biological Sciences at Blue Mountain Christian University. This

method employs traditional lecture along with questioning intermittently during the presentation of material by the instructor. This method also incorporates relevant video clips, group discussion and student debates. Student PowerPoint presentations are given from time to time as well. Classes that this method has been used in include General Microbiology, Fundamentals of Zoology, Plant Morphology, Ecology, and Systematic Botany. This method has been shown to improve student involvement and preparation in the subject as well as enhance student dispositions as shown by results from student questionnaires.

O14.03

9:40 COMBINING PREDICTED, CALCULATED, AND HANDS-ON NMR SPECTRA TO ENHANCE INSTRUCTION OF MOLECULAR STRUCTURE IN ORGANIC CHEMISTRY

Christopher Jurgenson[1], Larry Collins[2], Alexis Hartley[1]

[1]Delta State University, Cleveland, MS, [2]Longwood University, Farmville, VA

For most students, NMR is the first example of a spectroscopic method that gives direct evidence based on how a molecule is arranged. Spacial ability and spacial intelligence are critical skills needed to take a series of peaks in an NMR spectrum and translate them into Kekulé or Lewis structures drawn on paper. Typically, students who study NMR use an actual spectrometer to collect spectra on molecules that are then interpreted based on rules associated with the non-integer spin nuclide's environment (such as 1H and 13C). This takes into consideration molecular symmetry, degree of deshielding due to factors such as polarity and diamagnetic anisotropy, magnetic coupling, and relative integrated peak sizes. Numerous textbook questions and interactive websites exist to hone the student's ability to interpret NMR spectra, but even with these tools there is a steep learning curve that pose great difficulty for many students to overcome. The purpose of this study is to evaluate how hands-on NMR instruction is improved by utilizing two additional techniques alongside it - NMR prediction using ChemDoodle and Gaussian for calculating spectra. Both programs have a general user interface (GUI) used to draw molecules for predicting or calculating spectra. Learning how to draw molecules using a GUI is a simple skill that is reinforced through textbook figures and drawings utilized during organic chemistry lectures. Being able to draw a molecule followed by seeing a predicted or calculated spectrum will help the student better connect the two concepts and see how they are related. To evaluate the effectiveness of these methods a pilot survey was developed to measure student perceptions of learning (written by the research team) and content-focused questions as a measure to gauge actual student learning (written by the course instructor in the form of a quiz and worksheet). The survey contains Likert-scale and open-ended questions. A follow-up survey was developed as a measure to further explain results from the initial survey which showed that 100% of the students were able to report the value in what they were learning.

10:00 Break

O14.04

10:20 USING PROJECT BASED LEARNING IN A MIDDLE GRADE STEM BASED CURRICULUM FOCUSED ON LAUNCH, DESCENT AND RECONNAISSANCE FOR PLANETARY EXPLORATION: A TWO YEAR PROGRAM REVIEW

Joe Sumrall, Richard Balkin, Maddie Derito

University of Mississippi, Oxford, MS

This program involved middle grade students in a rocketry curriculum that focused on variables related to a) Launch, b) Descent, and C) Reconnaissance. Project Based Learning (PBL) was the primary teaching strategy used in the implementation of curricula. How this method related to career interests in underrepresented student populations within middle grades was evaluated. Specific objectives for the project were- (i) Through use of a Project Based Learning curriculum that focused on STEM topics-Launch, Descent and Reconnaissance in rocketry the program investigated changes in:

*Pre/post STEM career interests for underrepresented participants in the middle grades.

*Pre/post STEM skill attainment for underrepresented participants in the middle grades.

*Pre/post changes STEM understanding for underrepresented participants in the middle grades.

Project Outcomes/Resources will be disseminated via the state's Science Teachers Association website and the conducting of presentations/workshops at state and national conferences. Project resources will include underrepresented STEM related and community resources that focus on careers in STEM. In this program, project based learning (PBL) in science and engineering is defined as the modeling of real world applications of scientific/engineering principles for the purpose of challenging students to excel in skill areas including planning, testing and building. PBL activities proposed here are designed for grades 6-8. The proposed PBL structure falls into Barrows (1986) taxonomy for self-directedness as either student directed, or, more commonly, partially student- and teacher-directed. When describing the problem structure the PBL used in this proposal falls mainly under the category of full problem simulation (i.e., free inquiry), where problems are non-structured and leave out information.

