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Old Trace (milepost 221.4) on the Natchez Trace Parkway
The "Old Trace," the historic trail commemorated by the Natchez Trace Parkway today, still survives in segments. The Old Trace was the main road through the Old Southwest, connecting Natchez to Nashville by going through Chickasaw and Choctaw lands.

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FEBRUARY 29- MARCH-1, 2024

Thad Cochran Convention Center, Hattiesburg, MS

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Journal of the Mississippi Academy of Sciences

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WEDNESDAY, February 28, 2024 Registration Opens from 3:00- 5:00 pm Lobby area of convention center

Thursday February 29, 2024

Agriculture and Plant Sciences Room Union B	Animal, Fish, Wildlife, Veterinary Sciences Room Union A	Cellular, Molecular, and Developmental Biology Room TC 214	Chemistry and Chemical Engineering Room TC 210	Ecology and Evolutionary Biology Room TC 227	Geology and Geography Room Union C	Health Sciences Room TC 216
MORNING	MORNING	MORNING	MORNING	MORNING	MORNING	MORNING
Oral Session 8:00-12:00	Oral session with Marine	Oral Session 8:50-11:50	Oral Session	Guest Speakers Oral Session	Oral Session	Symposium 9:00-12:00
12:00 - 1:00 Lunch	12:00 - 1:00 Lunch	12:00 - 1:00 Lunch	12:00 - 1:00 Lunch	12:00 - 1:00 Lunch	12:00 - 1:00 Lunch	12:00 - 1:00 Lunch
AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON
POSTER SESSION TC 3rd floor Ballroom		Oral Session TC 214	Oral Sessions TC 210	Oral Session TC 227	Oral Session Union C	Oral Session TC 216
EVENING 3:30-7:30	EVENING 3:30-7:30	EVENING 3:30-7:30	EVENING 3:30-7:30	EVENING 3:30-7:30	EVENING 3:30-7:30	EVENING 3:30-7:30
MAS Awards Ceremony/ Dodgen Lecture Theater Poster Session/ Reception Grand ballrooms	MAS Awards Ceremony/ Dodgen Lecture Theater Poster Session/ Reception Grand ballrooms	MAS Awards Ceremony/ Dodgen Lecture Theater Poster Session/ Reception Grand ballrooms	MAS Awards Ceremony/ Dodgen Lecture Theater Poster Session/ Reception Grand ballrooms	MAS Awards Ceremony/ Dodgen Lecture Theater Poster Session/ Reception Grand ballrooms	MAS Awards Ceremony/ Dodgen Lecture Theater Poster Session/ Reception Grand ballrooms	MAS Awards Ceremony/ Dodgen Lecture Theater Poster Session/ Reception Grand ballrooms

Thursday February 29, 2024

History and Philosophy of Science	Marine and Atmospheric Sciences	Mathematics, Computer Sciences, Statistics	Neuroscience	Physics and Engineering	Psychology and Social Sciences	Science Education
Room TC 229	Room Union A	Room Union G	Room TC 218	Room Union H	Room TC 228	Room Union D
MORNING	MORNING	MORNING	MORNING	MORNING	MORNING	MORNING
Oral Session	Oral Session	Oral Session	Oral Session	Oral session	Open	Oral Session
12:00 - 1:00 Lunch	12:00 - 1:00 Lunch	12:00 - 1:00 Lunch	12:00 - 1:00 Lunch	12:00 - 1:00 Lunch	12:00 - 1:00 Lunch	12:00 - 1:00 Lunch
AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON
Oral Session TC 229		Oral Session Union G	Oral Session TC 218	Oral Session UnionH	Oral Sessions TC 228	Symposium Union D
EVENING 3:30-7:30	EVENING 3:30-7:30	EVENING 3:30-7:30	EVENING 3:30-7:30	EVENING 3:30-7:30	EVENING 3:30-7:30	EVENING 3:30-7:30
MAS Awards Ceremony/ Dodgen Lecture Theater	MAS Awards Ceremony/ Dodgen Lecture Theater	MAS Awards Ceremony/ Dodgen Lecture Theater	MAS Awards Ceremony/ Dodgen Lecture Theater	MAS Awards Ceremony/ Dodgen Lecture Theater	MAS Awards Ceremony/ Dodgen Lecture Theater	MAS Awards Ceremony/ Dodgen Lecture Theater
Poster Session/ Reception Grand ballrooms	Poster Session/ Reception Grand ballrooms	Poster Session/ Reception Grand ballrooms	Poster Session/ Reception Grand ballrooms	Poster Session/ Reception Grand ballrooms	Poster Session/ Reception Grand ballrooms	Poster Session/ Reception Grand ballrooms

Community College Out-Reach Event
12-00-1:030
Union A

Association for Women Geoscientists
12:15-1:15
Room TBA

LSMAMP
11:00-1:00
Advisory Board
TC 226

Mississippi INBRE
12:00- 1:00
Instrumentation Services Core Presentation
TC 218

Friday, March 1, 2024

Agriculture and Plant Sciences	Cellular, Molecular, and Developmental Biology	Chemistry and Chemical Engineering	Geology and Geography	Health Sciences	History and Philosophy of Science	Math and Computer Science and Statistics	Physics	Science Education
TC 216	Union H	TC 210	Union C	TC 218	TC 229	Union G	Union D	TC 228
MORNING	MORNING	MORNING	MORNING	MORNING	MORNING	MORNING	MORNING	MORNING
Oral Sessions	Oral Sessions	Oral Sessions	Oral Sessions	Oral Session Workshop High School Poster TC Ballroom 10:00-11:00	Oral Sessions	Oral Sessions	Awards and business	Workshop 9:00-12:00
12:00 - 1:00 Lunch	12:00 - 1:00 Lunch	12:00 - 1:00 Lunch	12:00 - 1:00 Lunch	12:00 - 1:00 Lunch	12:00 - 1:00 Lunch	12:00 - 1:00 Lunch	12:00 - 1:00 Lunch	12:00 - 1:00 Lunch
AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON
Symposium Awards Theater	Symposium Awards Theater	Symposium Awards Theater	Oral Session business mteeting and awards	Symposium Awards Theater	Symposium Awards Theater	Symposium Awards Theater	Symposium Awards Theater	Symposium Awards Theater
ADJOURN	ADJOURN	ADJOURN	ADJOURN	ADJOURN	ADJOURN	Oral Session	ADJOURN	ADJOURN

LSMAMP	Mississippi-INBRE/ Millsaps Scholars	High School Alcorn Symposium/ Awards	Mississippi-INBRE Data Science Syposium
Union B	Theater	TC 216	TC 210
11:00-3:00	10:00-1:00 3 min rapid fire/ Awards	11:00-1:00	2:00-5:00

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If Coming from Jackson, MS –Go South on I-49 (85.8 miles):

Turn left onto Northwood Drive
Turn right onto 4th Street

Turn left onto Golden Eagles Drive

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 Orleans

Take exit 67A for US 49 towards Hattiesburg, MS

Turn left onto Northwood Drive
Turn right onto 4th Street

Turn left onto Golden Eagles Drive

If Coming from the Lorman MS on Highway 61 S:
Take US 61 S to MS-552

Turn left onto MS-28 E

Take slight right Onto MS-550 E

Turn onto US-84-E

Slight right on MS-184 E

Turn left onto Northwood Drive
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If Coming from Mississippi Valley State University on US-82 W:
Follow MS-7 South to US 49 W in Belzoni

Continue on US 49 South toward Jackson, Hattiesburg

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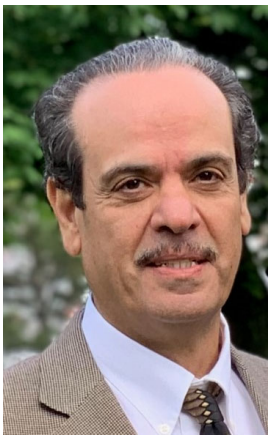


This year marks our 88th Annual Meeting for the Mississippi Academy of Sciences (MAS)!!! I am honored to say that I have been a member of this prestigious academy and have attended **very** meeting for the past **30** years. I have had the chance to meet many elite members of our scientific community, and have gained so many friends and colleagues. I watched our academy make leaps and bounds to build a community of scientist that care about the education and professionalism of the next generation of leaders. I believe that is what makes our Academy unique. MAS is affiliated with the National Association of Academies of Science (NAAS) and our academy directly aligns with NAAS core values where we strive to enhance learning, foster science and technology, and engage in professional development.

The board and division chairs and co-chairs are extremely dedicated to the mission of our Academy and have been meeting and working together to create the program for the upcoming meeting. We value our members and are interested in what you have to say. We are open to your suggestions and want to make sure that we are meeting the needs of both young and established scientist. We encourage everyone to participate within your division, it is a great opportunity to put forward your knowledge and expertise into the academy. Our academy has room to grow and we are open to ideas and to increasing our membership. We are stronger when we are united and working together.

MAS 1997, Biloxi, MS

A I reflect on my past 30 years within the MAS. I have served in every role imaginable. I served as a member, presenter, student poster judge, division vice-chair and chair, local arrangement chair (responsible for bringing the easels and boards, poster set-up, and dismantling), elected board member, president, fellow, and executive director. I will tell you that I still have numerous goals and aspirations for this organization. I am determined to make sure that we are always offering events that are enlightening, engaging, supportive to the development of our younger generation, and most importantly fun to attend!

We are indebted to our sponsors for their immeasurable support not just for this annual meeting, but throughout the year. We are so very fortunate to have the backing of our leaders at every college and university within our state, along with USDA and industry. We look forward to this continued partnership and we ask that you send an email to the Deans and Vice Presidents of Research at your institutions to thank them for their support and express how it has benefited you in your moment to shine at the MAS.

I hope that you have a wonderful time at the upcoming meeting, and I want to encourage you to invite your colleagues to join us. Sometimes as scientist we are a bit timid, but get out of your comfort zone, volunteer to help in your division, or help with judging student posters or oral presentations, or even volunteering to help organize the divisional programs. Remember it is everyone's academy and we all should have a voice.

The President's Column

Babu P. Patlolla, Ph.D. , FMAS
Dean College of Arts and Science
Alcorn State University

It is my great pleasure to welcome you all to the 88th Annual Meeting of the Mississippi Academy of Sciences. As the President of this esteemed organization, I am honored to be a part of this gathering of brilliant minds from various fields of science. This year's meeting promises to be an exciting one, with a diverse range of topics and discussions that will undoubtedly inspire and challenge us all. We have an impressive lineup of keynote speakers, panel discussions, and presentations that will cover a wide range of scientific disciplines.

As we gather here today, we are reminded of the importance of science in our daily lives. Science has played a critical role in shaping our world, from the development of life-saving medicines to the exploration of space. It's through science that we have been able to understand the complexities of our universe and make significant advancements in technology and innovation. As members of the Mississippi Academy of Sciences, we have a responsibility to continue pushing the boundaries of scientific knowledge and to use our expertise to address the challenges facing our world today. I am confident that this meeting will provide us with the opportunity to share our ideas, collaborate, and learn from one another.

I would like to extend my gratitude to the organizers of this meeting for their hard work and dedication in putting together such a fantastic program. I want to acknowledge MS-INBRE as a major sponsor and other sponsors for their generous support to the academy. I would also like to thank all of you for your unrelenting support to the Mississippi Academy of Science. I look forward to a productive and engaging meeting and wish you all a successful and enjoyable experience.

Sincerely,
Babu P. Patlolla, Ph.D.,
President, Mississippi Academy of Science

Bio: Dr. Patlolla currently holds the position of Dean for the College of Arts and Sciences and Professor of Biology at Alcorn State University. He received his Bachelor of Science in Biology and Chemistry and Master of Science in Genetics from Osmania University, India. He has a Master of Science in Biology and PhD in Environmental Sciences from Jackson State University. Dr. Patlolla is the son of Sri P. Anna Rao and the Late Smt. P Susheela of Raparthy, Telangana, India. He is married to Dr. Anita Patlolla and together they have a son (Shiva) and a daughter (Sapna).

MISSISSIPPI ACADEMY OF SCIENCES AWARD WINNERS 2024

Contribution to Science

David Magers, Ph.D.

Mississippi College

Dr. David H. Magers is Professor of Chemistry & Chemical Physics at Mississippi College (MC) where he has worked for thirty-five years. He grew up in Bentonia, MS and earned his ACS-certified BS in Chemistry at MC in 1982. Dr. Magers earned his Ph.D. in Theoretical Chemistry from the Quantum Theory Project at the University of Florida under the direction of Dr. Rodney J. Bartlett graduating in 1988 with a double graduate minor in physics and mathematics. He then was a postdoctoral research fellow at Harvard University with Nobel laureate Dr. William N. Lipscomb.

Since returning to MC, Dr. Magers has taught over 30 different courses. Most have been in chemistry, but a few have been in physics and mathematics. He also teaches an interdisciplinary course each spring on science and theology entitled *Knowing and Believing: Epistemological Perspectives on Science and Religion* with philosophy professor Dr. John Meadors. In 2003, Dr. Magers was chosen as the Distinguished Faculty Lecturer of the College of Arts and Sciences at MC, and in 2005 he was named Distinguished Professor of the Year for the university. Dr. Magers has also been honored by the Mississippi Local Section of the American Chemical Society. In 2003 he was named Chemist of the Year, and in 2013 he was chosen as the recipient of the Johnnie-Marie Whitfield Service Award.

Dr. Magers has 40 publications in peer-reviewed journals, has given 48 invited lectures at universities around the Southeast, has presented an additional 40 posters or talks, and has directed 36 theses. He has also co-directed one dissertation (Dr. Shelley A. Smith, VP of Students at Belhaven University) at Jackson State University with Dr. Glake Hill. He has mentored 138 students in his Computational Chemistry Group at MC. These students have cumulatively presented over 690 posters and talks. That number should pass 700 at the 2024 Annual Meeting of the MAS. For sixteen years (2004-2019), Dr. Magers co-organized the annual Tougaloo College – Mississippi College Undergraduate Research Symposium which provided students from all disciplines an opportunity to present their research.

Dr. Magers is married to Dr. Tina L. Magers, Director of Education at Mississippi Baptist Medical Center. Their eldest son, Dr. D. Brandon Magers, is chair of the Chemistry Department at Belhaven University. Their youngest son, Dr. Andrew K. Magers, is a clinical psychologist and owner of the Renewal Health Group in Madison, MS.

Dudley Peeler Award
Contribution to the Mississippi Academy of Sciences

K. Raja Reddy, Ph.D.
William Giles Distinguished Professor
Mississippi State University, MS

Dr. K. Raja Reddy received all his BS, MS, and Ph.D. degrees from Sri Venkateswara University, Tirupati, India, in 1975, 1977, and 1984. He joined the Plant and Soil Sciences Department at Mississippi State in 1988 and became a Research Professor in 1992. He was named a William L. Giles Distinguished Professor in 2021.

Dr. Reddy's research interests include the impact of anthropogenic climate change, remote sensing, and crop modeling applications on agricultural resource management through the lens of environmental plant physiology. He has over 33 years of research experience at Mississippi State and manages the state-of-the-art sunlit plant growth chambers known as Soil-Plant-Atmosphere-Research (SPAR) (https://www.spar.msstate.edu/). He is responsible for and credited with many critical discoveries across multiple facets of agriculture. His research includes the impact of climate change on crop physiology, growth, and development of several outstanding foods, fiber, and native grassland and forage crops of global importance - cotton, soybean, rice, corn, sorghum, sweet potato, switchgrass, Bahiagrass, many horticultural crops, and domain expertise areas of remote sensing and stress physiology, and crop model applications.

Dr. Reddy has over 300 publications, including two books written, four edited volumes, and over 30 book chapters. In addition to his research obligations, he developed a capstone graduate-level course, environmental plant physiology, that interfaces research, teaching, and learning based on research he conducted using state-of-the-art SPAR facilities at Mississippi State. He received external funding from federal and state commodities boards and private industry to support his research and training program.

Dr. Reddy has received several recognitions and awards: LR Ahuja Ag. Systems Modeling Award from the Soil Science Society of America (2023), SEC Faculty Achievement Award (2019), MSU's Ralph E. Powe Award (2012), ICAC Cotton Researcher of the Year Award (2020), the Outstanding Research Award in Cotton Physiology (2010) by the National Cotton Council of America, the Mississippi Academy of Sciences Outstanding Contributions Science Award (2020), the DAFV's Superior Faculty Research Award (2018) and International Service Award (2016), the MAFES's Excellence in Research Awards (2006, 2018), and six-times MAFES's Outstanding Publication Awards (2002, 2006, 2012, 2014, 2018, 2021). In addition, he became elected Fellow of the American Society of Agronomy (2005), the Crop Science Society of America (2006), the American Association for the Advancement of Science, AAAS (2020), and the Mississippi Academy of Sciences (2021). In 2021, Stanford University listed him as one of the World's Top 2% Scientists in Plant Biology and Botany.

He has trained over 40 visiting and 16 postdoctoral scientists, 30 graduate students (16 Ph.D. and 14 MS), and 10 undergraduate research scholars worldwide in multiple areas such as crop stress physiology, climate change, crop modeling, remote sensing, and global food security.

Outside of his numerous academic and research obligations, Dr. Reddy serves as faculty advisor of the Indian Student Association on campus. In the Starkville community, he is actively involved with the Kiwanis Club. Dr. Reddy has extended his leadership skills to the organization by chairing numerous committees, the Kiwanis Board, and serving as chapter President. Dr. Reddy is also actively nurturing and engaging local High School Key Club students in developing service-leadership skills and 4-H students by providing global mindedness and citizenship through various campus programs. He enjoys photography, cooking, and entertaining families and friends with east-west fusion spicy food.

Mississippi Academy of Sciences
Presidential Award

Mr. Archie Tucker

Area Director, United States Department of Agriculture, Agriculture Research Service (USDA, ARS), Southeast Area, Stoneville, Mississippi

Archie Tucker serves in a SES position as the Area Director for the United States Department of Agriculture, Agriculture Research Service (USDA, ARS), Southeast Area in Stoneville, Mississippi. He is responsible for providing leadership and operational accountability for the ARS research programs in the states of Mississippi, Alabama, Louisiana, Tennessee, Arkansas, Georgia, Florida, North Carolina, South Carolina, Puerto Rico, and the Virgin Islands. This includes approximately 1,550 employees, of which 485 are Ph.D. scientists, and oversees an annual budget of 354 million dollars. Archie held prior positions in ARS as Associate Area Director, Assistant Area Director, Deputy Area Director, Area Administrative Officer, Area Property Management Officer, and Biological Science Technician. Archie has been in ARS for 48 years, starting as a 16-year-old high school student. He received the 2022 Meritorious Executive Presidential Rank Award and a Secretary Honor Award in recognition and appreciation of exceptional performance and outstanding contributions to the success of the USDA.

Mississippi Academy of Sciences
Early Career Award

Dana N. "Nikki" Reinemann, Ph.D.

Assistant Professor of Biomedical Engineering,
University of Mississippi, MS

Dr. Dana N. "Nikki" Reinemann is an Assistant Professor of Biomedical Engineering and Affiliate Assistant Professor of Chemical Engineering at the University of Mississippi. She received her B.S. in Chemical Engineering and B.S. in Chemistry degrees from the University of Mississippi and her Ph.D. in Chemical and Biomolecular Engineering from Vanderbilt University. The main research thrust of her Molecular Biophysics and Engineering lab is using multi-disciplinary approaches to understand how cytoskeletal elements work together at the molecular level to facilitate emergent, large-scale cellular tasks necessary to sustain life. Under her leadership as a junior faculty member, her lab's work has resulted in 11 publications, with 6 of those having undergraduate authors; over $2.6 million in research funding, including from the American Heart Association Career Development Award and National Institutes of Health R35 MIRA Award (the first award of its kind at the University of Mississippi, the second in the entire state of Mississippi); being named a 2022 Young Innovator in Cellular and Molecular Bioengineering by the Biomedical Engineering Society; and being awarded the UM School of Engineering Junior Faculty Research Award. She was recently awarded NIH funding to bring the first TIRF microscope to the University of Mississippi.

Dr. Reinemann is also passionate about effective research mentorship and broadening participation in STEM. She has mentored 20+ undergraduates, 3 graduate students, and 3 high school students in the research lab, with over 70% of those being female. She further led efforts at the administrative level to establish mentorship training for faculty and senior students in research settings at the University of Mississippi. She is also the PI of the NSF-funded Ole Miss Nanoengineering Summer Research Experience for Undergraduates (REU) Program, the first in Mississippi and the first NSF-funded REU in the UM School of Engineering. The program provides research opportunities for students from underrepresented groups or who do not have access to research at their current institutions. Dr. Reinemann recently received networking funding from the Biophysical Society to host the Mid-South Biophysics Symposium at the University of Mississippi. The 2023 Mid-South Biophysics Symposium brought together labs from Mississippi, Louisiana, Tennessee, Alabama, and Georgia with a diverse (demographically and scientifically) set of platform talks, flash talks, and poster presentations. Together, these efforts have led to her being awarded the UM School of Engineering Faculty Service Award and the UM Diversity Innovator Award.

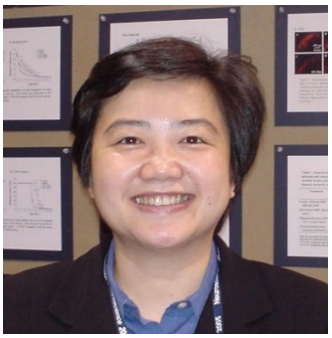
Mississippi Academy of Sciences Fellows -Class of 2024

Fellows of Mississippi Academy of Sciences

Dr. Nacer Bellaloui, Ph.D., FMAS
Research Plant Physiologist, Crop Genetics Research Unit
USDA-ARS, Stoneville, MS

Dr. Nacer Bellaloui is a Research Plant Physiologist at USDA-ARS in Stoneville, MS, USA, with the Crop Genetics Research Unit. He received his Diploma of Higher Studies (bachelor's degree) in Pant Biology from the University of Constantine, Algeria, in 1984 and his PhD in Plant Nutrition from the University of Leeds, UK, in 1989. Dr. Bellaloui was an Assistant Professor in Algeria (Africa) and a visiting scientist at the University of Hohenheim (Germany) and UC Davis, CA, USA.

Dr. Bellaloui joined USDA-ARS in 2004 as a Research Plant Physiologist, identifying the physiological and genetic mechanisms controlling soybean seed composition and mineral nutrition. Dr. Bellaloui, with his collaborators, demonstrated for the first time that the micronutrient boron is mobile in transgenic crops containing the sugar alcohol sorbitol; quantified for the first time the effect of maturity genes on soybean seed protein, oil, sugars, and mineral nutrition; with his collaborators, identified new genomic regions (QTL) associated with seed protein, oil, fatty acids, isoflavones, and minerals in soybean. Dr. Bellaloui, with 34 years of research experience, is internationally recognized in plant nutrition and has authored and co-authored over 140 peer-reviewed articles. He is a life member of the Mississippi Academy of Sciences, served as a Chair of the Agriculture and Plant Sciences Division, served as a chair of the Advances in Agricultural Research Committee with the Mississippi Academy of Sciences, served as a reviewer and editor of several national and international peer-reviewed journals.



Dr. Lir-Wan Fan, Ph.D. , FMAS
Professor of Pediatrics/Newborn Medicine
University of Mississippi Medical Center, Jackson, MS

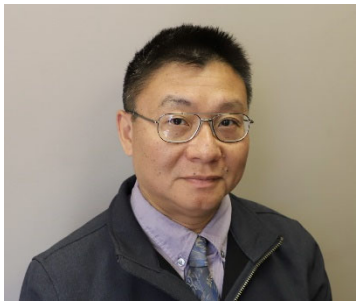
Lir-Wan Fan is a Professor of the Department of Pediatrics (Newborn Medicine Division) at the University of Mississippi Medical Center (UMMC). Dr. Fan received her PhD in Pharmacology and Toxicology (2002) from the UMMC. Dr. Fan has been involved in developmental neuroscience and neurodegeneration research, which investigates the mechanisms involved in the long-term adverse effects of perinatal brain inflammation on hypoxia-ischemia, intrauterine growth restriction, Attention-deficit/hyperactivity disorder (ADHD), Autism spectrum disorder, white matter disease, sleep disorders, adolescent craniotomy, and late-onset neurodegenerative diseases, such as idiopathic Parkinson's disease, and provide valuable information for developing strategies in prevention and therapeutic treatments of neurodegenerative diseases.

Dr. Fan has directed research grants from the NIH and Michael J. Fox Foundation, and her work has been published in leading journals in neuroscience and pediatric fields. She has authored or co-authored more than 80 peer-reviewed journal articles and published more than 300 abstracts. Dr. Fan has served as a research mentor and supervisor to over 40 students, including Base Pair students, SURE, MIRS-INBRE, HHMI, BWC-NSRE undergraduate students, PIN graduate students, medical students, a Postdoctoral Fellow, and Neonatal Perinatal Fellows. At the national level, she has served as a Grant Reviewer for several study sections for National Institutes such as NIH and USDA. In addition, Dr. Fan serves as a Director for the Mississippi Academy of Sciences (MAS) Council, an Editorial Review Board Member for several scientific journals, and a reviewer of many international journal articles.

Dr. Jamil Ibrahim, Ph.D. , FMAS
Former Associate Professor, Department of Dermatology
School of Medicine, University of Mississippi Medical Center, MS

Dr. Jamil Ibrahim has over 30 years of research and teaching experience. He had multiple appointments where he worked as Scientist IV, Research Supervisor, Associate Professor at SHRP, and Associate Professor at the School of Medicine, Department of Dermatology at the University of Mississippi Medical Center (UMMC). He has extensive work experience in teaching, research, and service. He taught graduate and undergraduate courses in Biostatistics, Research, Health Care Decision Making, and Epidemiology. He has a strong track record of academic and research achievements, including publications and presentations at MAS and other scientific societies, and he has participated in various research projects regionally and nationally. He has authored and co-authored many peer-reviewed scientific papers and presented over 100 abstracts at conferences and meetings nationwide. He has also demonstrated a strong commitment to advancing science and contributed several times to his respective scientific organizations, including MAS, where he has also played leadership roles as chair and co-chair of the Math, Computer Science, and Statistics divisions. He is the Mississippi Academy of Sciences President-elect and has received many awards from MAS. Dr. Ibrahim received numerous awards, including the Gold Humanism Award from UMMC and the Unsung Hero Award from the Mississippi Association of Institutional Research.

Over the years, Dr. Ibrahim has been involved with many grants, research, and service activities, including developing, chairing, and administering the campus-wide faculty, student, and employee assessment and evaluation activities. He also served on curriculum committees, educational committees, research committees, service and scholarship committees and web committees at schools' level, departmental level and institutional levels at the UMMC including the Institutional Assessment Committee, Academic Affairs Council Committee, School of Medicine Admissions Interview Subcommittee, School of Medicine Curriculum Committee, Opioid Research and Stewardship Program Committee, Research Affairs Committee, and the Southern Association of Colleges and School Commission on Colleges (SACSCOC) Writing Committee. In addition to his role at the UMMC as a statistical consultant, Dr. Ibrahim is a graduate adjunct faculty member at the JSU School of Population Health, where he taught courses in Biostatistics, Public Health, and Epidemiology.



Dr. Ping Zhang, Ph.D. , FMAS
Professor of Computer Science
Alcorn State University, MS

Dr. Ping Zhang is a full professor of Computer Science and the Department Chairperson of Mathematics and Computer Science at Alcorn State University. He holds a Ph.D. in Computer Science from the Center for Pattern Recognition and Machine Intelligence, Concordia University, Canada. He was a visiting scholar at Victoria University, Melbourne, Australia, from 1998 to 1999 and a Research Fellow at Nanyang Technological University, Singapore, from 1999 to 2021. He has been involved in Artificial Intelligence, Pattern Recognition, and Computer Vision research and teaching for over thirty years. As a PI or Co-PI, Dr. Zhang has implemented many research, teaching, and industrial projects, including research and teaching grants from NSF, USDA/NIFA, NIH, and DOD.
He has authored three book chapters and published over 50 research papers in international journals and conferences. He has advised over twenty master's students in Computer and Information Science. He received the Diversity and Inclusion Award from the Mississippi Board of Trustees of State Institutions of Higher Learning (IHL) in 2022. He was awarded the Google Machine Learning Award in 2022 and 2023. Dr. Zhang is currently the MAS division chair of Mathematics, Statistics, and Computer Science. He has been a senior member of IEEE since 2013. In recent years, Dr. Zhang has been working on AI research and teaching and offered Deep Machine Learning courses for HBCU undergraduate and graduate students at Alcorn State University.

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-2025

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 2025 FMAS November 15, 2024 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.edu

Become AN MAS FELLOW (FMAS)

2024 Dodgen Lecture

Thursday, February, 29, 2024

(Immediately following the 3:30 awards ceremony)

"TAKING CARE OF WHAT MATTERS" – CAPACITY BUILDING AND INVESTING IN OUR RESEARCH INFRASTRUCTURE

Given By

Dr. Scott T. Willard

Dean- College of Agriculture and Life Sciences

Director- **MS Agricultural and Forestry Experiment Station**

Mississippi State University

Dr. Scott Willard holds a bachelor's degree in Animal, Veterinary and Fisheries Sciences from the University of Rhode Island and a master's and doctorate from Texas A&M University. After a Postdoctoral Fellowship at the Medical University of South Carolina in Charleston, Dr. Willard joined Mississippi State University as an Assistant Professor in the Department of Animal and Dairy Sciences in 1999. He later moved to the position of Professor and Head of the Department of Biochemistry and Molecular Biology, and oversaw the programs of Entomology and Plant Pathology. Following this, and after eight years as Associate Dean and two years as the Interim Dean of the College of Agriculture and Life Sciences, he assumed the role in January of 2022 as the permanent Dean of the College of Agriculture and Life Sciences and as the Director of the Mississippi Agricultural and Forestry Experiment Station. Dr. Willard is a past Fellow of the Food Systems Leadership Institute and the Southeastern Conference Academic Leadership Development Program, and he currently serves as Chair for the Academic Program Section of the Association of Public and Land Grant Universities. Dr. Willard has been recognized for his research, teaching, service, and administrative leadership by numerous local, state, regional, national, and international organizations.

Louis Stokes Mississippi Alliance For Minority Participation (LSMAMP) Symposium and Retreat

Dr. Martha Tchounwou, Director of Scholars Academy at JSU

February 29- March 1, 2024

Room

LSMAMP Symposium Chairs:

Dr. Murrell Godfrey, University of Mississippi

Dr. Glake Hill, Jackson State University

Dr. Martha Tchounwou, Jackson State University

Dr. Santanu Banerjee, Tougaloo College

Dr. Felicite Noubissi, Jackson 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: African Americans, Hispanic Americans, American Indians, Alaska Natives, Native Hawaiians, and Native Pacific Islanders.

The LSAMP takes a comprehensive approach to student development and retention. Particular emphasis is placed on transforming undergraduate STEM education through innovative, evidence-based recruitment and retention strategies, and relevant educational experiences in support of racial and ethnic groups historically underrepresented in STEM disciplines.

The program also supports knowledge generation, knowledge utilization, assessment of program impacts, and dissemination activities. The program seeks new learning and immediate diffusion of scholarly research into the field. Under this program, funding for STEM education and broadening research participation activities include research to develop new models in STEM engagement, recruitment, and retention practices for all critical pathways to STEM careers and research. Such interventions include mentoring, successful learning practices and environments, STEM efficacy studies, use of technology to improve learning and student engagement.

Thursday, February 29, 2024

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)

Chair: Drs. Martha Tchounwou and Dr. Felicite Noubissi (Jackson State University)

Lunch

INSTRUMENTATION AND SERVICES CORE PRESENTATION

THURSDAY, FEB. 29

12 - 1 P.M.

THAD COCHRAN CENTER

ROOM 218

LEARN HOW MS-INBRE CAN ENHANCE YOUR RESEARCH

LUNCH AND REFRESHMENTS PROVIDED

REGISTER

MISSISSIPPI INBRE

IDeA Network of Biomedical Research Excellence

Friday, March 1st, MAS Symposia

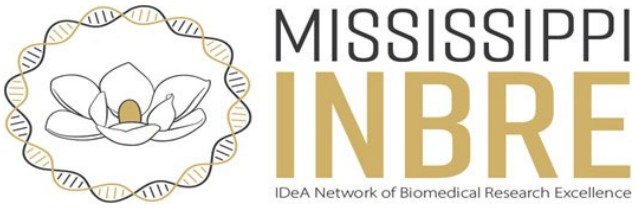
MAS Scholar Symposium

Sponsored by Mississippi INBRE, Millsaps College and Tougaloo College

Friday, March 1, 2024
10:00 A.M. (Theater)

88th Annual Mississippi Academy of Sciences Meeting
February 29 - March 1, 2024
Thad Cochran Convention Center Hattiesburg, 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 Chairman: Dr. Alex Flynt, Program Coordinator, Mississippi INBRE
The University of Southern Mississippi, Hattiesburg, MS
Awards Committee Co-Chairs: Dr. K. Raja Reddy, Mississippi State University
Dr. Shrinidhi Ambinakudige, 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) of the 14 divisions will score the **top 10% of graduate/post graduate student abstracts** to represent their division and present in the sponsored lunch award symposium, on Friday, March 1st from 10:30 – 1:00 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** of Friday, Friday, March 1st from 10:30.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 in MAS website no later the 2/20/2024 at 5 PM to be included in the competition and sent to Judges for initial screening.
4. On Friday, 3/1/2024 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. 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: Dr. Timothy J. Ward, Dean of Research, Millsaps College
Event Coordinator: Mariam Ageli, MAS Executive Assistant
Sponsored by 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 undergraduate student abstracts** to represent their division and present in the Millsaps sponsored lunch award symposium, "Honoring Excellence in Science in Mississippi," on Friday, Friday, March 1st from 10:30 am – 1:00 pm. **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, February 29th around 4-7 PM (see program for more details). Failure to physically present their poster and be present on Thursday 2/23/2024 disqualify the selected candidates from competing in the symposium. First author must be present to compete and 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. Power point poster must be uploaded in MAS website no later the 2/20/2024 at 5 PM to be included in the competition and sent to Judges for initial screening.
5. On Friday, 3/1/2024 all candidate will receive scholar recognition certificates and will be invited to the podium to say few words (one minute). 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)

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.**

Friday, March 1, 2024
MAS Scholar Symposium
Mississippi INBRE Graduate/Post Graduate Scholars Symposium
Honoring Excellence in Science in Mississippi

Symposium Chair: Dr. Alex Flynt, Program Coordinator, Mississippi INBRE The University of Southern Mississippi, Hattiesburg, MS

Session Co-Chairs & Moderators: Dr. Shrinidhi Ambinakudige, Mississippi State University Ambinakudige, Shrinidhi (shrinidhi@geosci.msstate.edu), and Dr. K. Raja Reddy, Mississippi State University (krreddy@pss.msstate.edu)

3-Minute Orals – 10:00 AM to 12 Noon, 1st March 2024
Room – Theater, Thad Cochran Convention Center Hattiesburg, MS

1. **Tolulope Ayo.** Delineation of molecular mechanisms that underlie TNF-α release from mast cells. University of Southern Mississippi. Advisor: Dr. Hao Xu.
2. **Puneeth Kumar Bolugallu Padmayya**. Digital anatomy viewer: a novel approach to medical education. Alcorn State University. Advisor: Dr. Ping Zhang.
3. **Caroline Doherty.** COVID-19 vaccination perceptions in Mississippi youth. University of Mississippi Medical Center School of Medicine. Advisor: Dr. Caroline Compretta.
4. **Davin Francis**. A quantitative analysis of the predictors of depression stigma and help-seeking attitudes. Jackson State University. Advisor: Dr. Pamela G. Banks.
5. **Alexis Hartley**. Using animations and videos of 3D crystalline structures to aid in teaching chemistry work-in-progress. Delta State University. Advisor: Dr. Joe Bentley.
6. **Derek Hoffman**. Description of the most complete dinosaur in Mississippi: a hadrosaur from an early Campanian locality in the Coffee Formation, Prentiss County. University of Southern Mississippi. Advisor: Dr. Alyson Brink.
7. **Tatyana Hollingbird**. Developing sweetpotato germplasm with enhanced performances by using agrobacterium-mediated transformation. Alcorn State University. Advisors: Dr. Chuquan Zhang & Dr. Yan Meng
8. **Nazmul Hosen.** Low molecular weight electrogenerated chemiluminescence probes (LMEPs) for the detection of nerve agent mimic. University of Southern Mississippi. Advisors: Dr. Wujian Miao & Dr. Karl J. Wallace.
9. **Mohammad Ibrahim.** Developing a New ICP-OES method to measure mercury levels in shellfish. Mississippi College. Advisor: Dr. Scoty Hearst.
10. **Shazeed-Ul Karim.** Novel nanocomposite drug delivery system for SARS-CoV-2 infections. The University of Southern Mississippi. Advisor: Dr. Fengwei Bai.
11. **Francis Kekessie.** Development of an organocatalyzed nucleophilic addition of masked acyl cyanides to azomethine imines. The University of Southern Mississippi. Advisor: Dr. Julie Pigza.
12. **Madison Klim**. Azithromycin ameliorates hypoxia-ischemia-induced sensorimotor impairments and brain inflammation in neonatal rats. University of Mississippi Medical Center. Advisor: Dr. Lir-Wan Fan.

13. **Amisha Parekh**. Magnesium-doped hydroxyapatite anodization coatings on titanium solid and 3D printed implant surfaces. University of Mississippi Medical Center. Advisor: Dr. Michael D. Roach.
14. **Ryan Phillips**. Rotting logs through the seasons: Drivers of thermal buffering in the microhabitat of temperature-sensitive organisms. University of Mississippi. Advisor: Dr. Ryan Garrick.
15. **Randal Roberts.** Using convolutional neural networks for integrated GPS/INS navigation. Mississippi State University. Advisor: Dr. Umar Iqbal.
16. **Ramandeep Kumar Sharma.** Climate trends and maize production nexus in Mississippi: empirical evidence from ARDL modeling. Mississippi State University. Advisor: Dr. Jagmandeep Dhillon.
17. **Namita Sinha.** Interaction of corn hybrid, plant population and nitrogen rate to mitigate preharvest mycotoxin contamination in corn. Mississippi State University. Advisor: Dr. Jagmandeep Dhillon.
18. **Bala Subramanyam Sivarathri.** Influence of biostimulants on emergence and seedling vigor under low and high temperatures. Mississippi State University. Advisor: Dr. Raju Bheemanahalli
19. **Faizan Tahir.** Honeybee *Apis mellifera* L. Responses to oxidative stress induced by pharmacological and pesticide compounds. University of Southern Mississippi. Advisor: Dr. Shahid Karim.
20. **Naflath Thenveettil**. Sub-optimal water levels can impede the growth and development of *Centella asiatica* (L.), a novel salad crop for Mississippi. Mississippi State University. Advisor: Dr. K. Raja Reddy.
21. **Courtney Wynn.** Gene expression and functional analysis of silk gland-specific UGT gene in moths. Mississippi State University. Advisor: Dr. Seung-Joon Ahn.
22. **Michel Zahorec.** Magnesium-doped hydroxyapatite anodization coatings on titanium solid and 3D printed implant surfaces. Florida State University. Advisor: Dr. Zina Ward.

JUDGE'S NAME: _____

3MT® COMPETITION JUDGING RUBRIC

SERIAL #:

PRESENTER NAME:

3MT TITLE:

SCORING CALIBRATION:

1	2	3	4	5	6	7
Does not meet expectations	Demonstrates competency but some major weaknesses	Demonstrates competency but some significant weaknesses	Good, but some flaws	Very good, only very minor flaws	Excellent, almost flawless	Outstanding, no flaws

Please include a score between 1 and 7 in the 2 sections below.
The competitor will then be provided with an overall score out of 14

COMPREHENSION AND CONTENT	
Presentation provided clear background and significance to the research question	
Presentation clearly described the research strategy/design	
Presentation clearly described the conclusions, outcomes, or impact of the research	

ENGAGEMENT AND COMMUNICATION	
The oration was delivered clearly, and the language was appropriate for a non-specialist audience	
The PowerPoint slide was well-defined and enhanced the presentation	
The presenter conveyed enthusiasm for their research and captured and maintained the audience's attention	

OVERALL SCORE (Section 1 + Section 2)	/42

COMMENTS

This very brief comment will be used to provide feedback to unsuccessful entrants via email. Please identify one positive and one area for improvement (the most obvious area). **e.g., xxx was good, but you need to work on xxx**

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Alcorn State University
MJAS Scholars Symposium
Room TC 216

Honoring Excellence in Science in Mississippi Among High School

Chairman: Dr. Babu Patlolla, Alcorn State University

Coordinator: Mariam Ageli, MAS Executive Assistant

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 symposium 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 score the **top 10% of high school student abstracts** to represent their division and present in the Alcorn State Univeristy sponsored lunch award symposium, "Honoring Excellence in Science in Mississippi," on Friday at the annual meeting. **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 either following the Dodgen event on Thursday at the annual meeting (see program for more details) and on Friday morning. Failure to physically present their poster and be present disqualify the selected candidates from competing in the symposium. First author must be present to compete and presentation by a co-author will not be accepted.
3. Candidates presenting on their poster 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).
4. On Friday, all candidate will receive scholar recognition certificates. Each selected candidate will receive a complementary one-year membership to MAS in addition of certificate of achievement. (Must be present awards ceremony to qualify for awards).

Alcorn State University (ASU)
Friday 11-12 : STEM Scholars Symposium Workshop

Moderator: Dr. Jermiah Billa, ASU

Title: Unleashing Your Communication Wings: Navigate STEM with DISC

Blast off into successful STEM careers with the power of communication! This interactive workshop takes you on a flight path with Take Flight DISC, where four unique birds – Eagle, Parrot, Dove, and Owl – represent different communication styles. Discover your "bird" style and learn how to adapt your approach to connect with

- ***Unleash your communication superpower***: Identify your "bird" style and its strengths.
- ***Master teamwork***: Learn how different birds interact and build synergy in STEM teams.
- ***Soar above misunderstandings***: Bridge communication gaps and build strong working relationships.

This workshop is more than just knowing your "bird" - it's about learning to fly together in a diverse STEM landscape. Prepare to unlock your communication potential and advance your future career!

Facilitator Biography

Jim Coughenour, MBA, PMP

Jim Coughenour is a seasoned Certified Coach, Speaker, Trainer, and a founding partner at Steps To Achieve. With over two decades of experience in strategic initiatives across healthcare, financial services, educational districts, and government sectors, Jim has honed his expertise in fostering professional growth. He holds an MBA from California University and a Bachelor's degree from the University of Pittsburgh.

At Steps To Achieve, Jim's mission is to empower individuals and teams to accomplish remarkable feats by enhancing communication and leadership skills. Through tailored professional development, coaching, assessments, and grant evaluations, he equips his clients with the tools for success.

Passionate about personal and team development, Jim provides one-on-one and group coaching, guiding clients to a clearer understanding of their management and leadership styles. This insight allows for more effective communication and fulfilling results. By addressing team dynamics and system interactions, he aids in improving performance, reducing conflict, and fostering better communication within diverse groups.

Jim's extensive background in managing large-scale projects and training numerous students makes him an asset to any professional workshop.

Steps To Achieve:

We empower people to achieve more incredible things! We help improve communications and leadership skills through professional development, coaching, assessments, and grant evaluations.

Some of our popular workshops:

- Taking Flight with DISC
  This high-energy workshop helps you heighten self-awareness, capitalize on your strengths, improve communications, and reduce conflict.

- Taking Flight with Emotional Intelligence
  This interactive workshop integrates the power of emotional intelligence with the DISC personality styles. Participants will gain practical insights and strategies to apply EQ personally and professionally.
- Everyone Communicates, Few Connect
  This workshop helps individuals and teams improve their communication and leadership skills.
- ReDISCovering Conflict
  This hands-on workshop helps you learn how to navigate conflicts and how our personalities influence conflict development, duration, and resolution.

To learn more, visit us at:

- Web: www.StepsToAchieve.com
- Facebook: https://www.facebook.com/StepsToAchieve
- Instagram: https://instagram.com/stepstoachieve
- Linkedin: https://www.linkedin.com/in/coughenourjim/
- Email: info@stepstoachieve.com

Symposium

Louis Stokes Mississippi Alliance For Minority Participation (LSMAMP)
Mississippi Academy of Sciences
Hattiesburg, MS 2024

Preparing for the Future and Taking Advantage of Opportunities.

Friday, March 1, 2024

Room Union B

11:00 - 12:00

Moderator: Mrs. Jacquline Vinson (University of Mississippi)

Motivational Speaker: Kendrick Savage

Dr. Kendrick Savage is a native of Oxford, MS. He earned a B.S. in mathematics from the University of Mississippi. During this time, he served as president and mentor of the LSMAMP program. He believes the LSMAMP Program provided him with the tools he needed to overcome a background filled with educational, financial, and social adversity. He went on to earn an M.S. in mathematics, an M.A. in teaching, and a Ph.D. in mathematics education from Mississippi State University. Dr. Savage is currently an Associate Professor of Mathematics at Georgia Gwinnett College where in his short time there he has been nominated for Georgia Gwinnett College's Outstanding Teacher of the Year Award twice, the Student Engagement Award, and the Outstanding Scholarship and Creative Activities Award. He has published several articles and book chapters on topics ranging from mathematical motivation to mathematics for social justice. Prior to becoming a professor, Dr. Savage was a high school mathematics teacher, where he received the STAR teacher of the year award. He is the author of his recently published book, *A Few Steps In The Right Direction: Give Yourself The Chance You Deserve*, a book about inspiration, lessons from his life, and giving yourself a chance.

Dr. Savage is also the founder of Savage Motivation, LLC with a strategic focus to increase student motivation and retention serving students in K-12, college, and graduate school through professional development, keynotes, and workshops. He is a highly sought-after speaker for high school, college, and graduate students. Dr. Savage enjoys strength training, spoken word poetry, and spending time with his family. His most precious gifts in life are his wife and his three beautiful little girls. His primary goal in life is to take the gifts God has blessed him with and work not only to touch the lives of those he encounters but to also make the world a better place.

12:00 – 12:30 pm: Lunch & Students' Networking and Mental Health (Dr. Godfry Murrell)
Moderators: Dr. Banerjee,(Tougaloo College) Dr. Hattie Spence, (Mississippi Valley State University) Dr. Felicite Noubissi (Jackson State University), Dr. Sarah Lee.(University of Southern Mississippi).

12:30 – 12:40 pm : Break

12:40am-1:25 pm: Research as a Corner Stone to Achieving a PhD.

Moderator: Trinity Starks (Graduate Student JSU)

Dr. Sharifa Love-Rutledge is a native of Moss Point, MS, and a 2004 top ten graduate of Moss Point High School. She was advised by former Mayor Ira Polk to attend Tougaloo College, and with his help and encouragement, she attended. She received her Bachelor's degree in Chemistry from Tougaloo College. While at Tougaloo she participated in the Ronald E. McNair Scholars and LSMAMP (Louis Stokes Mississippi Alliance for Minority Participation) programs, which helped to refine her interest, and solidified her career goals, she wanted to be a college professor. She was the Tougaloo College Outstanding LSMAMP Scholar in 2008.

After the completion of her B.S, she pursued a Ph.D. from the University of Alabama where she was the first African American Woman to complete a Ph.D. from the Chemistry Department. Her graduate work was cited as part of the body of work that led the European Food Safety Authority decision to remove trivalent chromium from its list of essential elements in 2014. While in Tuscaloosa, she was very active with her local NOBCChE chapter and the Epsilon Mu Sigma Chapter of Sigma Gamma Rho sorority spearheading the committees and organizing the STEM programming for the annual Youth Symposium because she recognized the value in exposing the next generation to the wonders of STEM.

Upon completion of her Ph.D., She completed a post-doctoral research appointment at Michigan State University and participated in programs like AGEP-PAI geared to preparing minority postdocs in STEM to pursue professor positions. In 2017, she joined the faculty at the University of Alabama in Huntsville as an Assistant Professor in the Chemistry department where she teaches General Chemistry and Biochemistry. She also actively pursues research in type 1 diabetes, insulin resistance, and metabolic changes related to non-alcoholic fatty liver disease and Alzheimer's disease. In 2022, she was recognized as one of the 1000 inspiring Black Scientist. She is also a FLARE, PRIDE-FTG, and Butler Williams Scholars Program alumni. She is a current Faculty ACCESS program participant. She is passionate about mentoring and training students; she has supervised 40 undergraduate and graduate students in her research lab. She serves as the UAH ALSAMP Program Director since 2019.

1:30pm - 2:15pm: Room Union B

The Importance of Interning (Oak Ridge Institute for Science and Education (ORISE):

Moderator: Dr. Ouida McAfee (Coahoma Community College)

DATA SCIENCE WORKSHOP

FRIDAY, MARCH 1

2 - 5 P.M.

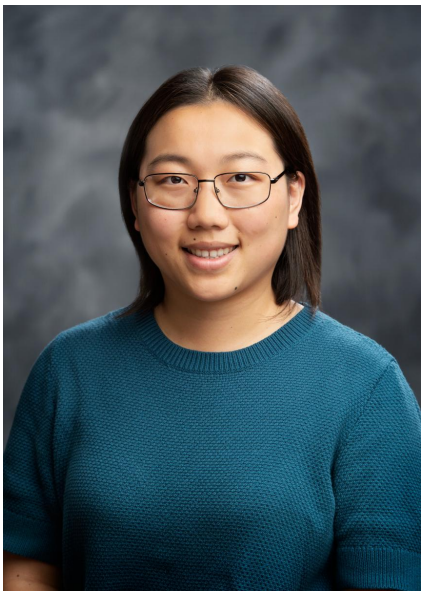
THAD COCHRAN CENTER

ROOM 210

SPONSORED BY

MISSISSIPPI INBRE

IDeA Network of Biomedical Research Excellence



Jingyi (Catherine) Shi, Ph.D.

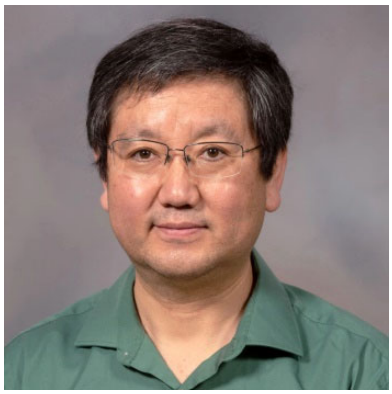
Mississippi State University

TITLE: Beginner Tool Introduction and Demonstration for Data Science/AI

Jingyi (Catherine) Shi, Ph.D., is an Assistant Professor of Statistics in the Department Mathematics and Statistics at Mississippi State University (MSU). With a doctoral degree in computer science focusing on health informatics, Dr. Shi possesses diverse data science and AI skills and continues her research in biomedical data science, including predictive modeling, feature selection, and knowledge extraction and representation. The courses she has taught range from data analysis, such as statistical methods and machine learning, to databases. She is now serving as an Associate Director of the Mississippi INBRE Data Science Core and is working for the MSU Data Science Program.

Abstract

Data Science (DS) and Artificial Intelligence (AI) are increasingly entering the public eye because their related technologies have been, or can be, very beneficial to human lives. Although the theories behind DS/AI can be complex, there are beginner-friendly tools or packages available that encapsulate complex algorithms and offer ready-to-use functions. These tools assist researchers in embarking on common analyses. Machine Learning (ML), as one of the core areas in DS/AI, has been a popular interest of new DS/AI learners. In this section, the speaker will introduce a beginner tool for ML and a few other relevant packages.



Yufeng Zheng, PhD
Associate Professor, Department of Data Science

School of Population Health, University of Mississippi Medical Center

Title: Deep Learning/AI Concepts and Applications

Dr. Zheng will discuss Data Science and advancement of technology in biomedical research and population health through integration of deep learning (DL) technologies and data-driven models.

Dr. Zheng will discuss Data Science and advancement of technology in biomedical research and population health through integration of deep learning (DL) technologies and data-driven models.
Dr. Yufeng Zheng is an associate professor of data science at the University of Mississippi Medical Center. He received his Ph.D. in optical engineering and image processing in 1997 from Tianjin University, China. From 2001 to 2005, he served as a postdoctoral research associate at the University of Louisville, Kentucky.

Dr. Zheng's research interests span various areas, including image processing and pattern recognition, neural networks and artificial intelligence, information fusion, biometrics (facial recognition), machine learning and computer vision, and computer-aided diagnosis.

Dr. Zheng holds a utility patent in face recognition. Dr. Zheng is Author or co-Author of three books, six book chapters, 27 articles in peer-reviewed journals, and 61 papers in conference proceedings. Dr. Zheng is a Cisco Certified Network Professional (CCNP) and holds senior memberships with IEEE & Signal Processing Society and SPIE.

ABSTRACT

AI is transformative technology that enhances all areas of data science. There are many successful Deep Learning (DL)/AI stories like OpenAI chatGPT and Tesla autonomous driving. In Biomedical sciences AI methods have been addressing needs that include medical imaging analysis, public health, drug discovery, biomedical NLP, and genomic analysis. However, how to apply DL/AI techniques to specific problems requires professional training and experience.

This session highlights the basic concepts of deep learning neural networks with emphasis on application development. We will begin with the definitions of normalization, convolution, loss, and gradient; then visit the architecture of convolutional neural networks (CNNs, e.g., AlexNet, ResNet-50) including convolutional/pooling/classification layers; finally setup the network training parameters such as loss, optimizer, and learning rate. At least one application (e.g., Image compression/denoising using Autoencoder, Face recognition using VGG-19.) will be demonstrated in classroom. Students can run the demo code (to be shared) in Google Colab (similar to Jupyter). We will briefly introduce the development tools: Python, TensorFlows/Keras, and Jupyter.

At the end, students will understand the AI concepts, process pipeline, and sample code for simple applications. Hopefully all participants realize DL/AI is a powerful yet affordable tool and further apply the AI technologies to their research and development.

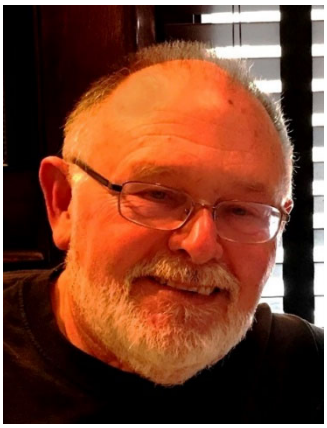
DIVISIONAL SYMPOSIA AND WORKSHOPS

Thursday, February 29, 2024

ECOLOGY AND EVOLUTIONARY BIOLOGY SYMPOSIA
8:00-10:10
Room TC 227

SYMPOSIA ON CONSERVATION THROUGH SCIENCE AND EDUCITON

***Organizers*: Dr. Seung-Joon Ahn[1] and Dr. Nina Baghai-Riding[2]**
[1]Mississippi State University, [2]Delta State University



Andrew Greller, Ph.D., Professor of Biology Emeritus at the City University of New York (CUNY), New York, NY.

Title: *"Identifications and Additions to Arthur Hollick's (1906) "Cretaceous Flora of Southern New York and New England" (Magothy Fm, Santonian, 86 my)"*

In two decades of collecting fossilized plant specimens, from two locations on Long Island, my collaborators and I have identified, verified, and added to the extensive flora (5 genera of ferns, 14 genera of conifers, and 77 genera of angiosperms, mainly dicots) compiled by Arthur Hollick at the end of the 19th Century. Hollick's specimens were mainly leaves, but included some fruits and seeds. Hollick assigned modern generic names to many of his (Mesozoic) leaf specimens, e.g., Magnolia, Liriodendron, Laurus, Myrica, Juglans, Platanus, Hymenaea, Clusia, Dalbergia, etc. In a series of publications and abstracts, we have added to the knowledge of this flora, by verifying the presence of Magnolia, Sassafras and Platanus. Further, we interpreted the enigmatic, flower-like specimen Tricalycites, as the female cone of a Cheirolepidaceae conifer. We added a new fern genus, Cyathea. Our recent findings of fruits and seeds have added the following taxa to the flora: a rose, a gourd, an Arisaema-like aroid infructescence, a passionfruit, a cherry-plum, and a winged fruit nearly identical to that of Dodonaea, the Florida hopbush. A new publication will include the finding of an inflorescence closely resembling Cimicifuga, bugbane. A surprising find was a section of fossilized soil, which contained at least 6 different types of root.

Andrew Greller, a native New Yorker, received the Ph.D. from Columbia University, in 1967. He is Professor of Biology Emeritus at the City University of New York (CUNY). Throughout his 30-year career at Queens College, he taught numerous college- and university-level courses on botany, ecology and bioclimatology. Andy is past-President of the Torrey Botanical Society, and an officer of the Long Island Botanical Society. He is a Research Associate of the New York Botanical Garden's Institute of Systematic Studies. He does original research on paleobotany, leads field trips, and presents lectures on a wide range of botanical and ecological topics.

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

Title: *"Tertiary palynomorphs from Eocene and Oligocene units in Southern Mississippi"*

Early Tertiary floras of the Gulf Coast region of the southeastern United States remain poorly known. As part of a larger study of late Paleogene units from Mississippi, palynological samples were collected from the Eocene Cockfield Formation and Oligocene Forest Hills, Bucatunna and Catahoula Formations. These four geologic units possess a diverse assortment of well-preserved palynomorphs that provide important age and palaeoecological data. Palynomorphs include freshwater algal spores, dinoflagellate cysts and theca, acritarchs, trilete and monolete spores, and gymnosperm and angiosperm pollen. The Bucatunna and Catahoula Formation palynofloras are also associated with leaf megafossils from fluvial/deltaic settings.

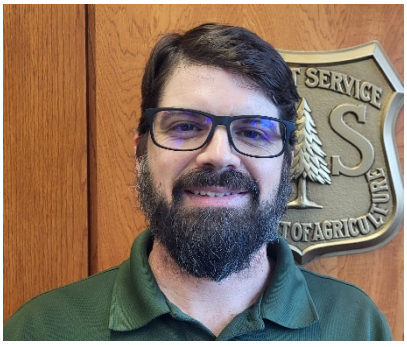
Nina Baghai-Riding is a Professor in Biology and Environmental Sciences at Delta State University. She teaches courses in environmental science, plant science, geology, and non-majors biology. She also manages the herbarium at Delta State University, which contains more than 17,000 specimens. Dr. Baghai-Riding 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.

Rick Hollis, Forestry Supervisor, Pearl River Valley Water Supply District (PRVWSD), Ridgeland, MS.

Title: Ips Beetle infestation in Mississippi, 2023-24

The infestation of Ips beetles have devastated the southern pines in our area. Back in the late summer and early fall of 2023, we suffered extreme drought which stressed all trees, urban and non-urban areas, to the point of making them susceptible to pest attacks and disease. identification of the pests, the type of damage they present and financial options are keys to the treatment. This is not a local issue, it is state wide. State agencies, private parties, and industry will feel the effects for years to come.

Rick Hollis, a Mississippi transplant from Tuscaloosa, Alabama, I have had a variety of Forestry employment opportunities that allowed me a broad knowledge of experience. A great desire for maintaining diversity, sustainability, as well as multiple use for all, is the ultimate challenge. Knowledge and education is vital in todayâ€™s world which is constantly evolving. We, as stewards of the land, need to evolve and change with the times to make rational and vital decisions to insure our natural resources for the future.
Currently, Pearl River Valley Water Supply District Forestry Supervisor, Ridgeland MS. Mississippi Forestry Commission Forester IV, Franklin and Jefferson County, MS. North Carolina Forest Service, Area Forester, Southern Pine Beetle Forester, and Forest Inventory Analysis Forester. Timber Procurement Forester, Stone Container Corporation, Brandon, MS. Consulting Forester, Tuscaloosa, AL. Mississippi Registered Forester #1668.



Chuck Burdine, USDA Forest Service, Southern Research Station, Southern Institute of Forest Genetics, Saucier, MS

Title: *"Bringing back the American chestnut: past challenges and future directions"*

The loss of the American chestnut (*Castanea dentata*) to chestnut blight (caused by *Cryphonectria parasitica*) is often considered North America's most significant ecological disaster. The destruction of the chestnut severely impacted the Appalachian forests along with local and regional economies. Thanks to the tree breeding efforts underway by various entities, blight-resistant seedlings are expected to be available in the next few years. However, before reintroduction to the forest, it is vital to produce resistant seedlings adapted to the local environment. Due to the coppice regenerating nature of stumps in the wild, an opportunity to preserve local genotypes by establishing germplasm conservation orchards is possible. In the last couple of years, the Southern Research Station (SRS) has made substantial progress in developing a modified nut-grafting technique that is resulting in the conservation of rare American chestnut genotypes located in natural forests and plantings in Mississippi, Alabama, Kentucky, and Georgia. Of further importance, American chestnut genotypes that evolved in the most southwestern area of the species' range (i.e., northeast Mississippi) are proving to be valuable sources of germplasm for producing trees that could be better adapted to warmer environments.

Chuck Burdine is a Biological Sciences Technician with the USDA-Forest Service at the Southern Research Station. He has been working at the Southern Institute of Forest Genetics, which is located at the Harrison Experimental Forest on the De Soto National Forest, for over 20 years. Throughout his career, Chuck has assisted with numerous projects dedicated to restoration efforts of the American chestnut. Recently, he started a PhD program at Mississippi State University and is focused on conserving American chestnut germplasm and asexual propagation techniques for future breeding efforts.

HEALTH SCIENCES
Symposium
POPULATION HEALTH DISPARITY AND DISEASE
9:10 AM-12:00 PM

Room TC 216

Moderators: Drs. D. Olga McDaniel, Lance Keller, and Maricica Pacurari

9:10-9:30 AM **Prelude to Symposium**

Merlin Margaret Gnanasigamani Manogaram, MD
Post-Doctoral Research Fellow,
School of Medicine, Department of Radiology
University of Mississippi Medical Center

Title of Talk: **"New Generation Technology and Disease Diagnostics"**

Dr. Manogaram will discuss Artificial Intelligence in medical diagnosis and its support to physician workload including Radiologists.

She believes advanced medical imaging techniques provide many applications for the diagnosis of variations of cancer tissues, neurological disorders, abdominal illnesses, many other medical conditions and heterogeneity in population health and disease including obesity and cardiovascular complications.

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.