A majority of lessons created start with a vignette challenge requiring students working in groups to problem solve, do inquiry, build proto-types, experiment and present through the Claim, Evidence, Reasoning (CER)

processes of doing science. Emphasis on uses of Project Based Learning in coordination with the 5E instructional model will occur within some lessons.

Significant Results/outcomes/findings

1. Males are more likely to identify males as scientists than females are likely to identify females as scientists.
2. There was slight improvement on the posttests of males identifying females as scientists.
3. Males are more likely to identify males as engineers than females are likely to identify females as engineers.
4. A slight increase was noted in females to identify as engineers.
5. There was slight improvement on the posttests of males identifying females as engineers.
6. POC students were underrepresented, lending any interpretation of these findings to be exploratory at best. White students may be more likely to identify white students as scientists than POC students identify POC students as scientists. White students may be more likely to identify white students as engineers than POC students identify POC students as engineers.
7. Seventh grade science teachers reported improved skills (e.g, graphing, controlling variables, measuring) were seen due to the rocketry program.
8. Standardized eighth grade science test scores increased suggesting an impact on students in year 1of the rocketry program.

O14.05

10:40 CREATING RESEARCH EXPERIENCES FOR UNDERGRADUATES AT MERIDIAN COMMUNITY COLLEGE

Angie Carraway[1], Samuel Swanner[1], Kaitlyn Hebig[1], Alondra Arreola-Espino[1], Julie Pigza[2], Keith Koenig[3]

[1]Meridian Community College, Meridian, MS, [2]The University of Southern Mississippi, Hattiesburg, MS, [3]Mississippi State University, Starkville, MS

Undergraduate research is a high-impact practice that improves student experience, retention, persistence, and completion. Traditionally, community college students in Mississippi have had few opportunities to engage in STEM research at the community college level. With the support of the Mississippi Space Grant Consortium, Meridian Community College has been able to engage small groups of students in undergraduate Chemistry research. Establishment of a research program at MCC has also provided other opportunities and sparked excitement in areas outside of the programs directly funded by Space Grant. Since the program's inception in Spring 2022, several undergraduate students have taken advantage of research opportunities in senior institutions and beyond.

O14.06

11:00 FACULTY AND STUDENT PERCEPTIONS OF CLASSROOM OFF-TASK TECHNOLOGY USE IN THE POST-PANDEMIC ERA

Britney Reulet, Jacob Daniels, Kristy Cole, Driscoll DeVaul, Robin Thompson, Katie Cassady, Seena S. Edgerton, Xiaoshan Gordy

University of Mississippi Medical Center, Jackson, MS

Background: The COVID-19 pandemic has permanently changed the landscape of education. Prior to the pandemic, technology was often utilized to supplement traditional teaching methods. However, since the pandemic technology has become the primary conduit of instructional delivery. Students have grown more accustomed to using technology in the academic classroom, leading to a significant increase in off-task technology use. Given the shifting role of technology in education in this post-pandemic era, it is essential to study this issue under the new circumstances. **Objective:** The purpose of this study is to explore the perceptions of faculty and students regarding students' classroom off-task technology use in the post-pandemic era. Through gaining insights into their perspectives, we can better assist faculty in refining their teaching methods and support students in adapting their learning strategies. **Methods:** This mixed-methods study will employ the sequential explanatory design. The target population includes faculty who teach and students who attend in-person classes. Faculty who teach and students who attend online classes will be excluded. Quantitative data will be collected first through a cross-sectional survey of faculty and students exploring their perceptions of students' classroom off-task technology. Qualitative data will be collected through semi-structured interviews. **Results:** Data collection will take place in November 2024. We anticipate that faculty and students will express contrasting perceptions regarding the extent and impact of off-task technology use in the classroom. Faculty may view off-task technology as a distraction that hinders learning and engagement, while students may perceive it as a necessary tool for multitasking. Additionally, we expect to identify key factors that contribute to off-task technology use, such as class structure, teaching methods, and student motivation. These insights will inform recommendations for faculty to develop strategies that foster focused technology use, potentially enhancing the learning environment and supporting student success in the post-pandemic educational landscape. **Conclusion:** Following data collection, a better understanding of the changing role of technology use in the post-pandemic classroom should emerge, offering valuable insights into faculty and student perspectives on off-task technology behaviors. By understanding these perceptions, we can support the development of teaching strategies that minimize distractions and foster a more engaged learning environment. The findings have the potential to guide both

faculty practices and student learning strategies, ultimately enhancing educational outcomes in an era where technology plays an integral role in the classroom.