Currently, Dr. Manogaram holds a position of Post-Doctoral Fellow 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.

9:45-10:15 AM

Tristan Clemons, PhD
Assistant Professor
School of Polymer Science and Engineering
University of southern Mississippi, Hattiesburg, MS.

Title of Talk: **"Application of Polymers, for the Treatment of Disease and Injury"**

Dr. Tristan Clemons will discuss an introduction into peptide amphiphile based supramolecular polymers as an exciting platform for biomaterial development, and provide examples of the utilization of these systems in the treatment of disease and injury. Tristan received his PhD degree in chemistry, 2014, from the University of

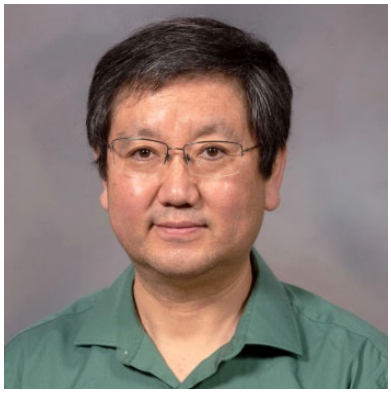
Western Australia. At the completion of his PhD he was awarded an Australian Biomedical Research Fellowship from the National Health and Medical Research Council of Australia to investigate nanomaterials for wound healing and scar treatments following burn injuries.

In 2018, Dr. Clemons relocated to Chicago to join the laboratory of Prof. Samuel Stupp at Northwestern University as a post-doctoral research fellow. The Clemons laboratory has long focused on the development of biomaterials for the treatment of disease and injury as well as for tissue regeneration applications.

He has developed a multidisciplinary laboratory, aiming to solve real world problems with polymer chemistry and biomedical engineering. The primary focus is the integration of polymer chemistry with biology to provide novel functional and therapeutic strategies for the treatment of cardiovascular disease, cancer, central nervous system and burn injury.

Dr. Clemons has won several awards including the Exxon Mobil Western Australian (WA) Student Scientist of the Year for his PhD work, a WA young Tall Poppy Science Award and was acknowledged as a CAS SciFinder Future Leader of Chemistry in 2018.

For more detail information about Dr. Clemons work and the future of the Clemons Lab you can visit his website at www.clemonslab.com.



10:20-10:50 AM

Yufeng Zheng, PhD
Associate Professor, Department of Data Science
School of Population Health, University of Mississippi Medical Center

Title of Talk**: "Deep Learning Technologies for Population Health Applications"**

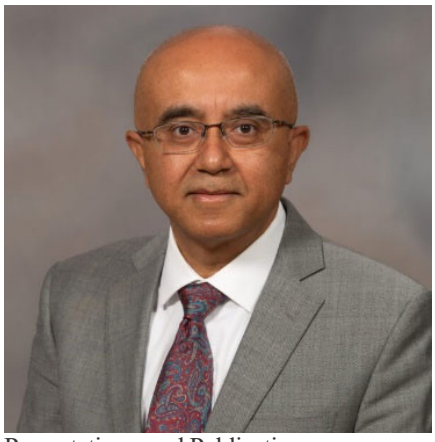
Dr. Zheng will discuss Data Science and advancement of technology in biomedical research and population health through integration of deep learning (DL) technologies and data-driven models.

Dr. Yufeng Zheng is an associate professor of data science at the University of Mississippi Medical Center. He received his Ph.D. in optical engineering and image processing in 1997 from Tianjin University, China. From 2001 to 2005, he served as a postdoctoral research associate at the University of Louisville, Kentucky.

Dr. Zheng's research interests span various areas, including image processing and pattern recognition, neural networks and artificial intelligence, information fusion, biometrics (facial recognition), machine learning and computer vision, and computer-aided diagnosis.

This presentation highlights advances by showcasing two health applications that leverage the capabilities of DL. Firstly, a You-Only-Look-Once (YOLO) fusion model demonstrates its prowess in detecting the location and predicting the risk of early-stage breast cancers using digital (X-ray) mammograms with an impressive accuracy of 92%. The integration of screening mammograms with computer-aided detection proves to be an indispensable and efficient tool for identifying early-stage cancers. Secondly, a hybrid DL model is introduced for estimating heart rate (HR) and blood oxygen saturation level (SPO2) from facial videos. Anticipating the continued evolution of intelligent deep learning models, it is envisioned that they will pave the way for even smarter health applications, potentially progressing into the realm of artificial intelligence (AI). The integration of DL and AI holds the promise of reducing disparities and enhancing healthcare outcomes.

Dr. Zheng holds a utility patent in face recognition. Dr. Zheng is Author or co-Author of three books, six book chapters, 27 articles in peer-reviewed journals, and 61 papers in conference proceedings. Dr. Zheng is a Cisco Certified Network Professional (CCNP) and holds senior memberships with IEEE & Signal Processing Society and SPIE.



10:20-10:50 AM
Saurabh Chandra, MD, PhD.
Director, Telehealth Research Center
University of Mississippi Medical Center

Title of Talk: **"Telehealth, advantages and challenges"**

Dr. Saurabh Chandra, is the Chief Telehealth Officer and Project Director for the Telehealth Center of Excellence at the University of Mississippi Medical Center.

Dr. Chandra will discuss the clinical implementation of Telehealth programs as well as the advantages and challenges. The core team supports programs locally, regionally, and nationally through daily Operation, Community collaboration, Presentations, and Publications.

Dr. Chandra received his medical degree from MLN Medical College in Allahabad, India. After receiving his medical degree, Dr. Chandra then worked on his PhD in Biological Sciences followed by a research post-doctoral fellowship at the Cincinnati Children's Hospital and Medical Center. This was followed by clinical training in Internal Medicine and Critical Care. He then completed an internal medicine residency at the Christ Hospital in Cincinnati and a fellowship in critical care medicine at the University of Pittsburgh Medical Center.

While working as a Tele ICU physician, Dr. Chandra developed a passion for Telehealth as a transformative modality for delivering cost effective health care. In his previous role, Dr. Chandra was the enterprise wide Medical Director of Telehealth at the largest health system in the state of New York where he oversaw the clinical implementation of Telehealth programs as well as the Tele ICU response to the COVID-19 pandemic.

Dr. Chandra provides strategic direction to the Center for Telehealth activities at UMMC. In addition, he is the Project Director for the Center for Excellence, grant from Health Resources & Services Administration (HRSA), and provides oversight to the implementation of innovative programs throughout the country.

PHYSICS AND ENGINEERING
Keynote
11:00 AM
Room Union H

PREPARING EXCELLENT ENGINEERS – IN AND OUT OF THE CLASSROOM

John Ball, PhD

Associate Professor and Robert Guyton Endowed Chair for Teaching Excellence

Electrical and Computer Engineering, Mississippi State University

Dr. John Ball is an Associate Professor in Electrical and Computer Engineering who holds the Guyton Endowed Chair of Teaching Excellence at Mississippi State University (MSU). He has 36+ years' experience in Academia, Private Industry, and Government. He teaches signal and data processing classes at MSU and has secured about $14.3 Million in 31 different funded projects from many sponsors in 2013 - 2024. He is also the lead faculty advisor for the MSU EcoCAR EV challenge team. He published over 150 peer-reviewed conference and journal papers.

Abstract: Preparing excellent engineers means more than providing good classes. In this talk, I will discuss some strategies in the classroom as well as out of the classroom, as well as relevant engineering areas in my teaching and research focus. In particular, I will focus on two very active research areas: wearables and autonomy. I will discuss research and teaching in these areas.

SCIENCE EDUCATION WORKSHOP
1:00 PM -2:00 PM
Room: Union D

THE PARADIGM OF CONSTRUCTIVISM

Mais Abdelhaq; Jazmin Martin; Yufeng Lu; Audra Schaefer; Nathan Tullos; Tim Dasinger,
University of Mississippi Medical Center, Jackson, MS

The purpose of this workshop is to outline using a constructivist approach in science education. Constructivism is a learning theory described as building knowledge based on previous experiences through active engagement of students including collaboration among peers. This workshop will provide examples of how the workshop team has used tenets of constructivism in the medical gross anatomy course at UMMC. For example, the team will discuss the implementation of leaders and peer teaching in laboratory settings and their reflections from the semester. During the workshop, participants will have the opportunity to build their own framework of how to use constructivism in their science education course.

Mais Abdelhaq, a current PhD student in the Clinical Anatomy program at UMMC. Graduated from the University of Edinburgh with MSc in Human Anatomy.

DIVISIONAL SYMPOSIA AND WORKSHOPS
Friday, March 1, 2024

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

FIELD TRIP TO Hattiesburg Zoo

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

In 1908, Mr. John Kemper, co-founder of Kamper and Lewin Manufacturing Co., donated 40 acres of land to the children of Hattiesburg to enjoy as a public park. Twelve acres of the park became established as the Hattiesburg Zoo. Opened in 1950, the Hattiesburg Zoo has evolved from a small collection of animals to the top attraction in Hattiesburg, Mississippi, as recognized by Tripadvisor.

In 1908, Mr. John Kemper, co-founder of Kamper and Lewin Manufacturing Co., donated 40 acres of land to the children of Hattiesburg to enjoy as a public park. Twelve acres of the park became established as the Hattiesburg Zoo. Opened in 1950, the Hattiesburg Zoo has evolved from a small collection of animals to the top attraction in Hattiesburg, Mississippi, as recognized by Tripadvisor.

In 2010, the Hattiesburg Convention Commission began to manage the Hattiesburg Zoo. Today, the Hattiesburg Zoo stands as a premier destination to discover exotic animals, explore educational exhibits, and enjoy family-oriented entertainment. Attractions include a ‘touch Africa’ petting zoo, giraffe feedings, an Australian wallaby walkabout, a mining expedition, and much more. Presently, the zoo has over 100 species of animals, including spider monkeys from Puerto Rico, bongos from sub-Saharan Africa, wallabies from Australia, giant antelopes from South America, and jaguars from North, Central and South America. Other notable animals include emus, eagles, flamingos, owls, zebras, a baby sloth, alligators, turtles, snakes, and a variety of other captivating creatures.

Over the years, the Hattiesburg Zoo has expanded its facilities to include new animal care centers, play areas for children, a giraffe barn, a bug hub, and various other amenities. Beyond providing a fun experience, the Zoo is dedicated to Conservation Biology, Educational and Outreach programs, and volunteer and docent programs.

Group rates are available at $8.00 per person. Tickets can also be purchased in advance by calling Laura Leggett (601) 545-4576 at the zoo. Drs. Nina Baghai-Riding and Seung-Joon Ahn will join MAS participants from 10 a.m. to 12 p.m. on Friday, March 1st.

- Address: 107 S. 17th Ave., Hattiesburg, MS 39401
- Hours: 10 a.m. – 4:00 p.m.

Regular Adult Admission to the Hattiesburg Zoo: $10 for ages 13 – 64; $7 for seniors 65+Group (20+) Discount rate: $8:00 per person

HEALTH SCIENCES SYMPOSIUM II 9:45-11:15
Room: TC 218

WORKSHOP

Moderators : Drs. D. Olga McDaniel and Lance Keller
University of Mississippi Medical Center Speakers and Topics

Laura Godfrey Hendon, MA, MS, CGC

Associate Professor
Director of Prenatal Genetic Services,
Department of Obstetrics and Gynecology, Division of Maternal Fetal Medicine, Department of Pediatrics, Division of Medical Genetics
University of Mississippi Medical Center

Title of Presentation: **"Genetic Counseling/Non-invasive Prenatal Testing/Genetic Technology"**

Laura G. Hendon is an Associate Professor of Pediatrics and Ob-Gyn at the University of Mississippi Medical Center (UMMC). She is UMMC's most senior certified genetic counselor (CGC) with over 12 years of experience providing counseling across the lifespan, with particular expertise in prenatal genetics.

In this workshop, she will review the current landscape of prenatal genetic screening and diagnostic testing, with a particular focus on cell-free DNA technology. Through a review of real case scenarios, she will show how utilizing this exciting technology along with other forms of genetic testing can lead to important diagnoses for patients and their families.

Laura received her Bachelor of Science in Biology with a Minor in Chemistry in 2006 from the University of Mississippi in Oxford. Then in 2008 she received her Master of Arts in Biomedical Science, studying Molecular Genetics and Genomics, from Washington University in Saint Louis, MO. In addition, she has a Master degree of Science in Genetic Counseling, in 2011, from the University of Texas Health Science Center, Houston, TX.

Laura returned to Mississippi, to became a Genetic Counselor for the Department of Pediatrics, Division of Medical Genetics at UMMC, in July 2011. She became Assistant Professor in 2017 and currently, she is an Associate Professor of Pediatrics and Ob-Gyn at UMMC. She is actively engaged in medical education, clinical research, and student supervision at UMMC and across the state of Mississippi. Laura serves as a clinical genetic counselor in pediatric, prenatal, and adult clinics. She established first trimester screening, noninvasive prenatal screening, and prenatal microarray testing at UMMC. She provides education and training to Ob-Gyn residents, MFM fellows, and other University students. In addition, she coordinates observation experiences for Mississippi high school and college students interested in the field.

Laura has contributed to multiple NIH/NHGRI, NIGMS, etc funding development over the past several years at UMMC and other academic institutions. She has numerous Academic Honors, Memberships and a long list of publications. For detailed information you may contact her at lhendon@umc.edu

SCIENCE EDUCATION
Friday, March 1, 2024
8:30-11:30
Room Union D

Workshop

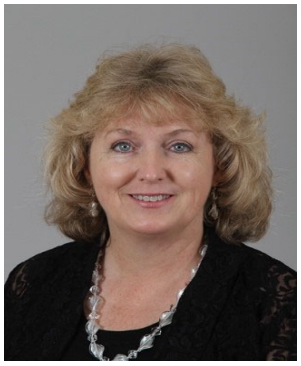
The *Wolbachia Rodeo*: A STEM COMPETITION FOR STUDENTS

Denise Thibodeaux[1], Kathy McKone[1], Rob Rockhold[2]

[1]Copiah Lincoln Community College, Wesson, MS; [2]University of Mississippi Medical Center, Jackson, MS

The *Wolbachia* Rodeo was an idea inspired by the curriculum, Discover the Microbes Within: The *Wolbachia Project,* developed by Seth Bordenstein while at the Marine Biological Lab in Woods Hole, MA. Starting in 2011, a few Mississippi schools have participated in the nation's only high-tech DNA rodeo which assists high school students in developing molecular biology techniques such as micropipetting, DNA extraction/purification, polymerase chain reaction and electrophoresis. Students participating in the *Wolbachia* rodeo work in teams to extract DNA from local insect pests (ants, fleas, & mosquitoes) to determine infection rates with the bacteria *Wolbachia,* a special interest to the scientific community because of its abundance and ability to affect the host's DNA. *Wolbachia* is currently being researched as a biological agent for controlling mosquito populations. Insect vectors and fire ant pests cause problems to which all Mississippi students can relate and find an interest. The rodeo's resources provide opportunities for students from diverse backgrounds to view STEM career possibilities as they participate in a collaborative environment, exploring the first step in a possible biological control by determining the *Wolbachia* infection rate of local insect pests. This workshop trains teachers, of all levels, in extracting, purifying, and amplifying insect DNA, which will be analyzed after running on a E-gel, to determine *Wolbachia* infection rates of designated insects. This project is supported in part by a grant from the Phil Hardin Foundation of Mississippi

Denise Thibodeaux



Lucy (Kathy) McKone, NBCT

Rob Rockhold, PhD

Denise Thibodeaux is the academic chair and biological science instructor on the Natchez campus of Copiah-Lincoln Community College with 27 years of experience teaching at the secondary and community college levels. She has been a lead teacher in the UMMC Base Pair and STEMI programs and was the 2017 recipient of the NABT Outstanding Biology Teacher Award. She is currently pursuing a Doctorate of Education (EdD) in Higher Education Administration at the University of Southern Mississippi.

Lucy (Kathy) McKone, NBCT, is the lead teacher for Mississippi's Princeton Molecular Biology Satellite and has led numerous biotechnology teacher workshops in efforts to expose students to the world of research, including designing and conducting the first Wolbachia Rodeo. She has taught science at the high school and community college level for over 35 years and received the Presidential Award for Excellence in Mathematics and Science Teaching in 2011.

Dr. Rockhold is Professor Emeritus of Pharmacology & Toxicology at the University of Mississippi Medical Center and a Life member of MAS. He has been involved in STEM outreach activities for many years.

Thad Cochran Center

121 West Memorial Drive, Hattiesburg, MS 39406

R. C. Cook Union

NOTES

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**
9	**Marine and Atmospheric Sciences**
10	**Mathematics, Computer Science, and Statistics**
11	**Neuroscience**
12	**Physics and Engineering**
13	**Psychology and Social Sciences**
14	**Science Education**

2nd number is 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: Jagmandeep Dhillon

Mississippi State University

Co-Chair: Shankar Ganapathi Shanmugam

Mississippi State University

Co-Chair: Gary Feng

USDA-ARS

Thursday, February 29, 2024

MORNING

Room Union B

8:00 Welcome and Opening Remarks Oral Session

O1.01

8:15 RAPID DETECTION OF THE AIRBORNE PHYTOPATHOGENS IN VEGETABLES UTILIZING A SPORE TRAPPING SYSTEM

Mikeria Wallace, Emran Ali

Alcorn State University, Lorman, MS

Airborne sporangia play a pivotal role as the primary culprits behind economically devastating vegetable diseases, including downy and powdery mildew, in Mississippi. These pathogens fall within the biotrophic oomycete category and disseminate through meticulously mapped dispersal spores, capable of traversing through air currents prevalent in the warm and humid summers of Mississippi. Over the past two decades, a shift in the pathogen population has led to a decline in the efficacy of fungicides, necessitating an increased focus on molecular characterization and epidemiological studies. Detecting phytopathogens in a timely manner is vital for the vegetable industry, which heavily relies on the prompt application of fungicides within an integrated management approach. The optimization of fungicide application timing can be achieved through the implementation of early and sensitive molecular detection methods. To address this requirement, we have devised a cost-effective and straightforward spore trap collection method, complemented by advanced molecular techniques such as PCR and qPCR. This enables the early identification of a significant phytopathogen, Pseudoperonospora spp, the causative agent of downy mildew diseases in vegetables. Airborne sporangia were gathered from the ASU model farm at Alcorn State University, Mississippi, and subsequently amplified using P. cubensis-specific molecular markers. These endeavors contribute to the establishment of a bio-surveillance system for P. cubensis. When integrated into the existing monitoring system, this approach holds the promise of significantly improving management strategies for airborne phytopathogens in vegetables.

O1.02

8:30 CHARACTERIZATION OF ROOT TRAIT VARIABILITY IN SOYBEAN

Bala Subramanyam Sivarathri, K. Raja Reddy, Raju Bheemanahalli

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

A robust root system helps plants efficiently uptake water and nutrients from the soil, manage stress, and withstand adverse conditions. Selecting and breeding genotypes with efficient root systems is important for increasing adaptation to specific environmental conditions. Therefore, exploring genetic variability in root traits and understanding the associations with above-ground characteristics is essential. This will help identify genotypes with optimal root traits to improve resource use efficiency in rainfed environments. A set of 227 diverse soybean germplasm accessions were phenotyped for shoot and root traits in specially designed root beds. Roots were separated from the shoot at harvest (35 d after planting) to record root system architecture traits. Significant ($p < 0.001$) genetic variability was observed in all the measured traits. The root volume ranged from 0.17 cm^3 to 2.61 cm^3, with an average of 1.20 cm^3, and it had a strong positive correlation with root biomass ($r = 0.84$), projected area, surface area ($r = 0.94$), and root length ($r = 0.77$). The number of forks ranged from 465.3 to 9220, with an average of 3704, and it was highly correlated with root length and root length per volume ($r = 0.96$). Root crossings ranged from 57 to 1582, with an average of 443.1, with the highest correlation with forks ($r = 0.98$). Above-ground biomass production ranged from 0.66 g to 25.55 g, with an average of 8.9 g, while root biomass ranged from 0.04 g to 2.29 g, with an average of 0.79 g. In summary, soybean genotypes exhibit a large variability in root growth and branching traits, with a strong correlation between above-ground traits.

O1.03

8:45 DROUGHT RESILIENCE OF COTTON BREEDING LINES DURING REPRODUCTIVE STAGE

Mohan K Bista, Bikash Adhikari, K Raja Reddy, Raju Bheemanahalli

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

Cotton *(Gossypium* spp.) is an industrial crop cultivated worldwide for textile fiber and high-quality oil and protein meal. Cotton is predominantly grown in upland conditions but faces significant production challenges. Suboptimal rainfall and prolonged droughts during sensitive growth stages threaten cotton production in all growing regions, including the US midsouth. Moreover, the scarcity of irrigation sources during the reproductive stage further exacerbates the drought stress. Therefore, developing drought-tolerant cultivars has become a priority.

Understanding the reproductive stage response of breeding lines to drought stress is essential. Twelve cotton breeding lines were exposed to 100% (control) and 50% irrigation (drought) during the flowering and boll development stages to explore the phenotypic plasticity of physiological, tissue temperature, and yield-related parameters. The results revealed that drought-stressed plants had lower stomatal conductance by 83%, transpiration by 73%, and the quantum efficiency of photosystem II (PhiPS2) by 12% compared to the control. Further, cotton boll temperature exhibited no significant increase under drought; however, both canopy (2.6°C) and leaf temperature (1.7°C) demonstrated a marked elevation ($p < 0.01$) in drought-stressed plants compared to control. This observation suggests a potential difference in transpiration between the vegetative and reproductive parts of cotton under drought stress conditions. The compromised physiological traits significantly reduced boll number (57%) and cotton seed yield (59%). These findings indicate that the variability observed in cotton breeding lines under drought stress can be utilized in drought-tolerant breeding programs and genomic studies.

O1.04

9:00 EXPLORATION OF NOVEL DETECTION METHODS FOR AIRBORNE PHYTOPATHOGENS IN VEGETABLES UTILIZING A SPORE TRAPPING SYSTEM

Mikeria Wallace, Sumyya Waliullah, Chunquan Zhang, Emran Ali

Alcorn State University, Lorman, MS

Airborne sporangia serve as the primary causative agents of economically devastating vegetable diseases, such as downy and powdery mildew, in Mississippi. These pathogens belong to the biotrophic oomycete category and are dispersed through mapped dispersal spores, capable of traveling through air movements prevalent in the warm and humid summers of Mississippi. Over the past two decades, a shift in the pathogen population has resulted in a loss of fungicide efficacy, prompting an increased emphasis on molecular characterization and epidemiological studies. The timely detection of phytopathogens is crucial for the vegetable industry, where an integrated management approach heavily relies on the prompt application of fungicides. Enhancing the timing of fungicide applications is possible through the implementation of early and sensitive molecular detection methods. To address this need, we have developed a cost-effective and straightforward spore trap collection method. This method is coupled with advanced molecular techniques, including PCR and qPCR, enabling the early detection of one important phytopathogen *Pseduoperonospora spp*, the causal agent of downy mildew diseases of vegetables. Airborne sporangia were collected from the ASU model farm at Alcorn State University, Mississippi, and subsequently amplified using P. cubensis-specific molecular markers. These efforts contribute to the establishment of a bio-surveillance system for *P. cubensis*. When integrated with the existing monitoring system, this approach promises to significantly enhance management strategies for airborne phytopathogens in vegetables.

O1.05

9:15 DEVELOPING SWEET POTATO GERMPLASM WITH ENHANCED PERFORMANCES BY USING AGROBACTERIUM-MEDIATED TRANSFORMATION

Tatyana Hollingbird[1], Chunquan Zhang[1], Lei Wang[2], Ling Li[2], Yan Meng[1]

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

Sweet potato (*Ipomoea batatas* (L.) Lam.) is widely grown in tropical and subtropical areas and is among the 10 most important food crops worldwide. However, sweet potato contains lower protein content compared to other staple foods like maize, rice, wheat, and soybean. Moreover, as a crop produced by vegetative propagation, cultivar decline due to viral infections significantly reduces sweet potato yield and storage root quality. The Arabidopsis specific Qua-quine Starch (QQS) gene and its major interactor, a nuclear factor Y subunit C4 (NF-YC4) gene regulate carbon and nitrogen partitioning to starch and protein not only in Arabidopsis, but also in soybean and other crops. To develop sweet potato plants with improved protein content and viral resistance, we optimized protocols to generate transgenic sweet potato with QQS gene and NF-YC4. QQS was cloned from *Arabidopsis thaliana* ecotype Columbia 0 (Col-0); sweet potato NF-YC4 was cloned from varieties PI318846, "Jewel" PI566638 and "Red Jewel" PI566648. Arabidopsis QQS expressing and sweet potato NF-YC4 overexpressing vectors were constructed. These vectors were transformed into *Agrobacterium tumefaciens* strain EHA105. In this study, we did the selection marker concentration test in these two sweet potato lines, and further optimized the regeneration and *Agrobacterium*-mediated gene transformation systems for PI318846 and PI566648 cultivars. Preliminary results showed that expression of foreign genes in kanamycin resistant callus was achieved using *A. tumefaciens* strain EHA105 harboring the expression cassette.

O1.06

9:30 DEVELOPMENT OF MULTIPLE DISEASE-RESISTANT RICE LINES THROUGH MARKER-ASSISTED BACKCROSS BREEDING

Raveendra Chandavarapu[1], Ramalingam J[2], Raja Reddy K[1], Raju Bheemanahalli[1]

[1]Dept. of Plant and Soil Sciences, Mississippi State University, MS, United States, [2]Tamil Nadu Agricultural University, Coimbatore, India

Rice is one of the most important food crops for more than

half of the world population. Various biotic stresses like bacterial blight, blast, and sheath blight are the most common diseases causing substantial yield loss in rice around the world. Stacking of broad-spectrum resistance genes/ Quantitative traits loci (QTLs) into popular cultivars is becoming a major objective of any disease resistance breeding program. ASD 16 and ADT 43 are widely grown rice cultivars in South India that are susceptible to bacterial blight (BB), blast, and sheath blight diseases. The present study was carried out to improve the cultivars (ASD 16 and ADT 43) through introgression of bacterial blight (*xa5*, *xa13*, and *Xa21*), blast (*Pi54*), and sheath blight (*qSBR7-1*, *qSBR11-1*, and *qSBR11-2*) resistance genes/QTLs by marker-assisted backcross breeding (MABB). IRBB60 (*xa5*, *xa13*, and *Xa21*) and Tetep (*Pi54*; *qSBR7-1*, *qSBR11-1*, and *qSBR11-2*) were used as donors to introgress disease resistance into the recurrent parents (ASD 16 and ADT 43). Homozygous (BC_3F_3 generation), three-gene bacterial blight pyramided (*xa5* + *xa13* + *Xa21*) lines were developed, and these lines were crossed with Tetep to combine blast (*Pi54*) and sheath blight (*qSBR7-1*, *qSBR11-1*, and *qSBR11-2*) resistance. In BC_3F_3 generation, the improved pyramided lines carrying a total of seven genes/QTLs (*xa5* + *xa13* + *Xa21* + *Pi54* + *qSBR7-1* + *qSBR11-1* + *qSBR11-2*) were selected through molecular and phenotypic assay, and these were evaluated for resistance against bacterial blight, blast, and sheath blight diseases under greenhouse conditions. We have selected nine lines in ASD 16 background and 15 lines in ADT 43 background, exhibiting a high degree of resistance to BB, blast, and sheath blight diseases and possessing phenotypes of recurrent parents. The improved pyramided lines are expected to be used as improved varieties or could be used as a potential donor in breeding programs. The present study successfully introgressed *Pi54*, and qSBR QTLs (*qSBR7-1*, *qSBR11-1*, and *qSBR11-2*) from Tetep and major effective BB-resistant genes (*xa5*, *xa13*, and *Xa21*) from IRBB60 into the commercial varieties for durable resistance to multiple diseases.

O1.07

9:45 CLIMATE TRENDS AND MAIZE PRODUCTION NEXUS IN MISSISSIPPI: EMPIRICAL EVIDENCE FROM ARDL MODELLING

Ramandeep Kumar Sharma[1], Jagmandeep Dhillon[1], Pushp Kumar[2], Raju Bheemanahalli[1], Xiaofei Li[1], Michael Cox[1], Krishna Reddy[3]

[1]Mississippi State University, [2]Manipal University, [3]Production Systems Research Unit, USDA-ARS, Stoneville, MS

Climate change poses a significant threat to agriculture. However, climatic trends and their impact on Mississippi (MS) maize (Zea mays L.) are unknown. The objectives were to: (i) analyze trends in climatic variables (1970 to 2020) using the Mann-Kendall and Sen slope method, (ii) quantify the impact of climate change on maize yield in the short and long run using the auto-regressive distributive lag (ARDL) model, and (iii) categorize the critical months for maize-climate link using Pearson's correlation matrix. The climatic variables considered were maximum temperature (Tmax), minimum temperature (Tmin), diurnal temperature range (DTR), precipitation (PT), relative humidity (RH), and carbon emissions (CO_2). The pre-analysis, post-analysis, and model robustness statistical tests were verified, and all conditions were met. A significant upward trend in Tmax (0.13 °C/decade), Tmin (0.27 °C/decade), and CO_2 (5.1 units/decade), and a downward trend in DTR (0.15 °C/decade) was noted. The PT and RH insignificantly increased by 4.32 mm and 0.11% per decade, respectively. The ARDL model explained 76.6% of the total variations in maize yield. Notably, the maize yield had a negative correlation with Tmax for June, and July, with PT in August, and with DTR for June, July, and August, whereas a positive correlation was noted with Tmin in June, July, and August. Overall, a unit change in Tmax reduced the maize yield by 7.39% and 26.33%, and a unit change in PT reduced it by 0.65% and 2.69% in the short and long run, respectively. However, a unit change in Tmin and CO_2 emissions increased maize yield by 20.68% and 0.63% in the long run with no short-run effect. Overall, it is imperative to reassess the agronomic management strategies, developing and testing cultivars adaptable to the revealed climatic trend, with the ability to withstand severe weather conditions in ensuring sustainable maize production.

10:00 Break

O1.08

10:15 FIELD PERFORMANCE OF BIOSTIMULANTS IN MISSISSIPPI CORN

Praveen Gajula, Corey Bryant, Raju Bheemanahalli, Vaughn Reed, Erick Larson, Jagman Dhillon

Mississippi State University, Starkville, MS

Corn *(Zea mays L.)* is a versatile crop, ranked third in acerage within Mississippi (MS). Nonetheless, current stagnant yield, inefficient nitrogen (N) recovery, and fertilizer cost fluctuations are inflicting economic losses and contributing to environmental degradation. Failure to seek a new strategy poses a risk to meeting the global food demand, creating uncertainty in food supply. The utilization of biostimulants in agricultural practices has garnered significant interest due to their potential to enhance crop productivity and reduce environmental impact. Thus, a field study was carried out in 2022 and 2023 at two locations in MS. A split plot design was implemented, with four N rates as main plot including 0 (control), 90, 180, 224 kg N ha^{-1} at Starkville and an additional 270 kg N ha^{-1} at Stoneville. Subplot factor was six microbial biostimulants (Source®, Envita®, iNvigorate®, Blue N®, Micro AZ™, and Bio level phosN®)

applied as both foliar and in-furrow at V4-V5 growth stages, alongwith a no biostimulant check. R statistical software was used to analyze the data. Nitrogen rates significantly influenced grain yield at all site years, whereas biostimulants showed no effect on yield. Specifically, in Starkville 2023 the yield varied from 3.77 Mg ha^{-1} in control to 12.15 Mg ha^{-1} at 180 kg N ha^{-1}. In Stoneville (2022 & 2023) the yield ranged from 6.55 to 14.20 Mg ha^{-1}. Overall, microbial biostimulants had no impact on corn yield and further research on diverse biostimulant categories is warranted to reveal their potential benefits for productivity and environmental sustainability.

O1.09

10:30 INTERACTION OF CORN HYBRID, PLANT POPULATION AND NITROGEN RATE TO MITIGATE PREHARVEST MYCOTOXIN CONTAMINATION IN CORN

Namita Sinha, Raju Bhemanahalli, Vaughn Reed, Brien Henry, Dan Jeffers, Krishna Reddy, Jagman Dhillon

Mississippi State University, Starkville, MS

Mycotoxins produced by *Aspergillus flavus* (aflatoxin) and *Fusarium verticillioides* (fumonisin) are carcinogenic and detrimental to human and animal health. Preharvest aflatoxin and fumonisin contamination in corn *(Zea mays* L.*)* are prevalent in Southeastern US. Moreover, presence of these mycotoxins above the regulatory limit makes the grain unmarketable. Therefore, this multi-site study aimed to assess how effective management practices (plant population and nitrogen rate) aid in reducing mycotoxin contamination in hot and humid environments. The objective of the study is to determine a hybrid-specific agronomic optimum plant population (AOPP), and agronomic optimum nitrogen rate (AONR) in mitigating preharvest aflatoxin and fumonisin contamination. The factors tested includes four plant populations (75,000, 87,500, 100,000 and 112,500 plants ha^{-1}), nitrogen (N) rates (0, 112, 224, and 336 kg N ha^{-1}) and corn hybrids with and without Bt traits (DKC 70-27 and DKC 70-25, respectively) in naturally infested and inoculated corn ears on a split-plot design. Higher N rates are hypothesized to ease the plant stress due to intraspecific competition exerted by higher plant populations and mitigate the preharvest mycotoxin contamination in corn ears, leading to better quality corn yield. Preliminary results will be presented.

O1.10

10:45 INFLUENCE OF COVER CROPPING ON SOIL MICROBIAL ACTIVITIES RELATED TO CARBON AND NITROGEN DYNAMICS IN CORN FARMING SYSTEMS

Durga Purushotham Mahesh Chinthalapudi[1, 2], Raju Bheemanahalli[1], Joshua White[1], Shankar Ganapathi *Shanmugam[1, 2]*

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

Soil microbial communities are pivotal players in nutrient cycling processes that substantially impact crop yield and soil vitality in agricultural systems. Despite the growing recognition of cover crops as a promising avenue for enhancing soil health and shaping microbial composition, a comprehensive understanding of their synergistic effects on ecosystem services remains notably deficient. Addressing this significant knowledge gap, our three-year study employs a strip plot design across two distinct locations—Starkville and Newton—to rigorously assess the effects of various cover crops (ryegrass, balansa clover, red clover, radish, and cover-crop mixes) and nitrogen levels (0 lb. and 100 lb.) on soil microbial communities and carbon/nitrogen cycling within corn production systems. Preliminary findings show significant disparities in microbial community structures across locations. While Shannon diversity indices revealed no significant differentiation among cover crop treatments in Newton, significant differences were observed among cover crops in Starkville. Intriguingly, plots receiving 100 lbs. of N showed elevated Shannon diversity compared to 0 lbs. N plots. Moreover, enzymatic assays and active carbon analyses results show that soils from plots with ryegrass and CC-mix2 had higher activity relative to other treatments. Nitrogen cycling genes, specifically amoA and nifH, also exhibited significant differences across cover crop treatments. Overall, our initial results indicate that ryegrass and CC-mix2 markedly enhance bacterial richness, Shannon diversity, POXC, soil enzymatic activity, and the abundance of microbial taxa integral to nitrogen cycling processes.

O1.11

11:00 ANALYSIS OF SYSTEMIC ACQUIRED RESISTANCE BY MONITORING REDOX-MEDIATED TRANSCRIPTIONAL DYNAMICS IN ARABIDOPSIS

Rezwana Rhman Setu[1], Sargis Karapetyan[2], Philip Berg[3], Sorina Popescu[1], George Popescu[3], Ye Xin [1]

[1]Department of Biochemistry, Molecular Biology, Entomology, and Plant Pathology, Mississippi State University, [2]Department of Biology, Duke University, Durham, NC, [3]Institute for Genomics, Biocomputing, and Biotechnology, Mississippi State University, Mississippi State, MS

In plants, systemic acquired resistance (SAR) provides long-lasting, broad-spectrum protection against pathogens through a priming mechanism involving redox and phytohormonal signaling. However, there is limited knowledge regarding transcriptional dynamics during SAR onset and the redox involvement in SAR maintenance. Our previous work has identified several key genes to understand the regulatory dynamics of SAR onset. Here we investigate these dynamics by analyzing the transcriptional activity of *GRXS13* (Glutaredoxins,

At1g03850), a disease resistance-related CC-type GRX strongly inducible by SA. To track these dynamics, we fused a luciferase reporter gene tothe promoter region of *GRXS13* by gateway cloning. We transformed *A. thaliana* wild-type Columbia ecotype (Col-0) and the SAR-defective *top2* mutant plants with this *GRXS13* reporter construct using *Agrobacterium*-mediated floral dip transformation. We infiltrated T1 generation plants with *Pseudomonas syringae* pv. tomato DC3000 expressing avrRpt2 to prompt SAR. Promotor transcriptional activity was then tracked by monitoring bioluminescence at two-hour intervals after infection for four days in 12 h light and 12 h dark diurnal cycles. We observed oscillatory dynamics of the *GRXS13* expression in planta during SAR onset and compared it with the transcriptional response of SAR driver genes previously identified. Comparative analysis of *GRXS13* dynamics in Col-0 and the *top2* mutant provides insights into how dysregulated redox signaling affects SAR onset. In the future, we plan to analyze the transcriptional dynamics of a larger set of SAR marker genes to further understand the role of redox signaling in plant immunity.

O1.12

11:15 ADVANCING ANNUAL RYEGRASS: OPTIMIZING ANTHESIS TIMING FOR IMPROVED AGRICULTURAL PERFORMANCE

Prakriti Adhikari, Brian Baldwin, Jesse Morrison

Mississippi State University, Starkville, MS

Annual ryegrass (*Lolium perenne* ssp. *multiflorum*) is an abundant cool-season species in the Southeast. It has extended its habitat beyond pastures and encroaches into winter-fallow row crop fields. Its capacity to establish and achieve high-densities positions it as an exceptional cover crop, its late senescence and its resistance to multiple herbicides pose significant challenges for eradication by spring planting. Developing a variety of ryegrass that naturally senescence earlier in the spring would enable us to exploit ryegrass as a cover crop (weed suppression, soil stabilization, and nutrient scavenging). This study is designed to assess the response of annual ryegrass to recurring phenotypic selection aimed at altering the timing of anthesis, i.e., the flowering period. In 2022, a base population of annual ryegrass characterized by anthesis dates spanning from March 21 to April 2, (x anthesis date of March 28) was collected from the wild. Nine hundred and three seedlings of this population were grown in the 50-cell deep trays under ambient winter conditions. To initiate the first cycle of selection (Cycle 1), upon anthesis the cycle 0 population was segregated into two distinct groups: the "E" group, consisting of the 70 progenies earliest to anthesis, and the "L" group, comprising the last seventy populations to reach anthesis. Plants were allowed to polycross within each group. Seed harvested from selected groups formed the basis for and additional cycle of selection. For cycle 1 (winter 2023), 500 seed from the base population and 1000 seed each from the E and L populations were planted. Plants will be segregated again based on anthesis date, and data recorded. Following two cycles of selection, genetic variation will be calculated to assess gain due to selection using X^2, ANOVA, and h^2 for the anthesis date. The E population will be assessed for usefulness as a cover crop, or if additional cycles of selection are necessary.

O1.13

11:30 EFFECTS OF DROUGHT STRESS ON PHYSIOLOGY, GROWTH AND DEVELOPMENT OF COWPEA

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

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

Cowpea (*Vigna unguiculata*) is a legume crop grown in arid and semi-arid regions for food and feed. It is popular for producing high-quality protein beans in dry, under-fertilized, and marginal lands. However, rainfed-grown cowpeas are often exposed to inadequate soil moisture during critical growth and development stages, leading to various physiological abnormalities and decreasing their genetic potential. Despite the sensitivity of these stages to drought, the interaction between drought at different growth stages and yield has been overlooked. In this study, we quantified the impact of drought stress on different phenological stages by assessing physiology, pigment, and yield parameters. Two cowpea genotypes (UCR 369 and EpicSelect.4) were exposed to two irrigation levels at the V2, V4, R1, and R2 stages for 14 days. The soil moisture levels were maintained at either 100% irrigation (control) or 50% irrigation (drought) using a semi-automated irrigation system. After 14 days of drought, pots were rewatered and maintained under non-stress control conditions until physiological maturity. Physiology, pigment, and biomass were collected at each growth stage. Drought stress-induced changes in yield and quality parameters were assessed. Drought stress at different growth stages significantly reduced stomatal conductance, transpiration, and other photosynthesis-related pigments among genotypes. For instance, drought at the V2 stage reduced stomatal conductance on average by 55% to reduce water loss via transpiration, hampered photosynthesis (87%), and increased canopy temperature by 2.8 °C compared to the control. Drought stress significantly impacted node number and other yield components across growth stages. However, the total biomass reduction after 14 days of stress was maximum in the V2 stage followed by the other growth stages, indicating greater sensitivity of this stage to drought stress.

O1.14

11:45 IMPACT OF POTASSIUM NUTRITION LEVELS ON GROWTH AND DEVELOPMENT OF CORN

Naflath Thenveettil[1], Krishna N. Reddy[2], K. Raja Reddy[1]

[1]*Mississippi State University, Mississippi state, MS,* [2]*USDA-ARS, Crop Production Systems Research Unit, Stoneville, MS*

Potassium deficiency in corn is an emerging concern, especially in drought-prone areas. Under severe deficiency, the leaf margins start yellowing, eventually leading to leaf necrosis and plant wilting. A pot study was conducted to understand the effect of varying potassium rates on corn plants' growth and physiology under controlled environmental conditions. The plants were grown in sand media under five levels of potassium concentration: 0%, 5%, 20%, 40%, and 100% (control) using modified Hoagland's nutrient solution in completely randomized design. The plant growth and development were monitored at different leaf growth stages until the V10 growth stage. Physiological parameters were measured before the termination of the experiment, 50 days after planting. Significant differences in plant growth and physiological parameters were recorded in response to potassium rates. The leaf area declined with potassium deficiency in different growth stages along with reduced leaf dry weight. The rate of leaf biomass accumulation was 1.6 g day^{-1} under control, while it was 1.3 g day^{-1} under 0% potassium rate. A similar reduction was observed for total biomass accumulation, 7.7 g day^{-1} under control and 5.4 g day^{-1} under 0% potassium rate. Under potassium deficiency, an increase in root-to-shoot ratio was noted, with enhanced root growth at 5% potassium concentration (40 g $plant^{-1}$ dry weight and 0.33 root-to-shoot ratio) as compared to control (24 g $plant^{-1}$ and 0.16, respectively). The low-potassium rate resulted in reduced leaf potassium concentration. For the physiological response to the applied potassium levels, the photosynthesis drastically declined with 30% and 35% reduction under 5% and 0% potassium concentrations, respectively, compared to the 100%. Potassium rates at 0% and 5% resulted in a decrease in stomatal conductance and internal CO_2 concentration. The leaf chlorophyll and flavonoid levels increased with increased leaf potassium levels. Linear relationships were observed between leaf potassium concentration and electron transport rate ($R^2 = 0.98$), transpiration rate ($R^2 = 0.91$), and chlorophyll content ($R^2 = 0.58$). The functional relationship between potassium levels and corn plant growth and development will help develop models under potassium limitation for field applications.

12:00 General Session

Thursday, February 29, 2024

AFTERNOON

DIVISION POSTER SESSION 1:00-3:00 PM

Union

Posters will be judged in the division and will also be presented in the General Poster Session.

P1.01

EFFECTS OF DROUGHT STRESS ON PHYSIOLOGY, GROWTH AND DEVELOPMENT OF COWPEA

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

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

Cowpea (*Vigna unguiculata*) is a legume crop grown in arid and semi-arid regions for food and feed. It is popular for producing high-quality protein beans in dry, under-fertilized, and marginal lands. However, rainfed-grown cowpeas are often exposed to inadequate soil moisture during critical growth and development stages, leading to various physiological abnormalities and decreasing their genetic potential. Despite the sensitivity of these stages to drought, the interaction between drought at different growth stages and yield has been overlooked. In this study, we quantified the impact of drought stress on different phenological stages by assessing physiology, pigment, and yield parameters. Two cowpea genotypes (UCR 369 and EpicSelect.4) were exposed to two irrigation levels at the V2, V4, R1, and R2 stages for 14 days. The soil moisture levels were maintained at either 100% irrigation (control) or 50% irrigation (drought) using a semi-automated irrigation system. After 14 days of drought, pots were rewatered and maintained under non-stress control conditions until physiological maturity. Physiology, pigment, and biomass were collected at each growth stage. Drought stress-induced changes in yield and quality parameters were assessed. Drought stress at different growth stages significantly reduced stomatal conductance, transpiration, and other photosynthesis-related pigments among genotypes. For instance, drought at the V2 stage reduced stomatal conductance on average by 55% to reduce water loss via transpiration, hampered photosynthesis (87%), and increased canopy temperature by 2.8 °C compared to the control. Drought stress significantly impacted node number and other yield components across growth stages. However, the total biomass reduction after 14 days of stress was maximum in the V2 stage followed by the other growth stages, indicating greater sensitivity of this stage to drought stress.

P1.02

MORPHOLOGICAL CHARACTERIZATION OF RICE GENOTYPES FOR CHILLING STRESS TOLERANCE

Raveendra Chandavarapu, Raja Reddy K, Raju Bheemanahalli

Dept. of Plant and Soil Sciences, Mississippi State University, MS

Rice is a staple food crop for over half of the world's population, providing around 23% of the world's food. Early-stage chilling stress is one of the challenges limiting seedling emergence and optimum plant population. Death

of seedlings and uneven establishment can lead to yield loss under chilling stress. Therefore, we hypothesized that rice genotypes that emerge uniformly and maintain vigorous shoot-root growth would enhance early-stage chilling tolerance. This investigation aimed to determine the variability in cold tolerance among rice genotypes and identify chilling tolerant genotypes with superior seedling vigor. By analyzing decade-long daily average air temperature, two temperatures closely resembling the early (15°C, chilling) and regular (26°C, control) planting in the southern US were identified. In this study, rice genotypes were grown under control (30/22 °C, day/night temperatures) and chilling (22/14 °C, day/night temperatures) conditions for 14 days after the two-leaf stages. At 28 days after sowing, chilling stress induced a significant reduction in the number of leaves (41%), shoot length (21.7%), and root length (7.7%) compared to control. The panel had 31.7% and 46% lower root and total biomass under chilling stress than the control, respectively. Root dry weight was strongly correlated with root fresh weight (r=0.99), shoot fresh weight (r=0.84), and shoot dry weight (r=0.84) under chilling. The potential chilling adaptive genetic loci associated with reducing the negative impact of chilling stress, chilling-tolerant donor lines, and routes to increase chilling tolerance at the early seedling stage in rice will be discussed.

P1.03

EFFECTS OF HEAT STRESS ON COTTON PHYSIOLOGY AND YIELD

Mohan K Bista, Bikash Adhikari, K Raja Reddy, Raju Bheemanahalli

Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS 39762, USA.

Although cotton is well adapted to tropical and subtropical regions, it is vulnerable to heat stress during its flowering and boll development stages. Rising temperatures due to climate change significantly threaten cotton production in major cotton-growing regions. On the other hand, modern cotton cultivars are more sensitive to heat stress, resulting in variable yields from year to year when exposed to temperatures above the optimum. Thus, identifying and selecting stress-tolerant lines or traits that boost tolerance to stress is a crucial first step for breeding. To examine the impact of heat stress on cotton, a study was conducted on 12 breeding lines exposed to heat stress (38°C/24°C, day/night temperature) during flowering and boll development. The genetic variability in physiological, canopy temperature, and yield-related parameters were explored. The results revealed that heat stress led to a significant reduction in stomatal conductance (83%), transpiration (49%), and quantum efficiency of photosystem II (37%) across cotton lines, compared to the control (32°C/24°C, day/night). Furthermore, heat-stressed plants had a higher (90C) leaf temperature than the control plants. Cotton seed yield declined significantly (5% to 34%) due to heat stress, while the decline on boll number was less (1% to 20%). Some lines (Coker-315, Deltapine, and M-240) showed minimal cotton seed yield decline (<10%) and better physiology under heat stress. The study also explored the variability of fiber quality traits among breeding lines and their interaction with heat stress. These findings highlight the need for developing heat-tolerant cotton cultivars to ensure stable yields in the face of climate change.

P1.04

EFFICACY OF BIOSTIMULANTS IN REDUCING DROUGHT AND HEAT STRESS IN SOYBEANS

Vijaykumar Hosahalli[1], Lekshmy Sankarapillai[1], Corey Bryant[2], K.Raja Reddy[1], Jagman Dhillon[1], Raju Bheemanahalli[1]

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

Soybean-growing regions often experience heat and drought during reproductive stages, which leads to lower yields. Biostimulants have recently been proposed as a sustainable and viable solution to improve soybean productivity under stressful environments. This study investigated the effects of different biostimulants, individually and in combination, alleviating heat and drought stress during the reproductive and grain-filling stages. Plants grown under optimum conditions were exposed to long-term heat stress during R1-R8 and short-term drought during R5. The efficacy of biostimulants was evaluated by comparing yield and morphological parameters under drought or heat with an untreated control. Results showed that BioP increased pod number under drought but substantially reduced pod weight compared to the untreated control when applied at planting. Combining BioSa and BioFriendly increased plant height and reduced seed weight compared to the untreated control under heat stress. However, HM-2163, Fertiactyl, Azterknot, and the treated check (standard insecticide and fungicide treatment) showed a marginal increase in seed yields over the untreated control under drought. These findings show some potential of biostimulants in alleviating stress impact on soybeans during the reproductive stage. However, to gain a more comprehensive understanding of their potential benefits, we are evaluating the effectiveness of these biostimulants in field conditions.

P1.05

INFLUENCE OF BIOSTIMULANTS ON EMERGENCE AND SEEDLING VIGOR UNDER LOW AND HIGH TEMPERATURES

Bala Subramanyam Sivarathri[1], Corey Bryant[2], K. Raja Reddy[1], Jagman Dhillion[1], Raju Bheemanahalli[1]

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

Abiotic stresses significantly impact germination and seedling vigor traits, which can lead to reduced crop yields. The germination process relies on temperature, moisture, and oxygen, and it plays a crucial role in achieving a better crop stand in the fields. Incorporating biostimulants into modern agricultural practices has been proposed as an excellent way of sustainable farming. Biostimulants help enhance soybean growth and development, improve nutrient use efficiency, and effectively mitigate the negative impact of abiotic stresses. Soybean seeds were treated with seven different biostimulants, both individually and in combination, and exposed to chilling (10/20 °C,day/night), optimum (20/30°C,day/night) and high (38/25°C,day/night) temperatures. Biostimulant-induced changes in emergence and growth of the seedlings were recorded. Our findings showed that the seeds treated with biostimulants had a shorter time to reach 50% emergence and demonstrated varying levels of increased biomass under both low and high-temperature stress compared to optimal temperature. Fertiactyl reduced the time to 50% emergence by 48 hours, which led to a 30% increase in biomass under chilling. Similarly, Biowake+Biofriendly reduced the time to 50% emergence by 33 hours and promoted biomass production by 17% under high temperature. Under optimal temperature, BioSa+Biofriendly+Polymer and BioWake improved biomass by 9% and 19%, respectively. Overall, the findings suggest that the application of biostimulants can greatly shorten the time needed for seedlings to emerge, which in turn helps them to adapt to low and high temperature conditions.

P1.06

ISOLATION AND CHARACTERIZATION OF TRICHODERMA ISOLATES FROM MISSISSIPPI

Glennescia Tenner, Daniel Collins

Alcorn State University, Lorman, MS

Many Trichoderma species are used as biological control agents for suppression of soilborne plant diseases, promoting plant growth and enhanced uptake of nutrients. Several studies have shown that the use of indigenous Trichoderma species is important approach in developing sustainable plant disease management strategies. In a preliminary study Ten indigenous *Trichoderma harzianum* isolates were recovered from Giant Miscanthus roots cultivated on the Alcorn State University Agricultural Experiment Station Lorman, Mississippi. Trichoderma isolates were identified by DNA ITS, Sanger sequencing. These isolates were photographed to create a picture album and morphological characterizations. Isolates were further characterized for their metabolic activities in the lab using HiCarbo Biochemical testing enzymatic signatures. These isolates were variable and their biochemical enzymatic activity. This study is being expanded to include other soil types and cropping systems areas of Mississippi to isolate indigenous Trichoderma species for characterization and evaluation as potential biological control agents.

P1.07

ABUNDANCE AND CONTROL OF NUISANCE WATERSHIELD (Brasenia schreberi) POPULATIONS IN MISSISSIPPI

MacKenzie Cade, Gray Turnage

Mississippi State University, Starkville, MS

Aquatic nuisance plants (ANS) can negatively affect water chemistry, ecological processes, biodiversity, and human uses of water resources. One such ANS, watershield (*Brasenia schreberi*), can be problematic in water bodies of the southeastern U.S. if not properly managed. Chemical control measures for this plant are minimal, thus, resource managers and landowners have limited options for managing this species. The goal of this research was to assess the prevalence of watershield in Mississippi waterbodies along with the efficacy of submersed injections of a protoporphyrinogen-oxidase (PPO) inhibiting herbicide, flumioxazin, for control of water shield. A series of mesocosm and field trials were conducted to assess rate reductions of submersed flumioxazin injections for watershield control. Mesocosm data suggested flumioxazin applications above a quarter of the maximum label rate (100 ppb) reduced water shield biomass by >70% 8 weeks after treatment (WAT) compared to non-treated plants. Submersed applications of flumioxazin (100 ppb) to a field population reduced watershield leaf density 88% and biomass 99% compared to non-treated plants 8 WAT. In 2022, 21 lakes in south Mississippi were surveyed for watershield presence. Watershield prevalence was not correlated to depth or diversity suggesting water clarity and plant community composition are not drivers of watershield prevalence. However, plant diversity was positively correlated to littoral depth of lakes suggesting lakes with greater water clarity can support more diverse plant communities. This project identified a new control measure for management of nuisance watershield populations giving Mississippi resource managers and landowners a new management option for this species.

P1.08

PHYSIOLOGICAL, GROWTH, AND MARKETABLE BIOMASS RESPONSES OF *Cantella asiatica* (L.) TO SOIL SALINITY STRESS

Ali Alsughayyir, Naflath Thenveettil, K. Raja Reddy

Mississippi State University, Starkville, MS

Centella asiatica (L.), widely used in many countries in the food, nutraceutical, and pharmaceutical Industries, has gained importance in recent years. However, systematic studies that describe functional relationships between growth and abiotic stresses are not well-established enough to develop management tools. Like drought and heat, soil salinization threatens global crop production, affecting 6% of total land area and 20% of cultivated crop area. The global saline area is expected to increase due to poor irrigation practices and applications of high salt water for

irrigation, particularly in arid and semi-arid regions with higher evapotranspiration than precipitation. An experiment was conducted with varying salt concentration levels (0 to 15 ds' m^{-1} at 3 dS m^{-1} increments) for plant growth with optimum water and nutrients. All pots were irrigated with salt added to standard Hoagland's nutrient solution. Before the treatment, pots (23 cm height × 31cm diameter) with established plants were raised to have uniform growth and development. Marketable fresh and dry biomass, petiole length, and individual leaf areas were measured seven weeks after the treatment. Photosynthetic, fluorescence, and pigments were measured a day before the final harvest. The maximum leaf photosynthesis rate (32.63 µmol m^{-2} s^{-1}) observed in the control treatment declined linearly (R^2 = 0.99) with increase in salt concentration. Even stomatal conductance, Ci/Ca, and fluorescence decreased linearly with increased salt concentration. Stomatal decline contributed more (slope = 6.03%) than non-stomal limitation (slope = 1.99%) to the decrease in photosynthesis (slope = 4.27%) under saline conditions. Impaired carbon limitation caused a decline in petiole and individual leaf areas, reducing marketable fresh (5.2%) and dry (slope 4%) weights with increased salt concentration. The identified salt-specific indices for growth and marketable fresh and dry biomass traits should help manage *Centella* production practices under saline conditions. They can be incorporated into a *Centella* simulation model to improve management practices under present and future climatic conditions.

P1.09

ASSESSMENT OF TWO MUSCADINE GRAPE (*Vitis rotundifolia*) MAPPING POPULATIONS FOR TOLERANCE TO PIERCE'S DISEASE PATHOGEN *Xylella fastidiosa*

Anushka Tennakoon[1], Dmitri Mavrodi[1], Ebrahiem Babiker[2]

[1]School of Biological, Environmental and Earth Sciences, The University of Southern Mississippi, Hattiesburg, MS, [2]USDA Agricultural Research Service, Thad Cochran Southern Horticultural Laboratory, Poplarville, MS

Xylella fastidiosa (*Xf*) is a xylem-limited plant pathogenic bacteria that causes Pierce's Disease (PD) in grapevines. Table grapes (*Vitis vinifera*) are more susceptible to PD than wild-type Muscadine grapes (*Vitis rotundifolia*). Characteristic symptoms of PD-affected grapevines include leaf scorching, leaf blade abscission from the petiole, uneven maturation of the stem forming green islands, and shriveled berries. Infected vines typically die within 3-4 years, thus reducing the economic life span (~ 20 years) of mature vines. Although therapeutic methods to control *Xf* in table grapes are under development, the pathogen is most effectively managed by prophylactic measures, such as breeding for resistance to PD. Characterization of resistant genes is essential in breeding cultivars resistant to PD. Therefore, to understand the underlying genetic basis for PD tolerance, a half-sib mapping population consisting of 142 individuals, and a full-sib mapping population of 35 individuals were assessed under natural PD pressure. Muscadines are asymptomatic for PD, which causes difficulties in direct quantification of the bacterial load. Hence, bacterial concentrations in leaf tissues were quantified by two molecular methods, qPCR and Droplet Digital PCR (ddPCR). The analysis of plant samples spiked with *Xf* genomic DNA revealed that both assays quantified the expected bacterial copy numbers with no interference of any PCR inhibitors in grape leaf tissues. The qPCR assay had a broad detection range ranging from 10^1 -10^7 copies while the ddPCR assay was limited to 10^1 - 10^5 target gene copies. The *Xf* levels in field-grown accessions peak at 10^5 gene copies, which makes either assay suitable for accurate pathogen quantification. Of 195 analyzed accessions under natural PD pressure, 53 tested positive for Xf, suggesting the population segregates for PD. These preliminary results indicate that the mapping populations are suitable for mapping QTLs for PD tolerance.

P1.10

EVALUATING THE INFLUENCE OF SOIL MICROBIAL NITROGEN REGULATIONS IN SWEET POTATO COVER CROP MANAGEMENT

Lahari Nekkalapudi , Mark Shankle, William Kingery, Shankar Ganapati Shanmugham

Mississippi State University, Starkville, MS

Mississippi is the third-largest producer of sweet potato *(Ipomoea batata)* in the United States. An adequate supply of nitrogen (N) is required for the profitable and sustainable production of sweet potatoes. Regardless of N supply, microorganisms play a vital role in regulating the availability of N to crops, whether in the form of fertilizer, organic matter, or crop residues, by altering the oxidation state of N. There is limited research studying the role of soil microorganisms in augmenting soil health when integrated with cover crops in the sweet potato production system. A study was initiated in 2023 at the Pontotoc Ridge-Flatwoods Branch Experiment Station in Pontotoc, Mississippi (MS), to assess the effects of cover crops on nitrogen availability in sweet potato. This study was implemented in a randomized block design following a split block arrangement and replicated four times. A total of three N treatments (0, 50, 100 lb/acre) and three cover crop treatments (no cover crop, winter wheat cover crop, and clover cover crop) were adopted. Cover crops will be planted in fall and terminated in spring before planting sweet potato. Soil samples were collected at the time of planting and after the harvesting of sweet potato and termination of cover crop. These collected soil samples undergo analysis for both physical and chemical properties. Amplicon targeting the bacteria (16s) and fungal (ITS) were sequenced for soil microbiome characterization. DNA sequence data was analyzed using MOTHUR (version 1.42.0) and QIIME (quantitative insights into microbial ecology). R statistical software was

used for analyzing the data. Cover crop treatments showed a 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. Additionally, evaluating the sequencing data is important for revealing the effects of N and cover crop treatments, which helps us understand the key mechanisms that influence soil microbial regulation of N in sweet potato and cover crop production systems.

P1.11

MACHINE LEARNING ALGORITHMS FOR YIELD PREDICTION OF CORN AND SOYBEAN: A SYSTEMATIC LITERATURE REVIEW

Ramandeep Kumar Sharma[1], Jasleen Kaur[2], Chandan Kumar[1], Sandhir Sharma[2], Jagmandeep Dhillon[1]

[1]Mississippi State University,Starkville, MS, [2]Chitkara University

Crop yield is one of the most important aspects of agriculture, capturing the interest of agricultural scientists, academicians, and researchers. Traditional crop yield prediction methods often rely on statistical models that are based on historical data and do not account for the complex interactions among environmental factors, soil, and crop genetics. Given the abundance of data accessible in agriculture, Machine learning algorithms can analyze large and heterogeneous datasets and identify patterns and relationships that traditional methods cannot capture. The main objectives of the review include: exploring machine learning and deep learning techniques used to predict the crop yield using various input parameters, to evaluate the accuracy measures considered for measuring the performance of these techniques, examining the efficiency of these techniques, exploring the input parameters used for modeling, to compare the performance of algorithms for crop yield prediction and to explore the efficiency of hybridized models. In the current study, we performed a systematic literature review (SLR) to get insight into algorithms, input parameters, and evaluation parameters used in the relevant papers. The target crops for the study are corn/maize and soybean. We were able to identify 1859 related papers from four databases, out of which we selected 82 papers for further analysis after considering inclusion and exclusion criteria. The results of SLR shows that the most popular machine learning algorithm among researchers of the selected domain is Random Forest, Artificial Neural Networks (ANN), Support Vector Machines, and XG Boost. Additionally, LSTM and CNN are the most widely used deep learning techniques for crop prediction. From the literature reviewed, it has also been shown that temperature, precipitation, crop historical yield, NDVI, and pH value are the most considered input parameters by the researchers of the selected domain. The current review has also shown the inclination towards the hybridization of models for enhancing the model accuracy. The study also highlights the most influential input parameters. Temperature and precipitation were considered the most influential factors affecting crop yields. Apart from these factors, soil water-related variables, nutrients, and NDVI have considerable influence on crop yield. This analysis can be useful for academicians and researchers looking for futuristic directions in each research domain.

P1.12

SOYBEAN-CLIMATE RELATIONSHIP IN MISSISSIPPI BETWEEN 1970-2020

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Studying historical response of crops to weather conditions at a finer scale is essential for devising agricultural strategies tailored to expected climate changes. However, determining the relationship between crop and climate in Mississippi (MS) remains elusive. Therefore, this research attempted to i) estimate climate trends between 1970 and 2020 in MS during the soybean growing season (SGS) using the Mann-Kendall and Sen slope method, ii) calculate the impact of climate change on soybean yield using an auto-regressive distributive lag (ARDL) econometric model, and iii) identify the most critical months from a crop-climate perspective by generating a correlation between the detrended yield and the monthly average for each climatic variable. Specific variables considered were maximum temperature (Tmax), minimum temperature (Tmin), diurnal temperature range (DTR), precipitation (PT), carbon dioxide emissions (CO2), and relative humidity (RH). All required diagnostic-tests i.e., pre-analysis, post-analysis, model-sensitivity, and assessing the models' goodness-of-fit were performed and statistical standards were met. A positive trend in Tmin (+0.25 °C/decade), and a negative trend in DTR (0.18 °C/decade) was found. Although Tmax, PT, and RH showed non-significant trends, numerical changes were noted as +0.11 °C/decade, +3.03 mm/decade, and 0.06 %/decade, respectively. Furthermore, soybean yield was positively correlated with Tmin (in June and September), PT (in July and August), and RH (in July), but negatively correlated with Tmax (in July and August) and DTR (in June, July, and August). Soybean yield was observed to be significantly reduced by 18.11 % over the long-term and by 5.51 % over the short-term for every 1 °C increase in Tmax. With every unit increase in Tmin and CO2 emissions, the yield of soybeans increased significantly by 7.76 % and 3.04 %, respectively. Altogether, soybeans in MS exhibited variable sensitivity to short- and long-terms climatic changes. The results highlight the importance of testing climate-resilient agronomic practices and cultivars

that encompass asymmetric sensitivities in response to climatic conditions of MS.

P1.13

FIELD PERFORMANCE OF BIOSTIMULANTS IN MISSISSIPPI CORN

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Corn *(Zea mays L.)* is a versatile crop, ranked third in acerage within Mississippi (MS). Nonetheless, current stagnant yield, inefficient nitrogen (N) recovery, and fertilizer cost fluctuations are inflicting economic losses and contributing to environmental degradation. Failure to seek a new strategy poses a risk to meeting the global food demand, creating uncertainty in food supply. The utilization of biostimulants in agricultural practices has garnered significant interest due to their potential to enhance crop productivity and reduce environmental impact. Thus, a field study was carried out in 2022 and 2023 at two locations in MS. A split plot design was implemented, with four N rates as main plot including 0 (control), 90, 180, 224 kg N ha^{-1} at Starkville and an additional 270 kg N ha^{-1} at Stoneville. Subplot factor was six microbial biostimulants (Source®, Envita®, iNvigorate®, Blue N®, Micro AZ™, and Bio level phosN®) applied as both foliar and in-furrow at V4-V5 growth stages, alongwith a no biostimulant check. R statistical software was used to analyze the data. Nitrogen rates significantly influenced grain yield at all site years, whereas biostimulants showed no effect on yield. Specifically, in Starkville 2023 the yield varied from 3.77 Mg ha^{-1} in control to 12.15 Mg ha^{-1} at 180 kg N ha^{-1}. In Stoneville (2022 & 2023) the yield ranged from 6.55 to 14.20 Mg ha^{-1}. Overall, microbial biostimulants had no impact on corn yield and further research on diverse biostimulant categories is warranted to reveal their potential benefits for productivity and environmental sustainability.

P1.14

INTERACTION OF CORN HYBRID, PLANT POPULATION AND NITROGEN RATE TO MITIGATE PREHARVEST MYCOTOXIN CONTAMINATION IN CORN

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Mycotoxins produced by *Aspergillus flavus* (aflatoxin) and *Fusarium verticillioides* (fumonisin) are carcinogenic and detrimental to human and animal health. Preharvest aflatoxin and fumonisin contamination in corn *(Zea mays* L.*)* are prevalent in Southeastern US. Moreover, presence of these mycotoxins above the regulatory limit makes the grain unmarketable. Therefore, this multi-site study aimed to assess how effective management practices (plant population and nitrogen rate) aid in reducing mycotoxin contamination in hot and humid environments. The objective of the study is to determine a hybrid-specific agronomic optimum plant population (AOPP), and agronomic optimum nitrogen rate (AONR) in mitigating preharvest aflatoxin and fumonisin contamination. The factors tested includes four plant populations (75,000, 87,500, 100,000 and 112,500 plants ha^{-1}), nitrogen (N) rates (0, 112, 224, and 336 kg N ha^{-1}) and corn hybrids with and without Bt traits (DKC 70-27 and DKC 70-25, respectively) in naturally infested and inoculated corn ears on a split-plot design. Higher N rates are hypothesized to ease the plant stress due to intraspecific competition exerted by higher plant populations and mitigate the preharvest mycotoxin contamination in corn ears, leading to better quality corn yield. Preliminary results will be presented.

P1.15

CHARACTERIZING INSECT FRASS ASSOCIATED MICROBIOME AND THEIR METABOLIC DIVERSITY USING BIOLOG ECO PLATES

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Insect frass**,** a major residual stream from *entomoculture* for food and feed, holds the potential as a soil amendment. Insect frass-associated microbiota, is a diverse community of microorganisms thriving in insect excrement. If applied as bio-fertilizer, they could play a pivotal role in nutrient cycling, soil health, and plant-microbe interactions. This microbiome's composition is intricately modulated by the originating insect species, its dietary intake, and the frass's processing state (either raw or processed). The nuanced impact of these factors on the frass's functional contributions to plant vigor remains largely underexplored in scientific literature. To bridge this gap in understanding, we have designed the present study to elucidate the composition and functional capabilities of the microbiome associated with insect frass, evaluating its role in sustainable agriculture. We have collected insect frass samples from various sources and industrial treatments, such as raw frass and air-dried frass, different feedstocks, and diet sources, for this study. We extracted genomic DNA from the frass samples using the QIAGEN DNeasy Power Soil Pro Kit. We will be performing Amplicon sequencing to target the 16S-V4 region (bacterial) and ITS2 (fungal), using Biolog EcoPlates, we studied variations in carbon source utilization patterns in microbial metabolic profiles among insect frass derived from different insect sources and those subjected to varying diets. This highlights the impact of insect species and dietary variations on the functional potential of the frass-associated microbiome. No significant differences were observed between raw and dry treatments, suggesting that

the procedure methods do not substantially alter the metabolic diversity of the frass microbiome. Cricket exhibited the highest AWCD (average well color development) value among insect treatments, while in the diet treatments, OWDA (organic waste and drying agent) showed the highest AWCD. Mealworm has the highest Shannon diversity index, whereas in diet treatments we found PCFW (pre-consumer food waste) treatments have superior value. This research contributes to our understanding of the ecological significance of insect frass and its microbial inhabitants. By combining high-throughput sequencing with Biolog EcoPlate analyses, we offer a holistic view of the insect frass microbiome's taxonomic composition and metabolic potential. Insights gained from this study have implications for nutrient cycling, soil health, and agricultural practices, emphasizing the importance of considering the frass microbiome in broader ecological contexts. Ongoing research aims to delve deeper into specific microbial taxa and their functional roles, providing a foundation for sustainable ecosystem management strategies.

P1.16

FUNGAL COMMUNITIES SHIFTS IN CORN PRODUCTION SYSTEMS WITH VARIED COVER CROP AND NITROGEN FERTILIZER TREATMENTS

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Cover cropping (CC) is proposed to augment soil microbial diversity and activity, which are critical components of soil health. This is due to the pivotal role of soil microbial communities in driving essential biogeochemical processes. Moreover, the diversity within these communities are sensitive to agricultural management practices, potentially resulting variations in ecosystem functionality. Especially, different CC species on fungal groups varies, underlining the intricate relationship between CC and soil microbial ecology. We compared fungal community compositions of bulk soils differing by cover crop and N fertilizer treatments. Our three-year study employs a strip plot design across two distinct locations—Starkville and Newton—to rigorously assess the effects of various cover crops (ryegrass, balansa clover, red clover, radish, and cover-crop mixes) and nitrogen levels (0 lb. and 100 lb.). In our study, we employed Illumina amplicon sequencing to assess the impact of cover crop (CC) and nitrogen (N) fertilizer treatments on fungal assemblages. Alpha diversity results revealed that neither CC's nor N fertilizer treatments significantly influenced the diversity within fungal communities. However, in terms of beta diversity, we observed notable distinctions, with significant clustering evident across different locations and in response to various cover crop treatments. Predominant fungal phyla identified in both locations included *Ascomycota* (~90%), *Basidiomycota, Rozellomycota, Chytridiomycota, and Mortierellomycota*, each constituting around 1%. Notably, these phyla exhibited significant across cover crop plots. Overall, our preliminary findings indicate that while fungal alpha diversity remained unaffected, beta diversity and the abundance of major fungal phyla were significantly influenced by both cover crop and N fertilizer treatments.

P1.17

ASSESSING THE X-RAY RADIOLOGICAL IMPACT ON LOROPETALUM GALL

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Loropetalum, *Loropetalum chinense* (R. Br.) Oliv., is a popular landscape plant, but it can be infected by the gram-negative bacteria *Pseudomonas amygdali* pv *loropetali* pv. nov. Bacterial diseases are difficult to control, and this particular bacteria usually leads to the disposal of the plant, resulting in economic losses for the nursery. These bacteria are causing galls on loropetalum which can cause stem girdling leading to reduced growth and possibly death of the plant. The bacteria will infect the plant if it can permeate through a cut or wound in the bark. This creates a major avenue for disease transmission when propagating from cuttings if cuttings are taken from infected plants. It is important that nurseries use proper sanitation steps to reduce the number of infested plants. One of the best ways to begin those sanitation steps is to start with clean-cutting material. With growing public concerns about chemical pesticides and their residues, irradiation is becoming a viable alternative and an effective nonchemical treatment for the control of several pathogens. Sanitation via irradiation is not a new concept. Lab equipment and medical equipment and devices are sanitized via irradiation (usually gamma) regularly. Many fruits, vegetables, and other foodstuffs are also irradiated, especially ones traveling into ports, to help control invasive pests the products could be harboring. Studies have shown successful results when gamma irradiation was applied to *Pseudomonas* spp., therefore we hypothesize that x-ray irradiation could eliminate *P. amygdali* pv. *loropetali*. Bacteria were subjected to six levels of x-ray irradiation 0, 0.5, 1, 1.5, 2, 2.5 kGy (0, 500, 1000, 1500, 2000, 2500 Gy). Initial results showed that x-ray treatment to pure bacteria strains resulted in significant bacterial reduction at all levels, with complete inactivity being observed in the 1.5, 2, and 2.5 kGy (1500, 2000, and 2500 Gy) treatments. With these findings, further studies are being conducted to

determine the application of radiation's ability to clean up infected loropetalum plant material.

P1.18

ASSESSING DROUGHT RESPONSES OF SOUTH MISSISSIPPI GROWN BUNCH GRAPES

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Despite a growing interest among local growers, the production of high-quality bunch grapes in Mississippi faces significant challenges attributed to the difficult climate and diseases. The limited understanding of plant stress adaptation in the region also raises concerns about sustainability. Thus, identifying resilient grape cultivars becomes imperative in overcoming these obstacles. To tackle these issues and enhance production potential, this study assessed the drought tolerance of southern bunch grape cultivars. The research took place at the Mississippi Agricultural and Forestry Experiment Station South Mississippi Branch in Poplarville, Mississippi from late May to early September in 2023. The experiment was arranged as a randomized complete block design of nine interspecific hybrid bunch grape cultivars or selections: 'Ambulo Blanc'. 'Black Spanish', 'Blanc du Bois', 'Lomanto', 'MidSouth', 'Miss Blanc', 'Muench', OK392, and 'Victoria Red'. Data collection included the monitoring of weather and phenological events. Additionally, measurements were taken of stomatal density, water loss, stomatal conductance, transpiration, vapor pressure deficit, and chlorophyll fluorescence in grapevine leaves both in the field and from collected 2.54 cm leaf disks that underwent a 4-hour drought simulation. 'Miss Blanc' and OK392 had the highest stomatal density, while 'Black Spanish' had the lowest. Monthly outdoor measurements displayed no differences between cultivars in stomatal conductance, transpiration, vapor pressure deficit, or chlorophyll fluorescence. During the initial round of the drought treatment, 'Lomanto' experienced the most water loss and 'Victoria Red' experienced the least. 'Muench', 'Lomanto', and 'Black Spanish' exhibited the highest stomatal conductance and transpiration. In contrast, 'Blanc du Bois' displayed the lowest stomatal conductance, and it had the highest vapor pressure deficit, with 'Muench' registering the lowest. Moving to the second round, 'Muench', 'MidSouth', and 'Lomanto' experienced the highest water loss, while 'Ambulo Blanc' and 'Victoria Red' experienced the least. 'MidSouth' demonstrated the highest stomatal conductance and transpiration, whereas OK392 showed the lowest, but OK392 displayed the highest fluorescence, while 'Lomanto', 'MidSouth', and 'Black Spanish' had the lowest values. In the third round, 'Miss Blanc' recorded the highest vapor pressure deficit, with 'Black Spanish', 'Victoria Red', 'Muench', and 'MidSouth' having the lowest. Additionally, OK392, 'Muench', and 'Victoria Red' exhibited the highest fluorescence, contrasting with 'Blanc du Bois', which showed the lowest. Finally, in the fourth round, 'MidSouth' and 'Lomanto' experienced the most water loss and 'Ambulo Blanc' experienced the least. 'Muench', 'Black Spanish', and 'Lomanto' maintained the highest stomatal conductance and transpiration, with OK392 recording the lowest, and 'Ambulo Blanc' exhibited the highest vapor pressure deficit, while 'Muench' displayed the lowest. In the first year of this study, despite individual variations in gas exchange measurements, the overarching observation was that most cultivars tended to exhibit similar trends within each round of drought, contributing valuable insights into the complex dynamics of grapevine responses to water stress conditions.

P1.19

EVALUATION OF PLANT GROWTH REGULATORS ON SWEET POTATO SLIP PROPAGATION

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The production cycle of sweet potato involves several phases presenting unique challenges, notably during the transplanted slip stage. Sweet potato slips, used for asexual propagation, often exhibit non-uniform characteristics, leading to difficulties during transplanting. Additionally, the transition from greenhouse conditions to the field environment poses environmental risks and wilting, resulting in low transplant survival rates. High slip mortality rates present economic and logistical problems to producers. Several Plant Growth Regulators, PGRs, have been documented to cause lignification or thickening of cell walls and can mediate environmental stresses in other crops, but have not been studied its effects when it comes to their application in sweet potatoes slips. Therefore, the current study at Mississippi State University involves three greenhouse trials with the primary goal of identifying the most effective PGR types and concentrations to enhance sweet potato slip quality and improve transplant establishment rates. Experiment 1 involves a randomized complete block design testing multiple PGR types and concentrations on sweet potao slips. Measurements such as plant height, stem diameter, number of nodes, SPAD, leaf area, and water content were collected and compared to a control group to determine the effects of PGRs on the plants. These experiments aim to contribute to our understanding of the effects of PGRs on sweet potato slip quality, enhance sweet potato production, and reduce losses associated with low slip survival rates.

P1.20

RESPONSE OF DIFFERENT RASPBERRY CULTIVARS TO MISSISSIPPI CLIMATIC CONDITIONS

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Raspberry is an important fruit crop commercially grown in all temperate regions around the world and the demand for raspberries has been steadily increasing in recent years due to their perceived health benefits. Although cooler summer temperatures and mild winters are ideal for raspberries, newer cultivars have made it possible for them to survive warmer temperatures and increased sunlight. This has prompted local Mississippi growers to explore raspberry cultivation. However, there lacks research-based recommendations on raspberry cultivars suitable for Mississippi's climate. The objective of this study was to evaluate raspberry cultivars in terms of plant growth, heat and cold tolerance, pest and disease resistance, berry yield, quality, and fruiting season to identify the best-suited cultivars for Mississippi. The study was conducted at Mississippi State University, North Farm in Starkville, MS. It followed a randomized complete block design with two types of fertilizer and involved 26 raspberry cultivars. Environmental conditions, planting, and maintenance practices were meticulously recorded. Data collection included measurements of plant growth, photosynthetic rate, berry yield and berry quality. The results show that raspberry yield was influenced by fertilizer treatment and cultivar. The fruit size, soluble solid contents, juice pH, and fruit color were not influenced by fertilizer treatment. Notably, early-season fruit weight was higher for “BP1”, “Himbo”, “Prelude”, and “Joan” under conventional fertilizer, while “Fall Gold” and “Heritage” under organic fertilizer had lower early-season fruit weight. In the late season, “Himbo” and “Caroline” under conventional fertilizer had the highest average single berry weight, and “Encore” and “Prelude” had the largest fruit numbers. The fruit's soluble solid content was highest in “Heritage”, indicating a sweeter taste, and the pH remained consistent across treatments. Fruit color varied between cultivars, with differences in lightness, redness, and yellow coloration. This ongoing experiment aims to provide valuable insights into the selection of raspberry cultivars for Mississippi growers. Further analysis will offer more conclusive results to assist local growers in diversifying their crop profiles and enhancing farm incomes.

P1.21

ANALYSIS OF SYSTEMIC ACQUIRED RESISTANCE BY MONITORING REDOX-MEDIATED TRANSCRIPTIONAL DYNAMICS IN ARABIDOPSIS

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In plants, systemic acquired resistance (SAR) provides long-lasting, broad-spectrum protection against pathogens through a priming mechanism involving redox and phytohormonal signaling. However, there is limited knowledge regarding transcriptional dynamics during SAR onset and the redox involvement in SAR maintenance. Our previous work has identified several key genes to understand the regulatory dynamics of SAR onset. Here we investigate these dynamics by analyzing the transcriptional activity of *GRXS13* (Glutaredoxins, At1g03850), a disease resistance-related CC-type GRX strongly inducible by SA. To track these dynamics, we fused a luciferase reporter gene tothe promoter region of *GRXS13* by gateway cloning. We transformed *A. thaliana* wild-type Columbia ecotype (Col-0) and the SAR-defective *top2* mutant plants with this *GRXS13* reporter construct using *Agrobacterium*-mediated floral dip transformation. We infiltrated T1 generation plants with *Pseudomonas syringae* pv. tomato DC3000 expressing avrRpt2 to prompt SAR. Promotor transcriptional activity was then tracked by monitoring bioluminescence at two-hour intervals after infection for four days in 12 h light and 12 h dark diurnal cycles. We observed oscillatory dynamics of the *GRXS13* expression in planta during SAR onset and compared it with the transcriptional response of SAR driver genes previously identified. Comparative analysis of *GRXS13* dynamics in Col-0 and the *top2* mutant provides insights into how dysregulated redox signaling affects SAR onset. In the future, we plan to analyze the transcriptional dynamics of a larger set of SAR marker genes to further understand the role of redox signaling in plant immunity.

P1.22

EFFECTS OF FIRE ON SEEDLING EMERGENCE IN OAK WOODLANDS IN NORTHERN MISSISSIPPI

Javen Allen[1, 2]

[1]McNair Scholar, [2]Jackson Heart Study Scholar

Fire is a significant ecological process that shapes the structure of woodland ecosystems. This study investigated the effects of controlled fires on seedling emergence in restored and unrestored oak woodlands in northern Mississippi. The study examined whether fire promoted seedling establishment and emergence and thus the potential for restoring fire-adapted vegetation at sites that have had a long history of fire suppression. To observe seedling emergence, four experimental plots were observed over time as two of the four plots were subjected to treatment via prescribed burning. The other two plots were used as control plots to compare the four.

The findings in this experiment suggest that fire had a significant effect on seedling emergence in oak woodlands. At all four sites, burning alone increased the amount of exposed bare ground without reducing vegetation cover compared to unburned controls. The addition of a pre-emergent herbicide to one-half of the burned plots, however, reduced the percent cover of vegetation. Given that the pre-emergent herbicide had little effect on established plants, the differences in vegetation cover between burned plots that had received the pre-emergent herbicide and those that had not was most likely due to suppression of fire-stimulated seedling emergence by the herbicide. Fire stimulated seedling emergence may be attributed to increased sunlight availability, reduced competition, and enhanced germination cues triggered by fire.

Understanding the effects of fire on seedling emergence in oak woodlands is crucial for informing land management strategies and conservation efforts. This study contributes to existing knowledge by highlighting the potential benefits of prescribed burning in restoring oak woodlands and facilitating seedling establishment. These findings can aid in developing effective fire management plans to enhance the ecological biodiversity of oak woodlands in northern Mississippi and similar regions.

P1.23

A PRELIMINARY SURVEY OF PEST AND BENEFICIAL INSECTS IMPACTING SMALL FARMS IN MISSISSIPPI

Morgan Gaspard, Daniel Collins

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Small farmers in the southern region of the U.S. face serious challenges in been substantial. Socially disadvantaged small farmers are more vulnerable to losses due to lack of Integrated Pest Management (IPM) knowledge, limited resources, and challenging circumstances for managing plant pests. Typically, most IPM projects have focused on large farms. This is a unique project in that it addresses Small Farm IPM. Information is needed on the pest and beneficial insects impacting small farms in order to develop effective research, extension, and educational programs to address small farmers integrated pest management needs and concerns. A preliminary plant pest survey was conducted on six farms in southwest and central Mississippi to document the various pests and beneficial insects found on small farms. Seven small farms were surveyed in Adams, Claiborne, Hinds, Forest and Pearl River counties Mississippi and East Baton Rouge Parish, Louisiana. A variety of insect pest were identified on vegetable crops including stink bugs, aphids, tomato hornworms, army worms, squash bugs, and leaf-footed bugs, Beneficial insects identified were ladybug beetles, assassin bugs, predatory wasps, and a variety of bees. Future research will include a detailed statewide survey of both pests and beneficial insects impacting underserved small farmers in Mississippi.

P1.24

A PRELIMINARY SURVEY OF PLANT DISEASES IMPACTING SMALL FARMS IN MISSISSIPPI

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Small farmers in the southern region of the U.S. face serious challenges in managing plant diseases, weeds, and insects in crops and forest ecosystems. 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. Socially disadvantaged small farmers are more vulnerable to losses due to lack of Integrated Pest Management (IPM) knowledge, limited resources, and challenging circumstances for managing plant pests. Typically, most IPM projects have focused on large farms. This is a unique project in that it addresses Small Farm IPM. Information is needed on the important plant diseases and casual agents impacting small farms in order to develop effective research, extension, and educational programs to address small farmers integrated pest management needs and concerns. A preliminary plant disease survey was conducted on six farms in southwest and central Mississippi to document the various plant pathogens impacting small farms. Seven small farms were surveyed in Adams, Claiborne, Hinds, Forest, and Pearl River counties June-July 2023. A wide variety of fungal plant diseases were identified such as southern blight, early blight, cercospora leaf spot on squash. Bacterial diseases identified included fire blight on pears, bacterial leaf spot on peppers, and pierce's disease on muscadine grapes. Over 30 fungal morphotypes were isolated and these cultures will be sent for DNA identification. Future research will include a statewide plant disease survey of underserved small farmers fruit and vegetable crops in Mississippi.

P1.25

ELEMENTAL ANALYSIS OF HEIRLOOM AND HYBRID TOMATO VARIETIES FOR HYPERKALEMIC AND HYPERNATREMIC PATIENTS ON RESTRICTIVE DIETS

Addie Jolly, Jameson Cook, Alana Latorre, Selah Roberts, Gracie Bassett, Ashley Carter, Mitchel Creel, ArKayla Martin, Stephen Mills, Analee Rios, Sohal Sukhbir, Hinaben Patanvadia, Harsh Patel, Anuradha Ragila, Pinalba Zala, Nilay Kantibhai Zalavadiya, Trent Selby, and Scoty

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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 or hypernatremic follow restrictive diets that reduce potassium or 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 34 different 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. In future studies, we will hydroponically cultivate the select varieties found in this study to further reduce potassium and sodium levels without reducing other essential elements.

P1.26

DEVELOPING EFFICIENT BIOTECHNOLOGICAL APPROACHES FOR SWEET POTATO VIRUS DETECTION AND REMOVAL

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As a member of *Convolvulaceae* family, sweet potato (*Ipomoea batatas* L.) is an important crop for food security. As one of the top three vegetable crops grown in Mississippi, one major limitation to sweet potato production is the cumulative effect of virus infection leading to cultivar decline and yield losses. In this study, we have developed nucleic acid-based polymerase chain reaction (PCR) and reverse-transcription PCR (RT-PCR) techniques to detect the infection of five of the most prevalent viruses in the USA, which showed high sensitivity and confirmation at the genomic level of viral species and strains. To produce virus-tested sweet potato seedlings, we developed meristem-tip culture technology combined with heat treatment to provide farmers with healthy propagating materials that are free of detectable viruses. In this study, totally 8 lines of sweet potato have been collected and processed for virus removal. Primers targeting to conserved regions of the know sweet potato viruses were used for this nucleic acid-based detection. The virus detection and virus removal protocols were optimized in this study. The optimized protocols will work for the purpose of viral detection and eradicating from elite sweet potato lines in Mississippi. Virus-free planting material has been delivered and will be propagated in Agriculture Research Station of Alcorn State University at Preston, Mississippi for performance evaluation.

P1.27

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

Jameson Cook, Alana Latorre, Selah Roberts, Gracie Bassett, Ashley Carter, Mitchel Creel, Addie Jolly, ArKayla Martin, Stephen Mills, Analee Rios, Sohal Sukhbir, Hinaben Patanvadia, Harsh Patel, Anuradha Ragila, Pinalba Zala, Nilay Kantibhai Zalavadiya, Trent Selby, and Scoty Hearst

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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 37 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.

P1.28

SUB-OPTIMAL WATER LEVELS CAN IMPEDE THE GROWTH AND DEVELOPMENT OF *Centella asiatica* (L.)

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Centella asiatica (L.) is a medicinally important plant with wound healing, anti-inflammatory, and cognitive functions. Apart from being used in the cosmetic industry, the plant is a leafy vegetable in southeast Asia. Since the crop is native to wetland and marshy areas, sub-optimal water levels can affect plant growth and development. The current study was carried out to understand the effect of sub-optimal water levels on physiology and growth properties of *Centella* using a mini-hoop house structure in two sets. In each set, pots (23 cm height × 31 cm diameter) with established plants were exposed to four moisture levels at 100% (control), 80%, 60%, and 40% throughout the growth period. The leaf growth, physiology, and plant biomass were found to have significant changes in response to the applied moisture levels. The sets significantly differed in the petiole length, leaf area, and marketable dry weight. Across the sets, a drastic reduction in stomatal conductance was observed under moisture-

limited conditions, causing an 88% decline under 40% moisture level compared to the control. These resulted in the upbringing of canopy temperature in water-stressed pots. The leaf level photosynthesis was linearly associated with soil moisture levels (R^2= 0.96), resulting in a 69% reduction under 40% moisture level over control. These culminated in a reduction of plant biomass accumulation from 0.64 (control) to 0.26 (40%) kg m^{-2} dry weight in the first set and 0.57 (control) to 0.28 (40%) kg m^{-2} dry weight in the second set. Under 80% moisture level, the fresh weight of the above-ground biomass was 3 kg m^{-2}, 54% lower than the control (5.5 kg m^{-2}), and drastically reduced to 1 kg m^{-2} under 40% moisture level. Across the sets, the leaf area and petiole length declined upon increasing moisture stress with a reduction of 19% and 34%, respectively, under 40% moisture level as compared to control. Thus, adequate water availability is critical to the successful biomass production of *Centella*.

P1.29

CHANGES IN SOIL AGGREGATE STABILITY AND ASSOCIATED FACTORS FOLLOWING COVER CROP MANAGEMENT IN NORTHEASTERN MISSISSIPPI

Wei Dai[1, 2], Gray Feng[1], Yanbo Huang[1], Ardeshir Adeli[1], Johnie N. Jenkins[1]

[1]USDA-ARS, Genetics and Sustainable Agricultural Research Unit, [2]ORISE Postdoctoral Research Fellow, USA

Soil aggregates are the fundamental units of soil structure, and soil aggregate stability has a positive influence on improving soil porosity, water holding capacity, permeability, and reducing soil erosion. We investigated the effects of various cover crops on soil aggregate stability indices [mean weight diameter (MWD, mm), water-stable aggregates greater than 0.25 mm ($WSA_{>0.25}$, %), and soil erodibility factor (K factor)] and their relationship to environmental factors in Marietta silt loam upland soil under a corn-cotton cropping system. A field experiment was conducted from 2019 through 2022 in the R. R. Foil Plant Science Research Center, Northeastern Mississippi with the cover crop treatments including elbon rye (*Secale cereale* L.), daikon radish (*Raphanus sativus ssp. acanthiformis*), Austrian winter field peas (*Lathyrus hirsutus*), and a mixture of the three-cover crop species. Soil samples were collected from depths of 0-5 cm and 5-10 cm in the spring of 2022 after planting three years of those cover crops. The samples were wet-sieved to five classes of aggregates with different sizes (> 2, 2-1, 1-0.5, 0.5-0.25, and < 0.25 mm). The values of MWD, $WSA_{>0.25}$, and K factor at 0-10 cm depth ranged from 0.26 to 0.58 mm, 21.98 to 49.05%, and 0.13 to 0.18, respectively, in all treatments. Among cover crops selected for this study, rye displayed the greatest values for MWD (0.58 mm) across all treatments and soil depths. The $WSA_{>0.25}$ value of peas was significantly ($p < 0.05$) higher by 68.61% compared to the no cover crop treatments at 0-5 cm depth, while the K factor did not change significantly. The MWD, $WSA_{>0.25}$, and K factor were significantly ($p < 0.05$) correlated with soil organic carbon, pH, bulk density, phosphorus, potassium, and calcium. The dominant factors driving changes in these stability indices were pH and bulk density. In conclusion, these results suggested that cover crops, such as rye and peas, were beneficial to the stability of soil aggregates. This study provided a basis for understanding the mechanisms of soil stabilization in crop management systems.

P1.30

EFFECTS OF COVER CROPS AND POULTRY LITTER ON SOIL STRUCTURAL STABILITY IN UPLAND SOIL

Wei Dai[1, 2], Gray Feng[1], Yanbo Huang[1], Haile Tewolde[1], Mark W. Shankle[3, 4]

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Soil structure regulates soil function and can be impacted by agricultural management practices such as no-till, cover crops, and organic fertilizer use. This study explored the efficacy of multiple soil aggregate indices in quantifying soil structural development, utilizing five-year field experiment data from the Pontotoc Ridge-Flatwoods Branch Experiment Station in Pontotoc County, MS. The experiment had a split-plot design with cover crops [native vegetation (control), cerealrye (*Secale cereale;* R), winter wheat (*Triticum aestivum*; W), hairy vetch (*Viciavillosa*; V), and mustard (*Brassica rapa*) plus cereal rye (M+R)] as the main factor and with fertilizer source [no fertilizer (control), inorganic fertilizer (phosphorus, potassium, and elemental sulfur; Fert), and poultry litter (PL)] as the second factor. Soil aggregate size fractions were obtained using the wet-sieving method in the laboratory, and aggregate stability index (ASI), mean weight diameter (MWD),geometric mean diameter (GMD), and fractal dimension (FD) were calculated to assess soil aggregation using linear regression and principal component analysis(PCA). Results showed that the adoption of M+R crops for five years significantly ($p< 0.05$) increased soil organic carbon by 15.04% and 14.65% compared to NV and W, respectively, and the application of PL substantially ($p < 0.05$) increased soil organic carbon by 15.91% compared to the control. While the addition of cover crops and fertilization did not result in differences in ASI, MWD, GMD, and FD. The PCA exhibited clear effects of PL on aggregate structure and stability, demonstrating that the application of PL could compensate for the cover crop practices in maintaining and improving soil structure stability. The result of linear regression showed that ASI,MWD, and GMD were positively ($p <$

0.05) correlated with soil organic carbon, suggesting an increase in ASI, MWD, and GMD associated with increasing SOC. The FD was negatively ($p < 0.05$) correlated with MWD, GWD, and ASI. Also, the PCA revealed that FD decreased with increasing SOC, ASI, MWD, and GMD, suggesting that lower FD values indicate enhanced soil aggregation and structure. Collectively, the assessed indices, FD included, prove effective in gauging soil aggregation and structural stability. These metrics should be given additional consideration in managerial decisions to support soil productivity and agricultural sustainability.

P1.31

SOYBEAN YIELD RESPONSE TO MICRONUTRIENTS APPLICATION IN THE MISSISSIPPI DELTA

Ammar Bhandari, Tulsi Kharel

USDA-ARS, Stoneville, MS

Weather, fertilizer application, irrigation, and other management practices affect soybean (Glycine max) growth and yield. Soybean can be grown successfully in dryland and irrigated systems, and applying micro-nutrients might help increase yield in both production systems. The study aimed to determine the micronutrient effect on soybean yield in dryland and irrigated production systems. The experiment design was a split-plot design with four replications, where irrigation was whole plots and fertilizer treatment was subplots. 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), (ii) iron (Fe), (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 was planted on April 18, 2023. The micronutrients (Zn and Fe) were split into two applications. The first foliar application was 48 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 middle four rows were harvested using 8XP two row Combine for soybean yield. The average moisture was 12.5 %. Under the dryland production system, the half-dose Zn and Zn+Fe foliar application slightly increased the soybean yield compared to the control but was not statistically significant. Likewise, the full dose application, Zn, Fe, and Zn+Fe, slightly decreased the soybean yield compared to the control but were not statistically different. Under an irrigated production system, the half dose of Zn, Fe, and Zn + Fe application resulted in a similar soybean yield as the control. In the full dose application, the soybean yield was higher in control compared to Zn, Fe, and Zn + Fe treatments. However, only the Zn+Fe treatment yielded a significantly lower yield than the control, indicating that the full dose of Fe and Zn may be unnecessary under irrigated production systems. More research and multiple years of data are required to quantify the relationship between Zn and Fe micronutrient application and soybean yield under dryland and irrigated production systems in MS-Delta.

P1.32

CHARACTERIZING SEED COMPOSITION AND SEED QUALITY IN HEAT TOLERANT SOYBEAN IN THE SOUTHEAST UNITED STATES

Nacer Bellaloui[1], James Smith[1], Jeff Ray[1], Alemu Mengistu[2]

[1]USDA-ARS, Stoneville MS., [2]USDA-ARS, Jackson, TN.

High heat in the Early Soybean Production System (ESPS) is a major environmental stress factor, resulting in yield loss and poor seed quality, lower quality of seed composition constituents (nutrients) in heat sensitive soybeans, lower market grade, and reduction in the quality of soy meal and oil. To our knowledge, there are no commercial soybean cultivars that are heat-tolerant and have high levels of economically important seed constituents (seed protein, oil, and minerals) and quality components (reduced seed damage). Therefore, developing improved heat tolerant germplasm with high seed composition and quality is essential. The research was conducted at the USDA ARS Jamie Whitten Delta States Research Center at Stoneville, MS. The field trial was conducted using multiple cultivars and a recombinant inbred line (RIL) population derived from the cross DS25-1 (heat tolerant) x DT97-4290 (high yield and heat sensitive), planted in the field in 2018 and 2019. These RILs, segregating for tolerance to heat-induced seed damage, were phenotyped for seed composition and seed quality (seed germination and seed damage) traits, which in the past were shown to be associated with high heat. Results of the seed composition constituents showed significant variability among the RILs, the cultivars, and the parents. Significant variability was also observed among genotypes for mold, accelerated aging germination and hard seed, green seed damage, seed wrinkling, and purple seed stain. The release of heat-tolerant breeding lines in the future will be used by public and private breeders to develop improved cultivars which, when adopted by Mississippi producers, will be valuable for enabling producers to more effectively compete in soybean markets, both nationally and internationally. This presentation will discuss the physiological and genetic components of seed composition and seed quality.

P1.33

DETERMINING FIELD TRAFFICABILITY AND WORKABILITY IN SPRING FOR MISSISSIPPI AGRICULTURAL SOILS

Gary Feng[1], Yanbo Huang[1], Dennis Reginelli [2]

[1] USDA-ARS, [2] Mississippi Soybean Promotion Board

The challenge that Mississippi growers have to face is they have very limited window of field operation in spring after wet winter season. Planting is often delay due to

inaccessible wet fields in spring, growers are also forced to apply manure in fall though they know the nutrients could be washed away during rain season in winter. Soil compaction is a long-recognized soil sustainability threat worldwide. Soils are more susceptible to compaction when moist, because soil strength increases as soil dry. Trafficability is the capability of a soil to support traffic without wheel slippage and compaction, which is limited mostly by excessive moisture. Workability is the capability of the soil to be worked by tillage to achieve a specific goal, occurring optimally between some upper and lower soil moisture threshold, since soils can be either too wet or too dry for ideal workability. The objective of this research was to determine time-to-trafficability, shallow workability, and when a soil is conducive to traffic for field operation such as tillage, fertilization, and planting. APEX and SSURGO data were employed to obtain the field capacity at the soil surface (0-10 cm), threshold of field capacity defined for trafficability, and soil texture plasticity index (an indicator of compaction risk). Trafficability is defined as a threshold of 90-99.5% field capacity at the soil surface (0-10 cm). The lowest plasticity index was found for sands, while silty clays have the greatest plasticity index. Soil moisture was dried down from drainage, highlighting subsurface drainage tiles played a vital role for field trafficability and workability. Model derived estimates can inform agricultural field operation timing decisions and subsequent risk of soil compaction.

P1.34

HOW SAFE ARE ORGANIC FERTILIZERS- A RADIOACTIVITY ASSESSMENT STUDY

C. Dominic James, Jermiah Billa, John Adjaye

Alcorn State University, Lorman, MS

Living Organisms are continuously exposed to radiation due to their dependance on water and soil-based resources for their survival. Soils consists of Naturally Occurring Radioactive Materials (NORM) and depending on the geographical location, NORM concentrations vary across the globe. Lately, there is an appealing interest in organic farming due to its ability to produce farm products without usage of pesticides and industrial fertilizers. Though organic fertilizers are considered safer, factors such as location, depth, and presence of any man-made activities (such as industries) may result in presence of radioactivity in organic fertilizers. In this context, a pilot study on organic fertilizers was conducted. At least 15 organic fertilizers (cow manure~ 1 kg each) was collected from a local organic farming pit (located in Fayette, Mississippi) and tested for presence radioactivity. A 35% relative efficient Solid-State Detector (High Purity Germanium Detector) was used to conduct radioactivity analyses. Results from this study suggests, presence of few NORM isotopes and more interestingly trace quantities of Cs-137 (a man-made isotope, released during fission process) were detected. Presented results include radioactivity concentrations of various radioisotopes detected in this study and their activity concentrations. Based on the results, it is concluded that location of pit, depth, and impact of local nuclear plant may have resulted in presence of some of the radioisotopes detected in this study.

Thursday, February 29, 2024

EVENING

3:30 DODGEN LECTURE /AWARDS CEREMONY

THEATER

5:00 GENERAL POSTER SESSION

(immediately following Dodgen Event)

Friday, March 1, 2024

MORNING

Room TC 214

8:00 Welcome and Opening Remarks

O1.15

8:15 CHARACTERIZATION OF FUNGI INHABITING SQUASH (Cucurbita spp.) PLANTS IN SOUTHWEST MISSISSIPPI

Ariel Fritzgerald, Frank Mrema, Daniel Collins, Franklin Chukwuma, Tahir Rashid

Alcorn State University, Lorman, MS

Squash (Cucurbita spp.) is an economically significant crop due to its nutritional value, economic importance, and its function in addressing food insecurity among socially disadvantaged small farmers (SDSF). Small-scale farmers in the southern region of the U.S. face challenges in controlling diseases, weeds, and insects in specialty crops and forest ecosystems. The objective of this study was to depict the fungi inhabiting squash plants. Eighteen morpho-types strains isolated from squash were investigated for extracellular enzyme production (Laccase and Cellulase). For the Bavendamn reaction test, 0.1% Guaiacol was added to the media, and for Cellulase, 0.1% cellulose powder was included in the media and examined seven days post-inoculation. Among the 18 fungal strains characterized, 22% displayed a strongly positive Bavendamn reaction, indicating their ability to degrade the outer cell layer of squash and penetrate plant tissues. Interestingly, many fungal strains (39%) produced cellulase enzyme, with two strains showing significant enzyme as evidenced by the cleared area beneath the mycelia. Fungal Strains A and B showed higher amounts of Laccase and cellulase enzymes and thus tested on juvenile squash seedlings. Tissue decay on the challenged squash seedlings was observed on day 8 and 10, caused by fungal strain A and B, respectively, indicating distinct infection mechanisms. All seedlings challenged by Strains A and B had perished by day 12 and 15, respectively, underscoring their aggressive nature as squash fungal pathogens. More studies are required to investigate

different IPM approaches to control pathogenic fungi in squash plants.

O1.16

8:30 ARABIDOPSIS DEFENSE GENE PR2 EXPRESSION AGAINST THE *Pseudomonas syringae* INFECTION

Fredrick Banks[1], Ye Xia[2], Chunquan Zhang[1], Victor Njiti[1], Yan Meng[1]

[1]Alcorn State University, Lorman, MS, [2]Ohio State University, Columbus, OH

Arabidopsis thaliana serves as a model plant for studying gene functions involved in plant growth and defense. One of the most common plant bacterial pathogens known as *Pseudomonas syringae* can cause the development of bacterial speck on Arabidopsis and many other plant species and thus leading great yield losses. To evaluate plant defense response against the *Pseudomonas syringae* infection, we used real-time PCR to identify and confirm the defense related genes which are differently regulated upon this pathogen infections. The Psu DC3000 cells were grown on the King's B plate with rifampin as the selective antibiotic. The fresh bacterial cells grown on plates were collected and diluted in 10 mM MgCl2. For the pathogen inoculation assay, bacterial broth with the concentration of 1×10^5 CFU (colony forming unit)/mL (OD600 = 0.0002) in 10 mM MgCl2 were infiltrated into the abaxial side of the four-week-old *Arabidopsis* leaves using the 1 mL syringe. Three leaf discs for each technical replicate were collected. For each treatment, six technical replicates were applied. Each biological replicate was calculated as a single data point. Multiple independent biological replicates were used to calculate the mean, SD, and significant differences. Using Real-Time PCR, relative transcript levels of defense gene PR2 (Pathogenesis-related proteins 2) in treated *Arabidopsis* plants response to *Pseudomonas Syringae* infection and control leaves (CK) of *Arabidopsis* were assayed. Our results showed that the expression of defense gene PR2 was significantly upregulated in *Arabidopsis* plants upon this bacterial pathogen infection.

O1.17

8:45 *in vitro* PROPAGATION OF AFRICAN VIOLET (Saintpaulia ionantha H. Wendl.)

Alpha Jones, Fredrekis Banks, Saniyah Malone, Yan Meng

Alcorn State University, Lorman, MS

The global houseplant industry is a booming market and was valued at over $5.6 billion in 2021, in which the United States houseplant industry was worth $1.7 billion. The global ornamental plants market, which includes houseplants, is expected to reach $27.1 billion by 2025, with a Compound Annual Growth Rate (CAGR) of 6.9%. African violet (*Saintpaulia ionantha* H. Wendl.) is a popular ornamental pot plant since the1960s, recent breeding has introduced lots of new cultivars with more flower and leaf colors and forms. African Violet is usually propagated vegetatively from leaf cuttings by many home gardeners; however, constrictions are imposed by the multiplicity of plantlets in a limited growing space, resulting in unsymmetrical plants with elongated sideways-displaced petioles. Propagation by tissue culture overcomes this problem and results in many well-formed, single-stemmed plants from a given amount of leaf tissue. In this study, we used leaf and petiole as explants, developed an efficient regeneration protocol for the direct induction of shoots, involved the use of a cytokinin like BA or KT in combination with an auxin like IAA or NAA, on a Murashige and Skoog basal medium. Rooting was induced from shoots directly, even in the absence of an auxin, yet a low concentration (0.5 mg/L) of NAA was significantly stimulate the roots growth. African violets acclimatize easily, performed with over 98% of survival rate after transferring to soil. The regeneration protocol developed in this study may also benefit the in vitro culture and conservation of wild species of *Saintpaulia*.

O1.18

9:00 LONG TERM APPLICATION OF ANIMAL AND FOREST WASTES ON A MUSCADINE VINEYARD RAISED ON HEAVY SOIL AND ITS EFFECT ON YIELD AND SOIL HEALTH

Amya N. Jackson[1], Girish K. Panicker[1], L.C. Kibet[2], Willie L Mims[1]

[1]Alcorn State University Lorman, MS, [2]Langston University, Langston, OK

Increased concern for environmental quality has stimulated farmers to accept organic farming as an alternative to conventional agriculture. Muscadine (*Vitis rotundifolia var*. Summit) was grown on Memphis Silt Loam soil (Typic Hapludalf, silty, mixed, thermic) since 1992 with NPK fertilizers. Three treatments of organic manures (cow-C; poultry-P; cow+poultry-CP) with gypsum and pine mulch were applied in a CRD in 2000 after a transition period of five years from 1996. Control received inorganic fertilizers and traditional cultural practices. Percent canopy cover and yield were higher in organic manure-treated plants. The diameter, length, and degree Brix of the fruit had no significant difference. Soil compaction was always higher in control with lower soil moisture content and the compaction was lower in organic treatment with higher levels of organic matter. Concentrations of nitrate-N and P were higher in the surface soil with organic manures, but there was no trend in N or P enrichment in lower layers of the soil. A comprehensive assessment of soil health by Cornell Soil Health Lab showed the following: physical aggregate stability 19.0 (25), biological organic matter 4.0 (85), biological ACE soil protein index 6.8 (43), biological soil respiration 0.8 (75), biological active carbon 747 (90) and chemical soil pH 7.1 (100) with an overall quality score of 72 (Excellent). The results suggest that the controlled application of animal and forest wastes in basins of fruit crops can be an agronomically and environmentally sound practice to increase yield and keep the soil and humans healthy.

O1.19

9:15 IMPACT OF HIGH NIGHT TEMPERATURE ON SOYBEAN PHYSIOLOGY AND YIELD PARAMETERS

Lekshmy V. Sankarapillai[1], Bikash Adhikari[1], Salliana R. Stetina[2], K. Raja Reddy[1], Raju Bheemanahalli[1]

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

Multiple independent reports and climate models indicate that minimum night-time temperatures are rising faster than maximum day-time temperatures both globally and regionally. This phenomenon significantly contributes to global warming and reduces the temperature gap between day and night. This can have a profound impact on soybean growth and development. However, our current understanding of the effects of high night temperatures (HNT) on soybean physiology, yield, and quality-related parameters is limited. Thus, the primary objective of this study was to investigate the physiological and agronomic responses of commercially available soybean cultivars to HNT during the reproductive stage. Seventeen soybean cultivars grown under normal growing conditions were exposed to control (24◦C) and HNT (28◦C) with a common daytime temperature of 32◦C from R2 till physiological maturity. Plants exposed to +4 ºC warmer night showed a significant decrease (79%) in stomatal conductance and transpiration rate (67%) due to the increase in canopy temperature. Moreover, cultivars exposed to HNT stress exhibited a 37% increase in the respiration rate compared to the control. Among all cultivars tested, the cultivar S49-F5X had the least increase in respiration and had a comparable photosynthetic rate on the following day compared to the control. Furthermore, seed yield and quality trade-offs in response to HNT will be discussed. These findings offer valuable insights into the physiological impact of HNT at the cultivar level.

O1.20

9:30 SOYBEAN RESPONSE TO EARLY-AND LATE-SEASON WATERLOGGING

Bikash Adhikari[1], Lekshmy V Sankara Pillai[1], Jagmandeep Dhillon[1], Krishna N. Reddy[2], K. Raja Reddy[1], Raju Bheemanahalli[1]

[1]Department of plant and Soil Sciences, Mississippi State University, Mississippi State, MS, [2]USDA-ARS, Crop Production Systems Research Unit, Stoneville, MS

Waterlogging (WL) significantly impacts seedlings' emergence, leading to poor growth performance. Moreover, WL can prevent plants from reaching their full genetic potential due to reduced soil oxygen availability. Understanding the resilience of crops to WL is important for ensuring sustainable soybean cultivation in an ever-changing climate. We hypothesize that soybean cultivars may have developed varying tolerance to WL, allowing them to survive and recover under WL conditions. However, there is limited research on cultivar-specific responses to WL stress at different developmental stages under field conditions. To address this gap, we exposed five soybean cultivars to 7 days of WL (7 WL) during the early vegetative and flowering stages, followed by a period of ten days of recovery (10 DOR). We recorded several morpho-physiological, pigment, yield, and quality traits during stress and after recovery. During the early and reproductive stages, all soybean cultivars experienced a significant reduction in stomatal conductance and transpiration rate at 7 WL, with minimal or no recovery observed at 10 DOR. The highest reduction in stomatal conductance and transpiration was observed in AG47XF2, with the least observed in LS5029XF. Additionally, LS5029XF also had the least reduction in shoot biomass at 7 WL and 10 DOR during the early seedling stage. However, during the reproductive stage, the highest biomass reduction was observed for P4604XFS followed by LS5029XF. Furthermore, waterlogging significantly impacted all yield traits during both growth stages. On average, the yield decline was significantly higher for cultivars experiencing WL at the reproductive stage (74% for pod number and 73% for seed weight) compared to the early seedling stage (65% for pod number and 71% for seed weight). During the early seedling stage, yield was reduced by 70%, while the reproductive stage experienced an 82% reduction. Although both stages were affected, the reproductive stage was more critical in determining yield. Priority should be given to introducing new genetic resources to enhance soybean resilience to WL.

O1.21

9:45 UNDERSTANDING THE C3 TO CAM PHOTOSYNTHESIS TRANSITION IN *Mesembryanthemum crystallinum*

Qijie Guan, Sixue Chen

University of Mississippi, Oxford, MS

Salt stress impedes plant growth and development, and leads to yield loss. *Mesembryanthemum crystallinum* has become a model to study plant photosynthetic responses to salt stress. It has an adaptive mechanism of shifting from C_3 photosynthesis to crassulacean acid metabolism (CAM) photosynthesis under salt stress, which greatly enhances water usage efficiency and stress tolerance. Exploring the mechanisms of this transition may improve water conservation and stress resilience of C_3 crops. We used transcriptomic and proteomics to profile molecular changes during the diel cycle of C_3 to CAM transition. In *M. crystallinum*, CAM photosynthesis was initiated after 6 days of salt treatment, the transition takes place within a 3-day period, and plants became mostly CAM in 2 weeks. The integrated omics results confirmed expected changes associated with CAM photosynthesis, starch biosynthesis and degradation, and glycolysis/gluconeogenesis. Transcripts displayed greater circadian regulation than proteins. Oxidative phosphorylation was crucial, with the inositol pathway, involving methylation and

phosphorylation, potentially initiating the transition. V-type ATPases showed consistent transcription regulation, aiding in vacuolar osmotic pressure maintenance. *ABI1*, a major component in the ABA signaling pathway, could be the trigger for the salt-induced transition, as it inhibits ABA-dependent stomatal closure. Our work highlights the pivotal role of ABA pathways in the C_3 to CAM shift.

10:00 Break

O1.22

10:15 IN-SEASON CORN YIELD PREDICTION USING UAV MULTISPECTRAL DATA AND EXPLAINABLE ARTIFICIAL INTELLIGENCE

Chandan Kumar[1], Jagman Dhillon[1], Krishna Reddy[2]

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

In-season crop yield prediction is crucial for agricultural management and food security. Conventional approaches of yield estimation are time- and cost-ineffective. Machine learning (ML) models coupled with remotely sensed data from different platforms have been successfully used to predict crop yields. ML models are often criticized due to their 'black box' nature, which makes it difficult to understand how they make predictions. This study develops explainable ML models to predict corn yield using multispectral data acquired using Unmanned Aerial Vehicle (UAV). Twenty-four different vegetation indices (VIs) were derived from two corn fields located in Starkville and Brooksville, Mississippi, at the vegetative stage (V6) to identify the most suitable VIs. Different Machine Learning (ML) algorithms such as K-Nearest Neighbor (KNN), Principal Component Regression (PCR), Random Forest (RF), Support Vector Machine (SVM), and Neural Networks (NN) and their ensembles were evaluated to develop an accurate and reliable yield prediction model. Simplified Chlorophyll Content Index (SCCCI), Transformed Chlorophyll Absorption Reflectance Index (TCARI), and Normalized Difference Red Edge Index (NDRE) were among the most suitable VIs in predicting corn yield. The ensemble of SVM, RF, and NN significantly achieved higher accuracy (R^2 = 0.84-0.86 and RMSE = 1.03-1.2 Mg/ha) than the individual ML models (R^2 = 0.65-0.67 and RMSE = 1.54-1.59 Mg/ha). Local and global methods of model explanation such as permutational variable importance, partial dependence profiles, ceteris paribus profiles, and residual plots were used to understand the performance of developed ML models.

O1.23

10:30 SINGLE-CELL TYPE SYSTEMS BIOLOGY OF GUARD CELL IMMUNITY

Sixue Chen

University of Mississippi, Oxford, MS

Human population is expected to reach 9 billion by 2050, and global crop productivity needs to increase by 70% to feed the growing population. Unfortunately, pathogen infection and other adverse environmental conditions have posed grand challenges to crop yield and food security. Stomatal pores are major entry points of bacteria pathogens. How stomatal guard cells respond to pathogen invasion and other environmental factors (e.g., rising CO_2 levels) is an important and interesting question. Recently, we have reported a new redox proteomics method called cysTMTRAQ that combines two types of isobaric tags, isobaric tag for relative and absolute quantification (iTRAQ) and cysteine tandem mass tag (cysTMT) in one experiment. The method not only enables simultaneous analysis of cysteine redox changes and total protein level changes, but also allows determination of bona fide redox modified cysteines in proteins through correction of protein turnover. This technology has recently been applied to discover potential redox proteins in stomatal guard cells in response to the flagellin's N-terminal domain's 22-aa peptide (flg22) of *Pseudomonas syringae* pv. tomato str. DC3000 (PstDC3000). Stomatal closure was observed within 5 minutes of the flg22 treatment and became significant after 15 minutes of treatment. Reactive oxygen species (ROS) levels increased throughout the time course of treatment, and reached the peak at 15 minutes. Based on these results, three time points (15, 30 and 60 minutes) were selected for the cysTMTRAQ experiments. A total of 2144 proteins were identified, 677 contained cysteines with cysTMT labels, and 57 showed significant redox changes ($q < 0.05$) after flg22 treatment. Here I report the functional characterization of a lipid transfer protein in in guard cell innate immunity. Future directions in signal crosstalk and data integration in the context of stomatal disease triangle will be discussed.

O1.24

10:45 COMPARING PLANTED LOBLOLLY AND LONGLEAF PINE SEEDLING SURVIVAL NEAR THE MISSISSIPPI NORTHERN HISTORICAL RANGE OF LONGLEAF PINE

Curtis VanderSchaaf

Mississippi State University, Starkville, MS

Historically, longleaf pine was more dominant on the landscape than loblolly pine in much of southern 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, longleaf 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 longleaf 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 longleaf was established on nearly a 6-acre area in central Mississippi south of Crystal Springs on the Mississippi Agricultural and Forestry Experiment Station (MAFES) Truck Crops Branch Experiment Station. This location roughly corresponds to the northerly historical range of longleaf pine in this region. The soil type is

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 on 16-foot planting centers with a single shank to a depth near 15 inches. Seedlings obtained from the ArborGen Selma, AL nursery ($210.00 per thousand) were hand planted in March of 2023. Both species were planted at 454 seedlings per acre using 16 feet between rows and 6 feet between seedlings within a row. A first-year chemical herbaceous weed control treatment was conducted in late April. 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. In addition, the lanes between the rows were mowed three times during the 2023 growing season.

A historical drought occurred during 2023 beginning in mid-July until at least the submission date of mid-November (still ongoing); essentially no precipitation occurred. Beyond that, from July 16 to September 26, the daily maximum temperature exceeded 90°F a total of 65 days, where the average maximum daily temperature was 95.03°F. Despite the correct planting depths for the loblolly pine seedlings (deep) and the longleaf pine seedlings (shallow), casual observation shows survival to be very poor. A formal survey will be conducted in mid-January to determine survival rates

O1.25

11:00 INCREASING CAMPUS VIBRANCY USING AGROECOLOGY

M*onica Burr*[1], *Adam Kay*[2]

[1]*Alcorn State University, Lorman, MS,* [2]*St. Thomas University, Minneapolis, Minnesota*

Professional and graduate schools desire students who have research experience and are knowledgeable of social and community issues that impact health. Developing on campus undergraduate research opportunities that explore

the overlap between agriculture and health is key to developing competitive students for professional and graduate school. Using urban agriculture ecology to demonstrate the connection between academics and social issues, undergraduate students will explore new career pathways. This effort could lead to increasing STEM field diversity while providing students with research-based experience that address current social and community challenges.

O1.26

11:30 ELEMENT COMPARTMENTATION IS SEEDLING ROOTS INDICATES NOVEL PHYSIOLOGICAL MECHANISMS

Aniruddha Acharya[1]

Division of Mathematics & Sciences; Delta State University, Cleveland, MS

The evolution of air-land plants and their successful colonization of terrestrial habitats has been intrinsically related to the growth and development of roots. Besides mechanical support, nutrient sequestration and water uptake, plants roots interact with soil microbes and play a pivotal role in soil health, plant communication, plant immunity and stress tolerance. Root cells have evolved for polarized movement of inorganic ions and organic molecules with high degree of selectivity and regulation that maintains cellular homeostasis and support metabolic needs of plants.

Significant information is available on the role of plasmodesmata and membrane-bound channels and transporters in regulation of symplastic transport. However, the existence of a symplastic boundary is not yet experimentally validated. The above mentioned research gaps have been investigated by observing ion distribution of hydroponically grown seedling roots using electron microscopy and estimating their accumulation through bioanalytical techniques.

Results conclude that ion distribution in seedling roots indicates complex patterns of compartmentation that cannot be solely explained by apoplastic resistance.

The tissue-specific ion distribution indicates high degree of cellular ion homeostasis in general while some patterns in particular lead to the hypotheses about the existence of a symplastic boundary that has no anatomical manifestation, develops based on the developmental requirement of root tissues and is made of phosphorous-rich organic molecules.

O1.27

11:30 ON-SITE DIAGNOSIS OF PLANT DISEASES EMERGES AS A PROMISING TOOL FOR CONTEMPORARY EXTENSION PROGRAMMING

E*mran Ali, Sumyya Waliullah*

Alcorn State University, Lorman, MS

Plant pathogens are one of the main threats to agricultural production and affect the multibillion-dollar agricultural industry every year. Accurate and rapid identification of pathogens is the first step in controlling plant diseases and producing quality crops. While some common plantdiseases may be easy to identify in the field with a trained eye, many symptoms displayed by unhealthy plants could also be due to poor growing conditions, pests, chemical damage from fertilizers or fungicides, and plants could even be under attack by more than one pathogen at a time! If not diagnosed and treated immediately, some pathogens can spread very quickly. An entire field could be taken by pathogens in as little as 24 hours. Moreover, there can be a considerable amount of damage if pathogens are incorrectly diagnosed based purely on physical observations that result in unnecessary fungicide applications. Plant Pathologists use different tools to figure out what is making the plant unhealthy The three main methods used are microscopy, growth, and observation on media and molecular techniques. These methods require highly trained personnel with extensive knowledge of classical pathogen taxonomy. Moreover, these methods can take several days to weeks to complete and require a well-equipped (and well-funded) laboratory facility with bulky pieces of equipment. The demand for rapid onsite disease diagnosis has been growing over the last decade. Several molecular and serological techniques are currently being used for onsite disease diagnosis and results that are viewed in real-time, or after one hour with a color-changing dye, depending on the assay used. For example, Immunostrip assays (IA) function similar to a rapid COVID-19 antigen test - all one has to do is add diseased plant tissue to a buffer and add a test strip to the mix, and they will have a result in minutes (Figure 4A). These assays are not available for all pathogens but are a really valuable tool that anyone can use if they suspect a specific pathogen is present in their crop. Loop-mediated isothermal amplification, or LAMP, and Recombinase Polymerase Amplification, or RPA are the two important advanced technologies for the detection of specific pathogens. With the portability of real-time instruments being used for amplification, these techniques can provide on-site diagnostics. These assays for onsite diagnosis are very popular among growers, field specialists, and crop advisers. When time is of the essence, these tools can play a vital role by permitting early identification of disease and reducing the risk of an epidemic. Hence, these on-site disease detection tools have already demonstrated their indispensable role in contemporary extension practices.