O14.07

11:20 THE BRAIN DRAIN DILEMMA: MISSISSIPPI'S STARTLING LOSS OF OVERALL POPULATION AND HEALTH SCIENCE PROFESSIONALS

Edgar Meyers

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.

O14.08

11:40 EXPLORING THE QUALITY OF LIFE AND CAREER INTENTIONS OF NURSING FACULTY IN MISSISSIPPI: A MIXED-METHODS STUDY

Xiaoshan Gordy, Christy Savell, Margaret Calcote, Tawanda McNair, Xiaoqian Zhu, Angela Duck

[1]University of Mississippi Medical Center, Jackson, MS

Background: In Mississippi, the 2022 data indicated that nursing schools around the state turned away 2,400 qualified applicants, in part due to a nursing faculty shortage (Taft, 2022). To address the urgent shortage issue, it is essential to understand the contributing factors. **Objective:** This study aims to employ a mixed-methods study design to evaluate Mississippi nursing faculty's quality of life and factors that influence their intent to stay or leave the profession. **Methods:** This study will employ a sequential explanatory mix-methods study design (Creswell & Clark, 2017). The target population for this study is nursing faculty in an academic nursing program in Mississippi. The data will be collected in two consecutive phases, first quantitative and then qualitative. The quantitative phase involves an anonymous cross-sectional survey to all nursing faculty in Mississippi. The qualitative phase entails semi-structured individual interviews with survey respondents who have indicated their interest in participating in an interview. The quantitative data will be analyzed with SPSS version 29 and Stata 18. The qualitative data will be analyzed with the Constant Comparative Method (CCM). **Expected Results:** From the quantitative data, it is hypothesized that nursing faculty with higher CS will concurrently demonstrate lower BO and STS, in turn, they are more likely to stay with the current profession. From the qualitative interviews, it is difficult to predict the themes that will emerge, as different samples may yield varying results. **Conclusion:** The tailored insights to be gained from this research will have direct implications for the field of nursing as it will contribute to the development of targeted nursing faculty retention strategies, policies, and interventions, which will, in turn, help address the current nursing shortage in Mississippi.

THURSDAY, March 20, 2025

EVENING

4:00 DODGEN LECTURE /AWARDS CEREMONY

Hall B

5:00-7:00 GENERAL POSTER SESSION

(Immediately following Dodgen Event)

P14.01

SHAPING FUTURE SCIENTISTS: A REVIEW OF HANDS-ON EXPERIENCES IN GCRL'S SUMMER FIELD PROGRAMS

Laura Blackmon, Sarah Binte Faruque, Viginia Fleer Schweiss

University of Southern Mississippi, Hattiesburg, MS

The Gulf Coast Research Laboratory (GCRL) is part of The University of Southern Mississippi and is designated as Mississippi's Marine Laboratory. Established in 1947 at Ocean Springs, Mississippi, GCRL is a center for marine and coastal sciences education and research. GCRL hosts the Department of Coastal Sciences, the Center for Fisheries Research & Development, the Marine Education Center, and the Thad Cochran Marine Aquaculture Center. It is a hub for researchers and graduate students. It also proudly holds the GCRL Summer Field Program, designed to immerse undergraduate and graduate students in hands-on, field- and lab-based learning focused on coastal environments. For the last 77 years, the Summer Field Program has played a vital role in producing coastal and marine experts by supporting them in shaping their future careers. Each summer, students from various disciplines, such as biological sciences, marine science, and other natural sciences, participate in the four-week program to earn academic credits. The program provides practical and real-world experience in coastal and marine sciences.

In the Summer of 2024, the program offered two courses: Coastal Restoration (COA 441/551) and Marine Conservation (COA 450/550). A total of 25 students participated: 14 enrolled in Coastal Restoration and 11 in Marine Conservation. This study investigates these two courses' field activities and assesses how they actively engage students, help them gain practical experience, and choose their future careers. These courses, developed by experienced faculty, included comprehensive fieldwork components, such as designing, monitoring, and evaluating existing projects and implementing new initiatives. This hands-on fieldwork allowed students to deal with career-oriented real-world scenarios, gain practical insights, and support them in exploring and clarifying potential career paths. Through hands-on experiences like project monitoring and implementation, students acquire essential skills and insights that help them identify their interests and shape their career paths in the natural sciences.

P14.02

POSITIVE USES OF VIRTUAL REALITY, ITS LIMITATIONS, AND FUTURE PROSPECTS

Barsat Khadka, Mel Lee, Chijike Mgbam, Anish Kharal, Wynton Miller, Nhoojah Maharjan

School of Computing Sciences and Computer Engineering, The University of Southern Mississippi, Hattiesburg, MS

Virtual Reality (VR) is beyond just being a concept and is next to reality as it has already been employed in many industries. This exploration of both the pros and cons of VR deals with its potential diseases to be cured, challenging ethical issues, and the future of the virtual world. An excellent way in which this technology is used for mental health is by way of VR Exposure Therapy (VRET). VRET in which a patient's mind is virtually immersed into the situation they have experienced before has been shown to be effective in curing psychiatric disorders such as PTSD, anxiety, and phobias just to name a few. Studies reveal that patients are highly satisfied and more interested in VR-based therapies as they convey much pleasure unlike the conventional ones. For instance, military personnel as well as individuals who were present during traumatic events like the September 11 attacks were able to use VR therapy which allowed them to face the traumatic memories over and over again in a controlled and safe manner. Apart from being a problem-solving tool, VR is making strides in different fields such as education, healthcare, and training thanks to its immersive abilities which allow more direct learning and the real-life simulation of tough situations.

Still, in spite of the many positive uses of VR technology, it is not without its restrictions and issues of concern. One of the psychological disadvantages of VR is the possibility to increase the emotional response, thus causing the user to have more intense emotions than in physical. Research has shown that the users can experience more powerful negative emotions in VR which might result in increased rumination and emotional distress. Besides, the extended use of VR has been shown to cause dissociative symptoms in which users may have problems to differentiate between the virtual world and reality, especially those who have a predisposition to dissociative disorders. VR can also induce social isolation, because the users may become dependent on virtual interaction to satisfy the social needs which would slowly minimize face-to-face contact and, thus, create the feelings of loneliness.

To start with, it is imperative that ethical issues relating to VR are also tackled along with the successful integration of the technology with day to day activities. Among the examples that should be taken into consideration can be the unknown state of data privacy, the fact that there are potential security risks, and also that personal information is commonly gathered without any kind of regulation. VR Technologies' invasiveness in acquiring highly personal information like a user's biometric or physical movement data that can be misused in case the data is not tightly secured.

P14.03

Dr. Jay Grimes: A LIFE IN MARINE SCIENCES

Joyce Shaw, Brennan Collins

Gunter Library/Gulf Coast Research Laboratory, Ocean Springs, MS

Archival materials are an important special collection at the Gulf Coast Research Laboratory's (GCRL) Gunter

Library. The collection holds grey literature, article reprints, photographs, newspaper clippings, and other documentation by and about Dr. Jay Grimes. Dr. Grimes was a microbiologist and experienced administrator who served in both government and academia. Under his leadership, two academic departments were formed. First, the Department of Marine Science was crafted from the Center for Marine Science and the Center for Ocean and Atmospheric Modeling at Stennis Space Center, and second, the Department of Coastal Sciences (COA) composed of research scientists from GCRL. During his tenure as director, he oversaw the acquisition of the GCRL Cedar Point campus and the creation of the Thad Cochran Marine Aquaculture Center. From 1997 to 2007, Grimes served as Director of GCRL and as Provost and Vice President for Academic Affairs at The University of Southern Mississippi (USM). This project involved documenting the impact of Dr. Grimes' scholarly contributions to marine science by adding his publications to Gunter Library's database of GCRL publications, reviewing citation counts, and gathering and organizing photos, news clippings, reports, and other materials related to his time at GCRL and USM.