Animal, Fish, Wildlife, Veterinary Science

Chair: Hossam Abdelhamed

Mississippi State University

Co-Chair: Scoty Hearst

Mississippi College

Thursday, February 29, 2024

MORNING

ROOM Union A

(Following divisional abstract will be presented in the Marine and Atmospheric Science Division Oral Division #9)

8:15 Welcome and Remarks

O9.01

8:30 UNDERSTANDING, RAPID INTENSIFFIATION AND IMPACTS OF TROPICAL CYCLONES/HURRICANES: USING PREDICTIVE MODELS, HIGH WINDS AND HEAVY PRECIPITATION VARIABILITY

Remata Reddy[1], Mia Robinson1[1], Natalie Courtney[1], Makanna Collins[1], Francis Tuluri[1], Brian Blanton [2]

[1] Jackson State University, Jackson, MS, [2] Coastal Resilience Center, University of North Carolina at Chapel Hill (UNC), NC

Under the U.S. Department of Homeland Security (DHS) 2023 Program for Minority Serving Institutions, the study investigates the air-sea interactions, high winds, and precipitation variability associated with Hurricane Harvey and Matthew using satellite and RADAR data. Hurricane Harvey was a category 4 storm that made landfall in Texas near the Gulf of Mexico on august 25, 2017, with a low pressure of 938 millibar and with wind highest wind speed of 58.1 m/s, which caused up to $125 Billion Dollars of damage across portions of Texas and Louisiana. Harvey started off as a tropical storm on August 17, 2017. Tropical storm Matthew reached its peak strength as a category 5 hurricane, and by the time it reached Haiti on October 4, 2016, it was an extremely powerful category 4 hurricane with torrential rain and winds up to 145 mph. Matthew caused catastrophic damage to Haiti, as well as widespread devastation in the southeastern United States. Matthew was the largest humanitarian emergency due to the death tolls. Hurricane Matthew was the first Category 5 Atlantic storm since Hurricane Felix in 2007. With an estimated 546 deaths and $1.9 million in damages. We used Satellite (BUOY), and RADAR data from NOAA and NWS for collecting wind speed, air pressure, air and sea temperatures, and precipitation levels. We developed an empirical model, Hurricane Predictive Index (HPI), for predicting hurricane intensity using the above data with high wind speeds, heavy precipitation. The difference between air and sea temperatures was the highest at 7.1^0 C and heat fluxes were high using bulk models. When Hurricane Harvey's pressure was 943 millibars and HPI of -24.97 and was unstable which constitutes an early warning system. For Matthew, during rapid intensification, the large-scale heat fluxes strongest reaching 7170 J/m^2 and there is an inverse relationship between pressure and large-scale heat fluxes. This predictive model establishes an early warning system for hurricane prediction and rapid intensification and impacts.

O9.02

8:50 AIR QUALITY MODELING STUDY IN EL PASO, TX

Duanjun Lu[1]

[1]Jackson State University, Jackson, MS

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 1-km 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 investigate the inherent spatial and temporal PM variations. The data collected will contribute to a comprehensive report aimed at developing strategies to optimize healthy behaviors and address air quality issues in the region. This study is significant in understanding the impact of poor air quality and developing effective solutions to mitigate its effect.

O9.03

9:10 ASSOCIATION OF REGIONAL MOBILITY AND AIR QUALITY ON HEALTH IMPACTS

Francis Tuluri[1], Remata Reddy[1], Wilbur Walters[1], Ariana Dunlap[1]

[1]Jackson State University, Jackson, MS

Lockdown measures of different levels were implemented soon after WHO declared COVID-19 as a pandemic on the 11th of March 2020. The need for lockdown was a mitigation effort to control the then increasing COVID-19 incidence in different places worldwide. The large-scale implementation of lockdown has affected almost every area of business including the normal life. In the scientific community, there was an increase in the study of the effect of the COVID-19 pandemic lockdown on air quality and health. The mechanism of interplay between weather and air quality is complex, and similarly their impact on health.

Most of the research studies did show an improvement in air quality using several methods - some based on controlled experiments, and some based on machine learning modeling. In the present study examines the study of environmental factors, mobility, and air quality in the region of Mississippi, USA. The variables of study consider primarily temperature, pressure, humidity, wind speed for the weather; and Particulate Matter (PM2.5 and PM10), Ozone (O3), and Nitrogen dioxide (NO2) for the air quality over the period of last 10 years. The data of interest is collected from NOAA, Weather Underground, and EPA. Python programming and Statistical methods will be used to analyze the data. We will present the results of cross correlation between the variables of study to estimate the impact of lockdown on air quality and health in the region of study.

O9.04

9:30 ZOONOTIC SURVEILLANCE IN WILDLIFE OF CENTRAL MISSISSIPPI

Scoty Hearst and Trent Selby

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

The World Organization for Animal Health (WOAH) is a global intergovernmental agency with members including the United States and 180 other counties with the goal to control and prevent the spread of epizootic diseases. WOAH estimates that new human infectious diseases will emerge from animal reservoirs. Global surveillance of infectious diseases, including zoonoses, is required to prevent future outbreaks and global pandemics. For this reason, we have begun zoonotic surveillance in wildlife throughout central Mississippi. Our studies range from surveillance of SARs-CoV-2 in white-tailed deer to parasitic infections in raccoons to fish species. In this talk, we will discuss ongoing zoonotic surveillance projects throughout central Mississippi, potential zoonotic transmission routes, how zoonotic surveillance is an excellent tool for training research students, and future directions for our zoonotic surveillance projects.

12:00 General Session

Thursday, February 29, 2004

AFTERNOON

Room TC 210

(Following divisional abstracts will be presented in the

Chemistry and Chemical Engineering Division)

Wildlife

O4.13

2:20 CATFISH AS SENTINEL SPECIES FOR MONITORING TOXIC METALS IN THE MISSISSIPPI RIVER

Chinaza Nwaiwu, Ella Bailey, Javian Ervin, Stephen Mills, Fritz Valerio, Wilson Hooker, Jose Alfonso Xavier Fernandez, Caroline Armstrong, Christian Leach, Alison Cevallos, Trent Selby, and Scoty Hearst

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

Mining, industrial waste, farming runoff, and illegal dumping cause contamination of toxic elements in terrestrial and aquatic environments. Sampling water over vast regions to acquire adequate assessment of aquatic containment levels can be a daunting task. We hypothesis that catfish would bioaccumulate toxic metals acting as environmental sentinel species useful for monitoring contaminant levels in aquatic environments such as the Mississippi River. To explore this idea, we collected multiple catfish species from the Mississippi River and assessed their tissues for toxic metals. We sampled channel catfish (Ictalurus punctatus), flathead catfish (Pylodictis olivaris), and blue catfish (Ictalurus furcatus) from the Mississippi River near Davis Island, MS. In this study, we compare the bioaccumulation of toxic metals in catfish to water level concentrations to determine which species is the best fit sentinel. Overall, this data will conclude which catfish species is a superior sentinel species for toxic metal monitoring as compared to other catfish species inhabiting the same environment.

O4.14

2:40 SURVEILLANCE FOR ZOONOTIC PARASITES IN MISSISSIPPI RACCOONS

Javian Ervin, Stephen Mills, Chinaza Nwaiwu, Fritz Valerio, Wilson Hooker, Jose Alfonso Xavier Fernandez, Caroline Armstrong, Christian Leach, Trent Selby, and Scoty Hearst

Mississippi College Chemistry and Biochemistry Dept, Clinton, MS

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 Mississippi raccoons for intestinal parasites by necropsy. DNA was extracted from parasites to identify the genius and species using sanger sequencing of the 28s, 18s, COX1, and ITS genes. Here, we present our preliminary findings of parasites and identify zoonotic parasites that are a threat to public health.

O4.15

3:00 EXPANDED POLYSTYRENE CONSUMPTION BY INSECT LARVAE NATIVE TO MISSISSIPPI

Miles Taylor Leverette, Sydney Watts, Madison Ely, Nellie Massey, Trent Selby

Mississippi College, Clinton, MS

The world is producing twice as much plastic waste as two decades ago. In the United States, the *plastic waste* generated *annually* per person is 221 kg. Slow degradation allows plastics to accumulate in the environment. Insects and larvae certainly come into contact with the accumulated plastic waste. How this waste affects the insect's life cycle is of concern. Recently, we have discovered that several insect larvae native to Mississippi will consume large quantities of expanded polystyrene. The focus of this work is a multigenerational study of the Carolina Sphinx Caterpillar *(Manduca sexta)* and their ability to eat and possibly digest polystyrene. Wild-caught and lab-raised insect larvae at the 4^{th} or 5^{th} instar stage were fed a diet of expanded polystyrene. These larvae here able to pupate, hatch, mate, and lay eggs. From the polystyrene fed larvae, samples of the larvae frass, pupae, and hatched insects were extracted with tetrahydrofuran (THF) to isolate any polystyrene. After removal of the THF solvent, samples were studied by FT-IR and NMR spectroscopy. The results will be presented here.

Thursday, February 29,

2024 EVENING

3:30 DODGEN LECTURE/ AWARDS CEREMONY

THEATER

5:00 GENERAL POSTER SESSION

immediately following Dodgen Event)

P2.01

DEVELOPMENT OF A NONLETHAL METHOD FOR THE ANALYSIS OF TOXIC METALS IN FISH TISSUE

Ella Bailey, Javian Ervin, Stephen Mills, Chinaza Nwaiwu, Fritz Valerio, Wilson Hooker, Jose Alfonso Xavier Fernandez, Caroline Armstrong, Christian Leach, Alison Cevallos, Trent Selby, and Scoty Hearst

Mississippi College, Clinton, MS

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. The Mississippi River is home to hundreds of species of wildlife including fish species harvested for human consumption potentially exposing humans to heavy metals. The river is also used as a source for drinking water and crop irrigation, where pollution from landfills, agriculture, and industrial sources leach into the river potentially causing human exposure to heavy metals. Surveying toxic metal accumulation in fish requires euthanizing the fish. The goal of this study is to develop 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. Here, we evaluate a new nonlethal method for the analysis of toxic metals in fish tissue using a biopsy tool. We compared the level of toxic metals using the traditional fillet method vs the biopsy method to determine the efficacy of this nonlethal method. To compare these methods, samples were taken from channel catfish (*Ictalurus punctatus*) collected from a lake in central Mississippi and analyzed for toxic metals using an ICP-OES. Our results will reveal the accuracy of the nonlethal method compared to the traditional whole-fish methods. Once developed, this nonlethal biopsy method can be used to surveil toxic metal accumulation in catfish species form the Mississippi River without causing fish mortality.

P2.02

EFFECT OF DIFFERENT DOSES OF ISOQUINOLINE ALKALOIDS (IQS) ON GROWTH AND MICROBIOLOGICAL PARAMETERS IN BROILERS EXPOSED TO CLOSTRIDIUM PERFRINGENS CHALLENGE.

Ala Abudabos

School of Agriculture & applied Science, Alcorn State University, Lorman, MS

This study was carried out to test the effectiveness of different doses of Isoquinoline alkaloids (IQs) supplementation on growth performance of broilers challenged with *Clostridium Perfringens* (*C. perfringens*). In a 35-d trial, 360-day-old chicks were randomly distributed to 6 treatments of 10 replicates each as follows: T1, Control, no additive or challenge (-ve control); T2, Control + bacterial challenge (+ve control); T3, T2 + 0.10 g/kg diet Maxus (AGP); T4, T2 + 0.06 g/kg IQs, T5, T2 + 0.09 g/kg IQs and T6, T2 + 0.12 g/kg IQs. On d seven, all birds except -ve control (T1) were orally inoculated with *C. perfringens* as oral gavages using 10-fold dose of anticoccidial vaccine (Coccivac-D) followed by a cocktail containing *C. perfringens* at the rate of 4×10^8 CFU/ml. Performance results for the grower period (11 to 25 d) showed that daily gain (ADG), feed conversion ratio (FCR) and performance efficiency factor (PEF) were affected by treatment ($P<0.05$). Chicks on the -ve control had higher ADG compared to T2 ($P<0.05$); ADG of T3, T4, T5 and T6 were intermediate and insignificant to T1 or T2. Birds received T2 converted feed less efficiently compared to all other treatments. The lowest PEF was achieved from the +ve control when compared to the -ve control and T3 group ($P<0.05$). All performance parameters were affected by treatment except for DFI during finisher period (25-35 d). A significant difference in ADG, FCR and PEF were found due to treatment ($P<0.05$, $P<0.05$, $P<0.001$, respectively). Unchallenged chicks (T1) gained more weight, converted feed more efficiently and had higher PEF when compared to the +ve control (T2). ADG, FCR and PEF were intermediate for T5 and were statistically similar for the -ve control and T2 and T3, while, T4 had better FCR and PEF when compared to T2 and T3. During the finishing period (26-35 d), the group received 0.12 g IQs had numeric improvements in FCR and PEF compared to those received 0.06 g/kg or 0.09 g/kg. The results

revealed that birds in T1 group had the best cumulative daily gain (ADG) but it was similar to T3, T4, T5 and T6. Chicks from T2 (+ve control) had the lowest ADG ($P<0.001$). The -ve control, AGP and IQs groups (T4, T5 and T6) converted feed more efficiently compared to the +ve control groups (T2) ($P<0.001$). T1, T3, and T6 had higher overall performance efficiency factor (PEF) when compared T2, while T4 and T5 were intermediate ($P<0.001$). When examining the cumulative period (0-35 d), FCR was not affected by the dose of IQs, birds received 0.06, 0.09, and 0.12 g/kg performed like the -ve control group and AGP. Based on all previous results it can be concluded that the lower dose of IQs used in this experiment (0.06 g/kg) can be used as an alternative to AGP without negative effect on FCR.

P2.03

MULTISPECTRAL UAS MONITORING OF AN ALGAL BLOOM MANAGEMENT STRATEGY

Devin Terza, Keith Hitzelberger, Andrew Ohrberg, Mark Peterman, Kelsey Crane

Department of Geosciences, Mississippi State University, [2]College of Veterinary Medicine, Mississippi State University, Starkville, MS

Freshwater lakes, ponds, and rivers are important natural resources for Mississippi. From agricultural pursuits near the delta to catfish farms of central Mississippi, these water bodies are economically and environmentally critical. Due to agricultural runoff and warming temperatures, these waters are becoming increasingly phosphorus- and nitrogen-rich and conducive to the rapid growth of harmful algal blooms (HABs). HABs endanger habitats and fish by removing oxygen from the water and can also be toxic, killing mammals, birds, and fish that consume the algae. The situation is not hopeless. We investigated one mitigation strategy, Hydrogen Peroxide Treatment, at Chadwick Lake on the Mississippi State University, Starkville campus. Although the algae on this lake is not as extreme as those in the delta or other large lakes, it is still an interesting test location for management techniques as it receives agricultural runoff from athletic fields. We used a DJI Phantom P4 with RTK GPS, a multispectral drone with high resolution imagery and GPS, to monitor algae on the lake in order to determine the efficacy of this strategy. We produced weekly color and vegetation index maps of the lake and estimated the areal extent and weekly changes in location of algae blooms over a growing season using the DJI Terra Software. Using this UAS data, we are able to show that the Hydrogen Peroxide Treatment of Chadwick Lake provides a rapid, effective algae management strategy for our campus. This result is consistent with work performed by the Environmental Protection Agency's Antimicrobial Division, which also concluded that there are minimal environmental impacts from the use of Hydrogen Peroxide as the resulting transformation products of treatment are simply water and oxygen. Current and future work extends this treatment to other water bodies including catfish farms. We also show that multispectral UAS imagery is an efficient and accurate means for assessing algal treatments while keeping researchers at safe distances from the water bodies themselves.

P2.04

DEVELOPING A NEW ICP-OES METHOD TO MEASURE MERCURY LEVELS IN SHELLFISH

Mohammad Ibrahim, Parth Patel, Landon Ashley, Analee Mobley, Jeremy Evans, Claire Stokes, Joseph Kazery, Trent Selby, and Scoty Hearst

Department of Biology, Mississippi College, Clinton, MS

The shrimp fishery is a major global industry, where more than 3.0 million tons of shrimp are caught each year. Pollution in aquatic environments are a major concern for commercially farmed and wild-caught shrimping industries. Human activities, fossil fuels, industrial waste, discharge from rivers, and agricultural runoff can result in high levels of nutrients and environmental contaminant leaching into aquatic environments inhabited by shrimp. One such contaminant of concern is mercury. Mercury can be absorbed through the skin and mucous membranes causing both chronic and acute poisoning. Fish and shellfish have a natural tendency to concentrate mercury in their bodies, often in the form of methylmercury, a highly toxic organic compound of mercury. The most common method for measuring mercury is cold vapor atomic absorption spectroscopy. In this study, we developed a new method to measure mercury in fish and shellfish samples using an ICP-OES. With our new technique, we measured mercury levels in commercial shrimp samples from multiple global locations and found that the levels mirrored concentrations reported over 10 years ago. Overall, we found this new ICP-OES method as an effective technique useful for measuring mercury concentration in shellfish. In future studies, we will further develop this method to include other fish and shellfish samples.

P2.05

HEAVY METAL ANALYSIS OF AQUATIC SPECIES INHABITING A CREEK DOWNSTREAM FROM AN ACTIVE GRAVEL QUARRY

Harsh Patel, Parth Patel, Mohammad Ibrahim, Anuradha Ragila, Hinaben Patanvadia, Pinalba Zala, Nilay Kantibhai Zalavadiya, Joseph Kazery, and Scoty Hearst

TThe Department of Biology, Mississippi College, Clinton, MS

Gravel quarries are open mines where the gravel and sand are harvested for commercial uses. The natural vegetation, top soil, and subsoil layers are removed potential leaching heavy metal contaminants into the local environment. Potential environmental concerns for gravel mining include habitat fragmentation, dust, runoff pollution, and water contamination. There are multiple active gravel quarries in Yazoo county, Mississippi. Previous studies in

these areas revealed high levels of aluminum in water, soil, and plant samples. We hypothesized that heavy metal contaminates from these gravel quarries were leaching into nearby creek systems and potentially exposing aquatic wildlife to heavy metals such as aluminum. In this study, we collected multiple aquatic species inhabiting a creek containing gravel quarry runoff. We tested these specimens for toxic and trace elements to determine the ideal sentinel species to monitor heavy metal pollutants, such as aluminum, created from gravel mining. We collected crayfish, catfish, minnows, sunfish, bass, and newts. Samples were analyzed using an ICP-OES for Al, As, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Pb, and Zn. Statistics were used to determine the ideal sentinel species to monitor heavy metals in the creek environment. Our preliminary data suggests that crayfish species bioaccumulated high levels of metal contaminants and may be useful as sentinels for monitoring heavy metal pollutants in creek systems.

P2.06

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

Fritz Valerio, Christian Leach, Javian Ervin, Stephen Mills, William Janous, Chinaza Nwaiwu, Wilson Hooker, Jose Alfonso Xavier Fernandez, Caroline Armstrong, Alison Cevallos, Joseph Kazery, Nicole Phillips, Steven Everman, Trent Selby, and Scoty Hearst

The Department of Chemistry and Biochemistry, The Department of Biology, Mississippi College, Clinton, MS, Biological, Environmental, and Earth Sciences, the University of Southern Mississippi, Hattiesburg, MS, Department of Medicine, The University of Mississippi Medical Center, Jackson, MS

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. However, the status of zoonotic parasites in the Mississippi River are currently unknown. We prepose using fish as sentinels for surveying zoonotic parasites in the Mississippi River. We collected various fish species including: white crappie (Pomoxis annularis), channel catfish (Ictalurus punctatus), flathead catfish (Pylodictis olivaris), and blue catfish (Ictalurus furcatus) from the Mississippi River. We removed parasites in the fish tissue and used sanger sequencing of the COX1 gene and rDNA to identify the parasitic species. We also used next generation sequencing to identify the parasitic communities in Mississippi River fish. Here, we discuss our findings of zoonotic parasites concealed within the treacherous waters of the Mississippi River. Results from this study will lead to larger field studies along the Mississippi River and its watersheds to evaluate parasitic communities using eDNA.

P2.07

ABSORPTION OF LITHIUM IN VARIOUS ORGANS OF CRAYFISH: A LABORATORY STUDY

Andrew Doubert, Javian Ervin, Jacob Garteiser, Scoty Hearst, Joseph Kazery

Mississippi College, Clinton, MS

Heavy metals, such as lithium, are an upcoming contaminant. Lithium has many applications in alloys and batteries. With the increased use of lithium-ion batteries, it's only a matter of time before they find their way into environmental ecosystems. Organisms such as crayfish can be utilized to determine heavy metal contamination because the freshwater crawfish, specifically *Procambarus clarkii,* accumulates heavy metals from water and sediments in which it lives. Crayfish are known as bottom-dwellers of their aquatic ecosystem and tend to accumulate metals in their tissues, but can also exhibit a high resilience to environmental and metal contamination. The purpose of this study is to determine the concentration of absorption and translocation of lithium to various organs, as well as, to determine a hierarchical order of lithium in crayfish organs. Biometric data collected from the specimens was used to determine variations of transported lithium. Male and female *Procambrius clarkii* were fed 5 mg/kg of lithium-spiked food pellets. After several days, the hepatopancreas, gills, abdominal muscle, and intestines were removed, acid-digested, and then analyzed by an ICP-OES. Results are expected to yield higher concentrations of lithium in the digestive tract, followed by the hepatopancreas as it is the organ that deals with the absorption and storage of digested food. Levels in the gills and abdominal muscles are expected to be of lower concentration.

P2.08

ANALYSIS OF TOXIC METALS IN BIGMOUTH AND SMALLMOUTH BUFFALO FISH OF THE MISSISSIPPI RIVER

Jose Alfonso Xavier Fernandez, Ella Bailey, Javian Ervin, Stephen Mills, Chinaza Nwaiwu, Fritz Valerio, Wilson Hooker, Caroline Armstrong, Christian Leach, Alison Cevallos, Trent Selby, and Scoty Hearst

Mississippi College Chemistry and Biochemistry Dept, Clinton, MS

Pollution in the Mississippi River is a growing concern, where emerging contaminants, such as toxic metals are a threat to human and animal health. The Mississippi River is home to hundreds of species of wildlife including fish species harvested for human consumption potentially exposing humans to heavy metals. The river is also used as a source for drinking water and crop irrigation, where pollution from landfills, agriculture, and industrial sources leach into the river potentially causing human exposure to heavy metals. In this study, we examine the bioaccumulation of toxic metals in two species of sucker fish, from the Catostomidae family, inhabiting the

Mississippi River: The bigmouth buffalo (Ictiobus cyprinellus) and the small mouth buffalo (Ictiobus bubalus). These species of buffalo can live for centuries and were choose for their longevity and different diets. Bigmouth buffalo filter feed on algae and zooplankton, while smallmouth buffalo are detritivore and consume organic matter from the bottom of the river. In this study, we collected buffalo from the Mississippi River and analyzed for toxic metals using an ICP-OES. We hypothesized that bioaccumulation of toxic metals would vary between the two species based upon their differing diet. Our results will reveal if filter feeding or bottom feeding leads to greater bioaccumulation of toxic metals in fish inhabiting the Mississippi River.

P2.09

NUTRIENT AND HEAVY METAL ANALYSIS OF WEAK ANTLERS IN MISSISSIPPI WHITE-TAILED DEER

Caroline Armstrong, Jose Alfonso Xavier Fernandez, Lee Yelverton, Marguerite Yelverton, Megan Malone, Trent Selby and Scoty Hearst

The Department of Chemistry and Biochemistry, Mississippi College, Clinton, MS; The Highland Veterinary Clinic, Ridgeland, MS

Osteoporosis is a progressive disease marked by reduced bone density and thinning brittle bones. Osteoporosis is a major concern for Mississippi, where 27% of the population has reduced bone density. Pets can also be impacted by osteoporosis due to aging or poor diet, where globally, researchers have identified many environmental factors and deficiencies linked to osteoporosis making causation location specific. Deer antlers are a unique material that can used to monitor toxic and trace elements in the environment. Deer antlers are regrown each year allowing for elemental analysis of the environment of a particular region over time. Due to their rapid regrowth, antlers can be used to determine essential elements required for healthy bone growth advancing osteoporosis research. Broken antlers are more common in nutritionally stressed animals. Research findings in Europe have indicated that brittle and broken antlers can be caused by magnesium deficiency. Toxic metals such as Pb, Cd, Hg, and As can have a significant impact on bone growth. We hypothesized that deer with brittle antlers or antlers with breaks may have reduce levels of essential trace elements required for normal antler growth or have high levels of toxic metals contamination. To test our hypothesis, we collected bone samples, antler sheds, and antlers harvested by hunters. We used X-ray Densitometry, ICP-OES, and FT-IR to compared healthy antlers to brittle or broken antlers. We speculate that antlers can be used to monitor toxic elements in the environment. Completion of this study could reveal essential elements required for bone growth or reveal environmental contaminates due to toxic metal accumulation within the bone. We suggest that this research can further the understanding of environmental factors and deficiencies that lead to weak and brittle bones progressing osteoporosis research.

P2.10

TEMPERATURE EFFECTS ON ADSORPTION AND ABSORPTION OF AN UPCOMING POLLUTANT IN CRAYFISH

Javian Ervin, Andrew Doubert, Jacob Garteiser, Scoty Hearst, Joseph Kazery

Mississippi College, Clinton, MS

Crayfish are an integral part of an ecosystem and could pass on substances to different trophic levels being reflected by thermal changes in the environment, changing body mass and metabolic effects in response to changing temperatures. Temperature can affect by crayfishes by influence ion imbalance and alter metabolic pathways. Lithium is found in a trace number of soils, rocks, and in the aquatic environment. Lithium batteries are currently found in phones, car batteries, and watches making them readily available in our environment due to the lack of correct disposal. The purpose of this study is to test lithium adsorption and absorption in crayfish in increasing water temperatures. Live *Procambarus clarkii* crayfish were placed in four temperature-controlled tanks measuring 10.0, 18.0, 25.0, and 32.0 °C, respectively. Specimens were maintained at a constant pH with a 1 mg/L solution of lithium carbonate added in each tank. Crawfish biometric data was collected to determine variability of effects of lithium caused by temperature. The exoskeleton and abdomen were separated, digested using EPA acid-digestion procedures, and were then analyzed by Inductively Coupled Plasma Optical Emissions Spectroscopy (ICP-OES). In this experiment we expect to find increasing lithium concentration in the exoskeleton cuticle due to lithium adsorption in crayfish in respect to temperature, while absorption through metabolic processes are hindered at temperature extremes.

P2.11

EFFICACY OF SYNTHETIC WHITE-TAILED DEER ATTRACTANTS TO STIMULATE SCRAPING BEHAVIOR

William Janous, Stephen Mills, Trent Selby, and Scoty Hearst

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

Odocoileus virginianus (White-tailed Deer) are social animals that communicate using semiochemicals. Scraping behavior is an olfactory reproductive communication used by White-tailed Deer to establish social networks during the breeding season. Male scraping behavior is a complex scent-marking behavior which advertises sociosexual status and location to potential females as well as to competing males. Female scraping behavior is also a complex scent-marking behavior which signals mate interests, location, and sexual receptiveness. These semiochemical scent markers are produced in body fluids

such as urine, saliva, and glandular secretions released on to tree branches or the ground at scrape sites. Chronic wasting disease (CWD) is a fatal, highly contagious, prion disease occurring in cervids, especially white-tailed deer. These chemical deer secretions are harvested on commercial deer farms and sold to deer hunters as deer attractants creating over a 100 million dollars in revenue each year for the deer-lure industry. Spreading CWD to uninfected areas is a potential risk when using these authentic deer scents. Using a full synthetic deer attractant would greatly reduce that potential risk of spreading CWD from authentic deer-lures. In this study, we created a range of fully synthetic deer attractants and assessed their ability to stimulate scraping behavior and attract deer to investigate. We sprayed our synthetic attractants on potential tree branches and recorded deer behavioral responses using motion activated wildlife cameras. We are currently analyzing the digital data and will used statistical analysis to determine the efficacy of our synthetic attractants as compared to negative and positive controls. Overall, we suggest that the data in this study could be used to generate full synthetic deer attractants and reduced the spread of the CWD neurodegenerative disease from commercial non-synthetic deer-lures.

P2.12

MONITORING TOXIC METALS IN MARINE ENVIRONMENTS USING BLUE CRABS AS A SENTINEL SPECIES

Parth Patel and Scoty Hearst

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

Pollution in marine environments is a major concern for marine wildlife and fisheries especially in the Gulf of Mexico and the Persian Gulf. Discharge from the river systems and storm water runoff bring high levels of nutrients and environmental contaminants into the gulf and marine 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 marine watersheds. The levels of these contaminants in marine wildlife is unknown. We hypothesized that the blue crab (Callinectes sapidus) can be used as a sentinel species for monitoring toxic metals in marine environments. To explore this idea, we analyzed blue crab samples collected for the Gulf of Mexico and the Persian Gulf for toxic metals using an ICP-OES. Here, we compare toxic metals in the blue crabs from both locations to compare these levels with the maximum permissible levels established by World Health Organization, USDA, and Food and Agriculture Organization of the United Nations. We found unique heavy metal contamination in crab samples that varied by location. Overall, our data demonstrates that the blue crab can be used as sentinel species for monitoring toxic metals in marine environments leading to larger field studies.

P2.13

EVIDENCE OF SARS-COV-2 ANTIBODIES IN MISSISSIPPI WHITE-TAILED DEER

Stephen Mills[1], Pedro Palermo[2], Doug Watts[2], Kamen Campbell[4], John Bates[3], Scoty Hearst[1]

[1]Chemistry and Biochemistry, Mississippi College, Clinton, MS, [2]Department of Biological Sciences and Border Biomedical Research Center, The University of Texas at El Paso, El Paso, TX, [3] Department of Cell and Molecular Biology, University of Mississippi School of Medicine, Jackson, MS, [4] Deer Program, Mississippi Department of Wildlife Fisheries and Parks, Jackson, MS

Early detection and monitoring of SARS-CoV-2 infections in animal populations living in close proximity to humans is crucial for preventing reverse zoonosis of new viral strains. White-tailed deer (WTD), Odocoileus virginianus, are susceptible to zoonotic SARS-CoV-2 spill-over with evidence of infection among WTD populations reported in several states in the Northwest, Midwest, Southwest, and Northeast United States. Collection of samples is the major challenge for biosurveillance of wildlife populations. In this study, we developed a new SARS-CoV-2 surveillance strategy to detect antibody as evidence of SARS-CoV-2 infection using WTD kidney tissue collected from hunter-harvested deer. The kidney was chosen for its ease of collection and high level of perfusion and because blood samples are not readily available among killed animals. Using this kidney method combined with serosurveillance, we detected the first evidence of SARS-CoV-2 infection among WTD in Mississippi and the Southeast region of the United States. In 2021 to 2022, SARS-CoV-2- antibodies were detected in 67% of serum samples and in 26% of kidney tissue homogenates, and SARS-CoV-2 RNA were detected by RT-PCR in nasal swab samples from hunter-harvested deer. In 2022 to 2023, SARS-CoV-2 antibodies were detected in 62% of WTD serum samples, but SARS-CoV-2 RNA was not detected in nasal swabs. Increasing antibody positivity trends in WTD paralleled the SARS-CoV-2 Omicron virus infection wave in the human population in Mississippi that occurred in late 2021 and early 2022. Other observations included the use of camera traps to monitor the movement of WTD across the urban landscape and the use of a new bait-free population analysis method that revealed 130 WTD inhabiting an urban study site. We also documented WTD grazing near septic tank sprinklers raising the possibility of wastewater runoff as a potential anthroponotic transmission route of SARS-CoV-2 to WTD. Overall, this study demonstrated the potential efficacy of using tissue samples from hunter-harvested deer for biosurveillance of wildlife during a pandemic and provided evidence of zooanthroponotic infection of WTD populations by SARS-CoV-2 in Mississippi.

P2.14

COMPARISON OF METHODS FOR DETERMINING STRESS IN A CRAYFISH MODEL AND ENVIRONMENTAL APPLICATION

Javian Ervin[1], Andrew Doubert[2], Joseph Kazery[2], Jacob Garteiser[2]

[1]Mississippi, Clinton, MS, [2]Mississippi College, Clinton, MS

This study aims to address the biological source of stress in crayfish, *Procambarus clarkii*, similar to their local environment and to reproduce an inexpensive and accurate way to test stress levels for the welfare of crayfish in order to optimize management. Additionally, the study will further provide pharmacological evidence on the effect of anxiolytic drugs, specifically ondansetron, on crayfish to better predict human behavior on such medication. Serotonin is found to be the neurotransmitter that is released in response to stress and causes a cascade of effects. Ondansetron as a serotonin blocker should counter such effects. This study will provide insight into possible causes of crayfish to become stressed in response to different stressors to determine significance of them in natural environments and future means of prevention. The factors being investigated are hemolymph glycemic levels, dissolved oxygen concentration, and urine concentrations to efficiently predict how stress is caused by different biological agents. If such analyses are determined to be consistent, samples will be tested with a serotonin blocker to observe the effects of serotonin against stress. We expect all various testing methods to be significant and that the effects of ondansetron will reduce a stressful response.

12:00 General Session

Friday, March 1, 2024

AFTERNOON

12:00-1:00 Mississippi INBRE/ Millsaps Symposia

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

Thursday, February 29, 2024

MORNING
ROOM TC 214

ORAL PRESENTATION SESSION I
Moderators: Drs. James A. Stewart, Jr., Davida Crossley, Felicite Noubissi-Kamdem

8:30 WELCOME
Each speaker will have a 20-minutes to deliver their oral presentation followed by 10-minutes for questions and speaker transition.

O3.01

9:00 ASSOCIATION OF DCLK1 ISOFORM 3 WITH PROLIFERATION AND CHEMORESISTANCE OF COLORECTAL CANCER CELLS

Undergraduate Student

Alayjha Edwards, Lianna Li

Tougaloo College, Tougaloo, MS

Doublecortin-like kinase 1 (DCLK1) is a microtubule-binding protein kinase that is upregulatedin several tumors and is a marker for tumor stem cells. Elevated expression of DCLK1 isassociated with poor prognosis of multiple cancers. DCLK1 has five isoforms. Which isoform ofDCLK1 is more related to its tumorigenesis of cancer is not clear. Our project aims to identifythe function of DCLK1 isoform 3 during tumorigenesis. In the current research, we used theestablished DCLK1 isoform 3 over-expressing cells to investigate its function in the regulationof cell growth and its location in the cells. To achieve our goals, we confirmed DCLK1 isoform3 expression in the cells using western blot, and immunofluorescence to determine theexpression of DCLK1 isoform 3. We performed the MTT assay to determine its role in theregulation of cell growth. The results of the Western Blot demonstrated that the expression ofDCLK1 isoform 3 is very overexpressed. DCLK1 isoform 3 is expressed in the cytoplasm of thecolorectal cancer cells. Over-expression of DCLK1 isoform 3 significantly increases/decreasescell growth (Here increase or decrease depends on your results today). In conclusion, our studyindicates the DCLK1 isoform 3 might modify the growth of colorectal cancer cells, which

mightbe associated with tumorigenesis of colorectal cancer.

O3.02

9:30 DECIPHERING THE ROLE OF RNA INTERFERENCE IN BATS TOLERANCE TO VIRAL INFECTION

Graduate Student

Iyanuoluwani Owolabi, Alex Flynt

University of Southern Mississippi, Hattiesburg, MS

The unprecedented COVID-19 pandemic, caused by the novel coronavirus SARS-CoV-2, has resulted in a significant global loss of lives. Bats, identified as natural hosts for SARS-CoV-2, are crucial in the transmission of public health-relevant viruses, including those responsible for pandemics. Bats harbor a diverse array of coronaviruses, with over 4,800 sequences identified to date. The spillover of bat coronaviruses to humans, as seen with SARS-CoV, MERS-CoV, and SARS-CoV-2, underscores their role in zoonotic disease emergence. The ancestry of several human-transmissible coronaviruses can be traced back to bat coronaviruses, emphasizing the ongoing risk of emerging diseases.

Despite their role in disease transmission, bats are keystone species with vital ecological functions. Misguided perceptions and hostility towards bats have arisen due to their association with viruses, necessitating a more constructive approach. Understanding the bat-virus relationship is crucial, given bats' ability to harbor viruses without succumbing to illness. This knowledge forms the basis for developing therapeutic and preventive strategies to address potential risks while safeguarding bat populations.

This research focuses on an RNAi-based approach, specifically investigating small RNA expression in SARS-CoV-2-infected bat cells. The study identifies novel miRNAs and siRNAs, offering insights into RNAi gene-silencing and gene drive techniques for managing bat populations as potential virus hosts. The findings contribute to the understanding of bat-virus interactions, offering a foundation for developing measures to mitigate zoonotic diseases and reduce the likelihood of spillover events through innovative approaches, such as gene drive techniques.

10:00 - 10:30 BREAK

ORAL PRESENTATION SESSION II
Moderators: Drs. James A. Stewart, Jr., Davida Crossley, Noubissi-Kamdem

O3.03

10:30 INTERPLAY OF A-SYNUCLEIN AND TDP-43 PRION-LIKE DOMAIN: UNRAVELING CYTOPLASMIC INTERACTIONS AND THEIR SIGNIFICANCE IN NEURODEGENERATIVE DISEASES

Graduate Student

Azin Mirzazadeh[1, 2], Shailendra Dhakal[1, 2], Vijay Rangachari[1, 2]

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

Protein aggregation and amyloid formation are implicated in the pathogenesis of various neurodegenerative diseases including frontotemporal lobar degeneration (FTLD) and Lewy body disease. These disorders exhibit colocalized aggregates containing both TDP-43 and -synuclein (S), implicating specific molecular interactions between these proteins as underlying molecular mechanism for phenotypes observed. While prior studies in our lab revealed TDP-43 and S can synergistically form heterotypic amyloids in vitro, it remains unclear whether the two proteins interact in cellular cytoplasm where TDP-43 is present both within membraneless organelles called stress granules, and as insoluble aggregates in pathological conditions. By co-transfecting S and TDP-43 prion-like domain (TDP-43PrLD) in HeLa cells mimicking co-aggregation and stress, we elucidated the interactions between these two proteins in basal and stressed conditions. Our results support in vitro results and confirmed that S interacts with TDP-43PrLD both in stress granules under stress conditions and as cytoplasmic puncta in non-stressed conditions. The findings illuminate potential new role of S to regulate the phase separation and aggregation of TDP-43 in neurodegenerative disorders.

O3.04

11:00 ENZYME PROMISCUITY OF AN ARCHAEBACTERIUM HEXOKINASE

Undergraduate Student

Johnathan McCaskill, Christopher Jurgenson

Delta State University, Cleveland, MS

In the area of science, one of the major topics in the realm of science is the study of enzymes. Enzymes are the biological catalysts for many of our bodily functions. They play an important role by increasing the rate at which the required reaction is done. To perform its job, the enzyme needs to be bound to another biological surface known as the substrate. With the substrate, the enzyme activates, and whatever reaction that the enzyme is needed for, like transferring or breaking down of certain molecules, can be done at a healthy rate. Without the help of enzymes, many of our biochemical reactions would take infinitely too long to execute, and that could lead to many problems in living systems. It is also a known fact that many enzymes can only bond with specific substrates, and this is known as substrate specificity. However, many enzymes have the

ability to not only bond with their main substrate, but also carry out another reaction with a separate substrate. In this research, the many aspects of this topic, along with many instances, will be touched upon.

O3.05

11:30 FUNCTIONAL SIGNATURES IN RESPONSE TO RICKETTSIA INFECTION

Graduate Student

Abdulsalam Adegoke, Shahid Karim

University of Southern Mississippi; Hattiesburg, MS

Introduction: Blood-feeding arthropods, such as ticks, rely on robust cellular and humoral immunity to control pathogen invasion and replication. Tick immune cells, known as hemocytes, produce factors that can either facilitate or suppress microbial infection and replication. Controlling pathogen infection and replication is crucial in determining the vectorial capacity of tick vectors. Despite its significance, tick cellular immunity remains largely neglected and unexplored. In our published work, we identified five distinct populations of hemocytes—prohemocytes, plasmatocytes, spherulocytes, oenocytoids, and granulocytes—from the Gulf Coast tick, *Amblyomma (A) maculatum*. Furthermore, transcriptome analysis of Rickettsia-infected and uninfected hemocytes unveiled two hemocyte marker genes, nimrod b2 and eater, identified as functional markers of hemocyte phagocytosis.

Methods: To further identify additional hemocyte markers and elucidate their role in pathogen interactions, we isolated hemocytes from both Rickettsia-infected and uninfected *A. maculatum* ticks. Subsequently, we sequenced the hemocytes using the 10X Genomics single-cell RNA sequencing platform (scRNA-seq). Raw fastq files underwent mapping to the A. maculatum reference genome via the 10X Genomics Cell Ranger pipeline. The output reads from Cell Ranger was imported into the Seurat R package for quality control, cluster identification, and differential gene expression analysis. Results: Our findings indicated that three clusters (clusters 0, 3, 6) were significantly enriched in the uninfected group, while five clusters (clusters 1, 2, 4, 5, 7) were enriched in the Rickettsia-infected group. Differential gene expression analysis of highly expressed genes highlighted ferritin, metalloprotease, tumor necrosis factor receptor, serine protease inhibitors, transglutaminase, and cathepsin-L as the major hemocyte marker genes for each identified cluster. Conclusion: Ongoing experiments focus on functionally validating these genes using RNA interference, functional assays, assessing *Rickettsia* replication, and employing fluorescent antibody labeling. The completion of this study will significantly enhance our understanding of tick immune cell biology and serve as the foundation for future research on tick innate immunity and pathogen interactions.

12:00 - 1:30 GENERAL SESSIONS

Thursday, February 29, 2024
AFTERNOON
ROOM TC 214

ORAL PRESENTATION SESSION III
Moderators: Drs. James A. Stewart, Jr., Davida Crossley, Felicite Noubissi-Kamdem,

O3.06

1:30 DOXORUBICIN INDUCED-SCUBE3 NUCLEAR LOCALIZATION IS MEDIATED BY A FUNCTIONAL NLS SEQUENCE AND IS ESSENTIAL FOR ITS PRO-TUMORIGENIC ACTIONS IN BREAST CANCER

Undergraduate Student

Ayooluwa Ilesanm, Benjamin Onyeagucha

Mississippi University for Women, Columbus, MS

Signal peptide-CUB-EGF-like domain-containing protein 3 (SCUBE3) is a glycosylated secreted protein and cell membrane-associated protein. SCUBE3 is considered a signature gene in cancers and is known to mediate its actions in the pericellular space mainly. Prior to its secretion, SCUBE3 is localized in the cytoplasm. However, our study observed that SCUBE3 protein localized to the nucleus following doxorubicin (DOX) treatment. DOX is a first-line chemotherapeutic agent used in breast cancer treatment. SCUBE3 structural analysis showed that it lacks a DNA binding domain. Since SCUBE3 exerts its action by interactions with the cell surface or intracellular proteins, SCUBE3 action in the nucleus is likely via interaction with nuclear proteins. The precise function and mechanism underlying the nuclear localization of SCUBE3 remains unknown. In this study, we investigated SCUBE3 nuclear localization in triple-negative breast cancer, intending to dissect the mechanism of its nuclear trafficking induced by DOX treatment. Bioinformatic analysis of the SCUBE3 protein sequence with PSORTII and NLStradamus identified two different candidate nuclear localization sequences (NLS) at 532-RKGKGRRARTPP-543 (referred to as NLS-1) and 836-PPPKRKILIV-845 (referred to as NLS-2) within SCUBE3 domain. The mutagenesis of the NLS-1 abolished SCUBE3 nuclear import in the presence of DOX treatment. Consequently, mutation of the NLS-1 resulted in a significant reduction in the percent number of viable cells following DOX treatment. Altogether, these data show for the first time that SCUBE3 possesses a functional NLS sequence and that SCUBE3 actively localizes into the nucleus by a classical nuclear import mechanism involving the formation of SCUBE3 complexes with importin- . Nuclear SCUBE3 is required to promote cell survival in TNBC cells.

O3.07

2:00 DESIGN AND SYNTHESIS OF QUINOLINE SCAFFOLD-BASED ALLOSTERIC INHIBITORS OF HIV-1 INTEGRASE

Graduate Student

Krunal Patel, Julie Pigza, Matthew Donahue, Jacques Kessl

The University of Southern Mississippi, Hattiesburg, MS

The human immunodeficiency virus type-1 (HIV-1) infection remains a global health crisis, necessitating the development of innovative antiviral strategies. Recently, a novel class of antiretroviral agents called Allosteric Inhibitors of HIV-1 Integrase (ALLINI) drugs has emerged as a promising avenue in the fight against HIV-1. ALLINI compounds are a promising class of antiretroviral agents that target the integrase enzyme of HIV-1. By disrupting integrase multimerization, these drugs inhibit the assembly of the pre-integration complex and subsequent integration of viral DNA into the host genome tenfold. However, the ALLINI compounds are found to be more effective in the late stages of viral maturation as multimerization of integrase interferes with virion maturation through vDNA mislocalization rendering them noninfectious. ALLINI compounds have shown potent antiviral activity against a broad range of HIV-1 strains, including drug-resistant variants. This abstract provides an overview of the use of the ALLINI compounds based on quinoline scaffold derivatives which have been shown to exhibit enhanced potency, prolonged antiviral activity, and reduced likelihood of resistance. This research aims to optimize these compounds through derivatization and explore their applications as potential future combinations of highly active antiretroviral therapy (HAART).

O3.08

2:30 UNDERSTANDING ACOUSTIC PRESSURE INDUCED CELLULAR DEFORMATION THROUGH FINITE ELEMENT MODELING OF CELLULAR MECHANICS

Graduate Student

Flynn Mabowitz[1], Hamed Bakhtiyari[1], Zhenhua Tian[2], Raheleh Miralami[1]

[1]Mississippi State University, Starkville, MS, [2]Virginia Tech, Blacksburg, VA

Cells in living organisms constantly respond to a variety of stimuli, including mechanical forces. These interactions are fundamental to numerous biological processes, such as cell differentiation, tissue repair, and response to injury. External mechanical stimuli can also lead to major cell deformations, intracellular damage, and membrane rupture. While it is well known that mechanical stimuli elicit cellular responses, the mechanisms by which cells interpret and respond to these stimuli are not fully understood. This knowledge gap limits our ability to manipulate these processes. Finite element modeling emerges as a powerful tool in this domain, offering a detailed and controlled approach to simulate and analyze the mechanical interactions at the cellular level. To further the understanding of mechanically induced cellular responses, this study accurately modeled HeLa cells membrane deformation and cytosolic mechanics when subjected to acoustic pressure. Using previously conducted acoustic tweezer-based HeLa cell deformations, this study collected vertical radial displacements of HeLa cell membrane deformation under acoustic pressure and applied established finite element analysis calibration techniques. Including mesh convergence studies. Our HeLa cell model not only successfully replicated observed cellular deformations of previously collected cellular data, but also demonstrated the ability to reproduce experimental data consistently. Mesh convergence studies also confirmed the suitability of our computer-generated mesh for this model in terms of accuracy and computational efficiency. Post-calibration, we subjected the model to cyclical loading, and areas of high stress were located on the cell membrane. The model was then exposed to various levels of force to determine its effect on membrane stresses. This HeLa cell model offers further insight into the cellular response to external mechanical stimuli and poses as foundation for future work in cellular finite element modeling.

3:00- 3:30 GENERAL SESSIONS

Thursday, February 29, 2024

EVENING

3:30 DODGEN LECTURE/ AWARDS CEREMONY

THEATER

5:00 GENERAL POSTER SESSION
(immediately following Dodgen Event)

POSTER PRESENTATION SESSION
Judges: Drs. James A. Stewart, Jr., Davida Crossley, Felicite Noubissi-Kamdem, Nikki Reinemann

Please limit poster discussions to 10-minutes

P3.01

INVESTIGATING ACTOMYOSIN BIOMECHANICAL DESIGN PRINCIPLES OF INTRACELLULAR MECHANOSENSING

Undergraduate Student

Victoria Amari[1], Leigh Hardin[1], William Weeks[1], Emily Kerivan[1], Dana N. Reinemann[1, 2]

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

Cytoskeletal ensembles exhibit mechanics that are not necessarily the sum of the components' single molecule properties, and this emergent behavior is not well understood. Cytoskeletal filaments may also act as force sensors that influence constituent motor protein behavior. To understand the elusive design principles of such emergent mechanics, we innovated an approach using a quartz crystal microbalance with dissipation monitoring (QCM-D) to measure mechanical changes within actomyosin bundles. We demonstrate that QCM-D can detect changes in actomyosin viscoelasticity due to molecular-level alterations, thus providing evidence for actin's role as a mechanical force-feedback sensor and a new approach for deciphering emergent cytoskeletal ensemble crosstalk. We further wish to understand how the local mechanical environment plays into this feedback system. Thus, we integrated a mechanically tunable collagen/heparin matrix constructed with a layer-by-layer (LbL) technique with our actomyosin ensemble assays to investigate the biophysical crosstalk mechanisms that drive myosin motor behavior and synergy.

P3.02

THE SACCHAROMYCES CEREVISIAE'S FERMENTATION EFFICIENCY INVERSELY CORRELATES WITH MITOCHONDRIAL DNA LEVELS.

Undergraduate Student

Ismael Maya, Myla Stanford, Antonia Thomas, Marta Piva

Department of Biological Sciences, College of Arts & Sciences, Alcorn State University, Lorman, MS

This study aimed to determine whether there is a relationship between the ability to perform alcoholic fermentation and the mitochondrial DNA (mtDNA) levels in *Saccharomyces cerevisiae*. We compared these parameters in three strains, a wild-type (CD) and two deletion mutants (*c* and *d*), which lack the *CCM1* or *DSS1* genes, respectively. These genes are essential for mitochondrial translation and are required to produce crucial members of the electron transport chain. Therefore, the corresponding deletion mutants (*c* and *d*) cannot grow in non-fermentable substrates and must obtain energy through fermentation. However, even wild-type yeast prefers this pathway to meet its energy demands. The experimental strains were fresh meiotic segregants derived from the heterozygous diploid *CcDd*: *CD*, *Cd*, and *cD*. A polymerase chain reaction (PCR) analysis confirmed the strains. The fermentation rate was determined by measuring the CO_2 released for five minutes after adding the inoculum to the culture medium, while the fermentation capacity was calculated per unit of yeast weight, dividing the amount of CO_2 by the amount of glucose, a fermentable substrate. The relative mtDNA levels were assessed by quantitative PCR, measuring the relative levels of *COX1* (a mitochondrially encoded gene) against *ALG9*, a nuclear-encoded gene. The amplicons were validated by restriction analysis. Our results showed a significantly negative correlation between the mtDNA levels and fermentation ($p < 0.05$). Moreover, the deletion mutants were Kluyver effect positive for galactose; thus, fermentation of this sugar depended on aerobic respiration. The *Cd* segregant, which has the lowest amount of mitochondrial genome, was the best strain, producing almost three times more CO_2 than the wild type. Still, the factor that correlates with the increased fermentation remains unclear: it may be the mtDNA levels or the inability to perform aerobic respiration, which are linked in this experimental design. Further research will deepen this study by measuring the fermentation parameters while changing the segregant's ability to conduct cellular respiration but keeping the mitochondrial genome levels steady. 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.**

P3.03

INVESTIGATING ACTIN-MICROTUBULE CROSSTALK AND COORDINATION WITH A NOVEL MULTI-FILAMENT OPTICAL TRAPPING APPROACH

Undergraduate Student

Abigail Moeller[1], Amzad Chowdury[2], Dana Reinemann[2]

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

Cytoskeletal mechanics are typically not the sum from those of its constituent proteins, and optical trapping can be used to probe such emergent behavior. The cytoskeleton consists of actin, microtubules (MTs), and intermediate filaments (IFs), all of which must cooperate and function together in order to control vital cellular processes such as cell migration, adhesion, contractility, and force transmission, among others. Historically, actin filaments and microtubules have been considered completely separate entities with distinct behaviors and locations. Previous *in vitro* reconstitution experiments involving the cytoskeleton tend to focus on the properties of individual proteins within similar cytoskeletal systems, such as kinesin and microtubules or myosins and actin filaments. However, recent evidence suggests that these cytoskeleton components are fundamentally intertwined, as they engage in complex interactions during cellular processes, such as overlapping between F-actin and microtubules in neuronal growth cones, the ends of microtubules probing actin-rich cellular cortex and utilizing common signaling cascades where microtubules influence F-actin, which reciprocally influence microtubule behaviors. There is increasing evidence of interactions and crosstalk between microtubule and actin filament systems through direct linkages, such as crosslinking proteins and motors, and environmental influences, such as crowding, filament

density, and filament polymerization. In addition, the cytoskeleton is a hierarchical ordered system, and the resulting emergent mechanics are difficult to identify or predict from studying proteins at the single-molecule level. The specific mechanistic properties of such interactions have yet to be fully examined, and signal coordination within the cytoskeleton remains a mystery. To better understand how seemingly disparate cytoskeletal proteins and filaments work together to facilitate cellular-level dynamics, we constructed an *in vitro* bundle assay, comprising proteins and filaments from both the microtubule and actin cytoskeleton, and measured system mechanics using optical tweezers. In particular, anillin can interact with both microtubules and actin and has recently been demonstrated to have the ability to generate pN-level forces as a crosslinker through diffusional entropic expansion. The interplay of such crosslinking with myosin, whose motility dynamics change when going from single molecules to ensembles, will reveal how entropic crosslinkers, dynamic motor proteins, and filaments of different stiffness facilitate communication at the molecular scale and throughout the local cytoskeletal environment.

P3.04

MODIFYING PROMISCUITY OF SULFOLOBUS TODOKAII HEXOKINASE

Faculty/Staff

Christopher Jurgenson

Delta State University, Cleveland, MS

Sulfolobus todokaii uses a promiscuous hexokinase which catalyzes the phosphorylation of four different sugars: glucose, mannose, glucosamine, and N-acetylglucosamine. Three amino acids near the activesite but unlikely to effect protein folding based on Rosetta calculations were selected for mutation, Y36A, H94S, and D140G, to determine if promiscuity can be expanded to catalyze other mono and disaccharides. The Y36A, H94S, and D140G mutations were cloned, transformed into overexpression strains, and overexpressed. An FPLC purification protocol is being developed using His-tag, anion exchange, and gel filtration. Purified protein will be used for crystallographic and kinetics experiments.

P3.05

A BALANCING ACT: PAN-NEURONAL OVER-EXPRESSION OF ATAXIN1 IN *DROSOPHILA MELANOGASTER* LEADS TO DECREASED LIFE SPAN AND SUBTLE BEHAVIORAL DEFICITS

Undergraduate Student

Sydney Davis, Emma Palmer, Aswathy Rai and Natraj Krishnan

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Spinocerebellar ataxia type 1 (SCA1) is a neurodegenerative disease caused by the expansion of a translated CAG repeat encoding glutamine in the ataxin-1 (Atx-1) protein. Interestingly, while overexpression of mutant Atx-1 with an expanded polyQ tract causes neurodegeneration in mice and flies, even human Atx-1 with a nonpathogenic repeat of $(CAG)_{14}$CAT-CAG-CAT$(CAG)_{15}$, such as hAtx-1[30Q], causes neuronal degeneration if expressed at sufficiently high levels in either mice or Drosophila. To understand the physiological consequences of overexpression of *Atx-1* in flies, the yeast two hybrid system was employed where wild-type ataxin-1 under UAS was driven pan-neuronally in nervous tissue of *Drosophila melanogaster* using the elav-GAL4 driver (elav-GAL4/UAS-Atx-1). Parallel controls were UAS-ATX-1/+ and elav-GAL4/+. The lifespan of flies overexpressing *Atx-1* was significantly reduced compared to controls. While daily locomotor activity rhythms were not markedly affected, the negative geotaxis response was significantly impacted in flies overexpressing *Atx-1*. The expression of *armadillo* which is required for both for cell-cell adhesion and for regulating gene expression during development was markedly reduced. Moreover, Drosophila Nemo (*nmo*) a member of a conserved family of protein kinases that have roles in diverse signaling processes during development was also affected. Taken together, our results point to a specific level of ataxin necessary for proper development and enhanced levels can have physiologically detrimental effects.

P3.06

BRINGING ORDER TO TRANSLATION: PHYSIOLOGICAL CONSEQUENCES OF DISRUPTION OF GENES ENCODING TRNA-GUANINE TRANSGLYCOSYLASE AND THE QUEUOSINE SALVAGE PROTEIN IN DROSOPHILA MELANOGASTER.

Undergraduate Student

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Queuosine which is a hypermodified 7-deaza-guanosine that occurs at the wobble anticodon position 34 of four tRNA (Tyr, Asn, Asp, His) species for amino acids His, Asn, Tyr, and Asp with 5 GUN anticodons. Although the Q-modification occurs in most organisms, its precise role remains unclear in eukaryotes. The enzyme that substitutes Q for G34 in the Q-tRNAs is tRNA-guanine transglycosylase (TGTase), encoded by the *Tgt* gene. Eukaryotic TGTases consist of a catalytic subunit (QTRT1) and a homologous accessory subunit (QTRTD1), forming a functional complex. Unlike eubacteria, eukaryotes are unable to synthesize the Q-nucleoside or its precursors *de novo*. Animals must therefore salvage the nucleobase of queuosine, known as queuine, using salvage proteins such as DUF2419. *Drosophila melanogaster* has a single *Tgt* gene (CG4947)

encoding the QTRT1 protein (NP_608585.1) and the accessory subunit gene (CG3434) encoding the protein QTRTD1 (NP_6483201.1) necessary for Q-tRNA formation. There is also a single gene (CG9752) encoding the potential Q-salvage protein family DUF2419 (NP_611573.1). It is hypothesized that lack of Q-tRNA modifications would impact an organism's physiology. To understand the physiological consequences of lack of such modification, disruption of the *Tgt* gene and its accessory subunit gene was achieved by ubiquitously driving the expression of an RNAi transgene targeting these genes using the powerful GAL4/UAS system. The lifespan, accumulation of protein carbonyls, dopamine levels and neuronal degeneration was documented in flies which lacked Q-tRNA compared to control flies. The obtained data lend strong support to the hypothesis that lack of Q-incorporation affects tRNA species such as tRNA-Asn, tRNA-Tyr and tRNA-His, which ultimately leads to neurodegenerative symptoms.

P3.07

CIRCADIAN LOCOMOTORY ACTIVITY PATTERNS EXHIBIT SEXUAL DIMORPHISM IN A DROSOPHILA MODEL OF SPINOCEREBELLAR ATAXIA TYPE 1

Undergraduate Student

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Brain dimorphism is a complex process, with multiple contributing mechanisms and pathways resulting in differences. Sex-based differences with regard to clinical features have been identified in a range of neurological diseases, including Alzheimer's disease (AD), Parkinson's disease (PD), Huntington's disease (HD), amyotrophic lateral sclerosis (ALS), multiple sclerosis (MS), and ischemic injury. In this study, a Drosophila model of Spinocerebellar ataxia type 1 (SCA1) a polyglutamine disease causing neurodegeneration was developed using the yeast two hybrid system. P{UAS-Hsap\ATX1.82Q}M6 which expresses humanAtaxin1 (ATX1 or SCA1) with a long PolyQ repeat of 82 amino acids under control of UAS was crossed to elav-GAL4, a pan-neuronal driver (elav-GAL4/UAS-ATX1.82Q) for driving gene expression throughout the nervous system. The circadian clock in Drosophila modulates a broad spectrum of physiological and behavioral processes including locomotor activity, sleep patterns, courtship, learning and memory, feeding behavior, chemosensation, and immune responses. Circadian locomotor activity was monitored in male and female SCA1 flies with parallel controls (UAS-ATX1.82Q/+ and elav-GAL4/+). Additionally, the expression of core clock genes - *per*, *tim*, *clk* and *cyc* was monitored over a 24 hr period (ZT0 - ZT 24). A distinct sexual dimorphism was recorded in the locomotor activity patterns as well as expression of core clock genes in the fly model of SCA1. Taken together, our results emphasize the role of sex-dependent effects on circadian locomotor activity pattern during SCA1 pathogenesis.

P3.08

UNCOVERING THE ROLE OF AMBLYOMMA AMERICANUM TRNA SYNTHETASES IN HEMATOPHAGY AND EHRLICHIA INFECTION

Undergraduate Student

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Transfer RNA synthetases are a family of enzymes that catalyze the addition of amino acids to their corresponding transfer RNAs (tRNAs) and play an essential role in protein synthesis. Recent research has uncovered intriguing connections between arthropod protein synthesis, development, and their ability to host and transmit pathogens. Ticks are obligate hematophagous ectoparasites that rely on prolonged feeding periods to complete their life cycle on a vertebrate host. Tick tRNA synthetases help the tick in continuous protein synthesis to evade the host immune system while stealing the host blood. These enzymes present a potential target for developing new tick control strategies. In this study, we investigate the crucial role of transfer RNA (tRNA) synthetases in the lone-star tick (*Amblyomma americanum*) during blood feeding on the host and propagation of *Ehrlichia chaffeensis* (EC) infection within the tick vector, the causative agent of human monocytic ehrlichiosis. We hypothesized that tRNA synthetases are indispensable in tick hematophagy, embryogenesis, and Ehrlichia infection. To validate this hypothesis, we used two commercially available tRNA synthetase inhibitors, Halofuginone (targeting prolyl-tRNA synthetase) and Borrelidin (targeting threonyl-tRNA synthetase), to evaluate their effects on the tick and pathogen infection at the cellular and organismal level. Preliminary data obtained from tick cell lines indicate that Halofuginone and Borrelidin affect tick protein synthesis and handicap EC proliferation. Additionally, our results demonstrated that both inhibitors have detrimental effects on the organism, resulting in impairment of tick feeding, leading to the death of ticks attached to the host after 24 hours. These results will provide a deep insight into the molecular mechanisms of these enzymes for designing new tick-specific inhibitors to prevent ticks and tick-borne diseases.

P3.09

DELINEATION OF MOLECULAR MECHANISMS THAT UNDERLIE TNF-α RELEASE FROM MAST CELLS

Graduate Student

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Mast cells are one of the major producers of tumor necrosis factor-alpha (TNF-), and mast cell-derived TNF- has been shown to be associated with pathological conditions such as rheumatoid arthritis, inflammatory bowel diseases, and allergic asthma. However, the molecular machinery underlying TNF- release from mast cells has been unclear, despite the conserved nature of exocytosis. To delineate the exocytic machinery required for TNF- release from mast cells, we systematically dissected the exocytic fusion machinery (e.g., Munc13, Munc18, and VAMP families) expressed in mast cells, using a combination of CRISPR-dependent knockout, RNA interference, and confocal microscopy. Out of the three Munc13 proteins found in mast cells, we have shown that Munc13-4 and Munc13-1 are required for IgE/allergen-triggered exocytosis of TNF- while BAIAP3 does not appear to be required. Of the three Munc18 homologs, we showed that Munc18-2 is the sole Munc18 homolog required for TNF- release in mast cells. Of the four VAMPs most likely involved in mast cell exocytosis, our knockout approach indicates VAMP7 but not VAMP3 is responsible for TNF- release. These findings will set the stage for unraveling therapeutic targets to treat diseases caused by mast cell-derived TNF- .