P14.04

WOMEN GEOSCIENTISTS IN THE MOVIES

Megan Le[1], *Sarah Lalk*[2]

[1]*Gunter Library/Gulf Coast Research Laboratory, Ocean Springs, MS,* [2]*Department of Geosciences at Mississippi State University, Starkville, MS*

As part of an ongoing effort to engage with women undergraduate and graduate students in The University of Southern Mississippi's School of Ocean Science and Engineering and Mississippi State University (MSU) Department of Geosciences programs, the Gulf Coast Research Laboratory's Gunter Library and the Department of Geosciences at MSU compiled and compared a list of popular movies with a geological theme or phenomenon featuring a woman scientist lead or supporting character. This fictional look into the portrayal of women as geoscientists allows for myth-busting analysis and discussion about career options and opportunities for students. These movies are a way to understand how popular culture views the work of women in the geosciences. The list includes a brief description of each film, and its age-appropriate rating. A short reading list of books and articles highlighting women in science was compiled as part of the project.

P14.05

USING WebMO TO INTRODUCE COMPUTATIONAL CHEMISTRY AT THE UNIVERSITY OF SOUTHERN MISSISSIPPI

Sadie Pitre, Julie Pigza

University of Southern Mississippi, Hattiesburg, MS

Computational chemistry is a rapidly evolving specialty within the field of chemistry. Computational chemistry utilizes theoretical calculations to simulate properties of molecules and chemical reactions. Computation is vital to many different industries like medicine, engineering, and environmental. Despite its significance, there are currently no computational chemistry courses offered at the University of Southern Mississippi (USM). This study investigates the integration of computational chemistry into the undergraduate laboratory curriculum using WebMO. Computational laboratory exercises were developed for Organic Chemistry I and II laboratories. The first lab was designed to help students visualize molecular shape and structure and includes Newman projections, dipole moments, functional groups, and isomers. The second lab is to aid students in viewing key molecular orbitals as they play a significant role in reactions such as electrophilic aromatic substitutions. These exercises were administered to students in conjunction with their regular laboratory content as a hybrid lab, with the computational exercises added as bonus. Surveys were administered both pre- and post-lab. This presentation will detail the exercises, describe the impact on student learning, and give suggestions for how to improve in the future. The ultimate goal of the research is to incorporate computational chemistry throughout the curriculum and within the research group.

P14.06

A PRELIMINARY STUDY: TEACHING INCLUSIVE THINKING AND ACCESSIBILITY IN KINESIOLOGY

Shavonda Jackson

Alcorn State University, Lorman, MS

Terms such as equity, equality, diversity, and inclusion are frequently explored in academic literature related to sports, physical education, kinesiology, and physical activity. In kinesiology, accessibility refers to tailoring approaches to accommodate the specific needs of individuals, especially those with disabilities. This may involve adjusting exercise programs, creating treatment plans, and enhancing accessibility in homes or workplaces. The growing emphasis on accessibility awareness and knowledge is not only a moral imperative but also a key factor in employment opportunities. Educational programs must effectively demonstrate their ability to teach these skills, particularly to students who will be working closely with individuals with diverse disabilities.

There's research focused on the accessibility of educational materials and applications used to promote physical activity, as well as discussions on ableism within kinesiology and higher education. However, there not much research on students' knowledge of accessibility upon entering a kinesiology course.

The purpose of this research is to determine knowledge of accessibility in incoming kinesiology students and the importance of assistive devices in the beginning of the course compared to the end of the course? We will focus 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 a consistent manner. We will report on a 3-semester evaluation of undergraduate biology students' accessibility awareness and knowledge, following a week of accessibility lectures consisting of power points, case studies, hands-on activities, and videos. We will measure student outcomes from quizzes and assignments, perceived effectiveness by way of a survey, and gains in awareness and knowledge will be determined at the end of the study by way of a pre and post survey.

P14.07

THE DUAL EDGES OF HEALTH AND LONGEVITY: NAVIGATING THE CHALLENGES OF EXTENDEDLIFE EXPECTANCY

Tyler Duncan[1], Kenneth R. Butler[2]

[1]Jackson State University, Jackson, MS, [2]University of Mississippi MedicalCenter, Jackson, MS

Advancements in healthcare and public health have significantlyincreased global life expectancy, marking one of modern society's greatest achievements. However, this progress presents complex societal, economic, and environmental challenges alongside its benefits. This review examines the multifaceted impacts of longevity, emphasizing sustainability, equity, and innovation as essential factors in addressing these challenges.

The rise in life expectancy has led to greater demand for healthcare services, particularly in managing chronic conditions such as diabetes, cardiovascular disease, and dementia. This demand strains healthcare systems, exacerbated by workforce shortages and rising costs. Addressing these pressures requires strategic investments in healthcare infrastructure, workforce development, and the integration of cost-effective solutions such as telemedicine and task-shifting models.

Economically, longer lifespans place increased pressure on public and private pension systems, amplifying financial burdens on working-age populations. As dependency ratios rise, reforms to retirement policies—such as raising retirement ages and adopting hybrid pension models—are necessary. Additionally, workforce participation among underrepresented groups, along with the useof automation and AI, can help sustain economic productivity in aging societies.

Aging populations also necessitate improved housing, social support systems, and transportation infrastructure. Urban planning efforts should incorporate age-friendly designs, while community-based caregiving programs can alleviate social isolation and healthcare demands. Technological innovations, including self-driving cars and mobility aids, further support elderly independence and social integration.

Environmental sustainability is another critical consideration, as longer lives increase resource consumption and medical waste production. Effective strategies include promoting circular economies, adopting sustainable agricultural practices, and improving waste management technologies. Innovations such as vertical membrane bioreactors can help minimize the healthcare sector's ecological footprint while ensuring resource availability for future generations.

Beyond logistical concerns, intergenerational equity and ethical dilemmas arise in life extension. Policymakers must balance resource distribution between younger and older populations to prevent social tensions. Ethical debates also highlight the need to prioritize quality of life rather than mere longevity, emphasizing patient-centered care, palliative approaches, and value-based healthcare models.

Proactive planning is essential to mitigating these challenges. Solutions include leveraging AI and telemedicine, promoting healthy aging initiatives, and reforming social policies to ensure fair resource allocation. Case studies, such as Denmark's elder care system and Japan's *Health Japan 21* initiative, provide models for implementing these strategies effectively.

A balanced approach to extended life expectancy requires collaboration among governments, researchers, and communities.

By prioritizing sustainability, equity, and innovation, societies can maximize the benefits of longevity while addressing its challenges. Achieving this balance will ensure that increased lifespans enhance collective well-being without compromising future generations' resources and opportunities.

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ABRIEF REVIEW OF THE PATHOPHYSIOLOGY,AND CLINICAL PRESENTATION,
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Ramiyah Thompson, Hamed Benghuzzi and Ibrahim Farah
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SYSTEMATIC REVIEW OF THE STATUS OF HYPERTENSION REPORTED TO CDC

Hayleigh Harrison, Ham Benghuzzi, and Ibrahim Farah
Department of Biology, Jackson State University, MS

In Memory

Lisa McCammon

April 23, 1958 — December 22, 2024

Lisa Jane McCammon was born April 23, 1958. She was the oldest daughter of Leon and Sarah McCammon. She passed unexpectedly on December 22, 2024.

Lisa was a lifelong resident of Jackson, MS. She worked at UMMC Department of Pharmacology as an administrative assistant for 39 years. Over the years working there, she formed many lifelong friendships that stayed with her throughout the years.

Lisa loved to cook. She treasured the family gatherings and spending time with her sisters, nieces, and nephews. She always held her family close and will be remember for her generous heart. She enjoyed shooting firearms. She adored her devoted companions, her dogs and always had them with her.

She is survived by her sisters, Marsha Loftin (Bill), Pam Burrell, Cindy Mitchell (Rick), and Jennifer Welch (Doyle). She also leaves behind an uncle, Paul Rigby and many nieces and nephews.

She is preceded in death by her parents, Leon and Sarah McCammon; grandparents, Paul and Wydell Rigby and Harvey and Gertrude McCammon.

REMEMBERING MY FRIEND— Lisa was one of my closest friends. We met at the University of Mississippi Medical Center (UMMC) in the Department of Pharmacology. At the time, I was working full-time while pursuing my PhD in Pharmacology, and Lisa was the first person I'd see every morning. She'd make coffee, and we'd chat about everything under the sun. Later, when I became a faculty member, Lisa transitioned from Pharmacology to Orthopedics, and we continued to collaborate. She made each day at work something to look forward to. Lisa was like a second mother to all our graduate students, medical students, and residents, always ensuring they had what they needed (including food) and offering a listening ear.