P3.10

LDL-INDUCED PROTEIN EXPRESSION PATTERNS IN FIBROBLASTS ANALOGOUS TO POLYCYSTIC OVARY SYNDROME (PCOS)

Undergraduate Student

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Multiple clinical research studies have shown that changes in the expression of specific proteins andincreased low-density lipoprotein (LDL) are associated with polycystic ovary syndrome (PCOS).Specifically, IGFBP-1, CX3CLI (fractalkine), GM-CSF, IL-6, MCP1, CCL5 (RANTES), IL-8 and MCP3 are increased within endometrial stromal fibroblasts during decidualization, a process that results insignificant changes to cells of the endometrium in preparation for, and during, pregnancy. Also,stimulation of ovarian follicles with hCG and FSH results in increased levels of bFGF and VEGF in the follicular fluid and serum of PCOS patients. In PCOS patients with increased levels of bFGF, mature oocytes are decreased. Furthermore, dyslipidemia is a common abnormality in about 70% of women with PCOS, and relatives of women with PCOS have been shown to have increased levels of LDL. In our studies, fibroblasts treated with LDL were used to determine the change in expression of proteins involved in decidualization and ovarian stimulation to determine if LDL uptake into fibroblasts could play a possible role in PCOS. GM970 fibroblasts were either untreated or treated with 50 ug/mL of LDL for 24 hours. LDL uptake into treated fibroblasts was verified via microscopy and lysates of treated (LDL) and untreated cells were applied to membrane-based antibody arrays to assess the change in expression of the various proteins. LDL treatment resulted in a similar expression pattern of proteins linked to PCOS that were measured in the clinical research studies. Although LDL treatment decreased the expression of IL-8 and MCP3, LDL uptake in GM970 fibroblasts increased the expression of IGFBP-1, CX3CLI (fractalkine), GM-CSF, IL-6, MCP1 and CCL5 (RANTES), indicating that LDL treatment induces expression of the majority of decidualization-related proteins. Moreover, LDL treatment increased the levels of bFGF and VEGF relative to the untreated control. PCOS is known to be a common endocrine disorder, but there may be other factors at play. Several factors such as heredity, insulin resistance, low-grade inflammation, and excess androgen may play a role in PCOS, but the exact cause of PCOS is currently unknown. These results point to a link between LDL metabolism and PCOS and further studies may reveal a new point of treatment for PCOS.

P3.11

IGF2BP1 REGULATES GLI1 AND PTCH1 IN A MOUSE MODEL OF BASAL CELL CARCINOMA (BCC)

Undergraduate Student

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Jackson State University, Jackson, MS

Insulin like Growth Factor 2 mRNA Binding Protein 1 (IGF2BP1) is a direct target of the Wnt/ -Catenin signaling pathway. IGF2BP1 was shown to be responsible for a variety of pleiotropic effects of the Wnt/ -Catenin signaling pathway in human colorectal cancer cells and to connect Wnt and Hedgehog (Hh) pathways by upregulating the transcriptional activator of the Hh pathway Gli1. This mode of regulation of Gli1 appears to be important to several functions of Wnt, such as survival and proliferation of colorectal cancer cells. Constitutive activation of the Hh pathway is responsible for the development of many cancers including basal cell carcinoma and Gli1 is the transcriptional factor through which the Hh pathway is mediated. Therefore, we hypothesized that inhibiting IGF2BP1 is important in the treatment of basal cell carcinoma as it will inhibit the Hh signaling. Our preliminary study showed that inhibition of IGF2BP1 in basal cell carcinoma cells significantly reduces tumor growth and the expression of Hh target genes in human xenograft tumor models. In this study we used skin samples collected from UVB-exposed skin specific IGF2BP1 knockout mice in the Ptch+/- background which is the mouse model for basal cell carcinoma. Immunofluorescence staining of the skin lesions shows that IGF2BP1 expression is significantly reduced in the skin of experimental mice compared to its

expression in the controls (P<0.05). The effect of this reduction in IGF2BP1 on Gli1 and Gli1 target Ptch1 will be discussed. Grant support: R03 CA223099-01, 5U54MD015929-03, the Society for Investigative Dermatology (SID) Freinkel Diversity Fellowship, and NSF Award Notice for Award ID 2142465 (awarded to FNK).

P3.12

THE ROLE OF ELMO IN BAI1-DRIVEN BREAST CANCER CELL FUSION

Undergraduate Student

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The purpose of this study is to determine the role of Engulfment and Cell Motility (ELMO) in BAI1-driven breast cancer cell fusion and metastasis. Breast cancer is the most common cancer in women and the second leading cause of cancer-related death among women in our population. Approximately 90% of breast cancer-related deaths are caused by metastasis. The mechanisms governing metastasis are still not well understood. Our lab previously showed that when breast cancer cells fuse with other cells, they produce hybrids that are heterogeneous and contribute to lung metastases in an in vivo model. To understand the mechanisms driving breast cancer cell fusion, we are assessing the role of BAI1/Elmo/ Dock180/ Rac signaling. A recent study identified apoptotic cells as a new type of cue that induces signaling *via* the Phosphatidylserine (PtdSer) receptor BAI1 to promote fusion of myoblasts by means of signaling through Elmo/ Dock180/ Rac. ELMO, Dock180, and Rac are overexpressed in breast cancers and associated with the most aggressive form of breast cancer. We had found that hypoxia and apoptotic cells promote breast cancer cell fusion. We hypothesize that hypoxia stress-induced apoptosis activates BAI1 that signals through Elmo/ Dock180/ Rac to induce breast cancer cell fusion. To assess the role of ELMO in this process, we cocultured the BAI1 knockout breast cancer cells MDA-MB-231 overexpressing ELMO and bone marrow derived mesenchymal stem cells (MSCs) and determined their ability to fuse compared to the one of cocultures of BAI1 knockout MDA-MB-231 and MSCs. The cre/loxP-stop-loxP-GFP system was used to identify the fusion products.

We found that knocking out BAI1 in breast cancer cells significantly reduced their ability to fuse with MSCs (P<0.001). Overexpressing ELMO in BAI1 knockout MDA-MB-231 cells rescued their ability to fuse with MSCs (P<0.001). This supports the contribution of ELMO to BAI1-dependent breast cancer cell fusion. These findings will potentially help in the development of a novel class of drugs to reduce breast cancer metastasis and death in our population. GRANT SUPPORT: The NIH/ NIMHD grant 5U54MD015929-03, the Society for Investigative Dermatology (SID) Freinkel Diversity Fellowship, and NSF Award Notice for Award ID 2142465 (awarded to FNK). LSMAMP and NINDS programs at Jackson State University.

P3.13

THE CONTRIBUTION OF DOK180 IN BAI1-DEPENDENT BREAST CANCER CELL FUSION

Undergraduate Student

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Breast cancer is the leading cause of cancer related death among women. Furthermore, the mortality rate due to breast cancer is higher in black women than in white women. One of the main reasons is that black women tend to acquire a more aggressive form of breast cancer called “Triple Negative Breast Cancer.” Triple Negative Breast Cancer has limited forms of treatment and is negative in three receptors (hence the name), these receptors are progesterone, estrogen, and Her2. It has been shown in studies that breast cancer cells spontaneously fuse with other cells to give rise to heterogeneous hybrids exhibiting higher ability to proliferate, migrate, and invade both in vitro and in vivo. This ability of hybrids to metastasize puts patients at higher risk. The heterogeneity in the hybrid population contributes to drug resistance. The purpose of our study is to understand the mechanisms that drive breast cancer cell fusion. A previous study discovered that the Phosphatidylserine (PtdSer) receptor protein BAI1 promoted myoblast fusion through the ELMO/DOCK180/RAC1 pathway. This pathway is also activated in breast cancer and correlates with the aggressive forms of breast cancer. In addition, our recent studies showed that BAI1 inhibition reduced breast cancer cell fusion. We hypothesized that BAI1 signals through the ELMO1/DOCK180/RAC1 pathway to promote breast cancer cell fusion. In this project, we used the BAI1 knockout breast cancer cells MDA-MB-231 and bone marrow-derived mesenchymal stem cells (MSCs) to analyze if an overexpression of the protein DOCK180 would rescue BAI1 inhibition, confirming that BAI1 signals through DOCK180 to induce breast cancer cell fusion. We used electroporation to introduce Cre expression constructs in the stem cells and loxP-STOP-loxP-GFP expression constructs in the cancer cells. We identified the fusion products based on their GFP expression using a fluorescent microscope. Our results showed that there was a significantly higher level of fusion events when the protein DOCK180 was overexpressed compared to when it was not (P<0.001). This supports our hypothesis that DOCK180 contributes to BAI1-driven breast cancer cell fusion. This study will contribute to drugs development that will be effective in breast cancer treatment and can lead to slowing down breast cancer related death in our population. GRANT SUPPORT: The NIH/ NIMHD grant 5U54MD015929-03, the Society for Investigative Dermatology (SID) Freinkel Diversity

Fellowship, and NSF Award Notice for Award ID 2142465 (awarded to FNK). LSAMP and NINDS programs at Jackson State University.

P3.14

KNOCKDOWN OF CES1 IN THP-1 MACROPHAGES INCREASES CITRATE AND DEPRESSES UDP-GLCNAC: FURTHER EVIDENCE OF CES1's ROLE IN REGULATING IMMUNOPHENOTYPE

Graduate Student

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Macrophages are innate immune cells with the capacity to differentiate into classically activated (M1) or alternatively activated (M2) cells that promote or attenuate inflammation, respectively. Inflammation that is precipitated in response to pathogen-associated molecular patterns (PAMPs) or damage-associated molecular patterns (DAMPs) is normally resolved during healthy physiology. However, dysregulated inflammation can lead to chronic inflammation, which initiates or complicates diseases like T2 diabetes, cancer, and atherosclerosis. Carboxylesterase 1 (CES1) is a serine hydrolase that catabolizes neutral lipids. Our published results indicate that THP-1 macrophages with deficient CES1 expression (CES1KD cells) exhibit larger quantities of lipid droplets than normal THP-1 macrophages (control cells) due to their reduced lipolytic activity. Further, CES1KD cells produce more IL-1b and prostaglandin E2 than control cells. Studies have also shown that classically activated M1 macrophages exhibit a broken citric acid cycle causing an intracellular buildup of proinflammatory citrate and succinate metabolites. Here, we report that CES1KD cells have greater levels of several TCA metabolites than control cells under both baseline and lipopolysaccharide (LPS)-stimulated conditions. These include lactate, citrate, cis-aconitate, and a-ketoglutarate, while succinate levels were depressed. Furthermore, in CES1KD cells there was a striking reduction in UDP-GlcNAc levels, a metabolite made by M2 macrophages. Surprisingly, LPS treatment of control and CES1KD cells did not alter any of the polar metabolites. Consistent with the cell-type differences found for the polar metabolites, RNA-seq indicated that M2 marker gene expression levels of *ALOX15*, *FABP4*, and *CD206* in CES1KD cells were lower than those in control cells. Gene ontology, KEGG, and Reactome database enrichment analyses of unstimulated CES1KD cells revealed an enrichment of upregulated gene pathways that are involved in antibacterial and antiviral defense, which was similar to the signature seen in control cells stimulated with LPS and IFN- . Thus, CES1KD macrophages under baseline conditions appear to exhibit a similar immunophenotype as M1 control cells. These findings further confirm that CES1 plays a role in regulating macrophage inflammatory immune responses, and that enhancing CES1 activity might reverse or attenuate the progress of diseases caused by chronic inflammation. [Supported by NIH R15HL157818-01A1

P3.15

MICROTUBULE-DESTABILIZING EFFECTS OF *Vernonia Amygdalina* FRACTIONS IN CANCER CELLS

Faculty/Staff

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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). VA fractions induce microtubule disassembly in a fashion similar to Nocodazole, but different to Taxol. Taken together, these observations demonstrate that VA contains biologically active components capable of inhibiting growth and proliferation of cancer cells, exerting their properties via mechanisms that target and trigger

disruption of microtubule organization, effectively causing apoptotic death.

P3.16

GENOMIC EXPLORATION OF *Mycobacterium tuberculosis*: UNRAVELING COMPLEXITY FOR EFFECTIVE INTERVENTION

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Mycobacterium tuberculosis, the causative agent of tuberculosis, is most often found attacking the lungs. We searched into the genomic aspects of *Mycobacterium tuberculosis*, addressing the need to understand its genetic complexity and implications for effective intervention. We explore the genomic landscape of *Mycobacterium tuberculosis*, shedding light on key genetic features. Emphasis is placed on recent developments in microbial genomics that contribute to our understanding of the organism's biology and pathogenicity. Focusing on the genes that exhibit variations within the *Mycobacterium tuberculosis* genome is crucial for advancing our knowledge and devising targeted strategies in the fight against tuberculosis.

P3.17

GENETIC ANALYSIS OF *Microcystis aeruginosa* and ITS ENVIRONMENTAL REPERCUSSIONS

Undergraduate Student

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Toxic algal blooms pose an ever-present threat to the goals of commercial, conservational, and recreational aquatic interests. The microcystins produced by Microcystis aeruginosa are one of the primary contributors to the toxicity such blooms present. An examination of the global effects of Microcystis aeruginosa on the interests mentioned above, as well as the genetics of the NIES-2481 and NIES-843 strains, was conducted with the goal of generating a better understanding of the issues toxic algal blooms present and considering countermeasures to combat such blooms. Conclusions are presented regarding possible outcomes of apathy toward Microcystis aeruginosa and suggestions for the future direction of algal research.

P3.18

ELUCIDATING THE MECHANISM UNDERLYING THE RESISTANCE OF MOUSE STEM CELLS TO LISTERIA INFECTION

Graduate Student

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A significant number of miscarriages has been attributed to unsuccessful implantation owing to immunological challenges the early embryo encounters during embryogenesis. However, the immune properties of early embryogenesis remain poorly understood. Our recent studies have demonstrated that mouse embryonic stem cells (ESCs) exhibit distinct immunological characteristics compared to differentiated somatic cells. Notably, they display attenuated responses to inflammatory cytokines and are insensitive to cytokine cytotoxicity. Our present study aims to investigate the antibacterial innate immunity of ESCs against *Listeria monocytogenes* (Lm), a gram-positive intracellular bacterium known to cause severe pregnancy complications. Our findings have shown that Lm induces strong inflammatory responses and cytopathogenic effects in macrophages and fibroblasts, as evidenced by the production of pro-inflammatory cytokines (TNF , IL-6, and IL-1). In contrast, ESCs did not exhibit the expression of these cytokines or apparent cytopathogenic effects upon Lm infection. To quantify the level of infection, we tracked Lm internalization by ESCs using GFP-tagged Lm via confocal microscopy. We observed significantly lower infection levels in ESCs compared to macrophages and fibroblasts. Furthermore, we tested the presence of actin assembly associated with Lm motility within the cells by staining GFP-tagged Lm-infected fibroblasts and ESCs with Rhodamine-phalloidin. This results in a population of bacteria with characteristic actin comet tails. In summary, our findings suggest ESCs possess inherent resistance to Lm infection compared to macrophages and fibroblasts. We hypothesize that ESCs' unresponsiveness to Lm may be a protective mechanism against bacterial pathogens. To test this hypothesis, ongoing molecular experiments are exploring the functionality of an alternative pathway that is involved in cellular resistance to bacterial pathogens. This study will provide valuable insights into the development of antibacterial innate immune responses during early embryogenesis.

P3.19

INVESTIGATING YAP1 INVOLVEMENT IN DIMORPHISM IN HISTOPLASMA CAPSULATUM

Undergraduate Student

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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 concentration 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* RNA strain from yeast to mold by changing the incubation temperature from 37ºC (to promote yeast

growth) and 25°C (to promote mold growth). When cells were grown in liquid HMM (Histoplasma Macrophage Medium), and HMM solid media, the *Yap1* RNAi strain started to convert to mold, but halted mold production prematurely. The wildtype and null strains were able to convert completely to mold. These results indicate that *Yap1* may be involved in dimorphism. SEM studies did not show any morphological changes along the surface of the cells in these strains, before and after morphological conversion from yeast to mold. Further studies are underway to determine if *Yap1* is involved in sulfur metabolism, which is believed to be a key component of *Hc* ability to convert from one morphotype to the other. These studies includes a glutathione assay, and measuring mRNA expression of sulfur metabolizing genes, *GSH1* and *GSH2*, in they *Yap1* RNAi, wildtype, and null strains via qRT-PCR.

P3.20

IN VIVO EFFECTS OF INSULIN-LIKE GROWTH FACTOR 2 MRNA-BINDING PROTEIN 1 (IGF2BP1) INHIBITION ON BASAL CELL CARCINOMA DEVELOPMENT

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The insulin-like growth factor 2 mRNA-binding protein 1 (IGF2BP1) is an RNA-binding protein that we previously identified as a *bona fide* transcriptional target of the Wnt/ -catenin signaling pathway. IGF2BP1 induction has been shown to regulate a set of genes that promote cellular adhesion, invasion, and extracellular matrix remodeling which are important in metastasis. Its expression has been shown to correlate with the most aggressive form of some cancers. We previously showed that IGF2BP1 serves as a mechanistic link in the cross-talk between Wnt and Hh pathways by upregulating the transcriptional activator of the Hh pathway GLI1. We hypothesized that IGF2BP1 is important in basal cell carcinoma development and progression. In this study, we used the basal cell carcinoma cell line, UW-BCC1, a human xenograft tumor model *Foxn1^{nu}*, and a mouse model of basal cell carcinoma, *Ptch*+/- to show that inhibition of IGF2BP1 significantly reduces tumor growth in xenograft mice ($P<0.05$) and in skin-specific IGF2BP1 knockout mice in the Ptch+/- background ($P<0.05$). Additional studies will determine whether inhibition of IGF2BP1 could reduce basal cell carcinoma tumors after they have developed.

P3.21

EVALUATION OF STATIC AND DYNAMIC CELL-SEEDING TECHNIQUES FOR GRAFT MATERIALS

Graduate Student

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Introduction: Bone grafting is a crucial procedure utilized in various surgical specialties, such as dental and orthopedic surgery. The growing demand for this technique has sparked significant research interest in the development of bone graft materials that promote faster healing.

In this particular study, we aimed to assess the maturation, differentiation, and mineralization of two types of graft materials. These materials were statically and dynamically seeded with human stem cells. We are grateful to Zavation Medical Products, LLC for providing us with both graft materials: Demineralized human bone (allograft fibers) and calcium phosphate/collagen/ -TCP/bioglass45S5 (Uni-fuZe-C-strips).

Methods: A total of 50,000 human stem cells (RoosterBio®) were seeded either statically or dynamically onto allograft fibers, strips, and control groups. The control groups consisted of cells cultured solely on tissue culture polystyrene plates with media (TCPS). In the static-seeded groups, cells were placed directly onto the graft fibers or strips, while in the dynamically seeded groups, the cells were stirred at 125 rpm for 30 minutes before seeding. To assess cell survival, differentiation, and maturation, DNA, MTT, ALP, and Alizarin red assays were conducted on both types of graft materials.

Results: All the graft samples indicated a gradual decrease in ALP levels as the DNA content increased, suggesting the differentiation of stem cells into functional osteoblasts. Moreover, the normalized MTT to DNA data revealed significant differences ($p<0.05$) between day 1 and day 21 for both statically seeded groups. Interestingly, no Alizarin red staining was observed in the fibers, while the strips exhibited significant staining by day 21.

However, it is important to note that the dynamic seeded data was contaminated, and as a result, it is currently undergoing re-testing to ensure accuracy and reliability.

Conclusions: By integrating the data obtained from the DNA, ALP, and Alizarin Red assays, it is evident that in the allograft fibers study, stem cells exhibited a greater affinity towards the TCPS environment compared to the fibers themselves. Conversely, in the strips study, stem cells demonstrated a preference for the strips over the

TCPS environment. To further validate these in vitro findings, future research will focus on completing the dynamic seeding process and confirming the results through an in vivo study utilizing the Sprague Dawley rat model.

Friday, March 1, 2024
MORNING
ROOM Union H

8:30 WELCOME

ORAL PRESENTATION SESSION IV
Moderators: Drs. James A. Stewart, Jr., Davida Crossley, Felicite Noubissi-Kamdem

O3.09

9:00 ELUCIDATING THE DESIGN PRINCIPLES OF EMERGENT ACTOMYOSIN SYNERGY AND MECHANICAL FORCE-FEEDBACK LOOPS

Faculty/Staff

Dana Reinemann

University of Mississippi, Oxford, MS

Cytoskeletal protein ensembles exhibit emergent mechanics where behavior exhibited in teams is not necessarily the sum of the components' single molecule properties. In addition, filaments may act as force sensors that distribute feedback and influence motor protein behavior. Development of cytoskeletal reconstitution assays that reflect a physiologically relevant environment has been a challenge for the biophysics field. In particular, optical trapping approaches to investigate motor protein dynamics have typically consisted of a reductionist geometry of a single motor and single filament. These assays not only do not capture the structural hierarchy in which motors with crosslinking ability function, but they also cannot capture the emergent mechanics that develop from ensembles of cytoskeletal proteins. To probe the molecular determinants of force generation, communication, and synergy of hierarchical cytoskeletal mechanics with high resolution, an optical trapping approach was developed that probes multiple motors and filaments in an ensemble. Using this method, we interrogate actomyosin mechanics to elucidate myosin II ensemble synergy and force regulation within a bundled actin assembly. We also developed a novel approach utilizing a quartz crystal microbalance with dissipation monitoring (QCM-D) to measure mechanical changes within actomyosin bundles. We demonstrate that QCM-D can detect changes in actomyosin viscoelasticity due to molecular-level alterations, such as concentration and nucleotide state, thus providing evidence for actin's role

O3.10

10:30 CONTROL OF PROTEIN DEGRADATION BY THE SHUTTLING FACTOR AND PROTEASE DDI2

Faculty/Staff

Galen Collins

Mississippi State University, Starkville, MS

Intracellular protein degradation is critical to remove regulatory or damaged proteins. In proliferating eukaryote cells, much of this degradation occurs through the ubiquitin-proteasome pathway. Part of this pathway involves a protein in mammals called Ddi2 that helps deliver substrates to proteasomes. Oddly, it also has its own protease domain. We have found that Ddi2's protease influences how it delivers substrates to proteasomes, that targeting the Ddi2 protease is likely involved in protein quality control pathways, and that this can lead to an increased accumulation of antigen-presenting complexes on the surface of cells. Thus, inhibiting Ddi2 could improve checkpoint inhibitor outcomes in cancer therapy.

10:00 – 10:30 BREAK

ORAL PRESENTATION SESSION V
Moderators: Drs. James A. Stewart, Jr., Davida Crossley, Felicite Noubissi-Kamdem,

O3.11

10:30 EHRLICHIA CHAFFEENSIS INDUCED DIFFERENTIALLY EXPRESSED MICRORNAS IN THE LONE-STAR TICK (*Amblyomma Americanum*)

Faculty/Staff

Deepak Kumar, Latoyia Downs, Shahid Karim

University of Southern Mississippi, Hattiesburg, MS

Introduction: MicroRNAs (miRNAs) represent a subset of small noncoding RNAs and carry tremendous potential for regulating gene expression at post-transcriptional level. They play pivotal roles in distinct cellular mechanisms including inhibition of bacterial, parasitic, and viral infections via immune response pathways. Intriguingly, pathogens have developed strategies to manipulate the host's miRNA profile, fostering environments conducive to successful infection. Therefore, changes in an arthropod host's miRNA profile in response to pathogen invasion could be critical in understanding host-pathogen dynamics. Additionally, this area of study could provide insights into discovering new targets for disease control and prevention. The main objective of the present study is to investigate the functional role of differentially expressed miRNAs upon *Ehrlichia chaffeensis* infection in tick vector, *Amblyomma americanum*. **Methods:** Small RNA libraries from infected and uninfected tick tissues (salivary glands, midgut) were prepared, pooled and sequenced on an Illumina Next Seq 500 high output (300 cycle) using TruSeq SBS kit v3 (Illumina) in line with the

manufacturer's protocols. Data analysis was performed by using the sRNAtoolbox webserver. Briefly, initial sequencing quality control step in FastQC (http://www.bioinformatics.babraham.ac.uk/projects/fastqc), preprocessing, mapping, and annotation were mainly conducted in sRNAbench module of sRNAtoolbox with customized scripts as necessary. edgeR was used to determine differential expression between uninfected and *Ehrlichia chaffeensis* infected tick tissues. Using sRNAbench's differential expression module, an expression matrix with the raw read counts for input into edgeR was generated to obtain differential miRNA expression. edgeR normalizes the data using the trimmed mean of M-values (TMM) method. An expression matrix was also generated with reads per million (RPM)-normalized expression values using the "single assignment" procedure in sRNAbench. As a result, each read mapping multiple times was only assigned once to the miRNA with the highest expression and only affected reads mapping to several different reference sequences, i.e., normally miRNA sequences from the same family. The RPM values were obtained by dividing the read count of a given miRNA by the total number of reads mapped to the miRNA library. **Results:** Altogether 70-75 miRNAs were identified along with their precursors in each of *Ehrlichia chaffeensis* infected as well as uninfected tick tissues. A list of differentially expressed microRNAs in Ech-infected tick tissues were also identified. Within the Ech-infected salivary glands, the differentially expressed miRNA consisted of 18 upregulated and 5 downregulated miRNAs. Meanwhile, in the Ech-infected midgut, 7 upregulated and 7 downregulated miRNAs were discovered. Studies have predicted roles of these known miRNAs in vector-host and vector-pathogen interactions specifically in immune response, pathogen survival, and immunomodulation in other tick species and arthropods. **Conclusion:** Selected differentially expressed miRNAs will be further characterized by miRNA inhibitory experiments and discussed in this presentation. These miRNAs can provide novel insights towards inhibiting *Ehrlichia chaffeensis* inside ticks.

O3.12

11:00 UNDERSTANDING THE ROLE OF ZNF493 IN COLON CANCER

Faculty/Staff

Benjamin Onyeagucha

Mississippi University for Women, Columbus, MS

Altered gene expressions are major drivers of cancer development, progression, and morbidity. Identifying key signature genes with altered expression could help in the effective diagnosis or treatment of cancer patients. We have identified the zinc finger 493 (ZNF493) as a gene whose expression is altered in colon cancer. We demonstrated that the ZNF493 is regulated by the S100P, a secreted glycosylated protein, through miR-155 in colon cancer cells. Colon cancer (CRC) is the third most common type of cancer and the third cause of cancer-related death. The ZNF493 is a member of the ZNF family, one of the largest groups of transcription factors in humans. ZNF members have been shown to have tumor suppressor or oncogenic functions in various cancers. However, very little is known about their expressions and the specific roles of many ZNFs in cancers. S100P and miR-155 expression are associated with pancreatic, breast, and colon cancer. We have previously demonstrated that the S100P protein binds to the Receptor for Advanced Glycosylation End product (RAGE) to regulate miR-155 expression via the AP-1 transcription factor. Using bioinformatics analysis, we identified a predicted miR-155 seed sequence on the ZNF493 3'-untranslate region (UTR). The overexpression of S100P or miR-155 significantly decreased the level of ZNF493 protein in colon cancer cells. Also, the knockdown of S100P or miR-155 expression resulted in elevated ZNF493 expression in colon cancer cells compared to control cells. To understand the clinical importance of ZNF493 in colon cancer, we analyzed the expression of ZNF493 in colon cancer specimens. The result showed that the expression of ZNF493 was significantly reduced in about 90% of the colon cancer tissue specimen compared to the matched-normal colon mucosa. This data suggested that the ZNF493 expression pattern could be a biomarker in colon cancer. The findings also warrant further investigation into the role of ZNF493 in colon cancer. Understanding the expression pattern and function of ZNF493 could provide new insight into the mechanism involved in colon cancer pathogenesis.

11:30 CELLULAR, MOLECULAR, DEVELOPMENTAL BIOLOGY DIVISION AWARDS
(sponsored by the Department of BioMolecular Sciences at University of Mississippi School of Pharmacy)

11:45 CELLULAR, MOLECULAR, DEVELOPMENTAL BIOLOGY DIVISION MEETING

Friday, March 1, 2024
AFTERNOON

12:00- 1:00 GENERAL SESSIONS

Mississippi INBRE/ Millsaps Symposia

Chemistry and Chemical Engineering

Chair: Karina Kaputsa
Tougaloo College
Co-Chair: Joseph Emerson
Mississippi State University
Vice-Chair: Rajaskekhar Kanchanapally
Mississippi Valley State University

Thursday, February 29, 2024
MORNING
Room TC 210

8:15 Opening Remarks

Biochemistry and Computational Chemistry

O4.01

8:30 DESIGNER PEPTIDES TO STUDY THE REDOX-CONTROLLED LIQUID-LIQUID PHASE SEPARATION

Malay Mondal[1], Penelope Jankoski[2], Tristan Clemons[2], and Vijay Rangachari[1]

[1]Department of Chemistry and Biochemistry, School of Mathematics and Natural Sciences, and [2]School of Polymer Science and Engineering, University of Southern Mississippi, Hattiesburg, MS

Liquid-liquid phase separation (LLPS), a process underlying the formation of biomolecular condensates has been under intense investigation lately. LLPS is a typical process by which proteins demix from the bulk solution to generate a dense and a dilute phase. This reversible phase separation process underlies the formation of membraneless organelles in cells. LLPS is best defined by a "stickers and spacers" model in which weak multivalent interactions between the stickers and conformational freedom by the spacers drive phase separation. In this work, we examined the effects of cysteine disulfide bonds as redox-reversible covalent stickers on LLPS by investigating short, 15-amino acid long peptides. Specifically, they were designed with Arg/Tyr stickers and Gly/Ser as spacers and interspersed cystines. The peptides were allowed to phase separate with poly-A RNA as counter ions. Using turbidity assays and microscopies (DIC and Confocal), we generated a phase diagram to define a phase boundary with varying concentrations of the peptide and RNA for complex coacervates and later defined the phase boundary with varying concentrations of salt (NaCl), peptides, and different pH for self coacervates. First, we established a phase boundary for the positive control peptide without cystines and followed up with a peptide containing two interspersed cystines. Our current findings show that the lower the concentration of peptide and the higher the concentration of poly-A RNA result in phase separation for complex coacervates, but self-coacervates form at comparatively high peptide and salt concentrations. Cystines seem to alter the phase boundary of self-coacervates depending on the redox conditions. Our study will incline our understanding of how covalent cross-links modulate LLPS and will provide a foundation for modifying the material properties of the droplets.

The authors thank the National Science Foundation for their funding under grant number NSF-CHE-1950840.

O4.02

8:50 RELATIVE STABILITIES OF AMINO AND NITRO DERIVATIVES OF 9-METHYLANTHRACENE AND 9-METHYLENE-9,10-DIHYDROANTHRACENE

Claire Stokes, David Magers

Mississippi College, Clinton, MS

In 1949, Clar and Wright reported that 6-methypentacene exists as 6-methylene-6,13-dihydropentacene at Room temperature (*Nature* 1949, *163*, 921). Thus, the aromaticity of the central ring and the planarity of the overall compound is destroyed by this shift. The same does not occur in anthracene. While the 9-methylene derivative of anthracene is a local minimum, the planar 9-methyl derivative is the more stable. In the current study we investigate if certain derivatives of these anthracene systems stabilize the methylene system relative to the methyl. Specifically, mono-, di-, tri-, tetra-, and penta-amino and nitro derivatives of anthracene are considered. Optimum equilibrium geometries, harmonic vibrational frequencies, and the corresponding zero-point vibrational energies are computed for each set of isomers using density functional theory. The DFT functionals employed are Becke's three-parameter hybrid functional with the Lee-Yang-Parr correlation functional, the M06-2X high nonlocality hybrid functional from Truhlar and Zhao, and the B97XD functional from Head-Gordan and coworkers which includes empirical dispersion. The basis sets employed are Dunning and coworkers' correlation consistent basis sets cc-pVDZ and cc-pVTZ. Natural bond orbital analysis is employed to help explain the factors contributing to the stabilization of each system. We gratefully acknowledge support from the Mississippi College Catalysts, the alumni support group of the Department of Chemistry & Biochemistry.

O4.03

9:10 PHOTOCHEMICAL SYNTHESIS OF ISOINDOLONE PIPERIDINES AS KINASE INHIBITORS: CONTROLLING THE REGIOCHEMISTRY OF UNSYMMETRICAL CHROMOPHORS

Zoe Elder[1], Tynai Bridges[1], Wolfgang Kramer[1], Caroline McKinney[1], Christian Hart[1], Matthew Donahue[2]

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

Photochemical cyclization reactions have long been employed to gain easy access to complex cyclic structures. Since most medicinal drugs contain regio- and stereospecific challenges, control of the photochemical cyclization reaction is essential in utilizing light in synthetic pathways.

Here we present our investigations in the photochemical key step in the synthesis of isoindolone piperidines. Isoindolone piperidines have applications as inhibitors of two key phosphorylating enzymes, glycogen synthase kinase-3 (GSK3) and cyclin-dependent kinases (CDKs). These enzymes are targets for inhibition to provide a tool in minimizing the harmful effects of excessive cell growth. Disruption of tightly regulated metabolic pathways leads to uncontrolled proliferation of cells as seen in invasive tumors. Valmerins are isoindolone piperidines that have been shown to inhibit GSK3/CDK enzymes during cell proliferation. In this project, we are using photochemical key steps in the synthesis of GSK3/CDK inhibitors. The syntheses are initiated from affordable building blocks and culminate in the regio- and stereo-controlled synthesis of the target molecules.

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

O4.04

9:30 PYRIDINE-BASED HIV INTEGRASE INHIBITORS: SIDE-CHAIN DEVELOPMENT

Tyler Twedt[1], Brenna Macaluso[1], Margaret Miller[1], Christopher Bruni[1], Wolfgang Kramer[1], Matthew Donahue[2], Jacques Kessl[2], Julie Pigza[2]

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

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

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

O4.05

9:50 IN SILICO STUDY ON NATURAL CHEMICAL COMPOUNDS FROM CITRIC ESSENTIAL OILS AS POTENTIAL INHIBITORS OF AN OMICRON SARS-COV-2 MUTANTS' SPIKE GLYCOPROTEIN

Jordhan D. Booth[1], Olha Ovchynnykova[2], Kostyantyn M. Sukhyy[2], Karina Kapusta[1]

[1]Department of Chemistry and Physics, Tougaloo College, Tougaloo, MS, [2]Ukrainian State University of Chemical Technology, Dnipro, Ukraine

COVID-19 is a disease that is caused by an aggressive virus, SARS-CoV-2, affecting the respiratory system of a human host. It has taken many lives since its emergence in 2019. Its noteworthy capacity for genetic mutation enables it to quickly adapt to environmental changes, influencing critical attributes such as transmissibility and immune escape. Thus, inhibitors capable of efficiently combating various viral mutants concurrently are of great interest. Our previous research showed some active natural compounds, such as hesperidin found in citruses, were effective against the binding of SARS-CoV-2 spike glycoprotein to its host receptor ACE2. These findings were proven by in-vitro investigations conducted by other researchers. Those results lead us to the idea of evaluating the effectiveness of other compounds found in citruses' essential oils. Spike Glycoprotein's Receptor Binding Domains (RBD) of SARS-CoV-2 from recently emerged variants/clades were chosen as targets. A total of 10 homology models were built and 7 reference structures of RBDs were used for comparison. All calculations were conducted using the Schrodinger Software Package. Molecular docking, molecular mechanics, and molecular dynamics were implemented to predict the efficiency of potential inhibitors. The results of this investigation hold potential for the utilization of a homology modeling approach in the prediction of RBD's secondary structure. This opens the prospects for further advancing the drug discovery process, offering novel paths for the development of multivariant, non-toxic natural medications.

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.

10:10 Break

Organic And Inorganic Synthesis

O4.06

10:30 LOW MOLECULAR WEIGHT ELECTROGENERATED CHEMILUMINESCENCE PROBES (LMEPS) FOR THE DETECTION OF NERVE AGENT MIMIC

Nazmul Hosen[1], Rashid Mia[2], Wujian Miao[1], Karl Wallace[1]

[1]The University of Southern Mississippi, Hattiesburg, MS, [2]Stephen F. Austin State University, Austin, TX

Studies have shown that Coumarin-enamine-based low molecular weight fluorescence probes (LMFPs) can phosphorylate diisopropyl fluorophosphate (DFP), diisopropyl chlorophosphate (DCP), and diethylcyanophosphonate (DECP), which are nerve agent mimics.[1,2] Using LMFPs as a potential tool for detecting these nerve agent mimics is a noteworthy development in chemical detection. We present a novel coumarin-enamine chemo-dosimeter that features various functional groups on the nitrogen atom at position 7 of the coumarin backbone. In the presence of a luminophore ($Ru(bpy)_3^{2+}$), the tertiary amine acts as a co-reactant in electrogenerated chemiluminescence (ECL). In this study, LMEP (probe2) has been reported to contain propyl and allyl groups, which differs from the previously reported LMFPs containing ethyl or propyl groups. Polymers can be formed by incorporating the allyl group into the molecule. Solution studies in DMSO were conducted to carry out photophysical studies, revealing large Stokes shifts of 120 nm. According to time-resolved fluorescence lifetime measurements, there are four possible keto-enol tautomers in DMSO. In addition, ECL studies in acetonitrile solvent have shown that adding DFP results in an ECL signal, with a five-fold increase in the ECL intensity observed.

O4.07

10:50 THE USE OF A THIAZOLE MODIFIED COUMARIN-ENAMINE BASED LMFP FOR THE DETECTION OF AG+ IONS IN VARIOUS ORGANIC SOLVENT SYSTEMS

Peyton Champion, Jaden Sierra, Eva Riveros, Karl Wallace

[1]University of Southern Mississippi, Hattiesburg, MS

Since manufacturing and refining processes are at an all-time high, waste from these industries is plaguing our environment with the accumulation of various metal ions, including silver (Ag^+) ions. This has caused a dire need for a method for the quick and selective detection of such analytes at a low cost. A low-molecular-weight fluorescent probe (LMFP) has been created using a coumarin-enamine template and adding a thiazole group to selectively detect the presence of silver ions in solution. These probes can monitor the presence of silver in solutions using only fluorescence spectroscopy, which makes them considerably more affordable and accessible than other methods of detection such as AES or MS. Binding studies using silver nitrate ($AgNO_3$) and silver acetate ($AgC_2H_3O_2$) have been carried out in various organic solvents such as dimethyl sulfoxide, acetonitrile, and acetone and have been monitored via NMR, UV-Vis, and fluorescence spectroscopy.

O4.08

11:10 DEVELOPMENT OF AN ORGANOCATALYZED NUCLEOPHILIC ADDITION OF MASKED ACYL CYANIDES TO AZOMETHINE IMINES

Francis K. Kekessie, Alex V. Helbling Julie A. Pigza

University of Southern Mississippi, Hattiesburg, MS

Noncovalent interactions (NCIs) are the collection of interactions between molecules and include hydrogen-bonding, ion-dipole, and - 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 future 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.

O4.09

11:30 PREPARATION OF CONJUGATED POLYPHENYLETHYNYLARENE MACROCYCLES

Alana Latorre, Trent Selby

Mississippi College, Clinton, MS

The preparation of -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.

12:00 General Session

Thursday, February 29, 2024

AFTERNOON

Room TC 210

Environmental Chemistry

O4.10

1:00 EVALUATION OF HEAVY METALS IN COSMETIC PRODUCTS AND THEIR RISK TO HUMAN HEALTH

Miles Taylor Leverette, Alison Cevallos, Caroline McCaleb, Ashley Basset, Pazia Kingma, ArKayla Martin, Maha Obaid, and Scoty Hearst

Mississippi College, Clinton, MS

Heavy metal contamination in cosmetic products is a serious threat to human. Toxic metals such as cadmium (Cd), lead (Pb), nickel (Ni), chromium (Cr), mercury (Hg), and arsenic (As) bioaccumulate and are highly toxic to living organisms. Exposure to toxic metals can cause serious health affects in humans such as: gastrointestinal, respiratory, cardiovascular, reproductive, renal, hemopoietic, and neurological disorders, and even death. Beauty products applied superficially to the human body such as: makeup products, lipstick, mascara, eye shadow, foundation, blush, highlighter, bronzer, and several other cleansing products. Regulation of these products is very limited with little information on the heavy metal content. In this study, we evaluate the concentrations of toxic metals in various brands of cosmetic products and emphasize their risk to human health. We evaluated the toxic metal content of beauty product samples using an ICP-OES. The outcome of this analysis will reveal the presence and level of toxic metal contaminants in beauty products and determine their risk to human health.

O4.11

1:20 HOST-GUEST INCLUSION OF A PARA-BIS-COUMARIN-ENAMINE PROBE IN WATER-SOLUBLE MACROCYCLES FOR ANALYTE DETECTION

Leah Case, Gavin Rose, Eva Riveros, Karl Wallace

University of Southern Mississippi, Hattiesburg, MS

The use of fluorescent molecular probes for the quick and easy detection of environmental pollutants has become an area of increasing interest in supramolecular chemistry. We have synthesized a *para-bis*-coumarin-enamine probe, which exhibits the double excited-state intramolecular proton transfer (*d*-ESIPT) mechanism, for the goal of analyte detection in natural bodies of water. To solubilize the probe in aqueous solutions, we have utilized inclusion chemistry and water-soluble macrocycles. When one-to-one and one-to-two ratios of the probe to *ß*-Cyclodextrin are combined, they self-assemble to form inclusion complexes, via the hydrophobic effect. These inclusion complexes have been shown to be soluble and stable in solutions of 20 mM HEPES buffer solution (pH 7.4). Solution-based binding studies were conducted for the divalent metal ions Cd^{2+}, Co^{2+}, Ni^{2+}, Pd^{2+}, and Zn^{2+}. Binding constants were calculated for both one-to-one and two-to-one metal to probe binding for Cd^{2+} ($\log K_{11} = 1.08 +/- 0.01$; $\log K_{21} = 8.11 +/- 0.09$; $\log ß = 9.19 +/- 0.09$) and Ni^{2+} ($\log K_{11} = 4.75 +/- 0.06$; $\log K_{21} = 4.86 +/- 0.10$; $\log ß = 9.60 +/- 0.15$) via UV-Vis and steady-state fluorescence spectroscopy titrations. Additionally, the *para-bis*-CE probe has been incorporated into paper test strips which allow for the selective detection of CN^- ions.

O4.12

1:40 USING INCLUSION CHEMISTRY TO DEVELOP WATER-SOLUBLE FLUORESCENT PROBES FOR METAL ION DETECTION

Meagan Stanley, Karl Wallace

University of Southern Mississippi, Hattiesburg, MS

A coumarin-enamine molecular probe has been found to bind divalent metal cations (Cd^{2+}, Co^{2+}, Cu^{2+}, Hg^{2+}, Ni^{2+}, and Zn^{2+}) in organic solvents such as DMSO. To establish biological and environmental significance, the probe must be studied in aqueous media; however, the probe is completely insoluble in water and undergoes hydrolysis within a few hours. It was found that including the probe in the cavity of -cyclodextrin induced solubility in water and inhibited hydrolysis. The photophysical properties of these inclusion compounds were studied in varying ratios of DMSO and 25 mM HEPES buffer at pH 7.4 (10:90, 25:75, 50:50, 75:25, and 99:1 DMSO:HEPES). Binding constants were calculated by titrating the inclusion compounds with a series of metal cations (Cd^{2+}, Co^{2+}, Cu^{2+}, Hg^{2+}, Ni^{2+}, and Zn^{2+}) in 50:50 DMSO:HEPES. Two metals, Ni^{2+} which quenched fluorescence intensity and Zn^{2+} which increased fluorescence intensity, were chosen to be studied in the full range of solvent systems. In 1:99 DMSO:HEPES, their fluorescence binding constants were calculated to be $\log K_a = 3.39$ and $\log K_a = 2.96$, respectively.

2:00 Break

Wildlife

O4.13

2:20 CATFISH AS SENTINEL SPECIES FOR MONITORING TOXIC METALS IN THE MISSISSIPPI RIVER

Chinaza Nwaiwu, Ella Bailey, Javian Ervin, Stephen Mills, Fritz Valerio, Wilson Hooker, Jose Alfonso Xavier Fernandez, Caroline Armstrong, Christian Leach, Alison Cevallos, Trent Selby, and Scoty Hearst

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

Mining, industrial waste, farming runoff, and illegal dumping cause contamination of toxic elements in terrestrial and aquatic environments. Sampling water over vast regions to acquire adequate assessment of aquatic containment levels can be a daunting task. We hypothesis that catfish would bioaccumulate toxic metals acting as environmental sentinel species useful for monitoring contaminant levels in aquatic environments such as the Mississippi River. To explore this idea, we collected multiple catfish species from the Mississippi River and assessed their tissues for toxic metals. We sampled channel catfish (Ictalurus punctatus), flathead catfish (Pylodictis olivaris), and blue catfish (Ictalurus furcatus) from the Mississippi River near Davis Island, MS. In this study, we compare the bioaccumulation of toxic metals in catfish to water level concentrations to determine which species is the best fit sentinel. Overall, this data will conclude which catfish species is a superior sentinel species for toxic metal monitoring as compared to other catfish species inhabiting the same environment.

O4.14

2:40 SURVEILLANCE FOR ZOONOTIC PARASITES IN MISSISSIPPI RACCOONS

Javian Ervin, Stephen Mills, Chinaza Nwaiwu, Fritz Valerio, Wilson Hooker, Jose Alfonso Xavier Fernandez, Caroline Armstrong, Christian Leach, Trent Selby, and Scoty Hearst

Mississippi College Chemistry and Biochemistry Dept, Clinton, MS

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 Mississippi raccoons for intestinal parasites by necropsy. DNA was extracted from parasites to identify the genius and species using sanger sequencing of the 28s, 18s, COX1, and ITS genes. Here, we present our preliminary findings of parasites and identify zoonotic parasites that are a threat to public health.

O4.15

3:00 EXPANDED POLYSTYRENE CONSUMPTION BY INSECT LARVAE NATIVE TO MISSISSIPPI

Miles Taylor Leverette, Sydney Watts, Madison Ely, Nellie Massey, Trent Selby

Mississippi College, Clinton, MS

The world is producing twice as much plastic waste as two decades ago. In the United States, the *plastic waste* generated *annually* per person is 221 kg. Slow degradation allows plastics to accumulate in the environment. Insects and larvae certainly come into contact with the accumulated plastic waste. How this waste affects the insect's life cycle is of concern. Recently, we have discovered that several insect larvae native to Mississippi will consume large quantities of expanded polystyrene. The focus of this work is a multigenerational study of the Carolina Sphinx Caterpillar *(Manduca sexta)* and their ability to eat and possibly digest polystyrene. Wild-caught and lab-raised insect larvae at the 4^{th} or 5^{th} instar stage were fed a diet of expanded polystyrene. These larvae here able to pupate, hatch, mate, and lay eggs. From the polystyrene fed larvae, samples of the larvae frass, pupae, and hatched insects were extracted with tetrahydrofuran (THF) to isolate any polystyrene. After removal of the THF solvent, samples were studied by FT-IR and NMR spectroscopy. The results will be presented here.

Thursday, February 29, 2024

EVENING

3:30 DODGEN LECTURE/ AWARDS CEREMONY

THEATER

GENERAL POSTER SESSION

(immediately following Dodgen Event)

P4.01

ADDITION OF MASKED ACYL CYANIDES TO SUBSTITUTED BENZYLIC ACETIMIDATES

Mackenzie Pierce, Julie Pigza, Francis Kekessie

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Masked acyl cyanide (MAC) reagents are useful moieties that demonstrate umpolung reactivity by serving as oxidation state 3 nucleophilic equivalents after an unmasking step. Their weakly acidic methine hydrogen can be activated by a mild base, such as a tertiary amine or carbonate, which makes them compatible in many types of reactions, including organocatalyzed reactions. As our research group has recently developed a scalable and detailed preparation of the key intermediate towards MAC, we have been able to synthesize various protecting group derivatives including TBS-MAC, MOM-MAC, and Ac-MAC. In the search for new bond-forming reactions of MAC reagents, we have found that trichloroacetimidates

could serve as useful alkylating agents. By utilizing substituted benzylic acetimidates as substrates, the addition of MAC and unmasking would lead to chiral benzylic acids, esters, or amides. These products serve as chiral building blocks towards pharmaceuticals and other relevant fields. This presentation will describe our efforts towards developing this new MAC alkylation reaction.

P4.02

CONVENTIONAL STRAIN ENERGIES OF CYCLOPROPYLBORANE, BORIRANE, BORETANE, THE DIBORETANES, BOROLANE, THE DIBOROLANES, BORINANE, AND THE DIBORINANES

Kaylee Hood, David Magers

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In 2012, Rubina and Rubin reported the first generation and spectroscopic identification of boretane through a strain-release-driven ring expansion of cyclopropylborane. Prior to this discovery, all four-membered boracycles which had been reported were unsaturated. In the current study, we build upon this discovery by calculating the conventional strain energies of cyclopropylborane , borirane, boretane, 1,2-diboretane, 1,3-diboretane, borolane, 1,2-diborolane, 1,3-diborolane, borinane, 1,2-diborinane, 1,3-diborinane, and 1,4-diborinane within the isodesmic, homodesmotic, and hyperhomodesmotic models. Optimum equilibrium geometries, harmonic vibrational frequencies, and corresponding electronic energies are computed for all pertinent molecular systems using SCF theory, second-order perturbation theory, and density functional theory (DFT). The DFT functionals employed are Becke's three-parameter hybrid functional using the LYP correlation functional and the M06-2X high nonlocality hybrid functional from Truhlar and Zhao. Three correlation-consistent basis sets are employed: cc-pVDZ, cc-pVTZ, and cc-pVQZ. Natural bond orbital analysis is employed to help explain the results. Results are also compared to the conventional strain energies of cyclic hydrocarbons. We gratefully acknowledge support from the Mississippi College Catalysts, the alumni support group of the Department of Chemistry & Biochemistry.

P4.03

ENTHALPIES OF FORMATION OF QUINOLINE DERIVATIVES BY HOMODESMOTIC REACTIONS

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Derivatives of quinoline and quinolone, specifically 5-nitro-8-hydroxyquinoline and 5-chloro-8-hydroxyquinoline, are useful as ligands in coordination compounds with Zn(II), Al(III), Cu(II), and Ru(II) and can be used as antimicrobial or antineoplasic (anticancer) agents. In the current study, we focus on the computation of the standard enthalpy of formation of these and other quinoline derivatives by homodesmotic reactions. In homodesmotic reactions the number and types of bonds and the bonding environment of each atom are conserved. The enthalpy of all of the reactants and products in each homodesmotic equation is computed using SCF theory and density functional theory (DFT). The DFT functionals employed are Becke's three-parameter hybrid functional with the Lee-Yang-Parr correlation functional, the M06-2X high nonlocality hybrid functional from Truhlar and Zhao, and the B97XD functional from Head-Gordan and coworkers which includes empirical dispersion. The basis sets employed are Dunning and coworkers' correlation consistent basis sets, cc-pVDZ, cc-pVTZ, and cc-pVQZ. From the resulting enthalpy of reaction, the desired enthalpy of formation is determined by use of reference values for all other systems in the reaction, and the computation of atomization energies is avoided. The results are so consistent that computed enthalpies of smaller compounds can be used as reference values for the computation of the enthalpies of larger compounds. We gratefully acknowledge support from the Mississippi College Catalysts, the alumni support group of the Department of Chemistry & Biochemistry.

P4.04

CONVENTIONAL STRAIN ENERGIES OF SMALL HETEROCYCLES OF CARBON AND SILICON AND THEIR AMINO AND NITRO DERIVATIVES BY MODEL REACTIONS

Eli Franklin, David Magers

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The conventional strain energies for three- and four-membered heterocycles of carbon and silicon as well as amino and nitro derivatives of these systems are computed within the isodesmic, homodesmotic, and hyperhomodesmotic models. Isodesmic reactions conserve number and types of bonds. Homodesmotic reactions are isodesmic reactions which also conserve the valence environment around each atom. Hyperhomodesmotic reactions are homodesmotic reactions which conserve the valence environment around each set of two bonded atoms. Computed results for cyclopropane and cyclobutane are compared with experimental values for these systems to demonstrate the reliability of the method. Amino and nitro derivatives are investigated to determine how electron donating and electron withdrawing groups effect the conventional strain energies. Optimum equilibrium geometries, harmonic vibrational frequencies, and corresponding electronic energies are computed for all pertinent molecular systems using SCF theory, second-order perturbation theory (MP2), and density functional theory. The DFT functionals employed are Becke's three-parameter hybrid functional with the Lee-Yang-Parr correlation functional, the M06-2X high nonlocality hybrid functional from Truhlar and Zhao, and the B97XD functional from Head-Gordan and coworkers which includes empirical dispersion. The basis sets employed are Dunning and coworkers' correlation consistent basis sets, cc-pVDZ, cc-pVTZ, and cc-pVQZ. Results indicate that silicon substitution reduces the conventional strain energy of cyclobutane most likely due to a reduction of Baeyer

strain (bond angle strain) but increases the conventional strain energy in cyclopropane by destroying the stabilizing factor of sigma delocalization. Natural bond orbital analysis is employed to help explain the results. We gratefully acknowledge support from the Mississippi College Catalysts, the alumni support group of the Department of Chemistry & Biochemistry.

P4.05

ANALYSIS OF TOXIC METAL CONTAMINATION IN COSMETIC BEAUTY PRODUCTS

Alison Cevallos, Caroline McCaleb, Ashley Basset, Pazia Kingma, Miles Taylor Leverette, ArKayla Martin, Maha Obaid, and Scoty Hearst

Mississippi College, Clinton, MS

Heavy metals such as cadmium (Cd), lead (Pb), nickel (Ni), chromium (Cr), mercury (Hg), and arsenic (As) bioaccumulate and are highly toxic to living organisms. Human exposure to these toxic metals can cause gastrointestinal, respiratory, cardiovascular, reproductive, renal, hemopoietic, and neurological disorders, and even death. Cosmetic are beauty products applied superficially to the human body such as: makeup products, lipstick, mascara, eye shadow, foundation, blush, highlighter, bronzer, and several other cleansing products. Regulation of these products is very limited with little information on the heavy metal content. Since the Covid-19 pandemic, product quality control and assurance have severely declined. We hypothesize that cosmetics are a source of heavy metals that could potentially expose human to toxic metals. To explore this idea, we evaluated the toxic metal content of cosmetic samples using an ICP-OES. The outcome of this analysis will reveal the presence and level of toxic metal contaminants in cosmetic beauty products and determine their threat level to human health.

P4.06

STABILIZATION FACTORS IN FLUORO AND CHLORO DERIVATIVES OF THE CYCLOPROPYL CARBINYL CATION

Hanna Bynum, David Magers

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While cyclopropyl carbinyl cation ($C_4H_7^+$) is a local minimum on the potential energy hypersurface, the global minimum is the cyclobutonium cation (lower in energy by approximately 2 kcal/mol). The same is certainly not true if the hydrogens of the CH_2 moiety are replaced with fluorines. In the current study we investigate the factors which stabilize the cyclopropyl configuration in fluoro and chloro derivatives of cyclopropyl carbinyl cation. Specifically, optimum equilibrium geometries, harmonic vibrational frequencies, and corresponding electronic energies are computed for $C_4H_7^+$, $C_3H_5CFH^+$, $C_3H_5CF_2^+$, $C_3H_5CClH^+$, and $C_3H_5CCl_2^+$ with SCF theory, second-order perturbation theory, and density functional theory (DFT). The DFT functionals employed are Becke's three-parameter hybrid functional with the Lee-Yang-Parr correlation functional, the M06-2X high nonlocality hybrid functional from Truhlar and Zhao, and the B97XD functional from Head-Gordan and coworkers which includes empirical dispersion. The basis sets employed are Dunning and coworkers' correlation consistent basis sets cc-pVDZ, cc-pVTZ, and cc-pVQZ. Natural bond orbital analysis is employed to help explain the factors contributing to the stabilization of each system. We gratefully acknowledge support from the Mississippi College Catalysts, the alumni support group of the Department of Chemistry & Biochemistry.

P4.07

CONVENTIONAL STRAIN ENERGY AND HYPERCONJUGATION IN CYCLOPROPYLBORANE AND FLUORO AND CHLORO DERIVATIVES

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Many studies of strain energies have considered those of cyclopropane and cyclobutane. Not only are these systems the prototypical small, cyclic hydrocarbons, but they generate additional interest because their conventional strain energies are usually reported to lie within one to two kcal/mol of each other despite cyclopropane obviously having more Baeyer strain (bond angle strain). This similarity is usually explained by the stabilizing sigma delocalization in cyclopropane. However, another study in our group has shown that cyclopropylborane is even less strained than cyclopropane. This added stability may be due, at least in part, to hyperconjugation of the C-C bonds in the ring with the empty *p* orbital on the borane. In the current study, we investigate this stabilization by calculating the conventional strain energies of fluoro and chloro derivatives of cyclopropylborane. Specifically, the conventional strain energies of cyclopropylborane, cyclopropyl-fluoroborane, cyclopropyl-difluoroborane, cyclopropyl-chloroborane, and cyclopropyl-dichloroborane are computed within the isodesmic, homodesmotic, and hyperhomodesmotic models. Optimum equilibrium geometries, harmonic vibrational frequencies, and corresponding electronic energies are computed for all pertinent molecular systems using SCF theory, second-order perturbation theory, and density functional theory (DFT). The DFT functionals employed are Becke's three-parameter hybrid functional with the Lee-Yang-Parr correlation functional, the M06-2X high nonlocality hybrid functional from Truhlar and Zhao, and the B97XD functional from Head-Gordan and coworkers which includes empirical dispersion. The basis sets employed are Dunning and coworkers' correlation consistent basis sets cc-pVDZ, cc-pVTZ, and cc-pVQZ. Natural bond orbital analysis is employed to judge the degree of hyperconjugation in each system. We gratefully acknowledge support from the Mississippi College Catalysts, the alumni support group of the Department of Chemistry & Biochemistry.

P4.08

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

Caroline McKinney[1], Zoe Elder[1], Tynai Bridges[1], Wolfgang Kramer[1], Matthew Donahue[2]

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Isoindolone piperidines are exhibiting inhibitory potential towards two key phosphorylating enzymes, glycogen synthase kinase-3 (GSK3) and cyclin-dependent kinases (CDKs). Both enzymes are prominent drug targets for cancer therapy because inhibition of metabolic enzymes can disrupt excessive cell growth. In this project, we are using photochemical cyclization as a key step in the synthesis of isoindolone piperidine GSK3/CDK inhibitors. The syntheses are initiated from affordable building blocks and culminate in the stereo-controlled synthesis of the target molecules. Variations in 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.

P4.09

SYNTHESIS OF PYRIDINE-BASED HIV INTEGRASE INHIBITORS

Brenna Macaluso[1], Christopher Bruni[1], Margaret Miller[1], Wolfgang Kramer[1], Matthew Donahue[2], Jacques Kessl[2], Julie Pigza[2]

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

HIV integrase is an important enzyme in the life cycle of the AIDS virus, it incorporates the viral DNA into the host cell genome. HIV integrase, reverse transcriptase and protease are three prominent targets in HIV drug development as they are unique to the virus.

HIV Integrase inhibitors are mostly based on aromatic heterocycles such as pyridine and quinoline. In this project, we are constructing the pyridine core by reaction of substituted malonic esters with aminocrotonate ester. Variations in 2 positions on the heteroaromatic cycle allows for improving the drug-target interactions. To advance the structure further, the side-chain is developed in a collaborative effort. Finally, the substituents on the pyridine core are introduced via palladium coupling reactions.

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.

P4.10

METHOD DEVELOPMENT TO IDENTIFY BIOMARKERS FOR THE ANALYSIS OF PULQUE

Hannah Meyer, Estrella Castillo, Thein Pham, Timothy Ward

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Evidence from earlier research indicated that potsherds were believed to have been used for the storage and distribution of pulque, a drink consisting of fermented sap from the maguey plant in Central Mexico. In this project, pulque samples from the central region of Mexico were obtained for analysis to determine suitable biomarkers for identification. Pulque's complex mixture of alcohols, lipids and fatty acids, was derivatized before injection into a GC-MS. The derivatization reagent used was N,O-Bis(trimethylsilyl)trifluoroacetamide (or BSTFA). 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 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 from the Mesoamerican region in Mexico.

P4.11

SYNTHESIS OF DIAMINO-PYRIDINYLETHYNYLARENE MACROCYCLES

Sydney Watts, Trent Selby

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Molecules containing high degrees of π-conjugation are ideal materials for advanced electronic and photonic applications. Conjugation should be promoted by constructing flat 2-dimensional architectures. We report here, the synthesis of highly-conjugated 2-dimensional diaminopolyphenylethynylarenes and diaminopyridinylethynylarenes. The synthesis of diaminopolyphenylethynylarenes begins with Sonogashira coupling of 1-ethynyl-3-aminobenzene with 1,2-diiodobenzene in good yield. The synthesis of diaminopyridinylethynylarenes is accomplished by coupling of 6-bromo-2-pyridinamine with 1,2-diethynylbenzene under Sonogashira conditions. Cyclization was accomplished by reacting the amino groups with glyoxal or oxalyl chloride. Additionally, these nitrogen containing molecules can easily be oxidized to radical cations giving rise to some unique electronic properties.

P4.12

ENTHALPIES OF FORMATION OF CHLORO, CYANO, AND METHYL DERIVATIVES OF HETEROCYCLIC AROMATICS BY HOMODESMOTIC REACTIONS

Gracie Bassett, David Magers

Mississippi College, Clinton, MS

Furan, pyrrole, oxazole, isoxazole, imidazole, and pyrazole are all examples of heterocyclic aromatic compounds. They and their derivatives have a variety of uses. 2,5-dimethyl-furan has been proposed as a possible biofuel; pyrrole is a component of both heme and chlorophyll; ibotenic acid, a derivative of isoxazole, is a powerful neurotoxin; and histidine is a derivative of imidazole. In the current study, we focus on the computation of the standard enthalpy of formation of chloro, cyano, and methyl derivatives of these aromatic heterocycles by homodesmotic reactions. In homodesmotic reactions the number and types of bonds and the bonding environment of each atom are conserved. The enthalpy of all of the reactants and products in each homodesmotic equation is computed using SCF theory, second-order perturbation theory, and density functional theory. The DFT functionals employed are Becke's three-parameter hybrid functional using the LYP correlation functional, the M06-2X high nonlocality hybrid functional from Truhlar and Zhao, and the B97XD functional from Head-Gordan and coworkers which includes empirical dispersion. The basis sets employed are Dunning and coworkers' correlation consistent basis sets, cc-pVDZ, cc-pVTZ, and cc-pVQZ. From the resulting enthalpy of reaction, the desired enthalpy of formation is determined by use of reference values for all other systems in the reaction, and the computation of atomization energies is avoided. We gratefully acknowledge support from the Mississippi College Catalysts, the alumni support group of the Department of Chemistry & Biochemistry.

P4.13

CONVENTIONAL STRAIN ENERGIES OF THIASILIRANE AND THE THIASILETANES

Avery Foret, David Magers

Mississippi College, Clinton, MS

The conventional strain energies for thiasilirane, 1,2-thiasiletane, and 1,3-thisiletane are determined within the isodesmic, homodesmotic, and hyperhomodesmotic models to investigate the effect of third-row elements on the strain energies of three- and four-membered rings especially the effect of sulfur and silicon. Previous studies in our group indicate that substitution of silicon in cyclopropane raises the conventional strain energy while substitution with sulfur lowers it. Optimum equilibrium geometries, harmonic vibrational frequencies, and corresponding electronic energies are computed for all pertinent molecular systems using self-consistent field (SCF) theory, second-order perturbation theory (MP2), and density functional theory (DFT). The DFT functionals employed are Becke's three-parameter hybrid functional using the LYP correlation functional, the M06-2X high nonlocality hybrid functional from Truhlar and Zhao, and , and the B97XD functional from Head-Gordan and coworkers which includes empirical dispersion. The basis sets employed are Dunning and coworkers' correlation consistent basis sets: cc-pVDZ, cc-pVTZ, and cc-pVQZ. Results are compared to the conventional strain energies of small cyclic hydrocarbons and to other heterocyclic systems. We gratefully acknowledge support from the Mississippi College Catalysts, the alumni support group of the Department of Chemistry & Biochemistry.

P4.14

THIADITHIAZYL SUBSTITUTION OF AMIDO TETRYLENES

Clifton Wagner, Uthpala Ekanayaka

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Sulfur-nitrogen ring systems serve as building blocks for the superconducting inorganic polymer polythiazyl. Research into the substitution chemistry of sulfur-nitrogen ring systems has resulted in examples of transition-metal and main-group functionalized sulfur-nitrogen ring systems with preserved ring structures. This inspired us to search for additional methods of incorporating sulfur-nitrogen rings into organometallic structures. The thiadithiazyl dichloride is a unusual sulfur-nitrogen compound that possesses a ring structure and an activated S-Cl bond. We hypothesize that the N-Si bond in an amido tetrylene, such as $Sn\{N(SiMe_3)_2\}_2$, could undergo sigma-bond metathesis to form a metal-amido sulfur-nitrogen complex and trimethylsilyl chloride. The resulting product allows for further exploration of inorganic polymers incorporating polythiazyl units, as well as other material synthesis protocols involving sulfur, nitrogen, and Group 14 metals.

P4.15

SYNTHESIS AND CHARACTERIZATION OF SILICA AEROGELS USING SUPERCRITICAL CO2

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Aerogels are ultra-low density (~0.02 g/cm^3) solid materials with extremely high surface areas that can be synthesized using sol-gel chemistry. They have been used in many diverse applications such as the dielectric material in supercapacitors, and by NASA to capture cosmic dust particles during the Stardust mission. Silica based (SiO_2) aerogels are sometimes referred to as "solid air" or "frozen smoke" due to their diaphanous nature. The chemical synthesis of silica based aerogels is relatively easy, but the process of solvent removal often results in collapse of the silica matrix due to capillary action from the solvent's surface tension.

This work centers on developing a method for the removal of the alcohol solvent from a sol-gel silica product using supercritical carbon dioxide at ~35°C and 79 atm pressure. A Leica EM CPD300 automated critical point dryer, normally used to remove water from biological specimens,

was used for this purpose. Variations in synthesis parameters were explored, and the resulting aerogels were characterized by their density and optical properties.

P4.16

USING ANIMATIONS AND VIDEOS OF 3D CRYSTALLINE STRUCTURES TO AID IN TEACHING CHEMISTRY WORK-IN-PROGRESS

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Visualization is very important to understanding many concepts in chemistry. We have purchased a large number of inorganic crystalline lattice models: a set of 9 basic crystal structures, a set of 14 Bravais type lattices, spinel, inverse spinel, perovskite, rutile, anatase, and others. We have used these models in teaching chemistry courses not only by the author but also by other chemistry faculty at Delta State. The teaching of subjects such as crystalline structures and calculations associated with these structures was greatly enhanced by the use of the models in a wide variety of courses. In addition, the PI has a YouTube channel (DrJoeBentley) which houses videos created for preparing students for our General Chemistry Laboratory I course. We are now engaged in creating instructional videos and animations of the crystal structures to add to the channel. The videos are for teaching Delta State students, but will also be available to anyone on the Internet who would like to learn more about crystalline systems. The research component of the project has been to investigate how the animations and videos enhance the learning of complex concepts by our students. By using pre-video and post-video quizzes related to these models, we have assessed the success of the project.

P4.17

pH-SELECTIVE PD1/PDL1 SIGNALING PATHWAY INHIBITORS AS CANCER IMMUNOTHERAPIES: IN SILICO APPROACH

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Despite the significant time and effort invested in developing treatments, cancer remains a leading cause of death all over the globe. Cancer is a disease that can affect any tissue in the body and is characterized by uncontrolled cell proliferation. The PD-1/PD-L1 pathway takes the midpoint stage in immune tolerance management within the tumor microenvironment. Operating through the interaction of PD-1 on activated T cells with PD-L1 on tumor and antigen-presenting cells, this pathway restrains T cell activation, proliferation, and cytotoxicity, thereby averting excessive immune responses. Thus, PD-L1 can serve as a target for the design of novel immunotherapies. Taking into consideration the difference in acidity between the healthy cell and a tumor microenvironment, we propose the design and development of pH-selective inhibitors. To achieve this goal a comprehensive in-silico approach was used employing the Schrodinger Software Package. A library of flavonoids was collected from the literature and scanned against the target PD-L1 protein structure at two conditions: physiological pH and acidic tumor microenvironment. Following extra-precision (XP) molecular docking, the more accurate molecular mechanic technique was utilized to predict the binding affinities of selected ligands. Additionally, the toxicity profiles of best-scoring compounds were assessed using ProTox-II, pkCSM, and ADMETlab web servers. The obtained results show the significant potential for further utilization of this new approach for the design of novel pH-selective PD1/PDL1 signaling pathway inhibitors as cancer immunotherapies.

P4.18

MACHINE LEARNING DETECTION OF RADIOACTIVE SOURCES USING MAXIMUM DETECTION DISTANCE FOR ENVIRONMENTAL REMEDIATION

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The role of radioactivity detection is of paramount importance in upholding public safety and effectively managing environmental risks. This study centers on the development of a methodology, harnessing machine learning techniques, to discern radioactivity in relation to background radiation levels. The data utilized is derived from field survey points collected through the deployment of a 4-wheel drive all-terrain vehicle (ATV) equipped with a Global Positioning System (GPS) and thallium-activated sodium iodide, NaI(Tl), gamma scintillation detector, within a 260-acre region of interest. This research's implications extend to critical applications, notably in the realm of emergency preparedness and mission planning, especially pertinent in scenarios involving the remediation of contaminated sites. The core innovation lies in the adaptation of a Maximum Detection Distances (MDD) calculation algorithm, harmonized with the localization function of a mobile gamma-ray detection system. When exploring specific routes, such as former roadways and earthen berms, the ability to detect a radioactive source is constrained by the distance from the path - therefore, knowing the MDD is significant to declare an area “clean”.

Distinct from the prevalent reliance on simulation-based data in many existing studies, this research adheres to the utilization of empirical data gleaned from field operations. This approach fosters a close alignment between the research and practical real-world applications. Search teams involved in emergency remedial clean-up can optimize survey routes to ensure that environmental monitoring areas are adequately covered where concerns of potential contamination may be present. The algorithm yields agreement with field measurements, considering the features such as gamma readings and coordinates, as well as showing scalability for very large regions, when

predicting the presence of radioactive sources. Ultimately, the outcome of this study holds the potential to bridge the chasm between theoretical advancements and their practical implementation, rending radiological monitoring technology more accessible and cost-effective for an expanded array of applications.

P4.19

A NOVEL Al-Rh PADDLE WHEEL COMPLEX FOR CATALYTIC HYDROGENATION /DEHYDROGENATION PROCESSES

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Considerable attention is paid to formic acid (FA, HCO2H) as a hydrogen storage substance. Dehydrogenation of FA and hydrogenation of CO2 are significant reactions in this regard. In the last decade, several molecularly defined and nanostructured catalysts have been created and thoroughly investigated for both processes. This study includes recFent developments in this field utilizing homogeneous catalysts from 2010 forward. The development of reversible H2 storage, including continuous H2 production from formic acid, is highlighted in addition to the development of catalysts for H2 generation. Recent developments in catalysts made of non-noble metals are given special attention. Methods: For the synthesis of complexes, all experiments were carried out under an inert atmosphere glove box using dry solvents, 1H, and 13C{1H}. NMR spectra were recorded on Bruker 300 spectrometers in either benzene-d6 or acetonitrile-d3 at ambient probe temperature (292 K). 1H and 13C NMR chemical shifts were determined by reference to the residual solvent resonances as internal references. The catalytic reactions were performed using standard soft techniques. 1H NMR and direct integration determined the products and conversion. The amount of Hydrogen generated was measured using an inverted water-filled burette. Results: Aluminate, Peridone, and Rhodium were combined with the addition of benzene-d6 and sat overnight. A paddle-wheel complex was the result of that reaction. The paddle wheel was then reacted with NAH and Deuterated Dichloromethane, and acetonitrile-d3 was added and sat overnight. As a result, the paddle wheel was hydrogenated. There was also a reaction between the paddle wheel and styrene twice, once with Deuterated Dichloromethane and once with benzene-d6. According to NMR, the conversion percentage increased over a period of time for both reactions. Conclusion: Many catalytic activities successfully hydrogenated and dehydrogenated the paddle wheel.

P4.20

EVALUATION OF HEAVY METALS IN COMMON COOKING SPICES AND THEIR RISK TO HUMAN HEALTH

Nilay Kantibhai Zalavadiya, Hinaben Patanvadia, Harsh Patel, Anuradha Ragila, Pinalba Zala, Addie Jolly, Jameson Cook, Alana Latorre, Selah Roberts, Gracie Bassett, Ashley Carter, Mitchel Creel, ArKayla Martin, Stephen Mills, Analee Rios, Sohal Sukhbir and Scoty Hearst

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Herbs and spices play a large role in cooking and in our daily lives. These seasonings add a little spice to our lives, making meals especially delicious. However along with the added flavor of herbs and spices, something less savory and potentially dangerous could be making its way into our meals. A recent study in Consumer Reports has found that certain spices such as turmeric, chili powder, and cumin may contain high levels of heavy metals such as lead, cadmium, and arsenic. Frequent exposure to even small amounts of lead, arsenic, cadmium, and other heavy metals is toxic and causes health problems over time. Heavy metal exposure in children affects brain development, increasing the risk for behavioral problems and lowers IQ. In adults, heavy metals can contribute to central nervous system problems, reproductive problems, and hypertension, and damage to kidney and immune function. In this study, we compare the level of toxic metals in everyday cooking spices purchased commercially from a local grocery store in Clinton, MS. The goal of this study was to identify spices that have high levels of toxic metals and to assess their threat to public health. We tested the following spices for toxic metals: garlic powder, fajita seasoning, onion powder, rose marry, curry powder, cayenne pepper, cinnamon, cumin, black pepper, chili powder, and BBQ rub. We evaluated the toxic metal content of these spice product samples using an ICP-OES. The outcome of this analysis will reveal the presence and level of toxic metal contaminants in these products and determine their risk to human health.

P4.21

LEAD, IT'S WHAT'S FOR DINNER: ASSESSMENT OF TOXIC METALS IN COOKING SPICES FROM INDIA

Hinaben Patanvadia, Pinalba Zala, Nilay Kantibhai Zalavadiya, Harsh Patel, Anuradha Ragila, Addie Jolly, Jameson Cook, Alana Latorre, Selah Roberts, Gracie Bassett, Ashley Carter, Mitchel Creel, ArKayla Martin, Stephen Mills, Analee Rios, Sohal Sukhbir and Scoty Hearst

Mississippi College Chemistry and Biochemistry Dept, Clinton, MS

Spices are an essential component of any kitchen to support a healthy diet. Spices make food more interesting by adding variety and exciting colors and flavors. Recent studies have found that certain spices from India may contain high levels of heavy metals such as lead, cadmium, and arsenic. Frequent exposure to even small amounts of lead, arsenic, cadmium, and other heavy metals is toxic and causes health problems over time. Heavy metal exposure in children affects brain development, increasing the risk for behavioral problems and lowers IQ. In adults, heavy metals can contribute to central nervous system problems,

reproductive problems, and hypertension, and damage to kidney and immune function. In this study, we compare the level of toxic metals in cooking spices from India. The goal of this study was to identify spices that have high levels of toxic metals and to assess their threat to public health. We tested the following spices for toxic metals: black salt, Pani Puri Masala, Tea Masala, Rajma Masala, Organic Thyme, Organic Masala, Organic Cumin Powder, Turmeric Powder, Maggi Masala, Garlic Powder, Buttermilk Masala, Organic Turmeric Powder, Coriander Turmeric Powder, Jalsha Powder, Kasmiai Chili Powder, Hing, Sambhar Masala, and G.V. Chili Powder. We evaluated the toxic metal content of these spice product samples using an ICP-OES. The outcome of this analysis will reveal the presence and level of toxic metal contaminants in these products and determine their risk to human health.

P4.22

ASSESSMENT OF TOXIC METALS CONTAMINATION IN COFFEE AND COCOA PRODUCTS

Anuradha Ragila, Hinaben Patanvadia, Pinalba Zala, Nilay Kantibhai Zalavadiya, Harsh Patel, Addie Jolly, Jameson Cook, Alana Latorre, Selah Roberts, Gracie Bassett, Ashley Carter, Mitchel Creel, ArKayla Martin, Stephen Mills, Analee Rios, Sohal Sukhbir, and Scoty Hearst

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Coffee is one of the most widely consumed beverages worldwide. Over 60% of people in the United States drink coffee on a daily basis. Coffee is produced from the coffea plant, which naturally contains caffeine with levels varying between individual plants. There are over 120 species of this plant. South American countries of Columbia and Brazil are the top coffee producers followed by Vietnam, Indonesia, and Ethiopia. Dry cocoa solids are derived from cocoa beans and often used as a baking powder. Cocoa beans give chocolate its characteristic flavors. Cocoa bean major producers are the Ivory Coast, Ghana, Eucador, Cameroon, Nigeria, Indonesia, and Brazil. Americans consume around 3 billion pounds of chocolate each year, or over 11 pounds per person. Recent studies suggest that heavy metals contaminants can be present in coffee beans and cocoa beans potentially exposing consumers to harmful substances. Heavy metals can be absorbed from contaminated soil and water and stored by coffee and cocoa plants in the roots, shoots, and the grains. The goal of this study was to identify coffee and cocoa brands based on countries of origin that have high levels of toxic metals and to assess their threat to public health. We tested multiple coffee brands and coco powders from various countries for toxic metals. We evaluated the toxic metal content of these product samples using an ICP-OES. The outcome of this analysis will reveal the presence and level of toxic metal contaminants in these coffee and cocoa products and determine their risk to human health.

P4.23

N-METHYLPYRIDINIUM AS A NOVEL CHARGED ACIDIFYING GROUP FOR SQUARAMIDE ORGANOCATALYSTS

Aiden J. Leise, Caitlyn M. Hailes, Brooke Warren, Julie A. Pigza

University of Southern Mississippi, Hattiesburg, MS

Squaramide organocatalysts (SQs) are a privileged type of catalyst with utility in a wide variety of reactions by taking advantage of noncovalent interactions with and between substrates. A key aspect of this catalytic scaffold's ability to interact with substrates is the acidity of its N-H bonds, a factor that is typically modulated via fluorinated electron-withdrawing substituents of the secondary amide. However, a rarely explored method of inducing squaramide acidity involves the incorporation of a positively-charged moiety in order to stabilize the partial atomic charge generated on the nitrogen. Additionally, this concept has not been incorporated into a bifunctional SQ catalyst. This poster will illustrate the synthesis of a novel bifunctional, charge-enhanced squaramide catalyst utilizing an N-methylpyridinium moiety as well as a functional comparison with comparable catalysts incorporating conventional acidifying groups.

P4.24

A SIMPLE AND SENSITIVE METHOD FOR DETECTION OF SILDENAFIL

Chloe Grizzell Maria, Manliang Feng

Department of Chemistry and Physics, Tougaloo College, Tougaloo, MS

Sildenafil is a phosphodiesterase type-5 inhibitor. It is a drug originally designed for the treatment of high blood pressure and angina and finds its use for the treatment erectile dysfunction (ED). There is some evidence of this drug having the potential to aid in the treatment of neurodegenerative diseases such as Parkinson's and Alzheimer's due to the drug's ability to inhibit the synthesis of nitric oxide in the body. It's important to monitor the amount of the drug taken, in that a high dosage can lead to hearing loss, increased risk of cardiovascular disease, and blurry or loss of vision. Methods to detect this drug are being investigated in order to further understand this phenomenon. In this research, a new sensitive UV-Vis absorption method was developed for the determination of sildenafil based on the formation of an ion-pair with anionic dyes such as Congo red, thymol blue and Calcein. Sildenafil forms ion-pairs with the dyes allowing it to be extracted to an organic phase and to eliminate interference from the biological sample matrix. Among other factors, pH has a significant effect on ion-pair formation and the detection. UV-vis spectroscopy was used to monitor the efficiency of the extraction of sildenafil to the organic, chloroform phase. It was found that thymol blue worked best in allowing for sildenafil to form ion pairs with chloroform, thus allowing for better detection and sensitivity. An acidic pH favors ion-pair formation as sildenafil is protonated under this condition. However, a

buffer that was too acidic would also extract thymol blue into the chloroform phase, thus interfering with the absorption spectrum of sildenafil. After optimizing the pH, the concentration of sildenafil as low as 20 ng/mL can be detected with a linear range from 40 ng/mL to 1200 ng/mL. This method has the potential to detect sildenafil in body fluids for the study of pharmacokinetics.

This work is supported by NSF Research Initiation Award under HBCU-Targeted Infusion Project: Award number 2205788.

P4.25

A NOVEL STRATEGY FOR SYNTHESIS OF MAGNETIC NANOMATERIALS IN ETHYLENE GLYCOL SOLVENT FOR BIOIMAGING

Samuel Holloway[1], Jing Qu[1], Daniel J. Adams[2], Sarah Morgan[2], Yongfeng Zhao[1]

[1] Department of Chemistry, Physics & Atmospheric Sciences, Jackson State University, Jackson, MS [2] School of Polymer Science and Engineering, The University of Southern Mississippi, Hattiesburg, MS.

This study presents a novel synthetic method for magnetic iron oxide (Fe_3O_4) nanomaterials and investigates their potential applications in bioimaging. Iron (III) acetylacetonate (Fe(acac)3) served as the iron source, with ethylene glycol (EG) as the solvent. Structural and morphological analyses were conducted using transmission electron microscopy (TEM), scanning electron microscopy (SEM), X-ray diffraction (XRD), and Fourier-transform infrared absorption spectroscopy (FTIR). The nanomaterials exhibited a spherical morphology with an average size of 200 nm. The magnetic properties of iron oxide nanomaterials were assessed through superconducting quantum interference device (SQUID) magnetometry, revealing a saturation magnetization of 82.82 emu/g at 10 Kelvin and 68.06 emu/g at 300 Kelvin, values considerably higher than those of Resovist® (53.1 emu/g) and Sinerem® (28.8 emu/g). The photothermal effect of iron oxide concentration was investigated, demonstrating a noticeable temperature increase with higher concentrations. Additionally, the magnetic imaging experiments showed that the iron oxide nanomaterials exhibit dual-modality T1- and T2-weighted magnetic resonance (MR) imaging capabilities. Consequently, these iron oxide nanomaterials show significant promise for biomedical applications due to their unique properties.

P4.26

DIRECT SYNTHESIS OF WATER-DISPERSIBLE MFe_2O_4 ($M=Fe^{2+}$, Ni^{2+}, Co^{2+}, Mn^{2+}) NANOPARTICLES WITH CONTINUE GROWTH

Jing Qu[1], Pohlee Cheah[1], Mikiyah Jefferson[1], Derrilynn Leach-Wilson[1], Daniel J. Adams[2], Sarah Morgan[2], Yongfeng Zhao[1]

[1] Department of Chemistry, Physics & Atmospheric Sciences, Jackson State University, Jackson, MS [2] School of Polymer Science and Engineering, The University of Southern Mississippi, Hattiesburg, MS.

In this study, we present a novel approach for the synthesis of metal-doped iron oxide nanoparticles (MFe_2O_4, M = Fe^{2+}, Mn^{2+}, Ni^{2+}, Co^{2+}). The fabrication process involves the decomposition of $Fe(acac)_3$ and $M(acac)_2$ in diethylene glycol (DEG) solvent. Characterization through TEM and XRD reveals that the as-synthesized nanoparticles possess a well-defined spherical single crystal structure. Continuous addition of precursors during synthesis leads to the continuous growth of MFe_2O_4 nanoparticles. The size and distribution of these nanoparticles are influenced by both the type and percentage of the metal dopant. Magnetization measurements using superconducting quantum interference device (SQUID) magnetometry at temperatures of 10 K and 300 K indicate that the manganese dopant can enhance the magnetic properties of the nanoparticles, whereas the other dopants diminish the nanoparticle magnetism. Furthermore, the MRI imaging results demonstrate that $MnFe_2O_4$ and $CoFe_2O_4$ exhibit an enhanced T2-weighted MRI effect compared to Fe_3O_4 nanoparticles. Overall, this study highlights promising prospects for the development and application of metal-doped iron oxide nanoparticles.

P4.27

COMPUTATIONAL STUDY ON IMMUNE ESCAPE OF THE SARS-COV-2 MUTANTS

Allyson McGowan, Jordhan D. Booth, Karina Kapusta

Department of Chemistry and Physics, Tougaloo College, Tougaloo, MS.

Throughout almost four years, SARS-CoV-2 has undergone numerous mutations. Some of these changes have been linked to higher death rates, increased spread, recurrent infections, immune escape, and more efficient virus replication, while the effects of others remain unclear or negligible. Despite substantial data on the impacts of these mutations, there are still inconsistencies and missing information. This project aimed to examine how mutations occurring in the SARS-CoV-2 spike glycoprotein may affect its immune escape. Advanced computational chemistry methods were applied to bridge existing knowledge gaps and enhance the understanding of how mutations in the spike glycoprotein impact vital viral characteristics, such as immune escape. The strategy involved constructing 3D models of different clades of a virus using homology modeling. These models were rigorously verified by comparison with known and available crystallographic structures: PDB IDs 6M0J (Wild-Type), 7T9L (21K or BA.1), 7XAZ (21K R346K mutant or BA.1.1), 7XB0 (21L), 7XWA (22B), 7XNS (22C), and 8IF2 (22E). The models, along with reference structures, were used to create complexes of these mutated forms with human-neutralizing antibodies to evaluate the strength of their interactions and the complexes' stability. The results from these simulations were validated against existing research and used to deepen our understanding of viral mutations and to provide a method for quickly predicting the immune escape of newly emerging variants

of SARS-CoV-2 based on limited data, such as a sequence of a protein.

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

SYNTHESIS OF CARBON DOTS FROM LEMON PEEL FOR SUSTAINABLE NANOMATERIAL APPLICATIONS

Olorunsola Kolawole, Zoe Scott, Paresh Ray

Department of Chemistry, Physics, and Atmospheric Sciences, Jackson, State University, Jackson, MS

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 and underscores the potential of carbon dots derived from fruit waste for innovative and sustainable material development.

P4.29

RADIOACTIVITY STUDIES ON FARM RAISED AND RIVER CATFISH

Stella Kiptui, Jermiah Billa, John Adjaye

Alcorn State University, Lorman, MS

Humans are vastly dependent on water-based resources for survival. The presence of Naturally Occurring Radioactive Materials (NORM) in soils can lead to dissolving of NORM isotopes in water which can impact isotopic transfer factors of radiation into aquatic organisms (such as fish). A radioactivity assessment study was performed on one of the major foods to Southern Americans- the Catfish. As part of this analysis, 15 catfish were collected from river Mississippi and analyzed for the presence of radioactive isotopes. A 35% relative efficiency High Purity Germanium Detector (HPGE) manufactured by Canberra USA was used to test catfish samples. To statistically justify our experiments, another set of 15 catfish samples collected from a catfish farm (located in Greenville, Mississippi) were analyzed using HPGE detector. Results indicated presence of Ra-226, Ra-228, and K-40 in both sets of samples. There was no indication of man-made isotopes within two sets of catfish samples. Further, measured radioactivity-based dose estimates were made considering the isotopic concentration in Bq/kg) and Dose Conversion Factors (DCF) in msV/ Bq. Lastly, the obtained activity-based dose values were compared with the Federal recommended dose limit of 1 msV/ year.

P4.30

EFFECT OF LIGNIN STRUCTURE ON TENSILE STRENGTH OF 3D-PRINTED LIGNIN-PA COMPOSITE

Ariole Bullock[1], Xianzhi Meng[2], Shuyang Zhang[2], Arthur Ragauskas[2]

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Lignin is a renewable polymer that is derived from coniferyl alcohol, sinapyl alcohol, and p-coumaryl alcohol. Lignin can be used for the structural support of plants and fuel combustion for low-cost electricity generation and heat. We conducted solvent lignin fractionation on organosolv lignin to obtain low and high molecular weight lignin and the chemical properties and molecular weight of lignin fractions were fully characterized. The obtained lignin substrates were blended with PA 12 followed by 3D printing to form lignin-PA dogbone. The tensile strength of the obtained 3D printed lignin-PA composite was tested to assess the effect of lignin molecular weight. Based on the data, the original lignin increased the tensile strength of the PA Composite. The tensile strength of PA was 32.64 MPa and once the original lignin was added, it increased from 30.48 MPa at 5% to 32.47 MPa and 37.20 MPa at 10% and 20%, respectively. However, the high-molecular-weight lignin decreased the tensile strength as the percentage increased from 5% to 10%. As of now, there is no clear trends as how the molecular weight of lignin affects the tensile strength of lignin-PA composite.

High School Posters

P4.31

IDENTIFYING UNKNOWN MATERIALS BY MEASURING THEIR LINEAR ATTENUATION COEFFICIENTS

Corbin Bass[1], Jermiah Billa[2], John Adjaye[2]

[1]Porters Chapel Academy, [2]Alcorn State University

Uknown Materials can easily be identified by measuring their densities (ratio of mass to volume). However, Industrial radiographers identify materials by measuring their Linear-Attenuation Coefficients of materials to identify the materials. Specifically, 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 analysis was 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 were not in pure form and may be in the form alloys, which resulted in a deviation from the expected/standard values of LAC for the three researched materials. As expected, lead was found to be better shielding material compared to the other two materials.

P4.32

RADIOLOGICAL HEALTH IMPLICATIONS OF WATER SOFTENERS

Joey Courville[1], Jermiah Billa[2], John adjaye[2]

[1]Porters Chapel Academy, [2]Alcorn State University

Water sustains life. In the U.S., citizens living in the urban areas completely rely on municipal water supply, whereas a vast majority of rural Americans rely on ground water. Depending on the location, water sources may contain salts and to remove salts present in water sources, consumers add water softeners prior to using water. 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 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 variable amounts of radioactive (K-40). In this context, a pilot study was proposed with a goal of theoretically estimating and experimentally measuring K-40 via the gamma spectroscopic analyses. Further, a safety assessment study on handling water softeners was performed by computing Radiological Health Hazard indicating parameters such as Gamma Index, External Hazard, and Annual Effective Dose were computed and compared to the world-wide accepted levels.

P4.33

CROP BASED RADIOACTIVITY INTRODUCED INTO FARMLANDS DUE TO FERTILIZATION

Benjamin Billa[1], John Adjaye[2], Kwabena Agyepong[2], Erol sarigul[2]

[1]Mississippi School for Mathematics and Sciences, [2]Alcorn State University

Fertilizers are part of the farming industry and have been helping mankind in improving plant growth and crop yields. Available as Nitrogen-Phosphorous-Potassium (N-P-K) in the market, the concentrations of these key elements in fertilizers are extensively varied. Depending on the plant health, farmers tend to add these fertilizers to obtain maximum yields. Phosphorous and Potassium fertilizers are derived from Phosphate and Potassium rocks which are cored from earth's crust. The presence of radioactivity is apparent as rocks are cored from earth's crust. Often, producers enhance potassium and phosphate levels in the fertilizers, and this may result in enhancing concentrations of Ra-226 (Phosphate) and K-40 (Potash) fertilizers. A study was performed on locally available fertilizers (0-46-0 and 0-0-60) by performing gamma spectrometric analyses using a high purity germanium detector. Based on the measured radioactivity values, radioactivity introduced into farmlands was estimated per acre of farmland. Measured concentrations of key isotopes of Ra-226, Th-232, and K-40 are 7.02 ±1.5, 8.9 ±1.12, & 47.3± 9.2 respectively, in 0-0-46(Phosphate) and1.32± 0.12 , 0.45± 0.13,& 15102±98, respectively in 0-0-60 (Potash). Estimated radioactivity introduced into farmlands indicated that tomatoes and cucumbers production will result in adding 1,246,619.86 and 1,061,681.75 Bq $acre^{-1}$ of radioactivity.

P4.34

ISOTOPIC TRANSFER FACTORS FROM SOIL TO EDIBLE PARTS OF SELECTED ROOT PRODUCTS

John McGee[1], Jermiah Billa[2], John Adjaye[2], Kwabena Agyepong[2]

[1]Porter Chapel Academy, Vicksburg, MS, [2]Alcorn State University

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. The 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.

Friday, March 1, 2024

MORNING

Room TC 210

8:45 Welcome and Opening Remarks

O4.16

9:00 MOLECULAR RECOGNITION OF ANION WITH UREA-THIOUREA BASED RECEPTORS

Md. Alamgir Hossain, Egboluche Tochukwu

Department of Chemistry, Physics and Atmospheric Sciences, Jackson State University, Jackson, MS

Anions play a critical role in chemistry and biology. Therefore, the synthesis of molecular receptors for selective binding of anionic guests is an important area of research in supramolecular chemistry. Although, there are many synthetic molecules that are capable of binding transition metal ions, neutral receptors for anions are still limited. This presentation will highlight several classes of urea and thiourea based compounds with variable dimensions and spacers for molecular recognition of anions of environmental and biological relevance. Acknowledgments: The project described was supported by Grant Number W911NF-19-1-0006 from the US Department of Defense.

O4.17

9:30 THE RING STRAIN OF CYCLOPROPANE, CYCLOBUTANE, AND SMALL HETEROCYCLES REVISITED

David Magers

Mississippi College, Clinton, MS

The strain energy in small cyclic compounds have interested chemists ever since Adolf von Baeyer studied the deviation of normal tetrahedral bond angles in cyclic alkanes in the 1880's. Most studies of ring strain have centered round the strain energy in cyclopropane and cyclobutane. Of course, these systems are the prototypical three- and four-membered rings, but they generate additional interest because of the remarkable similarity of their strain energies, which are almost always reported to lie between 1 and 2 kcal/mol of each other. This result is surprising because cyclopropane must have greater Baeyer or angle strain. The usual explanation is that cyclopropane is stabilized by sigma aromaticity. But cyclopropane is not the only three-membered ring with a relatively small strain energy. The strain of oxirane is quite similar to that of cyclopropane, while the strain of thiirane is much smaller. Yet, the strain energy of silirane is much larger. In the current study, the conventional strain energies of each of these systems is computed with the use of homodesmotic and hyperhomodesmotic model reactions and correlated with bond distances and bond angles. Furthermore, the electronic energies of these cyclic systems are broken down into the nuclear-electron attraction part and the two repulsive components, the nuclear-nuclear repulsion and the electron-electron repulsion, to examine their relative contributions. In addition, the reaction energies of the model reactions used to compute the conventional strain energies are calculated with each of these parts of the electronic energy to assess the contribution of each to the strain. Finally, natural bond order analysis is employed to help explain the factors contributing to the stabilization of each system. Support from the Mississippi College Catalysts, the alumni support group of the Department of Chemistry & Biochemistry, is gratefully acknowledged.

O4.18

10:00 HEAVY METAL HISTORY: USING METAL ANALYSIS IN ARCHEOLOGICAL STUDIES

Scoty Hearst

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

Identifying the chemical composition of archaeological samples is commonly used to determine authenticity and provides greater insight into historical events and cultural exchanges. In this talk, we will discuss metal analysis projects involving artifacts of archeological importance and discuss how these types of projects are useful for training chemistry students. In one of our studies, we use an ICP-OES to determine the chemical composition of pottery samples collected from various locations across the Holy Land. Pottery samples were collected throughout Israel at En Gedi, Hazor, Herodium, Masada, Timnah, Jerusalem, and Jericho. Samples were also collected from the Crusader's Banias Fort and Corinth, Greece. We determined the composition of these pottery samples and used social network analysis of their similarities to reveal potential trade routes and culture exchanges throughout the Holy Land during the Roman occupation. In another study, we examine metal artifacts found in a suspected Civil War camp site located in Bentonia, Mississippi. Local legends in the area tell of this particular location as an old Civil War camp site that was once occupied by Confederate soldiers. Using metal detectors, we uncovered multiple potential Civil War artifacts including tent nails, a fire starter, a pickaxe, a war axe, and a knife handle. We also found slag and evidence of smelting. Using an ICP-OES, we analyzed the elemental composition of each artifact and compared them to modern metals and certified reference materials. We found unique metal impurities in the potential Civil War artifacts not found in the modern metal samples suggesting this location to be a real Civil War campsite. Overall, metal analysis of archaeological samples can be a useful teaching tool that provides greater insight into historical events and cultural exchanges.

10:30 BREAK

O4.19

11:00 SPECTROSCOPY OF 1,8-NAPHTHALIMIDE-LINKED N-SUBSTITUTED HETEROAROMATIC COMPOUNDS

Wolfgang Kramer[1], Courtney Mullins[1], Ian Gould[2], Lauren Hoth[1], Irene Corrao[1]

[1]Millsaps College, [2]Arizona State University

N-alkoxy substituted heteroaromatic compounds based on pyridine, quinoline, isoquinoline and phenanthridine allow the photochemical generation of transient species that can be used to damage biomolecules and induce controlled cell death. The transient species, heteroaromatic radical cations and alkoxy radicals are produced with a quantum yield of about 0.55 as determined by trapping experiments.

Laser flash photolysis was used to analyze the photophysical properties of the bifunctional compounds. Excitation of the 1,8-naphthalimide chromophore led to photochemistry at the N-substituted heteroaromat. In this presentation, we are discussing the results of the transient absorption spectroscopy experiments. The transient species have each been shown to initiate DNA cleavage. By comparison with restriction endonuclease, cleaving assays indicates that both transient species might be involved in the cleaving process.

DNA double strand cleavage is desired for efficient cleavage. The bifunctional compounds presented in this project have the ability to induce DNA damage by two different mechanisms, thus showing potential for double strand cleavage.

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

O4.20

11:30 APPLICATIONS OF MASKED ACYL CYANIDES - BRIDGING SYNTHESIS AND COMPUTATIONAL CHEMISTRY

Julie Pigza

University of Southern Mississippi, Hattiesburg, MS

The Pigza research group focuses on the theme of noncovalent interactions as they are at the core of asymmetric catalysis and ultimately determine the fate of reactions. Masked acyl cyanide (MAC) reagents contain a weakly acidic methine hydrogen that can be activated by a mild base, making them prime for the study of noncovalent interactions in a variety of nucleophilic addition reactions including organocatalyzed reactions. Adducts can then be unmasked in a later step, revealing an ester, amide, or carboxylic acid functional group handle. This presentation will summarize three aspects of our research projects on MAC reagents: 1) their synthesis with various protecting groups, 2) their use as oxidation state three nucleophilic equivalents in reactions, and 3) the complementary computational study using density functional theory to better understand the relevant noncovalent interactions.

Friday, March 1, 2024

AFTERNOON

12:00-1:00
Mississippi INBRE/ Millsaps Symposia

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, February 29, 2024

MORNING

Room TC 227

8:00 Welcome and Opening Remarks

8:05 Recent additions to A. Holick's (1906) Cretaceous Flora of Southern New York and New England'

Andrew Greller

8:35 Tertiary palynomorphs from Eocene and Oligocene units in Southern Mississippi

Nina Baghai-Riding

9:05 Pine Beetle Pandemic
Rick Hollis

9:35 Fighting against American chestnut blight: History, current status, and future directions
Charles Burdine

9:40 Break

O5.01

10:15 CONSERVING AMERICAN CHESTNUT GENOTYPES FOR FUTURE BREEDING WITH PATHOGEN-RESISTANT SEEDLINGS

Charles Burdine[1,4], Chance K. Parker[2], Warren L. Nance[3], Esteban Galeano[4], Dana Nelson[5]

[1]USDA Forest Service, Southern Research Station, Southern Institute of Forest Genetics, Saucier, MS, [2]Natural Resource Conservation Service, Gulfport, MS, [3]Retired Scientist, Southern Institute of Forrest Genetics, Saucier, MS, [4]Departmnt of Forestry, Mississippi State University, Starkville, MS, [5]USDA Forest Service,

Southern Research Station, Forest Health Research and Education Center, Lexington, KY

The loss of the American chestnut (*Castanea dentata*) to chestnut blight (caused by *Cryphonectria parasitica*) is often considered North America's most significant ecological disaster. The destruction of the chestnut severely impacted the Appalachian forests along with local and regional economies. Thanks to the tree breeding efforts underway by various entities, blight-resistant seedlings are expected to be available in the next few years. However, before reintroduction to the forest, it is vital to produce resistant seedlings adapted to the local environment. Due to the coppice regenerating nature of stumps in the wild, an opportunity to preserve local genotypes by establishing germplasm conservation orchards is possible. In the last couple of years, the Southern Research Station (SRS) has made substantial progress in developing a modified nut-grafting technique that is resulting in the conservation of rare American chestnut genotypes located in natural forests and plantings in Mississippi, Alabama, Kentucky, and Georgia. In total, we clonally propagated scions from 76 genotypes. Overall, for the 2022/2023 grafting season, 67.4% of the grafts survived, with modest differences observed among scion origins, ranging from 76.7% for north Georgia to 61.1% for northeast Mississippi. Pots, media, and environmental settings that allowed for optimal growth and development are incorporated throughout this study. In addition, rootstock species (i.e., Chinese versus American chestnut) also resulted in variation in overall graft success (78% in Chinese compared to 42% for American chestnut). Key factors affecting grafting success include the timing of scion collection, scion preparation, rootstock preparation, cutting blade type, and acclimation of grafted plants from one stage to the next. Of further importance, it is expected that American chestnut genotypes that evolved in the most southwestern area of the species' range (i.e., northeast Mississippi) are proving to be valuable sources of germplasm for breeding trees that are adapted to warmer environments.

O5.02

10:30 ROTTING LOGS THROUGH THE SEASONS: DRIVERS OF THERMAL BUFFERING IN THE MICROHABITAT OF TEMPERATURE-SENSITIVE ORGANISMS

Ryan Phillips, Ryan Garrick

Department of Biology, University of Mississippi, Oxford, MS 38677, USA

Decaying dead wood serves as critical habitat for saproxylic organisms, which play an essential role in nutrient cycling and represent a large portion of forest biodiversity. Intensive management practices such as those associated with agroforestry and wildfire risk mitigation has led to global changes in the quality and quantity of dead wood. Generally, these practices have reduced the diameter and abundance of rotting logs on the forest floor. Arthropod assemblages of large diameter logs often differ from those of small diameter logs. One reason for this may be because some saproxylic organisms depend on the stable thermal environment and high moisture content of large diameter logs, given their intolerance of extreme temperatures and desiccation. However, little work has been done to characterize the internal environment of rotting logs. We deployed Thermochron i-button temperature loggers inside and outside of decaying logs in three forest regions in the southeastern US to investigate relationships between log diameter, decay stage, gravimetric moisture content, and various metrics of thermal buffering over the course of 10 months. Akaike information criterion model selection suggested that log diameter and moisture content are appropriate predictors of log buffering of minimum temperatures in the winter and maximum temperatures in the summer. Only log diameter was selected as a predictor of the reduction in the daily temperature range experienced by the interior of logs relative to the exterior in the spring. Linear mixed models built with these predictors identified significant relationships between diameter and the buffering of minimum temperatures in winter and between diameter and the reduction of the daily temperature range experienced within logs in the spring. Taken together, these findings suggest that the importance of log diameter in thermal buffering is season-dependent, as is the nature of which temperature extreme is being buffered against. Hence, there is considerable nuance with respect to what might constitute high- vs. low-quality habitat for saproxylic organisms. Further work should explore the drivers of the spatial distribution of temperatures within rotting logs and directly relate these characteristics to the saproxylic organismal diversity within these logs.

O5.03

10:45 DRYING EFFECTS ON AQUATIC FUNGI: VIGNETTES FROM NORTH AMERICAN INTERMITTENT STREAM NETWORKS

Charles T. Bond[1], Andrielle L. Kemajou Tchamba[2], Colin Jackson[2], Kevin Kuehn[1]

[1]University of Southern Mississippi, Hattiesburg, MS, [2]University of Mississippi, Oxford, MS

Fungi play numerous ecological roles in aquatic ecosystems, including as decomposers, pathogens, and symbionts of plants and algae. Most research on stream-inhabiting fungi comes from perennial streams (which flow year-round). However, over half of the world's streams are non-perennial (*e.g.*, intermittent or ephemeral), periodically drying out and re-wetting. Stream drying alters biogeochemical conditions, imposing natural selection on microbial (fungal) organisms and altering their function. However, these effects and their relevance to ecosystem services and water quality remain poorly understood. As part of the Aquatic Intermittency effects on Microbiomes in Streams project (AIMS), we used exploratory and experimental approaches to investigate the biodiversity and function of fungi and other microbes

across non-perennial stream networks in the United States. First taking an exploratory approach, we carried out fungal DNA metabarcoding from leaf litter, rock surfaces, and sediments across natural flow permanence gradients in the Konza Prairie, KS, and in the Talladega Forest, AL. This approach revealed significant effects of surface flow permanence and connectivity on fungal community composition. For example, at Konza, freshwater lichens (Verrucariaceae) preferred rocks at drier sites, suggesting their potential as bioindicators of local hydrological conditions. In leaf litter, Ingoldian aquatic hyphomycetes (AH) appeared to be outnumbered by plant-associated fungi (pathogens and other endophytes) which may act as facultative decomposers in streams. For example, *Alternaria*, a hyper-generalist plant pathogen known to grow in submerged leaf litter, emerged sediments, and endolithically (within rocks), was among the top genera in all three substrates. One of the few known AH in abundance was *Tetracladium marchalianum*, previously identified as a drying-stream specialist and root endophyte, implies that plant-associated niches may provide keystone aquatic decomposers with refugia from drying streams. Higher fungal diversity in leaf litter was correlated with lower activity of lignin-degrading enzymes, suggesting negative net diversity effects due to competitive interference, as has been documented in terrestrial decomposer communities. For an experimental approach, we built a dam to artificially dry a section of an intermittent stream in the Talladega Forest, where decomposition assays were deployed in the impacted reach and an upstream reference reach before, during, and after four weeks of reduced flow. Our experimental approach found a significant decrease in decomposition rates in riffles following flow reduction, and a rapid recovery of decomposition rates following the restoration of flow (Full-factorial ANOVA, $F_{4,178}$=12.8543, $p<0.0001$). Future research will investigate fungal biomass and community composition of these decomposition assays as well as leaf litter bags that were deployed alongside the cotton strips for all treatments.

O5.04

11:00 PLANT DIVERSITY AS A PREDICTOR OF SOIL ARTHROPOD DIVERSITY: AN ASSESSMENT OF LONG-TERM MONITORING PLOTS AT THE UNIVERSITY OF MISSISSIPPI FIELD STATION, UTILIZING OVERSTORY AND UNDERSTORY SURVEY DATA AND ANIMAL MITOCHONDRIAL DNA BARCODING

Caden Noonan, Jordan Jackson, Marjorie Holland, Ryan Garrick

Department of Biology, University of Mississippi, Oxford, MS 38677, USA

Soil arthropods play a vital role in forest ecosystems by actively participating in nutrient cycling through the decomposition of organic matter. Despite the considerable biodiversity that exists within these communities, these essential organisms are often overlooked due to their cryptic nature. We investigated whether the structural complexity of root zone microhabitats is heightened when both overstory and understory plant species richness is high, resulting in greater biodiversity within the associated soil arthropod communities. This study draws on data from long-term monitoring plots established at the University of Mississippi Field Station in 1996, providing extensive time-series information on understory and overstory plant diversity. Mitochondrial DNA sequence data were used to circumvent challenges of identifying soil invertebrates across various life stages. Phylogenetic diversity was used as the response variable in our statistical assessment of whether overstory and understory plant species richness holds predictive power. If a positive correlation is detected, this would suggest that plant biodiversity surveys could be valuable proxies for the needs of soil arthropods in conservation management plans, enhancing the sustainability of forest ecosystems.

O5.05

11:15 ANALYZING DOLIOLID SWIMMING BEHAVIORS AND THEIR POTENTIAL INFLUENCE ON VERTICAL DISTRIBUTIONS USING IMAGING TECHNOLOGIES

Meredith Rice[1], Adam Greer[2], Patrick Duffy[2]

Delta State University, Cleveland, MS, [2]Skidaway Institute of Oceanography, University of Georgia, Savannah, GA

Doliolids are pelagic tunicates that hold an important role in the marine food web and populate the water column at different depths, yet not much is known about their vertical distribution. Vertical distribution depends on the conditions in the water column that are favorable for doliolids such as food availability. Using imaging technologies such as mDPI and a benchtop imaging system we determine the distribution of the three life stages of doliolids based on their abundance at different depths and analyzing their swimming speeds. Peak abundance of doliolids occur at a depth between 20-30 meters due to the increase of chlorophyll *a* at those depths. It can be assumed that the life cycle of doliolids plays an important role in the distribution, because of the ways in which doliolids are produced. Doliolids undergo three life stages through their developmental process: nurse, phorozooid, and gonozooid. These life stages are found throughout the water column in different locations depending on food location.

O5.06

11:30 DESSICATION ADAPTATIONS IN ARMY ANTS: HOW WORKER SUBCASTES AND RAIN SHADOWS INFLUENCE DESICCATION RESISTANCE

Karen Robles Lopez, Kaitlin Baudier

The University of Southern Mississippi, Hattiesburg, MS

The ability of an organism to reduce water loss is known as desiccation resistance. Most research on insect desiccation resistance has focused on arid environments,

but tropical insects can also face desiccation challenges. Neotropical ecosystems exhibit the most diverse and abundant biodiversity on the planet but are heavily impacted by climate change because of high degrees of climatic specialization. Despite this, the biogeographic selective pressures that shape desiccation resistance in tropical insects are poorly described. For ants, the desiccation resistance varies from species to species and water loss is also greatly impacted by body size. In army ants like with *E. burchellii*, the subcastes that typically have different body size and lipids in the cuticle exhibit different threshold for desiccation. This matches with the tasks they perform for the colony and the wide variety of shaped prey types that they consume. The differences in physiology and adaptation among worker subcastes and Mellanby's rule (also known as the desiccation adaptation hypothesis) predicts the evolution of greater desiccation resistance among insects living in water-restricted environments. Here we test if body size differences in workers subcaste and tropical rain shadows follow Mellanby's rule have an effect in the desiccation resistance of army ants. Army ants are keystone predators and are found both in tropical rainforests as well as in tropical dry forests in northern Costa Rica. We tested whether Eciton differs (intra- and interspecifically) in desiccation resistance across this expanse. We performed desiccation assays in workers of 5 species across the genus *Eciton* (*Eciton burchellii, Eciton hamatum, Eciton lucanoides, Eciton mexicanum*, and *Eciton vagans*) on the grounds of high precipitation La Selva Biological Station and in the lower precipitation site of Santa Rosa National Park. We report patterns that widen our understanding of both army ant physiology and tropical ecology. These findings have the potential to aid conservation efforts of these species, and ecosystems, but may inform more efficient conservation strategies for tropical areas in general.

O5.07

11:45 *CULEX ANTILLUM MAGNORUM*: OVIPOSITION BEHAVIOR, MICROHABITAT ASSOCIATIONS, AND LIFE HISTORY

Liz Wynne, Donald Yee

The University of Southern Mississippi, Hattiesburg, MS

Culex antillummagnorum is the most widely distributed mosquito on the island of Puerto Rico, USA; this species, and all other species within the *Micraedes* subgenus, remains understudied. The scientific literature contains no information pertaining to *Cx. antillummagnorum*'s oviposition behavior, habitat associations, or life history. Therefore, this study contributes to the fundamental knowledge of an understudied mosquito species, and *Culex* subgenus, by examining the oviposition strategy and larval habitat selection of *Cx. antillummagnorum*- including how these behaviors may determine the distribution and abundance of this species within the Luquillo Experimental Forest (LEF) in Puerto Rico. *Culex antillummagnorum* also demands further study in light of a decades-old question regarding its method of oviposition. Previous research has suggested that *Cx. antillummagnorum* displays an oviposition mode not previously documented in the genus *Culex* - specifically, the toxorhynchitine method of emitting single eggs while hovering above water. To test this in-flight oviposition hypothesis, gravid *Cx. antillummagnorum* females were obtained within the LEF and allowed to oviposit in cages; in this way, the novel, atypical egg-laying behavior of *Cx. antillummagnorum* was finally recorded. Additionally, phytotelmata units (bromeliad leaf axils, *Heliconia* bracts, and palm spathes) in the forest were systematically sampled, and the presence of *Cx. antillummagnorum* larvae, as well as a suite of environmental factors, were quantified. Through the extraction of common abiotic and biotic features of favored oviposition sites, oviposition preference can thus be inferred- enabling the further elucidation of how larval habitat selection determines the ecological, spatial, and temporal distribution of this understudied species.

Thursday, February 29, 2024

AFTERNOON

Room TC 227

O5.08

1:00 MOLECULAR CHARACTERIZATION OF *AMBLYOMMA AMERICANUM* PHOSPHOLIPASE A2 GENE IN EHRLICHIA INFECTION AND ALPHA-GAL SYNDROME

Sabir Hussain[1,2], Surendra RaJ Sharma[1], Donald E Champagne[3], Shahid Karim[1]

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Alpha-Gal Syndrome (AGS) manifests as an IgE-mediated delayed-type hypersensitivity reaction to the oligosaccharide galactose- -1, 3-galactose (-gal), which is introduced into humans through the bite of the lone-star tick (*Amblyomma americanum*). Notably, -gal is identified in the salivary glands of the lone-star tick. However, the specific intrinsic factors within the tick that contribute to endogenous -gal production and its presentation to the host during hematophagy remain poorly understood. This study is designed to explore the functional role of PLA2 in *Ehrlichia chaffeensis* infection, and AGS development, focusing on *Amblyomma americanum*. Phospholipase A2 (PLA2) is an enzyme that plays a crucial role in the hydrolysis of phospholipids, which are major components of cell membranes. The main function of PLA2 is to cleave fatty acids from the sn-2

position of phospholipids, releasing arachidonic acid and lysophospholipids. PLA2 enzymes are involved in several key functions in ticks, primarily related to their feeding and survival strategies. An RNA interference approach was utilized to silence PLA2 in *Amblyomma americanum* to examine their function in -gal metabolism in tick and AGS onset. Temporal and tissue-dependent expression data from *Ehrlichia chaffeensis* infected ticks demonstrate that PLA2 expression is markedly higher in both the salivary gland and midgut during prolonged blood-feeding compared to clean salivary glands and midguts. Silencing of PLA2 gene using dsRNA significantly decreases the expression of alpha-gal in tick salivary glands. This data provides valuable insights into the role of PLA2 in *Amblyomma americanum* and underscores its significance in tick-pathogen interactions, and alpha-gal synthesis.

O5.09

1:15 GENE EXPRESSION AND FUNCTIONAL ANALYSIS OF SILK GLAND-SPECIFIC UGT GENE IN MOTHS

Courtney Wynn, Seung-Joon Ahn

Department of Biochemistry, Molecular Biology, Entomology, and Plant Pathology, Mississippi State University, Starkville, MS

The corn earworm (*Helicoverpa zea*) is a major agricultural pest devouring numerous economically important plants. Recently, a genomic analysis of the corn earworm identified 45 different UGT genes. Uridine diphosphate glycosyltransferase (UGT) is a multigene family of enzymes responsible for catalyzing glycosylation of small hydrophobic molecules. These enzymes participate in the detoxification of xenobiotics and biotransformation of endobiotics, where glucose conjugation increases the water solubility of lipophilic aglycone compounds. Utilizing quantitative and real-time PCR, we discovered a UGT gene, UGT34, being exclusively expressed in the larval silk glands. Further investigation showed UGT34 to be generally expressed at all larval instar levels and largely expressed in the middle and posterior subsegments of the silk glands. Additionally, the soybean looper (*Chrysodeixis includens*) was analyzed and found to have similar gene expression patterns, implying that UGT34 may play an important role in the silk glands of moths. To determine the function of UGT34, RNA interference (RNAi) was conducted, but revealed to be unsuccessful. Going forward, we plan to utilize the CRISPR-Cas9 gene editing technique to knock out the UGT34 gene. Single guide RNA (sgRNA) has been designed to induce the non-homologous end joining (NHEJ) pathway to produce random insertions or deletions at the target site. This technique will allow us to better understand UGT34's role and overcome the obstacles we faced using RNAi. Altogether, the present study implies that UGT34 may play an important role in silk glands, yet its molecular and physiological function needs to be determined by further study.

O5.10

1:30 CYTOPATHIC EFFECTS AND QUANTITATION OF HONEY BEE VIRUSES USING CELL CULTURE

Alexander McMenamin[1], Mike Goblirsch[2]

[1]USDA-ARS, Honey Bee Breeding, Genetics, and Physiology Research, Baton Rouge, LA

[2]USDA-ARS, Thad Cochran Southern Horticultural Research Laboratory, Poplarville, MS

Honey bee viruses impose a significant burden on the beekeeping industry. Viral infections can cause individual bee death, and depending on the prevalence of disease within the hive, contribute to its decline and death. Postive-strand RNA (+ssRNA) viruses are common infections of honey bee hives. High viral loads, in conjunction with exposure to other common stressors, such as pesticides, parasitic mites, and poor nutrition, can accelerate the progression of viral disease. Understanding the pathology associated with honey bee +ssRNA viral infections requires studies conducted at not only the organismal and hive levels, but also at the cellular and molecular levels. To fill gaps in our knowledge regarding honey bee-virus interactions at the cellular level, we utilized the continuous honey bee cell line, AmE-711, in experimental-infections with select +ssRNA viruses. We demonstrate that AmE-711 permits characterization of the cytopathology and immune response of honey bee cells to different virus infections. We also provide a comparison of quantifying viral genome copies using RT-qPCR to infectious dose using a plaque assay. Our goal is to show the utility of AmE-711 for virological studies.

O5.11

1:45 HONEY BEE (*APIS MELLIFERA* L.) RESPONSES TO OXIDATIVE STRESS INDUCED BY PHARMACOLOGICAL AND PESTICIDE COMPOUNDS

Faizan Tahir[1], Michael Goblirsch[2], John Adamczyk[2], Mohamed Alburaki[3], Shahid Karim[1]

[1] The University of Southern Mississippi, Hattiesburg, MS, [2] United States Department of Agriculture, Agricultural Research Service (USDA-ARS), Poplarville, MS, [3] USDA-ARS Bee Research Laboratory, Beltsville, MD

The western honey bee, *Apis mellifera* L., is a eusocial insect that plays a significant role in ecosystem balances and pollination of plants and food crops. Honey bees face multiple biotic and abiotic stressors, such as pathogens, diseases, chemical pesticides, and climate change, which all contribute to honey bee colony loss. This study investigated the impacts of multiple pharmacological and pesticide molecules on honey bee survival and gene regulation responses. In an 11-day cage experiment, sublethal doses of tunicamycin, thapsigargin, metformin, paraquat, hydrogen peroxide (H_2O_2), and imidacloprid were administered to newly emerged sister bees. Daily treatment consumption and mortality were recorded, as

well as the transcription expression of twelve major genes (*AChE-2*, *Apisimin*, *Apidaecin*, *mrjp1*, *Sodq*, *cp450*, *SelT*, *SelK*, *Ire1*, *Xbp1*, *Derl-1*, *Hsc70*), some of which are markers of oxidative and endoplasmic reticulum (ER) stresses in honey bees. At day 9 of the treatments, protein damage was quantified in caged bees. Kaplan-Meier model indicated significant ($p < 0.001$) toxicological effects of paraquat, hydrogen peroxide, and tunicamycin on bee survivorship compared to controls with better survivals for other molecules. Post-ingestive aversion responses were recorded only for tunicamycin, hydrogen peroxide, and imidacloprid. Nonetheless, significantly higher protein damage on day 9 was only identified in honey bees exposed to paraquat and imidacloprid. Some antioxidant genes significantly regulated vis-à-vis specific treatments. Our results reveal age-related regulation of other major genes with significant inter-gene positive correlation.

O5.12

2:00 THE INTERPLAY OF DIVISION OF LABOR AND THERMAL TOLERANCE IN A STINGLESS BEE SPECIES

Kristin Robinson, Kaitlin Baudier

The University of Southern Mississippi, Hattiesburg, MS

The current state of anthropogenic climate change is of particular concern for insects, especially in the tropics where the effects are predicted to be the most deleterious. Researching climatic tolerance in social insects is challenging because adaptations can exist at both an individual level and societal level; however, these studies are particularly important as social insects comprise a tremendous portion of the planet's animal biomass, biodiversity, and include many important pollinators. Considering how individual physiologies fit into the context of the whole colony may provide important insights into accurately assessing the effect of climate change and may inform new ways to think about within-colony variation beyond physiology. *Tetragonisca angustula* is a neotropical stingless bee species known to exhibit particularly high worker subcaste specialization in the form of a morphologically distinct soldier caste, a trait most commonly found and studied in ants and termites. We studied within-colony variation in thermal performance in this model species to shed light on how specialization in insect societies impacts colony survival under stressful thermal conditions. We also investigated whether any worker subcaste functions as a colony-level limiting factor. The thermal tolerance (CT_{max} and CT_{min}) of different worker subcastes of *T. angustula* was measured, and no differences were observed despite the differences in body size. We also assessed the functional microclimates of each worker subcaste and found that the foragers experience the most stressful microclimatic conditions. In other words, foragers are the limiting factor of the colony. This has major implications for ecosystem functioning and agriculture.

O5.13

2:15 IS THE PAPER WASP *MISCHOCYTTARUS MEXICANUS* CAPABLE OF WINTER ACCLIMATION?

Nadia Gillespie, Alycia Johnson, Kaitlin Baudier

The University of Southern Mississippi, Hattiesburg, MS

It is crucial to study climate adaptions because it informs our understanding of evolution process and helps us predict effects of climate change. The Mexican paper wasp (*Mischocyttarus mexicanus*) is a Mississippi native pollinator that is also valuable to the natural control of many plant pests. Previous studies have revealed there is a significant difference in temperature tolerance of this species across latitudes, but how much of that response is due to acclimation is unknown. We tested whether there is a difference in thermal performance between the summer and winter seasons, in natural colonies within the same site. We then manipulated the acclimation temperature of overwintering wasps and compared their resultant thermal tolerance. Results inform our understanding of the climatic flexibility of this ecologically important species.

O5.14

2:30 UNDERSTANDING POTENTIAL RESISTANCE MECHANISMS TO DIAMIDES IN SOYBEAN LOOPERS, *CHRYSODEIXIS INCLUDENS*, VIA TRANSCRIPTOME ANALYSIS

Sena Isbilir, Lauren Catchot, Fred Musser, Seung-Joon Ahn

Department of Biochemistry, Molecular Biology, Entomology, and Plant Pathology, Mississippi State University, Starkville, MS

The soybean looper (*Chrysodeixis includens*) is a defoliating pest of soybean and crops, causing approximately 16% of total insect damage in Mississippi. The pest is recognized for its annual migration pattern between Central America and the United States. Over the past decade, effective chemical control using diamides, which target insect ryanodine receptors (RyRs), including chlorantraniliprole, has been implemented. However, recent observations indicate a decline in the success rates of managing soybean looper populations in Puerto Rico, prompting an investigation into the potential development of resistance to diamides. In our previous study, we identified a moderate resistance of the Puerto Rico (PR) strain to chlorantraniliprole. Additionally, a case of diamide resistance in soybean loopers was reported in Brazil. The aim of this study is to investigate the potential resistance mechanisms in the soybean loopers to diamides. For that purpose, a comparative transcriptome analysis between the PR strain, which was mildly resistant to chlorantraniliprole (RR:10), and a susceptible laboratory strain was performed. The analysis revealed differential expressions of various genes based on susceptibility to chlorantraniliprole. Up-regulated genes in the PR strain include those encoding cuticle proteins, detoxification

enzymes such as cytochrome P450s (P450s), glutathione-S-transferases (GSTs), carboxyl/choline esterases (CCEs), uridine 5 -diphospho-glycosyltransferase (UGTs), and ATP-binding cassette transporters (ABC transporters) and antimicrobial peptides. On the other hand, down-regulated genes in the PR strain encompass those encoding other metabolic enzymes involving in digestion, cellular, and physiological processes, odorant receptors, and regulatory components. Detailed discussions on the dynamic profiles of the transcriptome are underway, and ongoing functional analyses are being conducted on the differentially expressed genes.