She saw the passion I had for the MAS and joined in to become the face of our academy. After her retirement from UMMC, she became even more involved with MAS, never missing an annual meeting and volunteering countless hours at the registration desk. What I admired most about Lisa was her kindness; she rarely spoke a negative word about anyone and welcomed everyone as a friend.

Lisa, I miss the warmth of your smile, your sweet Southern accent, your kind words, and your loving heart. Rest in peace—until we meet again!

Shelly Tucci- Jan 2025

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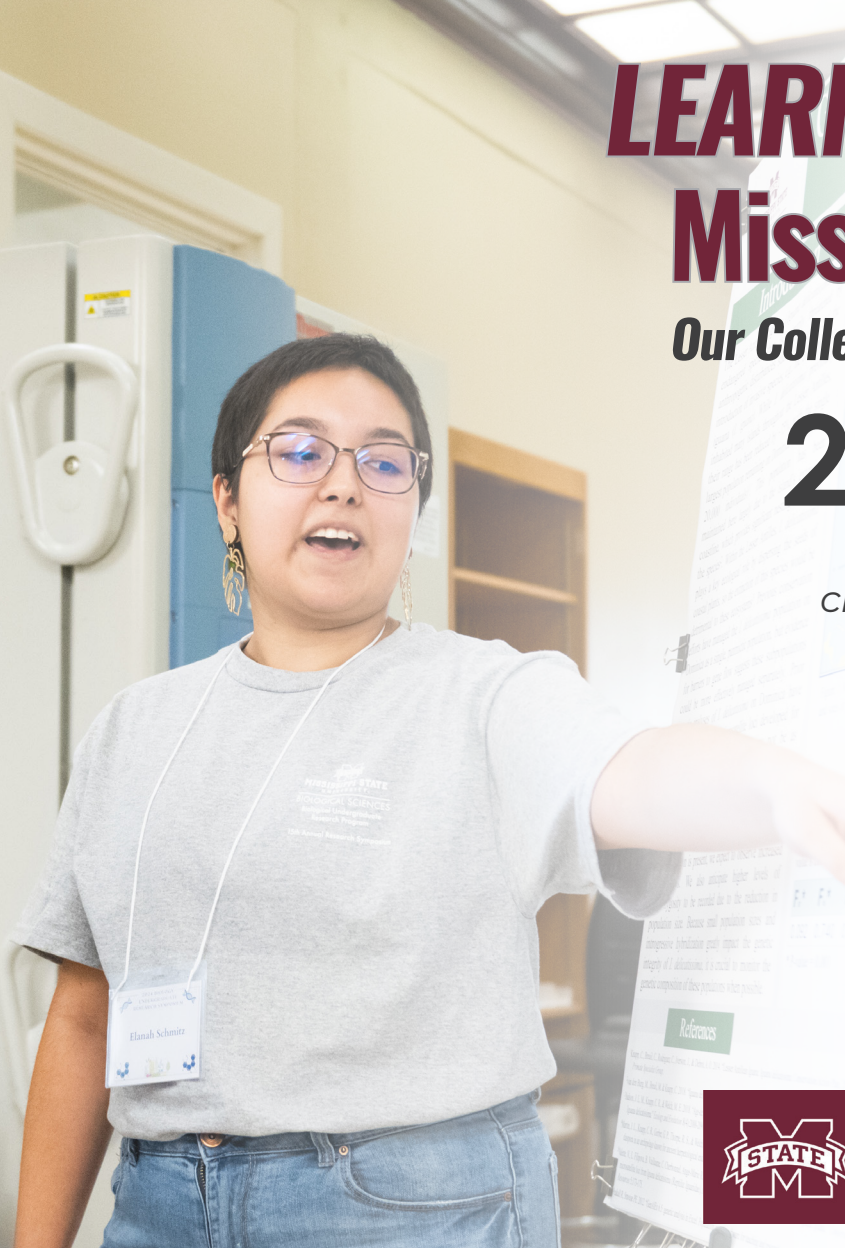

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