O5.15

2:45 CRISPR/CAS9 GENOME EDITING OF A PIGMENT TRANSPORTER GENE SCARLET IN THE SOYBEAN LOOPER, *CHRYSODEIXIS INCLUDES*

Sujin Lee, Seung-Joon Ahn

Department of Biochemistry, Molecular Biology, Entomology, and Plant Pathology, Mississippi State University, Starkville, MS

Pigment transporter genes have been used as visible markers or classic genetic studies to create genetic control for destructive crops pests. CRISPR/Cas9 technology has significantly advanced research on non-model organisms, but it has not been successful in gene editing for the soybean looper, *Chrysodeixis includens* due to limited genomic information and embryonic microinjection techniques. Here we report heritable knockout mutants in a pigment transporter scarlet gene in *C. includens* using CRISPR/Cas9-mediated mutagenesis. scarlet locus identified in a genome assembly of *C. includens* was found on chromosome 6, consisting of 14 exons and extending for 1,986 base pairs. Microinjection of Cas9 and two guide RNA into the embryos successfully induced significant mutant eye phenotypes in nine adults (16 %). Analysis of genotyping showed various indel mutations at the target site, resulting in a premature stop codon and frame shift. By single-pair cross, the mutant moths produced G1 and G2 offspring exhibited lightly pigmented compound eyes in both sexes. Our results provide the first successful case that the CRISPR/Cas9-mediated genome editing effectively induces mutations in *C. includes*, an economically important pest species in the United States.

O5.16

3:00 UNCOVERING THE ROLE OF TICK tRNA SYNTHETASES IN HEMATOPHAGY AND PATHOGEN INFECTION

Latoyia Downs, Shahid Karim

The University of Southern Mississippi, Hattiesburg, MS

Transfer RNA synthetases are a family of enzymes that catalyze the addition of amino acids to their corresponding transfer RNAs (tRNAs) and play an essential role in protein synthesis. Recent research has uncovered intriguing connections between arthropod protein synthesis, development, and their ability to host and transmit pathogens. Ticks are obligate hematophagous ectoparasites that rely on prolonged feeding periods to complete their life cycle on a vertebrate host. Tick tRNA synthetases help the tick in continuous protein synthesis to evade the host immune system while stealing the host blood. These enzymes present a potential target for developing new tick control strategies. This study investigated the crucial role of transfer RNA (tRNA) synthetases in the lone-star tick (*Amblyomma americanum*) during blood feeding on the host and propagation of *Ehrlichia chaffeensis* (EC), the causative agent of human monocytic ehrlichiosis, within the tick. We hypothesized that tRNA synthetases are indispensable in tick hematophagy, embryogenesis, and Ehrlichia infection. To validate this hypothesis, we used two commercially available tRNA synthetase inhibitors, Halofuginone (targeting prolyl-tRNA synthetase) and Borrelidin (targeting threonyl-tRNA synthetase), to evaluate their effects on the tick and pathogen infection at the cellular and organismal level. Preliminary data from tick cell lines indicate that Halofuginone and Borrelidin affect tick protein synthesis and handicap EC proliferation. Additionally, our results confirm that both inhibitors have detrimental effects on the organism, resulting in impairment of tick feeding, leading to the death of ticks attached to the host after 24 hours. These results provide a deep insight into the molecular mechanisms of these enzymes for designing new tick-specific inhibitors to prevent ticks and tick-borne diseases.

Thursday, February 29, 2024

EVENING

3:30 DODGEN LECTURE /AWARDS CEREMONY

THEATER

5:00 GENERAL POSTER SESSION

(immediately following Dodgen Event)

P5.01

ECONOMIC IMPORTANCE OF THE KIWIFRUIT WITH EMPHASIS ON ACTINIDIA DELICIOSA (ACTINIDIACEAE)

Savannah Conway, Bailey Simmons, Gavin Kolb, Raven Gurley, Nina Baghai-Riding

Delta State University, Cleveland, MS

Actinidia deliciosa (A. Chev.) C.F. Liang & A.R. Ferguson, (Actinidiaceae) also known as the fuzzy, green kiwifruit, is native to Southern China especially along the Yangtse River Valley. It is a climbing shrub or dioecious twining vine that can reach lengths of nine meters. It can grow naturally at various altitudes between 600 – 2,000 m. The leaves are deciduous, nearly circular in outline, possess long petioles, and are alternately arranged on stems. The fruits are derived from a compound pistil ovary

and possess a fuzzy, brown exocarp. Kiwifruits currently grow in temperate and subtropical climates throughout the world. *Actinidia deliciosa* is one of sixty species within the *Actinida*. In Economic Botany (BIO 404/504), students explored five diverse types of kiwifruits: *A. deliciosa* (green), *A. chinensis* (golden), *A. arguta* 'Geneva' (Geneva Hardy), *A. arguta* x *melanandra* (Ken's red) and *A. arguta* (Issai). All five types were categorized based on origin, appearance, date of commercialization, and seed content. Results indicated that the Ken's Red originated in New Zealand in the 1940s and has a purple red exocarp and mesocarp, few seeds, and a grape-size appearance. The golden kiwifruit originated in New Zealand in 1991 has a smooth, brown exocarp, a fleshy yellow mesocarp, few seeds, and is oval. In contrast, the Geneva Hardy originated in North America and has a greenish red exocarp, a green mesocarp, a red endocarp, several seeds, and is oval-shaped. The nutritional value of various kiwifruits need further exploration. Currently, kiwifruits are known to contain actinidin that helps to break down proteins into amino acids which can supply energy and aid in digestion. Kiwifruits also contain vitamins A and C, serotonin (a sleeping aid) antioxidants, potassium, and more. Chinese medicine uses these fruits to alleviate symptoms associated with asthma, high blood pressure, constipation, and eye diseases.

P5.02

PRESENCE OF CARCINOGENIC POLLUTANTS IN THE BIG BLACK RIVER, AT THE BORDER BETWEEN CLAIBORNE AND WARREN COUNTIES, MS

Myla Stanford, Ismael Maya, Antonia Thomas, Marta Piva

Alcorn State University, Lorman, MS

According to the Center for Disease Control and Prevention, the counties that border the Mississippi River have one of the highest rates of death in the state due to cancer. Carcinogens such as cadmium and arsenic may contaminate products used in agriculture, such as fertilizers, pesticides, and herbicides. The Big Black River carries large amounts of suspended sediment, primarily from agricultural runoff. The sediment consists of limestone, silt, sand, gravel, and clay; the latter absorbs cadmium. Water samples were collected in March, August, and October of 2023 and analyzed for the presence of agricultural pollutants with a dip strip photometer and a rapid inorganic arsenic assay. Lead and mercury were added as controls. The iron concentration and pH were also determined as the chemical reactions required less than 0.2 mg/L iron levels and a pH between 7 and 8. All samples were concentrated sixfold in a freeze-dryer. The first collection followed rainy weeks of cold or mild temperatures; no metal ions were detected in those samples, and the pH was neutral. The second collection was done after weeks of severe drought and triple-digit temperatures. The samples contained low levels of arsenic at 5 ppb, while lead, cadmium, and mercury were zero. The iron concentration was 0.02 mg/L, and the pH was between 8.5 and 9. Persistent summer drought conditions caused cadmium levels to increase to 10 ppm and arsenic concentrations to range between 5 and 10 ppb in the third sample. No iron was detected, and the pH was again somewhat alkaline. Future studies will determine cadmium levels in the sediment and plants that grow by the river as the cation accumulates in the soil and is taken up by crops.

P5.03

SOIL SPIKES: SMALL BUT MIGHTY IMPACT OF MICROPLASTICS

Claire Copeland, Grace Rogers, Jana Thoma

Department of Biological Sciences, Mississippi College, Clinton, MS

Abstract: Microplastics are defined as synthetic or polymeric materials having regular or irregular shapes (e.g. round, fibers, strands) that range in size from 1 m to 5 mm. Microplastics could be one of two origins: plastics directly released into nature as small particles (primary) or particles from large pieces of plastic that fragment into smaller pieces (secondary). This research broadly focuses on determining the abundance and diversity of microplastics in aquatic soil, which is less documented in academic literature to date. Primary goals of this research include testing the recovery rate of spiked soil samples, methodologies of our collection, and processing to determine efficiency and accuracy of our procedures used. Soil samples were collected from a pond in Choctaw Trails, a wooded property located in central Mississippi. After collection, samples were refrigerated until weighed, dried to remove excess water, and reweighed to measure water loss. Some samples were spiked with a variety of microplastic shapes in order to test oil extraction methods. Samples were also sieved into separate size categories. Inorganic material was dyed with Nile Red Dye and Fenton's Reagent to more easily identify and separate microplastics from soil particles. Samples were examined and analyzed with a fluorescent confocal microscope to count and record plastic morphology. Results presented here aid in determining efficiency and accuracy of these procedures in a larger-scale study of urban areas in central Mississippi.

P5.04

DEVELOPING A TOOL FOR PRE-DETERMINING THE FLOWERING DATES OF HONEY PLANTS

Elena Kostyleva

Alcorn State University, Lorman, MS

To create a continuous, ever-increasing flow of nectar into the beehive from the beginning to the end of the honey harvesting season, one needs to know the calendar dates for the flowering of honey plants. The flowering dates are directly dependent on meteorological conditions and do not coincide over the years. However, our studies have shown that the order of flowering as well as the intervals between flowering of different species remain relatively

constant, regardless of meteorological conditions. Thereby, the objective of the study was to develop a tool for pre-determining the flowering dates of the main honey plants in the state of Mississippi. Respectively, an algorithm was used to calculate approximate flowering dates of honey plant species in the region, using the date of flowering of the first species in a given year serving as an indicator. During this study, it was found that the most reliable species for this purpose was *Alnus serrulata*, the beginning of its flowering coincided with the beginning of an active period of honey bee life cycle. According to the algorithm, the first productive early spring species *Cliftonia monophylla* blooms on the 29th day after *Alnus*, *Trifolium repens* - on the 49th, *Robinia pseudoacacia* - on the 82nd, and the most productive honey plant in the region - *Liriodendron tulipifera* - on the 85th day. When the flowering season is extended, it is difficult to focus only on flowering of the first honey plant. More reliable and convenient is to select several most noticeable widespread species to more accurately predict flowering dates of not only early-, but also mid- and late-flowering honey plants. Our counts showed that *Liriodendron tulipifera* (for spring-summer species) and *Oxydendrum arboreum* (for late-summer and autumn species) are most suitable for this purpose.

P5.05

EXPLORING HOW MICROCLIMATES SHAPE THE RELATIONSHIP BETWEEN BODY SIZE AND THERMAL TOLERANCE IN A TROPICAL ANT COMMUNITY

Caroline Marley, Clayton Ziemke, Kaitlin Baudier

The University of Southern Mississippi, Hattiesburg, MS

Due to rising global temperatures, many animal populations are struggling to keep up with rapid changes in their environment. This is especially true for tropical ectotherms whose body temperature is largely determined by environmental temperature. Ants provide ecosystem services such as natural pest control and soil aeration in agricultural systems, so it is important to understand how these economically important insects will survive in a rapidly changing world. Previous work in army ants has shown that tropical microclimates influence the effects of morphology on thermal tolerance, with small-bodied workers of surface foraging species showing higher thermal limits than their counterparts in subterranean species. This may reflect selection on small-bodied "weak links" in species subject to more variable microclimates. We investigated whether this same pattern exists across another important microclimatic axis of thermal variation: between arboreal and leaflitter microhabitats. We tested upper and lower critical thermal limits of ants from a montane rainforest in Puerto Rico and measured body sizes for all ants assayed. This dataset includes leaf litter species which experience relatively moderate microclimates, as well as arboreal species subject to more variable microclimates. We compared the effects of body size on thermal tolerance as a function of microclimate using analysis of covariance (ANCOVA) to test the prediction under the weak link hypothesis that litter-nesting species would show stronger body size effects than arboreal species.

P5.06

UNDER THE MICROSCOPE OR UNDER THE RADAR: A STUDY ON MICROPLASTICS IN LENTIC SYSTEMS

Grace A. Rogers, Claire E. Copeland, Jana N. Thoma

Mississippi College, Clinton, MS

Microplastics are any insoluble, solid or polymer particles with a size ranging from 1 m to 5 mm, including both regular and irregular shapes (spheres, cubes, fibers, etc.). Microplastics are classified as either primary, which are microplastics manufactured with the intention of being less than 5 mm, or secondary, which are microplastics that have degraded to a size fraction less than 5 mm. The overall purpose of this research is to analyze the abundance and morphological diversity of microplastics in aquatic environments. The goal of these experiments is to determine the efficacy and accuracy of the methodologies used - primarily the Single-Pot Method - with samples collected from ponds at Choctaw Trails, a fifty-acre plot in central Mississippi, using spike tests. A known quantity of microplastics were used to spike samples; then, the percent recovery of microplastics was used to determine the validity of these procedures. Samples were collected and refrigerated until processing with the Single-Pot Method, which included a peroxide oxidation, removal of debris noticeably larger than 5 mm, vacuum-filtration, and dying with a lipophilic dye. The samples were then analyzed with a fluorescent confocal microscope to detect and count the reputed microplastics. During analysis, the microplastics were categorized into respective morphological classifications (e.g. fibers, spheres, and cubes).

P5.07

DOES DISTURBANCE STRIDULATION IN THE PASSALID BEETLE ODONTOTAENIUS DISJUNCTUS FUNCTION AS A FORM OF SOCIAL COMMUNICATION?

Haley Schonekas, Zoe Mabry, Kristin Robinson, Karen Robles Lopez, Alycia Johnson, Gabriella Cipriani[1], Alex Nguyen, Clayton Ziemke, Kaitlin Baudier

The University of Southern Mississippi, Hattiesburg, MS

Stridulation is the rubbing of body parts together to generate sound. Across class Insecta, stridulation functions as an important component of many essential behaviors including courtship, social recruitment, and predator deterrence. The subsocial passalid beetle *Odontotaenius disjunctus* boasts the largest acoustic repertoire of any beetle and performs a distinct stridulation when disturbed by predators. We investigated whether disturbance stridulation also functions as a form of social communication. Because these beetles live in small social

groups with high relatedness, we hypothesized that disturbance stridulation may signal retreat, rescue, or freeze behaviors among kin, any of which have the potential to benefit inclusive fitness during a predation event. To test this, we placed beetles from the same social group in a test arena and exposed them to disturbance stridulations, observing whether each beetle moved away-from or towards the source of the sound. We did this for both adult beetles and their larvae, keeping adults separate from larvae throughout the trials. We also used an established ethogram when testing adults to estimate behavioral diversity before and after exposure to disturbance stridulation, which, according to information theory, is predicted to decrease after communication has occurred. There was no information-theory-based evidence of communication. Defense stridulation prompted individuals to freeze rather than exhibit a retreat or rescue response in both adults and larvae. These results extend our understanding of the various adaptive values of stridulation across species and contexts.

P5.08

THERMAL TOLERANCE AS A PREDICTOR OF HURRICANE RESPONSE IN ANTS: MARIA 2017

Clayton Ziemke, Kaitlin Baudier, Donald Yee

The University of Southern Mississippi, Hattiesburg, MS

Climate models predict large hurricanes will be more frequent in the North Atlantic in the coming decades. To understand how increased hurricane regimes will affect extant ecosystems, a more detailed understanding of physiological limits at microclimatic scales is needed. Leaf litter arthropod surveys in the Luquillo Experimental Forest in Puerto Rico showed that ants increased in abundance 5-fold after Hurricane Maria, the strongest response of all taxa sampled. However, responses were not uniform across the ant community, suggesting important functional differences between species. We measured upper and lower critical temperatures for 12 species from this dataset. We used these and other trait values to create a series of models explaining species responses to Hurricane Maria. Knowing understory temperatures and temperature variability increase in the immediate wake of a hurricane, we hypothesized that higher upper thermal limits and broader thermal tolerance are significant predictors of positive hurricane responses. Results showed the importance of both pre-hurricane abundance and thermal tolerance as predictors of post-hurricane outcomes, but with some surprising nuances. These findings inform a broader understanding of tropical community responses of high-intensity cyclones.

P5.09

DIVISION OF LABOR IN FLIGHT BEHAVIOR OF STINGLESS BEE (*TETRAGONISCA ANGUSTULA*) SOLDIERS

Joseph Serio, Kristin Robinson, Kaitlin Baudier

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The stingless bee *Tetragonisca angustula* is native to Central and South America and exhibits an ecological rarity among its relatives in the clade Anthophila. Within colonies of this species, a morphologically distinct soldier caste exists and is responsible for guarding the nest against cleptobiotic species that rob the colony of stored nutrients and materials. As they age, soldiers transition from hovering guarding to standing guarding, yet the mechanism underlying this shift is not well-described. We tested the hypothesis that this division of labor is driven by an age-related decline in flight ability. During fieldwork conducted in Costa Rica in June of 2022, we studied twelve bees from each of ten colonies. Within each colony, we subjected foragers, standing guards, and hovering guards to flight assays. Groups of the ten bees were staged in separate containers and recorded for twenty minutes while sunlight illuminated the top of each container to motivate flight. In the lab, the frequency and duration of each flight was quantified by an observer that was blinded to the caste identity of individual bees to prevent bias. We compared flight frequency and duration across these worker sub-castes, which revealed interesting patterns in within-colony flight variation. These data provide crucial insights into the mechanisms regulating division of labor in eusocial species, further helping us to understand how division of labor operates in a broader range of societies including other insects and human cooperatives such as businesses.

P5.10

CHARACTERIZATION OF PHAGOCYTIC HEMOCYTES AND THE EFFECTS OF CHEMICAL DEPLETION OF THESE IMMUNE CELLS IN *APIS MELLIFERA*

Michael Oeth, Abdulsalam Adegoke, Shahid Karim

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The European honey bee (*Apis mellifera*) is part of the ecological backbone of biodiversity due to its ability to pollinate a wide variety of plants. Honey bees often rely on their immune system to perturb pathogen infection through phagocytic hemocytes within the hemolymph. However, Varroa mites, Nosema, and pesticides have been linked to weakening the immune system. Weakening of the immune system throughout the colony results in either hive death or hive loss when over-stressed. This study mainly focuses on determining the morphological and functional role of the hemocyte population within the system of the honeybee. Using Cell staining techniques and confocal microscopy, we distinguished the two distinct hemocyte populations within the circulating hemolymph of *Apis mellifera*. Hemocyte counting was incorporated as a method of determining the effectiveness of clodronate liposomes within the honeybee system. After injection of the liposomes, the bees were monitored for survivability over a span of 10 days. After staining the phagocytic hemocytes with a lectin stain (WGA - Wheat Germ Agglutinin) and a nuclear stain (DAPI), the application

confocal microscopy revealed two circulating hemocyte populations within the system of *Apis mellifera*, Granulocytes and Plasmatocytes. Additionally, with the injection of Fluospheres into the abdomen of the honeybee and staining with a cellular membrane stain (Vybrant CM-DIL) and nuclear stain (DAPI), we were able to visualize hemocyte phagocytosis within honeybee hemolymph samples. Identification of the granulocytes as the main hemocytes that phagocytize in the system of *Apis mellifera* was confirmed. Lastly, the injection of clodronate liposome into the abdomen of the honeybee which caused a significant drop in phagocytic hemocyte counts. Clodronate-injected bees had higher rates of mortality compared to the control group. Together these procedures represent steps toward understanding the relationship between a regulated immune system and honey bee health. It also adds an additional tool in immune system research within the honey bee community. In future work, we will introduce immunosuppressed worker bees with a bacterial challenge to quantify mortality when hemocyte populations are low.

P5.11

PEARS (*PYRUS*, ROSACEAE) ARE A NUTRITIONAL SOURCE OF FOOD

Geona Miles, JuEun Yun, Julie Hardy, Nina Baghai-Riding

Delta State University, Cleveland, MS

The genus *Pyrus*, in the Rosaceae family, grows mainly in cool, temperate wet climates. Centers of diversity include the Mediterranean, Europe, Central Asia, and North Africa. Pear fruits are pomes and are recognized as one of the 20 most popular fruits according to the Food and Drug Administration. There are over five thousand pear cultivars and 26 primary species of pears. At least ten pear cultivars/varieties occur as commercial crops in the United States. *Pyrus* trees may take three to seven years to mature and bear fruit. Large, fruited pear species have five carpels, but their hybrids are reported to have three to four carpels. During the Fall 2022 Economic Botany course at Delta State University, our group compared similarities and differences of six different pear species/varieties: the common/European pear (*Pyrus communis* L.), Bartlett (*Pyrus communis* 'Williams' Bon Chrétien'), green and red D'Anjou (*Pyrus communis* 'Anjou'), Bosc (*Pyrus communis* 'Bosc'), and Asian pears (*Pyrus pyrifolia*). Each type has a unique set of characters. The features compared included the time of harvest, color, taste, texture, overall shape, and nutrients. For example, the Asian pear had the shortest harvest period (August through September) whereas the red and green D'Anjou had the longest harvest season (October to July). The red D'Anjou and the common/European pear tend to be elongated in shape whereas the green D'Anjou and Asian pear shapes tend to be round or oval. The Bosc has a firm texture, is a cinnamon color, is crisper, has a long tapering neck, and is used in baking. Bartlett pears, when ripe, are typically soft and juicy, golden in color, have a pyriform shape, and are well suited for canning. Nutritional websites, regarding these six pear species/varieties, indicate the green D'Anjou pear has the highest daily nutritional quantities of vitamins (1% vitamin E, 7% vitamin C, and 5% vitamin K). In contrast, the Asian pear contains the lowest nutritional amount of essential daily vitamins including its lack of vitamin E. All six pear species/varieties associated with this study possess vitamins K and C. Besides vitamins, pears contain copper, magnesium, potassium, carbohydrates, fiber, and more. Copper and magnesium are important for maintaining the nervous system. Future research plans are to determine nutritional components of different pear varieties and species by using the Energy Dispersive X-Ray Fluorescence Spectroscopy associated with the JSM-6010LA scanning electron microscope at Delta State University including the Concorde (*P. communis* 'Concorde'), Seckel (*P. communis* 'Seckel'), Comice (*P. communis* 'Doyenné du Comice'), almond-leaved pear (*P. spinosa* Forssk), heart-shaped pear (*P. cordata* Desv.) and more. Understanding the chemical aspects of pears may enhance their marketability since they can provide many dietary benefits.

P5.12

A PLANT ANATOMICAL INVESTIGATION OF *HYDROCOTYLE BONARIENSIS* (ARALIACEAE)

Geona Miles, Nina Baghai-Riding, JuEun Yun, William Katembe

Delta State University, Cleveland, MS

The anatomy of *Hydrocotyle bonariensis* Comm. ex Lam. (largeleaf pennywort, Araliaceae) was investigated. Anatomical observations of the petioles, peduncles, rhizomes, roots, and other parts of this plant species have not been described previously. Using fresh samples, anatomical observations and cell measurements on stems, roots, leaves, and inflorescence components were compiled and analyzed. Single-edged razor blades and hand-held microtomes were used in preparing thin-sections, and prepared slides were stained with methylene blue, neutral red, safranin, or toluidine blue. A JEOL scanning electron microscope was used to analyze transverse sections of petioles and surface features of leaf epidermal regions. Thirty-five measurements were taken on major cell components: parenchyma in petiole, internodes between verticils, rhizome and peduncle; collenchyma in petiole and peduncle; guard cells on the abaxial and adaxial leaf surfaces; and more. Several cell types had a significant size range: cortex parenchyma (length 29 - 70 m and width 20 - 81 m), pedicel epidermal cells (length 8 - 20 m and width 8 - 22 m), and subsidiary cells on the leaf adaxial surface (length 8 - 45 m, width 16 - 46 m). Significant anatomical features include: amphistomatic stomata on leaf blades; anisocytic stomata on the leaf blades; paracytic stomata on sepals, petals, and the petiole; secretory ducts in rhizomes, petioles, and leaves; an abnormal eustele configuration of

vascular bundles in the petiole; roots with an actinostele; and subprolate, tricolporate pollen.

P5.13

A STUDY OF FIVE BIRD NESTS ON THE DELTA STATE UNIVERSITY CAMPUS

Geona Miles, Bailey Simmons, Katangela Gober, KaMya Reed, Nina Baghai-Riding

Delta State University, Cleveland, MS

Birds construct nests to have a safe place to lay eggs, incubate their eggs and raise their hatchlings. Nests vary in size, shape, and construction. Nests are defined as being composed of four functionally distinct parts: an attachment, an outer (decorative) layer, structural layers, and a lining; although not all parts are present in all nests. Each species was reported to have a characteristic nest style, which may correlate to their different behaviors. Previous studies suggest that birds may use certain materials for their nests such as fresh plant materials to deter parasites. At higher elevations, nests tend to have better insulation properties. In Spring 2023, one student group in BIO 415 - Materials and Methods in Environmental Science collected five bird nests on the Delta State University campus. Four sparrow nests were collected from live oak (*Quercus virginiana*) trees that border Fifth Street near the Walter-Caylor Science Building; a robin nest was collected on top of a concrete post by the Cain-Tatum dormitory. None of the nests were occupied when they were collected. After collection, the nests were dissected using tweezers and forceps. Nest contents were divided into organic and inorganic materials. The data was compiled into an Excel spreadsheet. A total of twelve contents were noted: twigs, acorns, leaves, moss, hair, grasses, bark, straw, cobwebs, sprouts, plastic, and mud. Twigs/sticks were found in all five nests but were the most abundant component by weight (80-95%) in the sparrow nests. Acorns, grass, and leaves were found in four of the five nests. In contrast, straw, sprouts, and mud were found only in the robin's nest with mud comprising the greatest weight (64%). Cobwebs were the rarest component and was present only in one sparrow nest. Moss found in the two sparrow's nests and the robin's nest may be an important component in holding moisture and preventing nests from drying out quickly. The complexity and stability of nests require further study. Future BIO 415 classes will attempt to better understand the process by which birds build these vital structures.

P5.14

SENSITIVITY TO IMIDACLOPRID INSECTICIDE VARIES AMONG SOME SOCIAL AND SOLITARY BEE SPECIES OF AGRICULTURAL VALUE

Blair Sampson[1], Ales Gregorc[2], Mohamed Alburaki[3], Christopher Werle[1], Shahid Karim[4], John Adamczyk[1], Patricia Knight[5]

[1]USDA-ARS Thad Cochran Southern Horticultural Laboratory, Poplarville, MS, [2]University of Maribor, Department of Agriculture and Life Sciences, Maribor, Slovenia, [3]USDA-ARS Bee Research Laboratory. Beltsville, MD, [4]University of Southern Mississippi, Department of Cell and Molecular Biology, Hattiesburg, MS, [5]Mississippi State University, Coastal Research and Extension Center, Biloxi, MS

Pollinator health risks from long-lasting neonicotinoid insecticides like imidacloprid have primarily focused on commercially managed, cavity-nesting bees in the genera *Apis*, *Bombus*, and *Osmia*. We expand these assessments to include 12 species of native and non-native crop pollinators of differing levels of body size, sociality, and floral specialization. Bees were collected throughout 2016 and 2017 from flowering blueberry, squash, pumpkin, sunflower and okra in south Mississippi, USA. Within 30 - 60 minutes of capture, bees were installed in bioassay cages made from transparent plastic cups and dark amber jars. Bees were fed via dental wicks saturated with 27% (1.25 M) sugar syrup containing a realistic range of sublethal concentrations of imidacloprid (0, 5, 20, or 100 ppb) that are often found in nectar. Bees displayed no visible tremors or convulsions except for a small sweat bee, *Halictus ligatus,* and only at 100ppb syrup. Imidacloprid shortened the captive longevities of the solitary bees. Tolerant bee species lived ~10 to 12 days in the bioassays and included two social and one solitary species: *Halictus ligatus, Apis mellifera* and *Ptilothrix bombiformis* (rose mallow bees), respectively. No other bee species tolerated imidacloprid as well as honey bees did, which exhibited no appreciable mortality and only modest paralysis across concentration. In contrast, native bees either lived shorter lives, experienced longer paralysis, or endured both. Overall, longevity decreased with concentration linearly for social bees and non-linearly for solitary species. The percentage of a bee's captive lifespan spent paralyzed increased logarithmically with concentration for all species, although bumble bees suffered longest. Of greatest concern was comparable debilitation of agriculturally valuable solitary bees at both low and high sublethal rates of imidacloprid.

P5.15

AQUATIC INVERTEBRATE STUDY OF TWO AQUATIC SYSTEMS AT DAHOMEY NATIONAL WILDLIFE REFUGE, MISSISSIPPI

Caleb Lankford, Nina Baghai-Riding

Delta State University, Cleveland, MS

Aquatic invertebrates serve as an important indicator regarding the health of freshwater ecosystems. As critical links in the food web, the presence of these small organisms can help scientists understand how factors like pollution and biotic relationships impact water quality. Passive sampling techniques, such as leaf-traps and Hester-Dendy samplers, can be used to survey aquatic sites. In this study, students of Conservation Biology 459/559 at Delta State University placed passive leaf-traps at two sites within Dahomey National Wildlife Refuge in

Mississippi. One was placed at Christmas Lake Branch and four were placed at Happy Hollow Pond. Leaf-traps were set on September 23, 2023 and collected on November 6, 2023. A Hester-Dendy sampler was also set at the Happy Hollow Pond location for the same duration. Other data pertaining to water quality, such as temperature, pH, and water hardness, were also collected for each site. Analysis of passive samplers was conducted at Delta State University after removal. A total of 86 specimens were recorded, representing 13 different taxa: stoneflies, mayflies, red worms, fingernail clams, beetles, leeches, and more. Using the specimens reported, a Hilsenhoff Biotic Index was calculated for each location to determine water quality. Christmas Lake Branch had a biotic index value of 6.45 (good-fair water quality), while Happy Hollow Lake had a value of 5.85 (good water quality). Differences in water quality between the two sites may be attributed to differences in water flow, connection to other sources of water, and current water levels. Previous years data reported higher numbers of aquatic invertebrates at Christmas Lake Branch. The decrease in current data could be linked to recent drought conditions and agricultural runoff from nearby fields. Additional leaf-traps should be placed at Christmas Lake Branch to better ascertain the aquatic life present.

P5.16

CHEMICAL FRACTIONATION OF PHOSPHORUS IN SOIL AS AFFECTED BY EXOPOLYSACCHARIDES FROM *RHIZOBIUM TROPICI*

Trinity Stark, Xinyun Xie, Huimin Zhang, Fengxiang X. Han

Jackson State University, Jackson, Mississippi

Phosphorus (P) is a crucial nutrient for optimal plant growth and essential to various biochemical processes. Exopolysaccharides (EPS) were excreted by soil microbes in soils. The importance of EPS on P availability in soil was not fully understood. The modified Hedley fractionation method was used to assess phosphate fractionation in soil as affected EPS from *Rhizobium tropici.* Results showed that EPS adsorption increased with the concentration of EPS in solutions. Soil original P was mainly present in the residual P and microbial binding P, followed by Ca-P and Al-P, while added P was distributed in the microbial binding P, followed by the residual P, Ca-P and Al-P with an increased water soluble and available P fractions. EPS significantly increased water soluble P and Ca-P while decreased the residual P and microbial binding P in the soil for both original soil P and added P. This study clearly shows significant influences of EPS on soil P availability and its fraction distribution in soils.

P5.17

ASSAYING FORAGING PREFERENCE IN LARVAL *DROSOPHILA MELANOGASTER*

Carson Jones, Frank Hensley

Mississippi College, Clinton, MS

The purpose of this project was to develop an assay of foraging preference for *Drosophila melanogaster* larvae based on the amount of time spent on various kinds of media. We established a foraging arena where two diets were distributed in a geometric pattern to present larvae with known probabilities of encountering each diet type when foraging randomly. We then tested whether larvae spent time on each diet proportionally to those probabilities or if they exhibit non-random foraging that indicates food preference. We compared foraging time on plain agar, orange Jell-O™, and orange extract-infused agar. For all food comparisons, larvae were found more frequently on the orange diets than on plain agar compared to the frequencies predicted by random foraging on the provided geometric pattern. This method could be used to assay food preferences in a variety of studies of nutrition and behavioral ecology, such as how larvae respond to nutrient-deficient diets when presented with alternatives, if their behavior exemplifies Optimal Foraging Theory, or the effects of competition on their foraging.

P5.18

EXPLORING THE VIRULENCE OF kasA and kasB GENE OF THE Mycobacterium tuberculosis STRAINS

Biraj Adhikari

Mississippi University for Women; Columbus; MS

Complex lipids on the pathogens cell surface are one of the cause of pathogens virulence. In case of M. tuberculosis, complex lipids along with lipoglycans on its cell surface makes its virulence stronger. In this study we are exploring the virulence caused by the gene product of kasA and kasB gene among different strains of M. tuberculosis.

P5.19

A DRAFT GENOME OF *Enterococcus gallinarum*

Zarin Reya

Mississippi University for Women, Columbus, MS

1 in 15 people in the US and 4% of the world's population suffer from autoimmune diseases. However, curing these diseases can pose a challenge. The translocation of a gut bacteria—*Enterococcus gallinarum*—to the liver can spark an autoimmune response in organisms susceptible to autoimmunity. Antibiotics can be used to subdue the growth of *E. galliranum* and the ramifications of autoimmune diseases like Systematic Lupus Erythematosus (SLE). This connection between *E. galliranum* and autoimmune diseases may have the potential to produce a cure. To investigate this relationship

further, this study will evaluate the genome of *E. galliranum*.

P5.20

EXPLORING THE EFFECT OF HomB: A COMPARATIVE STUDY OF *H. pylori* Strains J99 and 26695

Madison Bagwell

Mississippi University for Women, Columbus, MS

Statistically one of the most feared diseases is cancer. The bacterium, *Helicobacter pylori,* is the first bacterium to be a known carcinogen. This study will be comparing two strains of H. pylori, a HomA and HomB positive strain,*H. pylori J99*, and a HomA positive strain, *H. pylori 26695*. This study aims to propose a hypothesis to test the effect of HomB on the ability of *H. pylori 26695* to cause cancer.

P5.21

COMPARATIVE ANALYSIS OF VIRULENCE MECHANISMS IN Staphylococcus aureus and Escherichia coli: UNRAVELING PATHOGENIC STRATEGIES

Kimi Norway[1]

[1]Mississippi University for Women, Columbus, MS

We sequenced the genome of a recently identified strain of virulent *Aeromonas hydrophila* and performed comparative genomics against a known vAh pangenome. We sequenced the genome with the 250 bp read-length, paired-end Illumina MiSeq platform using the Nextera XT kit (Illumina, San Diego, CA) to prepare bar-coded fragment libraries according to the manufacturer's protocol. In addition, we generated long reads with the MinIon Torrent platform using the Genomic DNA preparation kit (Oxford Nano, Oxford, UK). Sequence reads were trimmed, and quality sequence reads will be assembled using the Galaxy platform using default settings.

P5.22

PHYLOGENETICS OF THE EASTERN FENCE LIZARD (*Sceloporus undulatus*) IN MISSISSIPPI

Travis Hagey, Brian Burnes

Mississippi University for Women, Columbus, MS

Molecular sequence analysis shows discordance in the species' ranges of Sceloporus consobrinus (Prairie Lizard) and Sceloporus undulatus (Eastern Fence Lizard). It was previously believed that Sceloporus undulatus could be found throughout the eastern US, up to the Mississippi River, with S. consobrinus on the western side of the Mississippi River, through Texas and Oklahoma, with small populations of S. consobrinus that had jumped the river into southern Mississippi. This was based on mitochondrial data. We are sequencing new specimens and we expect our data to show that southern MS Sceloporus to be Sceloporus undulatus lizards with consobrinus mitochondria.

P5.23

A COMPARISON OF GENOMES FROM OCEANOBACTER AND ALCANIVORAX IN RELATION TO OIL SPILLS

Avery Byerley

Mississippi University for Women

Columbus, Mississippi

The petroleum industry is a major global industry but causes lots of pollution and releases toxic waste into our environment. *Oceanobacter*-related bacteria could be considered as a major degrader of petroleum spills in tropical seas. Here we review the petroleum spill, including methods, designs, and describing how *Oceanobacter kriegii* and *Alcanivorax borkumensis* break down crude oil. Understanding of how these bacteria break down crude oil will help improve clean up during future oil spills.

P5.24

GENOMIC EXPLORATION OF *Enterococcus faecalis*: THE BACTERIA THAT SURVIVES VENOM

Karmen McCrory

Mississippi University for Women

Columbus, MS

Enterococcus faecalis is a species of *Enterococci*, a bacterium which can survive the harshest conditions, as well as resist antibiotics. In addition to its survival in these conditions, *Enterococcus faecalis* V583 has recently been discovered in snake and spider venom, so we will be comparing this strain to the reference strain of *Enterococcus faecalis.* This bacterium is commonly associated with disease, and the presence of *Enterococcus faecalis* in venom can cause wound infections in many envenomation victims, which explains the importance of the genomic exploration of this bacterium.

P5.25

COMPARATIVE GENOMIC OF Aeromonas hydrophila STRAINS ATCC 7966 AND ML09-119

McKenzie Middleton

Mississippi University for Women

Columbus, MS

Catfish farming in the US and carp farming in China have been affected in recent years by virulent *Aeromonas hydrophila*. This causes disease in fish, humans, and other species. We will review this strain of bacteria and find out what is causing it and how to keep it from happening to ensure safety and health of animals and humans. Future work is needed to help decide what is the best way to prevent this bacterium and use any known factors to help determine how to go about the best way to ensure health. We will compare these two strains to find the differences between them and

possibly figure out how mutations are occurring, and different strains are being developed.

P5.26

COMPARATIVE ANALYSIS OF *CARNOBACTERIUM MALTAROMATICUM ATCC35586* AND 1*8ISCM* GENOMES: INFLUENCES ON THE HEALTH AND LIVELIHOOD OF RAINBOW TROUT POPULATIONS

Abigail Petty

Mississippi University for Women

Columbus, MS

The oceans of the world are filled with many diverse creatures, but certain species within are encountering a rising problem due to *Carnobacterium maltaromaticum.* Sharks and rainbow trout are emerging victims of *C. maltaromaticum,* with stranding and disease surfacing amongst their species. These symptoms have resulted in drastic losses to both aquatic organisms and the related economy. Through research, we will go in-depth into *C. maltaromaticum* using genetics to further our understanding of the specific genomes that are affecting our oceans. Comparing *C. maltaromaticum ATCC35586* and the *18ISCm* genome will further the health and livelihood of the rainbow trout populations.

P5.27

GENOMIC ANALYSIS OF *PSEUDOMONAS AERUGINOSA*: MICROBIAL SPECIES CONNECTED TO CYSTIC FIBROSIS

Maggie Taylor

Mississippi University for Women, Columbus, MS

Cystic Fibrosis (CF) is a genetic disease that targets and disrupts the function of certain organs, which results in chest infections and difficulties in breathing and digestion. One of the major bacterial species that are prevalent in the airways of patients with CF is the species *Pseudomonas aeruginosa*. Colonization of this microbe severely worsens the prognosis in CF cases. Here we will analyze the genetic mechanisms and characterization of different strains of *P. aeruginosa*, including *P. aeruginosa* strains AES1M and AES1R. The comparison of the genomic analysis of these strains will contribute to our genetic understanding of one of the major microbial species that contribute to chronic respiratory infections in CF patients. This data could be used in the future for further genetic comparison to the other major microbial species that worsen the prognosis of patients with this disease.

Friday, March 1, 2024

MORNING

10:00-12:00 Field Trip
Hattiesburg, Zoo

Geology and Geography Chair:

Chair: Alyson Brink

University of Southern Mississippi

Co-Chair: Claire Babineaux

Mississippi State University

Thursday, February 29, 2024

MORNING

Room Union C

8:10 Divisional Welcome and Introductions

O6.01

8:20 PHYLLONITES OF THE BREVARD ZONE, SOUTHERN APPALACHIANS, ALABAMA

Andrew Williams[1], Jeremy Deans[2]

[1]Jackson, MS, [2]University of Southern Mississippi

The Brevard Zone is one of the longest (~600 km) and widest (~5 km) shear zones in the southern Appalachian Mountains between the Inner Piedmont and Blue Ridge provinces (Roper and Justus, 1973) with a protracted history of metamorphism and slip (Vouchez et al., 1993; Hatcher, 2001). The rocks in this zone are part of the Jacksons Gap Group and includes phyllonites with sericite+muscovite+chlorite+quartz phyllite and graphitic phyllite (Bentley and Neathery, 1970). Details of the protracted metamorphic and structural history are still unclear. In this study, new detailed mapping and petrographic analysis were completed in the Ponders quadrangle near Dadeville, AL, some of the southernmost exposures of this zone, to better understand the structural and metamorphic history of this zone. A total of 76 foliation measurements were made across ~15 outcrops. Poles to foliations fall along a NW-SE girdle. A cylindrical best fit indicates a hinge line of 17 towards 031. Mapping patterns indicate several sets of tight folds with trends to the northeast or southwest. Kinematic indicators from field observations signify a right-lateral sense of shear and from thin section observations signify a mixed sense of shear of reverse with the top to the southwest or top to the northeast, right-lateral strike-slip motion, and normal with top to the southeast. Textures observed in thin section indicate a large proportion of phyllosilicates (sericite, muscovite, biotite, chlorite) and, in some samples, graphite, as well as quartz and garnet. Muscovite and sericite are fine grained and define the foliation. Biotite is typically porphyroblastic and form sigma-clasts, usually with quartz tails. Quartz is in sigmoidal bands parallel to the foliation with polygonal crystals that do not have a shape or crystallographic preferred orientation.

Garnet is usually relict and altered. Rocks with phyllosilicates and stronger phases like quartz have been suggested to deform by frictional-viscous flow characterized by frictional sliding along interconnected phyllosilicate grain boundaries as well as fluid-assisted diffusive mass transfer of soluble phases (i.e., quartz), which has been shown experimentally (Handy, 1990) and in continental shear zones within convergent margins, namely the Karakoram Fault Zone in the Himalayan Mountains (Wallis et al., 2015). The textural observations of relict garnet and rotated porphyroblasts of biotite indicate that these rocks likely were metamorphosed and sheared under amphibolite grade conditions, possibly during the Acadian orogeny, which was peak metamorphism (Goldberg and Steltenpohl, 1990) or early in the Alleghenian orogeny (Hatcher, 2001). The fabrics formed during this earlier period were sheared and folded suggested by the mapping pattern, cylindrical best fit of the foliation poles, and the large range in kinematic indicators. At lower grades, frictional-viscous flow became the dominate deformation mechanism focusing slip along phyllosilicates and graphite during strike-slip motion becoming a zone of low effective shear strength. Fluid likely played a significant role in this deformation as shown by mass transfer of quartz to pressure shadows. Lower temperature shearing was likely during the Alleghenian orogeny, and was likely a zone of focused, preferential strain in the hinterland.

O6.02

8:40 INTEGRATING GIS TO BUILD RESILIENT CITIES: DEVELOPING A RESILIENT HOUSING RISK ASSESSMENT FOR THE CITY OF FOLEY, ALABAMA

Claire Babineaux, Andrew Nage[1], John Cartwright

Mississippi State University, Mississippi state, MS

Coastal communities are inundated with threats from climate change, including increasing sea level, frequency of storms, and flooding. Housing infrastructure is often not updated to cope with the increased destructive effects of coastal storms and flooding. As these communities grapple with dual challenges of population growth and an increasingly hazardous environment, the need for resilient housing is crucial. The integration of geographic information systems (GIS) plays a crucial role in constructing adaptive strategies in the development of resilient housing plans. So, a shift towards innovative and resilient housing solutions is essential, with GIS being a powerful tool to assist in informed decision-making through spatial analysis, risk assessment, land-use planning, leading to the identification of high-risk areas. By using GIS, communities can ensure a comprehensive approach to resilience by accounting for complex environmental variables, demographic data, and community-specific factors. Community-based planning and collaboration with local stakeholders, as well as GIS applications, are essential components in the development of adaptive strategies. Through this integrated approach, coastal communities can foster sustainable development while using GIS as a key tool to create resilient housing plans for climate-related challenges. This presentation highlights the process, development, and GIS support provided by the Geospatial Education and Outreach (GEO) Project in the development of a resilient housing plan for the City of Foley, Alabama.

O6.03

9:00 RANDOM CROSS-VALIDATION PRODUCES BIASED ASSESSMENT OF MACHINE LEARNING PERFORMANCE IN REGIONAL LANDSLIDE SUSCEPTIBILITY PREDICTION

Chandan Kumar[1], Gabriel Walton[2], Paul Santi[2]

[1]Mississippi State University, Starkville, MS, [2]Colorado School of Mines, Golden, CO.

Landslide susceptibility prediction developed using geospatial datasets and machine learning (ML) play a vital role in landslide hazard management. ML models' performance conventionally done using random cross-validation (R-CV) method. However, geospatial datasets usually exhibit spatial autocorrelation, which is often overlooked when assessing the predictive ability of ML models. This can lead to an over-optimistic performance assessment and induce potential barriers in implementing ML-derived solutions in real world applications including landslide hazard management. Present study aims to address this issue by comparing R-CV and spatial cross-validation (S-CV) methods, assessing their impact on various ML models, hyperparameter tuning, and learning curve analysis based on the number of variables. The experiment was conducted using regional landslide susceptibility models in the southern part of Peru. Results demonstrated that R-CV tend to produce optimistic performance assessment of ML models. R-CV produced ~8-15% higher accuracy compared to S-CV. Moreover, complex models like random forest, support vector machine and C5.0 tend to produce more optimistic results as compared to simpler models like linear discriminant analysis or logistic regression. Both cross-validation methods produce a slightly different optimal hyperparameter with R-CV producing optimistic performance estimation. It has been also observed that unlike S-CV, R-CV optimistically produced a higher accuracy when number of variables increases. This could falsely suggest the requirement of a higher number of variables to achieve higher accuracy from ML models. Therefore, this study recommends S-CV over R-CV for hyperparameter tuning, optimal variable selection and to

evaluate the overall performance of ML models in regional landslide susceptibility prediction.

O6.04

9:20 USING PETROLEUM FORENSICS LABORATORY TECHNIQUES TO DETERMINE SOURCES AND LIKELY CO-MINGLING OF CONTAMINANT PLUMES

Erin Kymes

WSP USA Inc.

An undisclosed site in east Mississippi previously functioned as a Natural Gas Processing Plant. Over the course of fifty years, the facility was owned and leased by numerous entities conducting various types of petroleum processing. At the time that WSP was hired to perform environmental consulting services, four known contamination plumes were related to former burn pit use located at the northwestern corner of the facility property, a historic total petroleum hydrocarbon (TPH) plume, a recent (~2009) petroleum condensate release, and a newly-discovered benzene plume on the northeastern portion of the facility property. Based on observed groundwater concentration trends, WSP suspected that the more recent petroleum condensate plume was co-mingling with our client's known historic TPH plume. To properly understand the environmental responsibility of our client, petroleum forensics analysis was performed to determine the age, current composition, original composition, and indicators of plume co-mingling.

O6.05

9:40 A HILLSLOPE HYDROLOGIC RESEARCH SITE IN THE GOODWIN CREEK EXPERIMENTAL WATERSHED FOR THE STUDY OF AQUIFER RECHARGE, EROSION, AND GROUNDWATER-SURFACE WATER INTERACTIONS

Andrew M. O'Reilly[1], Md Samiul Alim[2], Robert M. Holt[2], Craig J. Hickey[3], Leti T. Wodajo[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 affect 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 will consist of a transect of five shallow wells in the perennial water table supporting baseflow exchanges with the creek and one deep well in the underlying regional Winona-Tallahatta aquifer. Wells will be instrumented for continuous measurements of groundwater level and temperature. Adjacent to each of the shallow wells, sensors will be installed at five depths (5, 10, 20, 51, and 102 cm) to monitor soil moisture content, temperature, and electrical conductivity. Additionally, at three depths (20, 51, and 102 cm) sensors will measure soil matric potential from which groundwater recharge fluxes can be estimated. An electrical resistivity tomography (ERT) survey was conducted along the 501-m transect, and the resulting inverted resistivity profile shows that the aquifer is relatively thin (<10 m) near the creek and thick (>30 m) under the pasture. The depth of the aquifer is variable, outcropping or thinly confined over a short distance (<10 m) in the pasture but confined on both sides of the outcrop. Disturbed and undisturbed 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 results, indicating downward coarsening texture in the outcrop area and fine-grained texture in the confined area. Data collected at the site 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. Two existing berms/swales in the pasture were observed to retain water after rainfall. 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 DRILLING THE OLIGOCENE VICKSBURG GROUP, QUEENS HILL LAKE 7.5-MINUTE QUADRANGLE, HINDS COUNTY, MISSISSIPPI

Tim Palmer, Jonathan Leard, James Starnes

Mississippi Geological Survey, Jackson, MS

The focus of this drilling project was on constructing a 7.5-minute geologic map of the Queens Hill Lake quadrangle (quad) for STATEMAP and obtaining a sedimentary record of the Oligocene and bounding units. Prior to drilling the quad, a literature and geophysical log review was carried out to mitigate geologic uncertainty and develop a basic stratigraphic framework for the map. Following this work, drilling operations commenced on the WRB Ranch #1 stratigraphic test hole on 09/26/2023. The hole is located at 32° 24' 15.084'' N, 90° 32' 50.46'' W at an elevation of 245' and was spudded on 09/26/2023. The total depth of the hole is 300' and was logged for cuttings in 10' intervals. Open-hole geophysical log curves include gamma-ray, spontaneous potential, direct current, and resistivity. Based on drilling, cuttings descriptions, and log analysis, the lithology for the hole is as follows: 0-20' eolian silt (loess), 20-54' organic rich clay, 54-78' fossiliferous silty sand with clay, 78-110' limestone, 110-132' limestone and calcareous clay, 132-148' fine sand, 148-240' carbonaceous clay with lignite seams, and 240-TD (total depth) marine clay. Integrating outcrop and surrounding quad geologies with the drill results, the WRB Ranch #1 drilled through late Pleistocene eolian loess from surface to 20' and immediately transitioned into the Oligocene Bucatunna, Byram, Glendon, Mariana, Mint Spring, and Forest Hill formations. The top of the Eocene, represented by the Yazoo Formation was encountered at a measured depth of 240'. Two unconformities exist in the hole: 1) the Pleistocene-Oligocene contact and 2) the Forest Hill-Yazoo contact. Drilling and mapping were funded by the State of Mississippi and the United States Geological Survey, National Cooperative Geologic Mapping Program. The Survey expresses gratitude to the WRB Ranch for permission to drill the WRB Ranch #1 test. Drill cuttings and geophysical logs can be accessed by contacting the Office of Geology at MDEQ.

O6.07

10:40 A FULL SEQUENCE OF PRE-LOESS TERRACE DEPOSIT DRILLED IN YAZOO COUNTY, MISSISSIPPI

Jonathan Leard, James Starnes, Tim Palmer, Paul Parrish

Mississippi Office of Geology, Jackson, MS

The Phoenix Geologic Quadrangle was published by the Mississippi Office of Geology through funding from the United States Geological Survey and the State of Mississippi. This project was a continuation of the Mississippi Office of Geology's effort to delineate ancestral Mississippi River Pre-loess Terrace Deposits. Geophysical information available in the area demonstrated the Rawhide Terrace, the informal name for the Pre-loess Terrace level with an unconformable base of 220 feet above sea level identified at the Hammet Gravel Company pit at Rawhide, Mississippi. This level was drilled by the Mississippi Office of Geology in 2016 in the Vinzant #1 (MOG 149F0053) drill hole near Redwood in Warren County, Mississippi where it had an unconformable base at ~220 feet above sea level and a preserved clay cap at ~290 feet above sea level. Pre-loess Terrace Deposits typically consist of stratified layers of sands, gravels, and clays in a relative fining upward sequence. In certain settings, the fine grained, flood plain deposits are preserved beneath the Pleistocene loess. The first level of Pre-loess Terrace, the Rodney Terrace has much of its clay cap preserved. The Rodney Terrace, named for its surface expression in Rodney, Mississippi, has an unconformable base from 20 to 40 feet above sea level, and the loess contact is at 135 feet above sea level. The community of Pheonix sits on uncharacteristically flat topography compared to the surrounding, entrenched, loess terrain. It was hypothesized that there may be preserved clay cap present beneath the loess causing this low surface roughness. A home water supply well drilled in 1967 supported this hypothesis. On 25 April, 2023, Potter #2 (MOG 163U0142) was spudded at an elevation of 357 feet. After drilling through 52 feet of loess, a preserved clay cap was encountered. The clays continued an additional 38 feet and graded into 43 feet of stratified sands and gravel. The top of the loess contact was at ~300 feet above sea level and the base of the terrace was at ~220 feet above sea level. The extensive preservation of the Rodney Terrace has been attributed to its proximity to the Mississippi River. Some preservation, but less than that of the Rodney Terrace, supports the hypothesis that the Rawhide Terrace is the second level of Pre-loess Terrace Deposits, and a full section of this terrace is present beneath the community of Phoenix.

O6.08

11:00RADIOMETRIC DATES FROM A CORE OF THE RODNEY PRE-LOESS TERRACE DEPOSIT IN JEFFERSON COUNTY, MISSISSIPPI, AND IMPLICATIONS FOR THE AGE AND EVOLUTION OF THE MISSISSIPPI RIVER ALLUVIAL PLAIN

James Starnes, Jonathan Leard

MDEQ, Mississippi Office of Geology

Geologic Mapping of the Church Hill and Rodney Quadrangles in Jefferson County, Mississippi was published by the Mississippi Office of Geology in 2019 through funding from the United States Geological Survey and the State of Mississippi. The Bates # 1 hole

(063G0043) drilled at 31.73906, -91.22389 for this project records an intact Pleistocene ancestral Mississippi River Pre-loess Terrace complete alluvial sequence beneath a thick blanket of Peorian loess. The Bates #2 hole (MOG 063G0044) was spudded to better characterize the extensive deposit. Bates #2 spudded 1 April, 2019 at 31.75500, -91.23136 at an elevation of 195 feet mean sea level (MSL) in weathered loess that became increasingly anoxic with depth. Fifty-five feet of loess was drilled. The contact between the loess and terrace is marked by a paleosol. This paleosol is rich in iron-manganese pisoliths. Sixty feet of a fluvial upward-fining sequence of the terrace was drilled consisting of unconsolidated sands and gravels. The terrace gravels are in contact unconformably with the stiff, consolidated clay of the underlying Miocene subcrop at a depth of 175 feet. This hole identified the preserved top of the terrace at ~140 feet MSL and the base of the terrace at ~20 feet MSL. The Matheny #1 (063G0041) hole was spudded at 31.78139, -91.22747 at 75 feet MSL in the active flood plain to identify the base of the active Mississippi River Alluvium. This drilling shows 85 feet of alluvial fan and 33 feet of basal Mississippi River Alluvium. The contact with the alluvium and underlying Miocene occurred at a depth of 118 feet, or -43 feet MSL. These holes demonstrate the Rodney Terrace is the first terrace of the Mississippi River and equates the Rodney Terrace to the "Natchez Formation" described in MGS Bulletin 47: Adams County Mineral Resources. Bates #3 twinned Bates #2 to core the Rodney Terrace for radiometric dating. Bates #3 was spudded 30 August, 2022. Depth intervals 43-53, 63-73, 73-83, and 83-93 from the core were sampled and sent to Beta Analytics for bulk carbon analysis. A composite sample of pulmonate gastropod fossil shell fragments from the basal loess of the core was collected for corroboration. The conventional radiocarbon ages reported from Beta Analytics are respectively 24900 ± 110 BP, 15600 ± 40 BP, 17460 ± 50 BP, 17180 ± 50 BP, and 23210 ± 100 BP. The calibrated dates reported from Beta Analytics are respectively 29275 - 28811 cal BP, 18948 - 18801 cal BP, 21315 - 20896 cal BP, 20881 - 20561 cal BP, and 27692 - 27279 cal BP. The older dates of the loess and gastropod samples are attributed to the Limestone Effect. The clustered dates are consistent with the height of the Last Glacial Maxima as the abandonment of the Rodney Terrace. Thick deposits of loess were rapidly deposited on the uplands, blanketing and preserving the terrace surface as the active river valley below alluviated. This study constrains the age of all features in the active Lower Mississippi River Valley to the Last Glacial Maxima.

O6.09

11:20 A COLLAPSED SALT DOME IN HINDS COUNTY, MISSISSIPPI

Jonathan Leard, James Starnes, Tim Palmer

Mississippi Office of Geology, Jackson, Mississippi

The Brownsville Geologic Quadrangle was published by the Mississippi Office of Geology through funding from the United States Geological Survey and the State of Mississippi. The Brownsville Salt Dome influences the surface geology in Township 7 North, Range 2 West. There is current oil production from uplifted Eutaw and Perry Sand oil pools. Oil and gas tests are a source of data to better understand the collapse of the salt at depth. The salt stock is 4500 feet subsea. The Upper Cretaceous Tuscaloosa Formation is documented on the perimeter of the dome, cap rock then covers the stock. The Upper Cretaceous Eutaw Formation is uplifted over the dome and is faulted. The Prairie Bluff age equivalent reef, the Jackson Gas Rock is faulted and is greater than 500 feet thick on the top of the collapse. The Upper Paleocene to Lower Eocene Wilcox Formation has significant faulting documented from the salt diapirism and collapse. The Middle Eocene Zilpha-Winona Formations are faulted. The Middle Eocene Kosciusko Formation, which includes the Sparta Aquifer, is offset. The Office of Land and Water has identified the Middle Eocene Cockfield Formation as the primary aquifer, with a well near the collapse screened from 609 to 710 feet subsea. The Cockfield is also faulted, which is important to monitor as faults could be contamination conduits. The Middle to Upper Eocene Moodys Branch and Yazoo Formations are faulted. The drilling project included two holes, one near the center of the structure, and another off structure where a basal Forest Hill aquifer sand was expected and encountered. Providence Hill Farm #1 was spudded 4 April, 2023. Pleistocene Loess would have been present, but it was drilled in a gravel pit where the Loess overburden was removed. The hole spudded in the basal sands and gravels of a Pleistocene ancestral Mississippi River Pre-loess Terrace deposit. Because this resource is utilized, a full thickness for these gravels was not ascertained, but 30 feet of the deposit was encountered from the bottom of the pit. Then 100 feet of an unusual kaolin clay attributed to the Oligocene to Miocene Catahoula Formation was encountered. The hole continued into an 85-foot coarse-grained Catahoula Channel sand. This channel sand has eroded the Vicksburg limestone completely and unconformably overlies the Forest Hill Formation, which has been eroded to a five to ten feet carbonaceous, silty clay. The hole TD'd at 260 feet in the Yazoo Clay. Trotter #1 was drilled to verify that the sand encountered in Providence Hill Farm #1 was a Catahoula Channel sand and not a Basal Forest Hill sand. MGS Trotter #1 was spudded 16 May, 2023 in Pleistocene Loess. The Loess was 25 feet thick and then 60 feet of Vicksburg Group was encountered. The first 70 feet of the Forest Hill Formation was a dark brown carbonaceous clay and then 25 feet of carbonaceous fine sand, in stark contrast to the sand drilled

in Providence Hill Farm #1. MGS Trotter #1 TD'd at 250 feet in the Yazoo Clay.

O6.10

11:40 A PREHISTORIC LITHIC QUARRYING INDUSTRY OF ORTHOQUARTZITE FROM THE COCKFIELD FORMATION NEAR TCHULA, MISSISSIPPI

James Starnes

MDEQ, Mississippi Office of Geology

Outcrops of lithic quality orthoquartzites have been discovered in the lower sands of the Eocene (Claiborne age) Cockfield Formation in Holmes County, Mississippi, near Tchula. These outcrops are situated along the edge of the Loess Bluff Region and are exposed beneath the sands and gravels of the Pre-loess Terrace Deposits along the valley wall of Fannegusha Creek. The orthoquartzites of the Cockfield Formation and those of the Kosciusko Formation, which outcrops east of the area along the Carroll and Attala County lines, share similarities. Both are very fine-grained stones and can be strikingly similar in appearance because they formed as the result of quartz overgrowths interlocking sand grains. Fresh Cockfield Orthoquartzite is light gray and weathers to a tan to khaki. It is an extremely durable stone and is not subject to the same severity of diagenesis as other coastal plain orthoquartzite that formed because of opaline silica cementation. Extensive quarries of Cockfield Orthoquartzite were discovered just above the stream along the lower reaches of Fannegusha Creek. These outcrops show extensive mining activity for cultural procurement from battering along the outcrop and deposits of quarry debitage. During the initial investigation of the quarry complex, one quarry biface and several hammerstones were surface collected. Little is known about the cultural distribution of Cockfield Orthoquartzite because of the recent discovery of the lithic type and quarry. Age-diagnostic artifacts are rare at this archaeological site. This is because primary procurement was being conducted at the outcrop. Numerous multicomponent sites, including the Parrish Site, have been recorded along the first terrace of Fannegusha Creek adjacent to the Cockfield Orthoquartzite quarry complex. It is likely that many of these sites were developed around the Cockfield Orthoquartzite mining industry. Further archaeological investigations of the dense complex of prehistoric sites along Fannegusha Creek will likely yield evidence for secondary lithic processing and distribution of Cockfield Orthoquartzite. It is likely that Cockfield orthoquartzite has been misattributed as Kosciusko Quartzite on archaeological sites throughout the Mississippi Delta region. Further petrological studies are need for assigning diagnostic factors for discriminating Cockfield Orthoquartzite from Kosciusko Quartzite and potentially other similar orthoquartzites in the Gulf Coastal Plain. Proper identification of Cockfield Orthoquartzite in prehistoric lithic assemblages will yield greater insight into its significance as a lithic source, cultural and temporal distribution, and about the lithic trade of materials from the Loess Bluffs into the Delta region.

12:00 General Session

Thursday, February 29, 2024

AFTERNOON

Room Union C

O6.11

1:20 EXPLORATION OF LOCAL GEOSCIENCE IN AN ONLINE WATER RESOURCES COURSE

Christa Haney

Mississippi State University, Starkville, MS

Incorporating local hydrology into course assignments is an ideal way to increase student understanding of complex geoscience issues related to water quality and quantity. This presentation will explore strategies that teachers can use in an online classRoom to encourage students to collect and analyze hydrologic data. This approach was found to deepen understanding of local and regional environmental geoscience and hydrologic processes. Positive student feedback and a reported increase in engagement and relevance of course material was found when students conducted local research and data collection in an online undergraduate water resources course.

O6.12

1:40 ACCOMMODATING COLOR VISION DEFIENCES WITHIN A VISUAL SCIENTIFIC DISCIPLINE

Amy Moe-Hoffman, Renee Clary, Athena Owen Nagel

Department of Geosciences, Mississippi State University, Mississippi State, MS

Approximately 8% of males and 0.5% of females globally experience color vision deficiency, or colorblindness. While deuteranomaly (reduced green light sensitivity) is most common, some people experience protanomaly (reduced red light sensitivity) or blue-yellow vision discrimination deficiencies. Historically, accommodations for colorblind students included a reduction in color use and utilization of high contrast materials and/or labeled items. In the geosciences, these accommodations still required students to rely on lab partners, teaching assistants, or, in the case of GIS maps, determine the correct hex code to discern color differences to their complete assignments—dramatically reducing their independence and increasing the time they needed to allocate to the tasks. In Spring 2023, Mississippi State

University's Department of Geosciences and Department of Plant and Soil Sciences partnered with EnChroma to purchase glasses for students and faculty with colorblindness (deuteranomaly and protanomaly) so they could better discriminate between red and green hues. Housed in the Department of Geosciences, the glasses are available to faculty and staff to try on, and/or check out for a semester without cost. In Fall 2023, a MSU Diversity through Access Grant funded the purchase of 10 more pairs of EnChroma glasses (for a total of 16 pairs) and a partnership with EnChroma for International Color Blind Awareness month (September) resulted in the raffle of two additional pairs of glasses for a color vision deficient faculty member and a student. Thus far, student and public response has been overwhelmingly positive. The MSU Colorblindness Initiative provides support for a traditionally under-accommodated disability and opens doors to careers that may have been previously closed to these students.

O6.13

2:00 FIRST-YEAR EXPERIENCE AS A GEOLOGIST IN TRAINING AT THE MS DEPARTMENT OF ENVIRONMENTAL QUALITY

Ginger Trochesset

Mississippi Department of Environmental Quality, Jackson, MS

The Mississippi Department of Environmental Quality (MDEQ) offers STEM careers in geology, environmental science, technology, and engineering. There are Geologist in Training (GIT) positions across several offices, including Land & Water Resources, Geology, Pollution Control, and Field Services. The purpose of this talk is to give students, recent graduates, and professionals interested in careers in geosciences insight into some of the applied science topics that are analyzed by MDEQ from the perspective of a GIT with one year of experience in Water Resources Management.

O6.14

2:20 THE DREW MCGAHEY CLOVIS: A PLEISTOCENE ARTIFACT FROM COPIAH COUNTY, MISSISSIPPI

James Starnes

MDEQ, Mississippi Office of Geology, Jackson, MS

Humans entered the paleontological record in Mississippi during the last ice age. They encountered an environment that would seem strange to us today. The flora would be familiar to more northern climates than to the coastal plain. The landscape hosted an even stranger megafauna, now long extinct. Geology is the basis for the environment and is an integral part of archaeology. Geologic mapping is essential to understanding the age of landscapes, paleoenvironment, the distribution of natural resources available to its earlier inhabitants, and for characterizing the depositional environments and geochemistry conducive to preservation of archaeological resources. Stone tools that these Pleistocene inhabitants left behind are often the only evidence that we have of their presence on the landscape. Analysis of these lithics is typically the only window through which we can study these first peoples' relationship with their ancient environment. The ice-age first people's cultures are known by their tool styles or traditions and are collectively referred to by scientists as Paleoindian. They were thought to be highly specialized nomadic hunters of the megafauna of late Pleistocene, evidenced by their exquisitely made stone tools and the scarce number of longer-term occupation sites that they left behind. Discoveries of most known early Paleoindian artifacts in North America are happen-chance. Often stumbled upon by landowners, collectors, hobbyists, and very rarely by professionals in the field; making the public the primary resource of information to study this earliest cultural period in Mississippi's prehistory. Earlier this year, a Clovis point was found by a child in a stream and brought our attention. Clovis points are the earliest recognized artifacts found in Mississippi. This important discovery, made by Drew McGahey in northwest Copiah County, was special for several reasons. He is grandson of the late State Archaeologist, Sam McGahey whose work established the foundation for Paleoindian research in Mississippi. Our Survey geologists worked with Sam conducting research on the state's geoarchaeology. The find is also relevant to geologic mapping in the area and reveals important clues about these people who lived there and utilized the resources of their environment. The Drew McGahey Clovis was found is a chert gravel-choked creek bed rich with excellent quality stone resources derived from the Pre-loess Terraces. Flood plains of these creeks were once home to an abundance megafauna such as mastodon, bear, horses, sloth, and tapir as their fossil bones and teeth are common finds along these drainages in the Loess Hills. The Drew McGahey Clovis demonstrates familiarity with procurement and working of the locally available resources by adapting the knapping methodology of the Clovis tradition to the properties of the gravel. The geology and the geochemistry of the soils where the Drew McGahey Clovis was found demonstrates the potential of the Loess Hills environment for early sites with excellent preservation of things other than artifacts of stone dating to the late Pleistocene. From this may come a more complete, and likely more complex understanding about the life ways of Mississippi's first inhabitants.

O6.15

2:40 GEOLOGY OF THE HIGH-GROUND: THE CIVIL WAR BATTLE OF CHAMPION HILL, MAY 16, 1863

Tim Palmer Jonathan Leard, James Starnes

Mississippi Geological Survey, Jackson, MS

A pivotal battle in the Vicksburg Campaign took place on a very well-preserved ancestral Mississippi River terrace deposit near Edwards, Mississippi. East of the Big Black River, the terrace forms a conspicuous ridge extending N-S overlooking Jackson Creek. On the northern end of the ridge, the terrace forms Champion Hill, a hilltop with an elevation of 360' above MSL. The fight over Champion Hill proved to be as important to shaping the battle and the Vicksburg Campaign as the battle itself was in shaping the outcome of the war. On May 16, 1863, skirmishers between Grant and Pemberton's armies were engaged by 7:30 A.M., along the ridge as Grant advanced from the east. To counter, Pemberton's army set up a long defensive line between Raymond Road on the right and the crest of Champion Hill.

Based on National Park Service mapping carried out by the Office of Geology, the hill is underlain by a mid-Pleistocene age ancestral Mississippi River Pre-loess Terrace deposit, capped by a mantle of late Pleistocene eolian silt (loess). The loess and loosely packed terrace sands and gravels result in aggressive terrain and hostile fighting conditions. The Pre-loess Terrace deposit is made almost entirely of siliceous aggregate. The sands are quartzose and the gravel ranges in size from pea to boulder-sized clasts. Gravels are comprised of a wide variety of chert derived from Paleozoic limestones within the watershed of the upper Mississippi River valley like that of the Grant's fighting force, but also contain clasts of quartz, metaquartzite, sandstone, and rhyolite. Underlying the Pleistocene geology of Champion Hill is sandstone of the Oligocene aged Catahoula Formation. These sandstones indurate at the surface and outcrop along the edges Champion Hill below elevations of 340' above MSL.

Outnumbered two divisions to one, Pemberton's division occupying the crest of Champion Hill lost the high-ground by the AFTERNOON. However, Pemberton counter attacked, and regained control of the crest of the hill only to withdraw his divisions by 4:00 P.M across Bakers Creek to the west. By the end of the day, total casualties numbered approximately 6,200 and Grant continued his march toward Vicksburg. The geologic mapping of Champion Hill was funded by the National Park Service, Geologic Resources Division. The Survey expresses gratitude to Sid Champion, Nation Park Historian, and family heir to the Champion Hill property for guiding staff across the Champion Hill Battlefield. The Champions facilitated the transfer of the battlefield to the American Battlefield Trust and the National Park Service.

O6.16

3:00 WHOSE WOODS THESE ARE: HUMAN ENVIRONMENT RELATIONSHIPS AMONG STAKEHOLDERS OF SOUTH MISSISSIPPI'S LONGLEAF PINE ECOSYSTEM

Helen Greene

University of Southern Mississippi, Hattiesburg, MS

Between 1870 and 1920, the longleaf pine belt of the southeastern United States experienced an extensive and unsustainable period of logging. In the years after the logging boom the landscape of the Southeast was reforested, but fire suppression and a preference among landowners for loblolly pine resulted in a dense and less resilient forest with reduced biodiversity. This research looks at the human geography of remnants of the longleaf pine ecosystem in South Mississippi and the nature of contemporary relationships between South Mississippi residents and this ecosystem. In an effort to make sense of these complex relationships, I conducted ethnographic interviews with individuals involved in forestry, forest-related economic activities, forest conservation and restoration, and similar fields. For many people the longleaf pine ecosystem is more than the landscape outside of their window; it is also a place full of memory, connection, and meaning. Through this research, I have identified a collection of human-environment relationships in South Mississippi and illustrated how people have altered, and in turn been altered by, the contemporary landscapes of the longleaf pine ecosystem.

Thursday, February 29, 2024
EVENING

3:30 DODGEN LECTURE/ AWARDS CEREMONY
THEATER
5:00 GENERAL POSTER SESSION
(immediately following Dodgen Event)

P6.01

PALEOENVIRONMENTAL AND TAPHONOMIC IMPLICATIONS OF TWO PALYNOLOGICAL SAMPLES FROM THE COCKFIELD FORMATION, YAZOO COUNTY, MISSISSIPPI.

[1]Nina Baghai-Riding, [2]Carol L. Hotton, [3]James E. Starnes, [3]Jonathan R. Leard, [1]Olivia Pharr

[1]Division of Math and Sciences, Delta State University, Cleveland, MS, [2]National Museum of Natural History, Smithsonian Institution, Washington, DC, USA. [3]Mississippi Department of Environmental Quality, Office of Geology, Jackson, MS

An outcrop of the unconformable contact of the uppermost Claiborne Group and the overlying basal Jackson Group is exposed in the channel wall of Perry Creek near the community of Tinsley just north of center of the Section 13 and 14 boundary, Township 10 North, Range 3 West in Yazoo County, Mississippi. Here the terminal deltaic

carbonaceous to lignitic silty-to fine-sandy laminated clays of the Cockfield Formation give way to the transgression of shallow-marine calcareous, fossiliferous, glauconitic sandy marl of the Moodys Branch Formation, marking the environmental transition resulting from a global rise in sea level towards the end of the Eocene epoch. Marine deposits in the upper-most Cockfield Formation of this area, near the axis of the Mississippi Embayment, are termed the Creola Member. This part of the Cenozoic section is considered Bartonian in age and occupies the middle of the calcareous nanofossil zone NP17. Though marine macrofossils were not sampled at this outcrop; they are known from other outcrops in the county. This outcrop of the Claiborne-Jackson contact is anomalous because the beds are structurally high, exposed only at the apex of Tinsley Dome. During field work in 2022, subsequent the publication of the Tinsley 7.5-minute geologic quadrangle map, two matrix samples were gathered from the Cockfield Formation for palynological analysis. Sample 1 is from the creek floor, about 3 feet below the Claiborne-Jackson contact, whereas sample 2 was collected directly beneath the unconformity with the Moodys Branch Formation. Both samples contained well-preserved and diverse pollen, spores, algal cysts, and dinoflagellates, indicating a warm temperate environment. Sample 1 contained a slightly higher component of terrestrial taxa. In a 300-point count, angiosperms comprised 80.9%, conifers 1.9%, trilete spores 5.3%, monolete spores 6.6%, probable algal cysts 3.4%, and dinoflagellates 1.25%. Sample 2 indicated a more marine influence. In a 300-point count, angiosperms comprised 84.9%, conifers < 1%, trilete spores 4.8%, monolete spores 2%, probable algal cysts 4.5%, and dinoflagellates 3.2 %. Families/orders common to the two samples include Anemiaceae, Polypodiaceae, Pinaceae, Aquifoliaceae, Arecaceae or Liliales, Fagaceae, Juglandales, and Malvaceae. Families noted only in sample 1 include Lycopodiaceae, Sphagnaceae, and possibly Hydrodictyaceae (*Pediastrum*). Sample 2 contained specimens of *Rousea*, a eudicot incertae sedis, *Cyrillaceaepollenites*, the dinoflagellate *Cleistosphaeridium*, and internal linings of foraminifera. The majority of the palynomorphs were pristine, although pyritization was associated with a few specimens, suggesting limited transport/residence time in sediments before burial.

P6.02

PRELIMINARY SEDIMENTOLOGICAL STUDY OF UPPER CRETACEOUS AND LOWER TERTIARY STRATA IN OKTIBBEHA COUNTY, MISSISSIPPI

Johnathan Leard [1], MaKenna Collins[2], Ezat Heydari [2]

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

[1]Mississippi Department of Environmental Quality, Office of Geology, P. O. Box 2279, Jackson, MS [2]Department of Physics, Atmospheric Sciences, and Geoscience Jackson State University, Jackson, MS.

The Cretaceous - Paleogene Boundary (K-Pg) is one the most important events of the Phanerozoic Eon. It represents the major biological crisis that separates the Mesozoic and Cenozoic Eras. The K-Pg Boundary is exposed along an arc-shaped outcrop belt in northeast Mississippi. A research hole was drilled in Oktibbeha County, Mississippi, to investigate and characterize the K-Pg Boundary. Over 50 feet of conventional core was recovered. Three formations were encountered: The Prairie Bluff Formation at the base, the Clayton Formation in the Middle, and Porters Creek Formation at the top.Only the top 20 feet of the Prairie Bluff Formation occurs in the core. This rock unit shows two distinct cycles. Each cycle is about 10 feet thick and begins with white,bioturbated, pelecypod-rich sandy limestone that grades upward to a partly bioturbated muddy limestone which inturn transitions upward to dark gray, laminated calcareous, sandy mudstone. The Clayton Formation overlies the Prairie Bluff Formation with a transitional contact. This rock unit consists of about 10 feet of black-colored, laminated calcareous sandy mudstone. The Porters Creek Formation is represented by 24 feet and overlies the Clayton formation with a transitional contact. The Porters Creek Formation represents a major change in lithologic character from the underlying two formations. It is beige in color, it is not calcareous, and it lacks organic matter.Such a major change in lithology is considered to represent a significant departure in depositional environments. Fine grained lithologies and the absence of current induced sedimentary structures suggest that all three formations were deposited in a subtidal environment in waters deep enough not be affected by waves. Historically, the K-Pg Boundary is considered to be the contact between the Prairie Bluff and the ClaytonFormations in Mississippi. Typical characteristics of K-Pg Boundary such as a spherule-rich layer and featured indicative of tsunami deposits were not encountered in this location. The Upper Cretaceous Prairie Bluff limestone transitions in the Lower Paleocene Clayton Formationwithout any visible perturbation in sedimentological characteristics.

P6.03

HISTORICAL LAND USE, CONSERVATION AND FORESTRY

Chad Mackness

University of Southern Mississippi, Hattiesburg, MS

Longleaf pine (*Pinus palustris)* and river or giant cane (*Arundinaria gigantea*) arekeystone species and habitats to which several endangered or near-endangered species are

considered endemic or habitat specialists. One such bird is the Red-cockaded woodpecker(*Picoides borealis*). While researching the longleaf pine ecosystems as part of a research project using historical documents to recreate an accurate digital version and map of the pre-European forest composition and structure, I discovered that these beautiful birds have declined due to the decline and fragmentation of their habitat by up to 95% of its original range. They are seen throughout the Southern United States from Virginia in the east and across the entire historical range of the longleaf pine, including Texas and Oklahoma. The fragmentation of the longleaf pine was partially caused by the almost complete loss of the 'Cane Brakes' across the south. These brakes connected the understory of the longleaf pine forest stands. They were also the primary habitat for almost fifty different species, including six other species of butterflies. Giant cane itself is the only native bamboo species in North America. The research that I have conducted will allow for a plan to be implemented to help this species, as well as birds and land species, to increase in numbers. From the transcribed documents, the tables were created, and the points were plotted in ArcGIS Pro.

P6.04

HEC-RAS BASED DAM BREACH MODELING OF THE KAKHOVKA RESERVOIR: UKRAINE

Will Rivenbark[1], *Creighton Meyers*[1]

NAVOCEANO

Reservoirs are commonplace globally and depend on major infrastructure such as dams, embankments and spillways. They are frequently used for power generation, flood control, municipal and agricultural water supplies and recreation. However, when reservoirs fail they pose significant downstream flooding risks to man made infrastructure, wildlife habitats as well as possible loss of life. HEC-RAS dam breach analysis can be used to model a variety of possible dam structure failures. These failure scenarios range from natural causes, leading to piping and over-topping failure as well as from sabotage and destruction from war and terrorists. Additionally, these scenarios can be run under a variety pre and post failure conditions ranging from variable reservoir water volumes, the accounting for upstream discharge input as well as the size and placement of the dam breach within the basin.

In this study we use a HEC-RAS based dam breach model to generate a predicted flow hydrograph and resultant flooding from the June 2023 destruction of the Kakhovka Dam in Ukraine. Unlike many dam failure models which are based on a variety of hypothetical failure conditions, the flow hydrograph and resulting flood waters of our HEC-RAS model were calibrated to in-situ upstream and downstream water surface elevation measurements. Local measurements were taken daily near both the upstream Zaporizhzhia nuclear power plant (ZNPP) and the city of Kherson. Variables such as the Manning's roughness coefficients, reservoir storage capacity, spatially distributed sedimentation estimation as well as downstream boundary slope conditions were modified to generate a flow hydrograph with similar downstream rising limb, peak discharge rate, peak discharge arrival time and the recessionary limb of the flow hydrograph. Results of the calibrated model were compared to both in-situ measurements and a previously generated model from November 2022. The November 2022 model simulated a hypothetical dam breach of the Kakhovka Reservoir based on news sources confirming contested control of the Kakhovka Dam and reservoir on both sides of the Dnieper River. This analysis focused on assessing the possible environmental impacts of a potential breach to support humanitarian and disaster relief efforts. This study directly benefits future HEC-RAS products generated at NAVOCEANO allowing analysts to assess how individual variables impact the timing and shape of resulting dam breach simulated flow hydrographs.

Friday, March 1, 2024

MORNING

Room Union C

8:00 Welcome and Opening Remarks

O6.17

8:20 NEW PUBLICATION ON THE LATE CRETACEOUS *Neogastropoda (Stenoglossa)* OF MISSISSIPPI

David T. Dockery III

MDEQ Office of Geology, Jackson, MS

Printed copies of *Mississippi Cretaceous Neogastropoda (Stenoglossa) and Selected Mesogastropoda Illustrated*, Dockery, 2023: MDEQ Open File Report OF-337, 150 p. (Laura Luke, editor) were received by MDEQ Office of Geology on April 20, 2023. The International Code of Zoological Nomenclature now requires printed versions of all publications naming new species, thus the need for a printed version of OF-337. The new publication names 28 new species, two new genera, and one new subfamily. New species and their U. S. National Museum Paleontology type specimen numbers as they appear in the book include: *Astandes alta* USNM PAL 778029, *Palamete tallahatchiensis* 778030, *Buccinopsis rikardi* 778031, *Deussenia breukeleni* 778032, *Bullatafusus mississippiensis* 778033, *Bellifusus minutus* 778034, *Bellifusus annabellae* 778035, *Ornopsis carinata* 778036, *Ornopsis nodosa* 778037, *Protobusycon ellsi* 778038, *Fusimilis minutus* 778039, *Fusimilis nolani* 778040, *Fusimilis meganae* 77041, *Fusimilis andersoni* 778042, *Volutomorpha carolynae* 778043, *Volutomorpha terrellae*

778044, *Parafusus bullatus* 778045, *Parafusus starnesi* 778046, *Cylindrofusus patricae* 778047, *Cylindrofusus laneyae* 778048, *Pyropsis involutus* 778049, *Pyropis levis* 778050, *Pyropsis infundibulum* 778051, *Napulus canalis* 778052, *Napulus cymatiformis* 778053, *Dexiplex idea* 778054, and *Conomitra sohli* 778055. The systematics of the book followed that in Klaus Bandel and David T. Dockery III, 2016, *Mollusca of the Coon Creek Formation in Tennessee and Mississippi with a Sytematic Discussion of the Gastropoda*, p. 34-96, in Dana Ehret, T. Lynn Harrell Jr., and Sandy Ebersole, *Paleontology of the Cretaceous Coon Creek Formation*: Alabama Museum of Natural History, Bulletin 33, v. 1, August 1, 2016, 96 p. Specimens figured are beautifully preserved with unaltered original shell material, are of Campanian and Maastrichtian age, and are illustrated in multiple views.

O6.18

8:40 EXCAVATION AND ANALYSIS OF A CAMPANIAN MOSASAUR IN MONROE COUNTY, MISSISSIPPI

Paul C. Parrish[1], Jonathan Leard[1], James Starnes[1], Tim Palmer[1], Andrew Newcomb[1], Tranton Holder[1], Julie Parrish[1]

[1]MDEQ/MOOG

An important mosasaur fossil discovery was made in July of 2022 by George Phillips and Nicole Phillips of the Mississippi Museum of Natural Science. The Phillips were revisiting a previously recorded site known for Pleistocene age fossils eroding from the alluvium outcrops of a Monroe County creek. The floor of the creek is a window into Cretaceous bedrock known as the Mooreville Formation. The exposed bones were immediately recognized as belonging to a mosasaur. Across the Black Prairie region of northeast Mississippi, isolated remains of mosasaurs, namely the vertebrae, are not uncommon; however, finding a complete skull is extremely rare. George Phillips immediately contacted the Mississippi Office of Geology to get an excavation team together.

Scouting of the site revealed that other elements of the skeleton were present. Vertebrae and ribs were scattered, both in the chalk and on the surface nearby. Excavation began in early August of 2023. Drought conditions throughout the summer of 2023 kept the water levels in the area low. This allowed for an easier and less expensive excavation.

Based on earlier studies of the geology of the area by the Mississippi Office of Geology/Mississippi Geological Survey, the floor of the creek was determined to be the late Cretaceous Mooreville Formation that had been absolutely dated to 82 million years old. This time in the late Cretaceous is known as the Campanian age. The mosasaur would have lived in a shallow tropical sea that covered most of Mississippi at the time. After death, the mosasaur sank to its final resting place on a correlatable *Algerostrea falcata* bed which was quickly buried by lime-rich mud. The seas retreated to what is now the Gulf of Mexico over the next eighty million years. The limestone, marly chalk and calcareous clay of the Mooreville Formation lithified and entombed the skeleton.

The mosasaur was removed from the creek on August 23, 2023. The skull and the upper portion of the back were excavated primarily as a 500 kg block. Before being lifted, the exposed side of the specimen was plaster jacketed. The block was carried 70 m downstream by the team, and then it was placed on a sled and winched up an almost vertical 10 m creek bank. The team of six scientists from the Mississippi Office of Geology then deadlifted the block and sled into the back of the Ford F-350, which transported the specimen to the Mississippi Museum of Natural Science for curation.

O6.19

9:00 VARIATIONS IN CHLORIDE, TOTAL PHOSPHORUS, TOTAL NITROGEN, AND ALKALINITY IN RIVER WATERS IN YAZOO RIVER BASIN, MISSISSIPPI

Ryan Heydari

Madison Central High School, Madison, MS

The Yazoo River Basin (YRB), also known as the Alluvial Plain of Mississippi or the Mississippi's Delta region, is a geographically low area in the northwest part of the State of Mississippi. The area has fertile soil that makes it a major agricultural area in the state. The YRB is bounded on the eastern side by the steeply dipping Bluff Hills and on the western side by the Mississippi River. Major south-flowing rivers such as the Big Sunflower River, the Tallahatchie River, and the Yazoo River flow in this region. These rivers merge just north of the city of Vicksburg and drain into the Mississippi River. The United States Geological Survey in Mississippi conducted a major investigation on physical and chemical composition of the rivers and bayous in this region. Waters were collected by standard procedure and delivered to Mississippi's Department of Environmental Quality laboratory in Pearl, Mississippi, where the analysis was conducted. Only river water data is considered for this study. We specifically evaluate variations in chloride, total phosphorus, alkalinity, and total nitrogen in river waters of the YRB.

Chloride concentrations vary from 121 mg/L to 4 mg/L. Total phosphorus levels differ from 4.6 mg/L to 0.07 mg/L. Total nitrogen changes from 19.9 mg/L to 0.36 mg/L. Alkalinity is measured as total $CaCO_3$ and varies from 501 to 21. However, variations in concentrations of chloride, total phosphate, total nitrogen, and alkalinity are not randomly distributed in the YRB. The highest concentrations occur in the Little Tallahatchie River that originates from Sardis Lake. These values gradually decrease as the water flows southward. The lowest values are located along the Bluff Hills and increase westward from that location. These systematic trends indicate the river water compositions in the YRB are controlled by two factors: anthropogenic and natural causes. Extreme water composition in the river that flows from Sardis Lake, which is surrounded with recreational facilities, indicates a major anthropogenic contribution. Systematic increases in

concentrations of chloride, total phosphorus, total nitrogen, and alkalinity from east to west is attributed to natural causes as ground and surface water flow from the highlands of the Bluff Hills to the lowlands of the Delta. The ground water will interact with rock and sediment along its flow path, particularly loess deposits. Agricultural activity does not seem to be as prominent of a contributor to chloride, total phosphate, total nitrogen, and alkalinity in river waters as previously thought.

O6.20

9:20 ANALYSIS OF MICROPLASTICS IN FLUVIAL SEDIMENT OF THE PEARL RIVER, CENTRAL MISSISSIPPI

Willie Ponthie, Stan Galicki

Millsaps College, Jackson, MS

Plastic is an engineered material that's use is engrained into our society in every way possible. Plastics are chemically numerous, complex, and difficult to degrade naturally. The resistance to degradation results in plastic pollution becoming one of the greatest threats to our environments and ecosystems today. This study focuses on microplastic particles which are defined as less than 5.0 mm in size. Microplastics may be manufactured (primary) as small particles and fibers, such as those in exfoliants, beauty products, and textiles, or broken down from larger plastics which are exposed to solar radiation, abrasion, and other forms of physical weathering (secondary). Extensive research documenting the occurrence and fate of microplastics in marine environments such as coasts and estuaries began in 2004. However, relatively little research has been conducted in terrestrial freshwater environments. The primary objective of this research was to document the microplastic loading in Pearl River sediment. A 35 km reach of the Pearl River in central Mississippi between the Ross Barnett Spillway and the Savanna St. Wastewater Treatment Plant, flows through the most densely populated area of the state. The Hinds-Madison-Rankin Metropolitan Watershed is composed of 11 smaller watersheds and drains the urban areas of Jackson, Richland, Madison, Pearl, and Byram. The 779 km^2 watershed is home to 287,000 people. Fifty-seven point bar sediment samples were collected on the Pearl River with a sampling density of 1.8 samples/km. All samples were analyzed for grain size distribution using a mechanical sieve technique. The measurement of microplastic loading was accomplished by separating the microplastic particles from the sediment. The microplastic/sediment separation was accomplished using a density separation technique with sodium iodide (NaI) solution. This solution has a density of 1.52 to 1.55 g cm^{-3} compared to common plastics that have a density as high as 1.45 g cm^{-3}. Suspended microplastic particles were filtered through 1.5 glass microfiber filters and then counted under both white and UV light. Point bar sediments were well-sorted fine-grained sand. The majority of microplastic particles (94%) were fibers. Microplastic loading in point bar sediment samples ranged from 0 particles kg^{-1} up to 4,976 particles kg^{-1} and averaged 363 particles kg^{-1}. There was no evident pattern between microplastic sediment loading and sample location in the watershed or relative to the confluence of urban streams with the Pearl River. Comparison with similar studies conducted on fluvial systems in Europe and Asia suggest that land use and population density are critical factors in not only sediment loading, but the type of microplastics observed. The Pearl River discharges into Mississippi Sound; plastic pollution along the sampling route was continuous and numerous large accumulations were also observed. The accumulation of microplastics in fluvial sediment is likely also dependent on physical factors such as the short residence time in fluvial systems, periodic increases in discharge and possible scouring of sediment, and the lack of rhythmic wave action.

O6.21

9:40 PRELIMINARY SEDIMENTOLOGICAL STUDY OF UPPER CRETACEOUS AND LOWER TERTIARY STRATA IN OKTIBBEHA COUNTY, MISSISSIPPI

Johnathan Leard [1], MaKenna Collins[2], Ezat Heydari [2]

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

[1]Mississippi Department of Environmental Quality, Office of Geology, P. O. Box 2279, Jackson, MS [2]Department of Physics, Atmospheric Sciences, and Geoscience Jackson State University, Jackson, MS.

The Cretaceous - Paleogene Boundary (K-Pg) is one the most important events of the Phanerozoic Eon. It represents the major biological crisis that separates the Mesozoic and Cenozoic Eras. The K-Pg Boundary is exposed along an arc-shaped outcrop belt in northeast Mississippi. A research hole was drilled in Oktibbeha County, Mississippi, to investigate and characterize the K-Pg Boundary. Over 50 feet of conventional core was recovered. Three formations were encountered: The Prairie Bluff Formation at the base, the Clayton Formation in the Middle, and Porters Creek Formation at the top.Only the top 20 feet of the Prairie Bluff Formation occurs in the core. This rock unit shows two distinct cycles. Each cycle is about 10 feet thick and begins with white,bioturbated, pelecypod-rich sandy limestone that grades upward to a partly bioturbated muddy limestone which inturn transitions upward to dark gray, laminated calcareous, sandy mudstone. The Clayton Formation overlies the Prairie Bluff Formation with a transitional contact. This rock unit consists of about 10 feet of black-colored, laminated calcareous sandy mudstone. The Porters Creek Formation is represented by 24 feet and overlies the Clayton formation with a transitional contact. The Porters Creek Formation represents a major change in lithologic character from the underlying two formations. It is beige in color, it is not calcareous, and it lacks organic matter.Such a major change in lithology is considered to represent a significant departure in depositional environments. Fine grained lithologies and the absence of

current induced sedimentary structures suggest that all three formations were deposited in a subtidal environment in waters deep enough not be affected by waves. Historically, the K-Pg Boundary is considered to be the contact between the Prairie Bluff and the ClaytonFormations in Mississippi. Typical characteristics of K-Pg Boundary such as a spherule-rich layer and featured indicative of tsunami deposits were not encountered in this location. The Upper Cretaceous Prairie Bluff limestone transitions in the Lower Paleocene Clayton Formationwithout any visible perturbation in sedimentological characteristics.

O6.22

10:00 THE TAXONOMY AND SURVIVORSHIP OF INDIGENOUS OSTRACOD FAUNAS AFTER THE CRETACEOUS/PALEOGENE EXTINCTION EVENT

Helena Jimenez-Elder, Mark Puckett

University of Southern Mississippi, Hattiesburg, MS

Moscow Landing in Sumter County, western Alabama, is one of the best exposures of the Cretaceous/Paleogene (K/Pg) event boundary in the southeastern U.S. The Cretaceous Prairie Bluff Chalk, the underlying Paleocene Clayton Formation, and the overlying Porters Creek Formation have a ~75 ft. thick section exposed on the banks of the Tombigbee River. The Porters Creek Formation is a Paleocene marine clay deposit formed after the K/Pg extinction event. Microfauna were extremely affected by this event; very few taxa survived into the Paleogene or quickly died out shortly after. At the time, western and southern Alabama was covered in a shallow retreating sea that was home to an abundance of ostracod species restricted to the North American coastal plain. Studying ostracod faunal assemblages gives insight to the paleoenvironment, paleoecology, evolution, and adaptations of microorganisms undergoing the aftermath of a mass extinction event. Five samples that were processed using hydrogen peroxide and the Glauber's salt technique were sorted and picked for well-preserved specimens. A total of 21 species belonging to 14 genera were identified. Some observed species are presumed to have gone extinct in the Early Paleocene shortly after the K/Pg event, such as *Brachycythere ovata,* supported by its last occurrence found in the second youngest sample, with no presence in the youngest. While some species of a genera went extinct, other species of the same genera, such as *Brachycythere formosa,* evolved directly after the K/Pg event. This may have occurred to fill a biological niche left open by other now extinct species.

10:20 BREAK

O6.23

10:40 PALEONTOLOGICAL INSIGHTS FROM A LIME QUARRY IN CLAY COUNTY, MISSISSIPPI

Natalya Usachenko[1], Renee Clary[1], George Phillips[2], Athena Nagel[1], Darrel Schmitz[1]

[1]Mississippi State University, [2]Mississippi Museum of Natural Science

This project focused on the preliminary investigation of Campanian-aged marine deposits within a lime quarry in Clay County, Mississippi. This site exhibits a very prominent stratigraphic exposure of alternating marl and chalk beds containing a dense assortment of shallow marine fossils. Numerous infaunal traces are present throughout the consolidated strata, and ferrous sulfide concretions are abundant throughout the site. No prior research has been conducted at this locality; thus, the goals of this study were to employ field and laboratory methods to produce a detailed description of the site's geology and faunal assemblages, confirm the site's general geochronological placement, and assess the extent to which preliminary inferences on the ecology and biodiversity within the paleoenvironment could be made. This project will additionally be used to develop an educational outreach report that can be used to help optimize public understanding of this area's paleoenvironment and its potential economic benefits to the community.

Fieldwork consisted of measuring the total thickness of the section, marking and measuring thicknesses of the lithologic intervals, and collecting sediment and fossil samples from each measured interval, as well as from the outwash at the base and the top of the section. Approximately one liter of sediment was also collected at 15cm intervals vertically up section. Powdered samples (~0.1 mg each) were collected from these bulk sediments to obtain $CaCO_3$ weight percentages and ratios of stable Carbon and Oxygen isotopes (^{13}C and ^{18}O) via stable isotope mass spectrometry. Collected fossils were brought back to Mississippi State University where taphonomic and systematic assessments were made. Various bivalves were observed, including remains of inoceramids and anomiids, and specimens of the genera *Exogyra, Pycnodonte, Arctostrea,* and *Acutostrea.* Several occurrences of specimens were notably encrusted to valves of separate specimens, and borehole traces were frequently observed on several valves. Although scarce, remains of fish and marine reptiles have been observed as well, confirming the presence of vertebrates in the paleoenvironment. Scanning Electron Microscopy - Energy Dispersive X-Ray Microscopy (SEM-EDX) were also utilized at this institution to analyze the composition and surface microstructures of the sediment, ferrous sulfide material, and fossil organisms. Current findings suggest that this locality had been a dense, relatively diverse benthic ecosystem in a mid- to outer-shelf environment that underwent multiple redox cycles.

O6.24

11:00 DESCRIPTION OF THE MOST COMPLETE DINOSAUR IN MISSISSIPPI: A HADROSAUR FROM AN EARLY CAMPANIAN LOCALITY IN THE COFFEE FORMATION, PRENTISS COUNTY

Derek Hoffman[1], Alyson A Brink[1,2], Dave Hanes[3], George Phillips[3]

[1] University of Southern Mississippi, [2] Sam Noble Oklahoma Museum of Natural History, [3] Mississippi Museum of Natural Science

Poorly associated or isolated fragmentary remains from nearly 90 dinosaurs have been reported from Mississippi. The most notable find is a partial hadrosaur (USNM PAL 175583), but a recent discovery (MMNS VP-12239) represents the most complete dinosaur (approximately 16%) discovered thus far. It has yet to be systematically described, but preliminary analysis of the post-crania suggests it is an adult hadrosaur. It also represents the first confirmed dinosaur from the Coffee Formation (early-late Campanian). Located approximately 5 miles east of Booneville, the Tolar-Stevens site is early Campanian in age. Sediments at this site have been lithostratigraphically correlated to a lower shale unit of the Coffee Formation in Lee County where the formation in general has better age-constraints using, in part, ammonite biostratigraphy. Other fauna from this location include an unknown pterotrigoniid, ammonites (*Menabites*), trionychid turtle shell fragments, shark teeth, bony fish remains and a juvenile hadrosaur dentary. This dentary, associated with the adult skeleton, suggests the presence of a potential hadrosaur nesting ground. These dinosaurs will not only shed light on ornithopod dinosaur distribution in the southeastern United States during the Late Cretaceous but will add to our understanding of dinosaur biogeography on the poorly studied landmass of Appalachia.

O6.25

11:20 GIS: HISTORICAL LAND USE, CONSERVATION AND FORESTRY

Chad Mackness

University of Southern Mississippi, Hattiesburg, MS

Knowing the historical structure and composition of forested or previously forested land is considered a key component of conservation. Every region, state, county, and township had differences in the soil and composition of the vegetation with the forested ecosystems. While these ecosystems may be similar within an area, each area has its historical structure and composition. Even with this knowledge, there has not been much study into how historical documents such as land surveys can be used to create an accurate picture of the pre-European settlement construction of the forests. So little has been done with the original surveyors' notes and documentation that very few of them are available digitally. This research started with scanning and creating digital copies of the original surveyors' notes and the methodology and best practices to ensure that the digital copies met the current standards for producing and protecting these historical documents. This includes transcribing these documents in a form that could be used to create tables and for use by the visually impaired. From the transcribed documents, the tables were made, and the points were plotted in ArcGIS Pro. A feature layer was produced of how the forests, soil, and vegetation were on the land at European Settlement. The sample used for this research project was the surveyors' notes from Wayne County, MS, in 1809 and 1810. The last stage of this research was to use this data along with the current landcover information to create a restoration and conservation plan for the forests to help have an impact on maintaining species diversity and mitigating human-induced climate change.

O6.26

11:40 OVERBANK SEDIMENT DEPOSITION PATTERNS AND RATES THROUGH HISTORICAL TIMEFRAMES IN HEAVILY MODIFIED FLOODPLAINS OF THE LOWER MISSISSIPPI RIVER: SHIPLAND WMA AND ST. CATHERINE CREEK NWR

Seth Fradella, Franklin Heitmuller, Timothy Black

[1]he University of Southern Mississippi, Hattiesburg, MS

The Lower Mississippi River has undergone extensive modifications over the last century, including construction of dams, dikes, and revetments as well as channel cutoffs and dredging to improve navigation and mitigate flood ha ards. However, the long history of channel modification and land use changes have resulted in unanticipated alterations to sediment regime, erosional and depositional patterns, and flood fre uency severity. Most notably, flood control levees restrict the batture to 10-30 of the natural floodplain area, greatly limiting hydraulic connectivity and sediment storage se uestration capacity. In recent years, Natche , MS, has experienced some of the highest river stages on record, with much longer and more severe inundation than Vicksburg, MS, for the same flood event. This graduate research pro ect seeks to analy e flood deposits and assess variation in sedimentary features through the overbank profiles at Shipland WMA (48 km northwest of Vicksburg) and St. Catherine Creek NWR (18 km southwest of Natche) using five 6-meter floodplain sediment cores from both locations in various depositional sub environments. Preliminary results reveal visibly traceable sedimentary features across the floodplains with apparent and correlative strata between cores at each site, which will be supplemented using grain si e, geophysical (ground-penetrating radar) and eventual geochemical techni ues (x-ray fluorescence, C-14, and Cs-13 Pb-210 dating). Research will assess whether there is temporal and spatial variability in the flood sediments between Shipland WMA and St. Catherine Creek NWR in the context of the previous hundred years of river modifications.

2:00

Student Awards , Business Meeting
2025 Chairperson Elections
(Attendance required for award or nomination)

Health Sciences

Chair: Lance Keller
University of Mississippi Medical Center
Chair: Maricica Pacurari
University of Mississippi Medical Center
Co-Vice-Chair: Judy Gordy
University of Mississippi Medical Center
Co-Vice-Chair: Lamar Hamil
Belhaven University
Program Coordinator: Olga McDaniel
University of Mississippi Medical Center
Member: Frank Spradley
University of Mississippi Medical Center
Member: David Gordy
Member: Merlin Margaret Manogaram

Thursday February 29, 2024
MORNING
Room TC 216

9:00 **Welcome**
Dr. D. Olga McDaniel

9:10-9:30 AM **Prelude to Symposium**
Speaker and Topic:
Dr. Merlin M. G. Manogaram,
Post-Doctoral Research Fellow,
School of Medicine, Department of Radiology
University of Mississippi Medical Center

"**New generation technology and disease diagnostics**"

9:35-9:40 (Break 5 minutes)

9:45-12:00 noon Symposium

Theme: "Technology and Telehealth"
Moderators:
Drs. Lance E. Keller and Maricica Pacurari
(Speakers information can be found in the section on Divisional symposia and Workshop)

9:45-10:15
Dr. Tristan Clemons
University of Southern Mississippi
"APPLICATION OF POLYMERS, FOR THE TREATMENT OF DISEASE AND INJURY"

10:20-10:50
Dr. Yufeng Zheng
University of Mississippi Medical Center
"**DEEP LEARNING TECHNOLOGIES FOR POPULATION HEALTH APPLICATIONS"**

10:55-11:25
Dr. Saurabh Chandra
Chief Officer of Telehealth
University of Mississippi Medical Center
"TELEHEALTH, ADVANTAGES AND CHALLENGES"

11:25-11:45 **Question and Discussion**

12:00 **General Session**

Thursday February 29, 2024
AFTERNOON
Room TC 216

1:00 -3:00 PM
Health Science Division Oral Presentations
Session I
Moderators: Drs. D. Olga McDaniel, Gary Lamar Hamil
University of Mississippi Medical Center and Belhaven University
Topics:
Population Health/Clinical Modeling/Diagnostics

1:00 Welcome
O7.01
1:05 ATTENTION AUTOENCODER FOR ELECTROCARDIOGRAM DENOISING

Wesley Chorney[1], Haifeng Wang[1], Lu He[1], Seunghan Lee[1], Lir-Wan Fan[2]
[1]Mississippi State University, Mississippi State, MS, [2]University of Mississippi Medical Center, Jackson, MS

Electrocardiograms play a crucial role in detecting cardiovascular diseases. However, the presence of diverse sources of noise, such as baseline wander, muscle artifact, and electrode motion, can obscure the heart signal recorded by various monitors. In this study, we introduce a groundbreaking algorithm known as Convolutional Denoising Autoencoder with Block Attention Module (CDAE-BAM) designed to effectively eliminate noise from electrocardiograms by harnessing attention mechanisms within a convolutional denoising autoencoder. Our proposed algorithm incorporates an attention block that encompasses both spatial and channel

attention. Spatial attention focuses on identifying relevant features within channels in a signal, while channel attention identifies the most pertinent channels in a signal. We assess the performance of our algorithm by applying it to electrocardiogram signals from the MIT-BIH Noise Stress Test Database, the QT Database, the Computing in Cardiology Challenge 2017 Database, and the Medical Information Mart for Intensive Care Database. Our results demonstrate that the proposed method surpasses eight other state-of-the-art approaches in terms of the sum of squared distances, mean absolute distance, and cosine similarity, affirming its effectiveness in noise reduction for electrocardiograms.

O7.02

1:15 CHEMICAL COMPOSITION ANALYSIS OF DEEP SOUTH URBAN AMBIENT PARTICULATE MATTER

Maricica Pacurari[1], Irmanecia Cox[2]

[1]Department of Biology, Jackson State University, Jackson, MS, [2]Environmental Sciences Program, Jackson State University, Jackson, MS

Introduction. Air pollution, particularly particulate matter (PM) in urban environments poses significant health risks to the exposed population. CDC data indicates chronic bronchitis and sinusitis are the height in the South. This research aims to determine whether urban PM from South of Jackson poses cytotoxic and genotoxic effects on lung epithelial cells.

Materials and Methods. The PM from South of Jackson collected on paper filters and then subjected to PBS extraction. The liquid extracts were analyzed using SEM and elemental analysis. Cytotoxicity was assessed using MTT cell viability assay. Genotoxicity was evaluated by measuring Comet assay. Also, we analyzed alterations in gene expression involved in inflammatory and oxidative stress to elucidate potential mechanisms driving cellular responses.

Results. PM SEM images indicate nano-size particles, and elemental analysis indicates the presence of elements such as C, Si, Fe, S, and N. A concentration-dependent cytotoxic response of lung epithelial cells exposed to urban PM was found. This research sheds light on the intricate cellular responses of lung epithelial cells to Deep South Urban Ambient PM. It highlights the potential health risks associated with exposure to air pollution

O7.03

1:25 1:25 DISPARITIES OF TRIPLE NEGATIVE BREAST CANCER IN MISSISSIPPI

Javaria Khan1, Jinghe Mao2, Diva Melvin2, Muhammad Hassan3, Xinchun Zhou3[1]School of Medicine, 1Department of Pathology, Mississippi Medical Center, 2Department of Biology, Tougaloo College, 3Department od Pathology, University of Mississippi Medical Center

Background: Triple-negative breast cancer (TNBC) accounts for about 10-15% of all breast cancers nationwide with disparities of incidence and outcomes among races, geographic locations, and other factors. This study is aimed to analyze the differences in the rate of TNBC, patient conditions at time of diagnosis, and death from TNBC among women in Mississippi.

Methods: A retrospective study was conducted to serially review breast cancer cases diagnosed in the University of Mississippi Medical Center during May 2016 to May 2023. The entire breast cancer population was then stratified by race. The rate of TNBC, age and BMI at time of diagnosis, the rate of expiration were compared between African American (AA) and Caucasian American (CA) women with breast cancer. Two-tailed Student's T-test was used to calculate the difference in mean values, and Chi-Square Test was used to compare the difference in rates or percentages. The significant p value was set at $p < 0.05$.

Results: In total 291 women with breast cancer, AA patients were 195 (67.01%), CA patients were 88 (30.24%), and other were 8 (2.75%). The mean age of all patients was 58.3 years-old ranged 24-97). The mean BMI was 31.19. The patients with TNBC were 109 (37.46%) in entire studied population. A total of 32 (1.6%) patients, including 14 TNBC and 18 non-TNBC were expired with an average age of 61.84 and an average survival time of 20 months from diagnosis to expiration. As compared to CA patient population, AA breast cancer patients had onset at younger age (58.08±0.88 vs. 59.18±1.36), had a higher BMI (31.79±0.62 vs. 28.25±1.05, p=0.017), higher percentage of TNBC (41.54% vs. 30.68%, p=0.082 and OR=1.605), and higher rate of expiration (11.28% vs, 9.1%). Also, as compared to CA expired patients with breast cancer, AA expired patients were higher in BMI (29.57 vs. 28.61), had shorter survival time (17.5 months vs. 19.4 months), and died at younger age (61.84-year old vs. 66.38-year old with more subtype of TNBC (54.6% vs 12.5%, p=0.045, OR=9.6).

Conclusions: Breast cancer is greatly disparate racially between AA and CA) and geographically between Mississippi and US national average. The disparities are manifested in the proportion of TNBC subtype, age at onset of breast cancer, BMI at time of diagnosis, and death rate.

O7.04

1:35 MaGNESIUM-DOPED HYDROXYAPATITE ANODIZATION COATINGS ON TITANIUM SOLID AND 3D PRINTED IMPLANT SURFACES.

Amisha Parekh, Amol Janorkar, Scott Williamson, Jason Griggs, Michelle Tucci, Sreenivas Koka, Michael Roach

The University of Mississippi Medical Center, Jackson, MS

With the population median age increasing, there is an increasing need to improve dental implant lifetimes. Recent studies have shown that one of the common causes of implant failures is loss of osseointegration due to poor bone quality. Plasma-sprayed hydroxyapatite coatings have been shown to improve osseointegration but are

known to exhibit weak adhesion strengths. Comparatively, anodized coatings containing hydroxyapatite have shown improved adhesion strengths. Magnesium containing coatings have also shown enhanced osteoblast responses. Titanium, a commonly used bone implant material is biocompatible but has higher elastic modulus compared to natural bone. This leads to stress shielding which can lead to bone resorption. 3D printed porous titanium lattices have lower elastic modulus compared to their solid counterparts. Additionally, the porous structure can further help improve bone ingrowth and osseointegration. The objective of the present study was to produce magnesium-doped hydroxyapatite oxides on titanium solid and 3D printed porous lattice surfaces using a single-step anodization process. Commercially pure titanium solid and 3D printed gyroid discs were anodized (n=3) using pulsed-galvanostatic waveforms in two proprietary electrolytes to produce magnesium-doped hydroxyapatite oxides on titanium. Optical microscopy, scanning electron microscopy (SEM), thin film X-ray diffraction (XRD), electron dispersive spectroscopy (EDS), and Fourier transform infrared (FTIR) spectroscopy, were utilized to characterize surface topography, crystallinity, and chemistry of the anodized oxides. SEM analysis of oxides on both solid and gyroid specimens showed hierarchical multi-scaled surface topographies. XRD analysis of solid specimens revealed combinations of tri-calcium phosphate and hydroxyapatite crystalline compounds in each oxide while that of gyroid specimens revealed comparatively higher intensity hydroxyapatite peaks. Furthermore, FTIR analysis revealed evidence of bone-like carbonated apatite formation as the characteristic hydroxyapatite OH- peak around 3600 cm-1 was substituted by carbonate peaks at 1450 and 1570 cm-1 in each oxide. EDS analyses showed the average surface calcium-to-phosphate ratios to be 2.1 and 2.2, and the corresponding magnesium dopant uptake levels to be 0.6% and 1.3% in the oxides produced from the respective solid and gyroid specimens. Finally, the solid specimens had a bi-layered oxide having total thickness values of less than 20µm whereas the gyroid specimens had a single layer oxide having total thickness values of about 150µm which was found to be varying throughout the specimen as a result of its structure. Hydroxyapatite coatings and magnesium dopants have each been shown to enhance osseointegration. Moreover, the comparatively lower stress shielding effect of the gyroid specimens in combination with their porous microstructure could further contribute to improving osseointegration. Our magnesium-doped carbonated apatite anodized oxides on both solid as well as gyroid specimens combine these previously successful strategies and show much promise for improving future implant outcomes.

Break 5 minutes

O7.05

1:45 ELUCIDATING THE MECHANISM OF INTERLEUKIN-17A SIGNALING IN THE PATHOGENESIS OF WEST NILE VIRUS

Farzana Nazneen[1], Biswas Neupane[2], Shazeed-Ul Karim[1], Fengwei Bai[1]

[1]The University of Southern Mississippi, Hattiesburg, MS, [2]University of Pittsburgh, Pittsburgh, PA

West Nile Virus (WNV), a mosquito-borne neurotropic flavivirus, is considered as one of the leading causes of viral encephalitis. Since its detection in 1999 in the United States (US), 56,569 patients were diagnosed with WNV infection with 2,773 deaths due to various forms of neuroinvasive complications. As WNV is endemic to 48 states of the US, a constant threat of sudden WNV outbreak remains. But no vaccine or therapeutic is available against WNV infection till now. Our lab previously reported that interleukin-17A (IL-17A) promotes WNV clearance by facilitating the cytotoxicity of CD8+ T cells. As IL-17A has therapeutic potential, it is important to understand the detailed mechanism of how IL-17A promotes cytotoxicity. Utilizing the IL-17A receptor C deficient (Il17rc-/-) mouse model, our preliminary studies showed that Il17rc-/- mice are more susceptible to WNV infection with higher viral load in brain and reduced cytotoxicity in WNV-specific CD8+ T cells. Thus, it is inferred that IL-17RC subunit is important for protection against WNV infection and IL-17A initiates its signaling utilizing the IL-17RC subunit to promote the cytotoxicity of CD8+ T cells. Data also showed that treatment with rIL-17A can increase the cytotoxicity in WNV-specific CD8+ T cells. Interestingly, we found a novel role of IL-17A signaling in activating the phosphatidylinositol-3-kinase/mammalian target of rapamycin (PI3K/mTOR) signaling pathway in CD8+ T cells in mRNA level which in turn increases metabolism in CD8+ T cells to cope-up with the higher energy demand. Thus, our results demonstrated a novel mechanism of IL-17A signaling in the pathogenesis of WNV.

O7.06

1:55 TRAINING COMMUNITY LEADERS: THE SIGNIFICANCE AND IMPORTANCE OF STUDENT-RUN, FREE CLINICS IN THE REALM OF MEDICAL EDUCATION (Graduate Student)

Areejah Umar, Muneebah Umar

University of Mississippi Medical Center, Jackson, MS, 2Mississippi State University, Starkville, MS

Student-run free clinics, though often overlooked, occupy a unique and vital space within the medical landscape. Operating with limited resources and staffed by dedicated volunteers, these clinics serve a two-fold purpose: they provide instrumental training to medical students and serve as beacons of hope for underserved populations.

By reviewing current literature, it becomes clear that medical education is enhanced when collaboration is fostered between medical schools and free clinics.

Through increased emphasis on this approach, we can cultivate a generation of empathetic and compassionate doctors while improving health outcomes for some of America's most vulnerable communities. Clinics such as the Jackson Free Clinic in Jackson, Mississippi, and the Tulane student-run clinics in New Orleans, Louisiana, exemplify this collaborative model, demonstrating the transformative power of partnerships between students and community-based organizations.

Expanding upon this ideal, we can create a healthcare system that is both equitable and effective, ensuring that all individuals, regardless of their socioeconomic status, have access to quality healthcare. Through the continued growth and support of student-run free clinics, we can empower future healthcare providers and foster a more just and equitable healthcare system for all.

2:05 5 minutes Break

Session II

Moderators:

Drs. Maricica Pacurari and Judy Gordy

Jackson State University and University of Mississippi Medical Center

Topics: Population Health/Mental Health/Social Life Style and Stress.

O7.07

2:10 THE PARADOX OF LONG COVID

M. S. Zaman[1,3], Amal K. Mitra[2], Suleyman Tufa[3]

[1]Alcorn State University, Lorman, Mississippi, [2]Jackson State University, Jackson, Mississippi, [3]South Texas College, McAllen, TX

Long COVID (LC), also known as post-acute sequelae of SARS-CoV-2 infection (PASC), is a puzzling and debilitating condition affecting some people after recovering from acute COVID-19 infection. The clinical spectrum of LC encompasses a wide array of persistent symptoms, including but not limited to fatigue, dyspnea, cognitive dysfunction (brain fog), chest pain, palpitations, and mental health disturbances, often lingering for weeks or months beyond the acute phase of the viral illness. Studies reveal extended COVID-19 persistence, with 42% testing positive beyond 14 days, 12% for 90 days, and 4% even after 7 months. Fatigue affects 93% post-infection, hindering 77.7% from prior activities, while cognitive dysfunction, malaise, and dyspnea persist in over half of cases. After 12 weeks, 32% experience fatigue, 22% cognitive impairment. Hospitalized patients suffer 92.9% fatigue at 79 days post-onset. A quarter may face impaired lung function for a year; 50% show fibrosis on CT scans. AKI occurs in 28-77%, leading to chronic kidney disease in 35%. Liver function abnormalities affect 28.4%, while diabetes and neurologic symptoms emerge post-recovery, affecting millions in the US. The prevalence and heterogeneity of symptoms pose challenges in the diagnosis and management of the disease leading to requiring a multidisciplinary approach for optimal care. While the mechanisms underlying LC remain obscure, possible factors include lingering virus effects, imbalanced or compromised immune responses, microvascular damage, and the dysfunction of the nervous system, which calls for further research to unveil its pathophysiology. Epidemiological studies reveal a possible variability in LC manifestations across different age groups, genders, and disease severities. Furthermore, LC poses significant socio-economic burdens and healthcare challenges, emphasizing the need for long-term healthcare and support services. This overview aims to comprehensively explore LC - exploring its clinical manifestations, epidemiology, pathophysiology, and implications for healthcare systems and affected individuals.

O7.08

2:20 COMPASSION SATISFACTION, BURNOUT, SECONDARY TRAUMATIC STRESS AMONG PHYSICAL THERAPISTS AND PHYSICAL THERAPIST ASSISTANTS IN MISSISSIPPI: A CROSS-SECTIONAL STUDY

Jacob Daniels[1, 2], Xiaoshan Z. Gordy[1, 2], Sherry T. Colson[1, 2], Kimberly Wilcox[2], Michael R. Brown[1, 2], Driscoll P. Devaul[1, 2], William C. Pannell[1, 2]

[1]Univeristy of Mississippi Medical Center, [2]Jackson, MS

Background: Compassionate care is an important component of quality healthcare. Compassion fatigue (CF) is common among healthcare providers. However, there are limited studies investigating components of compassion fatigue among physical therapists and physical therapist assistants. This study investigates the prevalence of compassion satisfaction (CS), burnout (BO), and secondary traumatic stress (STS) among physical therapists and physical therapist assistants in the state of Mississippi during the COVID-19 pandemic.

Methods : A cross-sectional descriptive survey approach was used to collect data from 187 licensed physical therapists and physical therapy assistants in Mississippi. The survey utilized the Professional Quality of Life (ProQOL) questionnaire to assess the participants' well-being and job satisfaction.

Results: The results showed that the mean scores of the ProQOL subscales indicated a majority of individuals experienced medium (55%) to high (44%) compassion satisfaction. Burnout scores were low (41%) to medium (59%) with no response recording a high burnout rating. A majority (99%) of participants reported medium (37%) to low (62%) secondary traumatic stress. There were some significant differences in the mean scores in relation to the participants' demographic characteristics. Age showed a significant positive association with CS (=2.724, p=0.011) but not BO (=-1.471, p=0.149) or STS (=-0.454, p=0.633). Being a male is negatively associated with STS (=-4.063, p<0.001) but not CS (=-0.779, p=0.483) or BO (=-1.222, p=0.252). Neither education

nor care type were significant predictors for CS, BO, and STS. Whether respondents worked overtime appeared to be a significant predictor for STS (=3.520, p<0.001) but not for CS (=1.043, p=0.321) or BO (=1.167, p=0.247).

Conclusions: The findings of this study suggest that physical therapists in Mississippi experienced both compassion satisfaction as well as burnout and secondary traumatic stress during the COVID-

19 pandemic. However, the degree to which each individual experienced these were dependent on various factors and not all were statistically significant. Age, sex, and corresponding experience level of the practitioner seemed to play the biggest role. The results of this study highlights individual factors that could increase a physical therapist or physical therapist assistants likelihood of developing compassion fatigue.

O7.09

2:30 INTERGENERATIONAL PERSPECTIVES ON CURRENT AND FUTURE PERCEIVED NEEDS AND CONCERNS FOR OLDER ADULTS AGING IN PLACE IN RURAL MISSISSIPPI

Porsha Brown, Muhammad Riaz

Alcorn State University, Lorman, MS

The purpose of this study was to investigate the current and future perceived needs and concerns of three generations in a family with an older adult aging in place in rural Mississippi. This mixed-methods study used snowball sampling in addition to recruitment by community leaders such as Extension agents to collect data through semi-structured interviews and structured questionnaires that asked about current and future problems among aging adults in rural communities in Mississippi. It also explored services needed to address current and future problems among aging adults in rural communities in Mississippi Three generations from the same family in rural Mississippi participated in the study. The sample included older adults (G1; n = 22), adult children (G2; n = 23), and young adult grandchildren (G3; n = 19). Quantitative data were analyzed using SPSS Statistics, while qualitative data were managed with MaxQDA. Physical and mental health concerns were identified across all three generations. Financial concerns, including paying for basics such as food, medical and health care costs, and transportation issues, were most often reported by the two younger generations rather than the older adults. Services that assist with caregiving of older adults, including respite care, home health, and adult daycare options, were identified as services G2 and G3 family members reported as families currently needed or anticipated to need soon. Implications of the findings for families, community leaders, policymakers, non-profit organizations, and for-profit businesses were included.

O7.10

2:40 MENTAL HEALTH PROBLEMS AMONG ADOLESCENTS AFTER COVID-19

Amal K. Mitra[1], Sinjita Dutta[2]

[1]Department of Epidemiology and Biostatistics, College of Health Sciences, Jackson State University, Jackson, MS, [2]Department of Community Medicine, Institute of Postgraduate Medical Education & Research, Kolkata, West Bengal, India

Introduction: According to the Centers for Disease Control and Prevention (CDC), several major mental health problems including feelings of persistent sadness and hopelessness, as well as suicidal thoughts and behaviors, increased by about 40% among young people in recent years. The problem is even worse among adolescents as a result of school closure and home confinement during COVID-19. The U.S. Surgeon General has warned that young people are facing "devastating" mental health effects as a result of the challenges experienced by their generation, including the COVID-19 pandemic.

Objective: In this cross-sectional study, we aimed to identify the risk of major mental illness such as depression and anxiety in adolescents as a result of COVID-19.

Methods: The study was conducted from March-June 2023 in rural communities with support from IPGME&R, Kolkata, India. Two study physicians collected data by household visits using a pretested questionnaire. Sample households (n = 350) were randomly selected from a list of all households. Participants were enrolled after taking informed consent. Data were analyzed using SPSS version 28.0. PHQ-9 and GAD-7 questionnaires were used for depression and anxiety, respectively. Based on the total numerical scores, depression was categorized into none-to-minimal (score, 0-4), mild (score, 5-9), moderate (score, 10-14), moderately severe (score, 15-19) and severe (score, 20 and more). Similarly, anxiety scores were categorized into minimal (score, 0-4), mild (score, 5-9), moderate (score 10-14), and severe (score 15 and more).

Results: Prevalence of depression and anxiety among adolescents were 31% and 25%, respectively. The prevalence of depression and anxiety was significantly higher (both p <0.001) among families having COVID cases and in families having COVID deaths. After multivariate regression analysis, a higher depression score and a higher anxiety score were significantly predicted by number of COVID-19 cases in the family, presence of any COVID-19 cases, and COVID-19 deaths in family, and were inversely proportional to the family income.

Conclusions: The study showed that the COVID-19 pandemic directly impacted adolescents' level of depression and anxiety.

Funding: The Fulbright-Nehru Academic and Professional Excellence Award 2022-2023, Department of State, United States.

O7.11

2:50 SOCIAL DETERMINANTS AND STROKE PREVALENCE IN MISSISSIPPI: INSIGHTS FROM THE 2022 BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (Graduate Student)

Minhazul Abedin,Benjamin H. Walker, Fazlay S. Faruque, Ph.D.

John D. Bower School of Population Health, University of Mississippi Medical Center, Jackson, MS

Introduction: Stroke stands as a prominent cause of mortality in Mississippi, with the state recording the highest annual death rate (57.6/1,000 population) in the nation, according to 2021 CDC estimates. This research aims to estimate the prevalence of stroke and assess the impact of social determinants of health on stroke incidents within the Mississippi adult population in 2022.

Methodology: Utilizing data from the 2022 Behavioral Risk Factor Surveillance System (BFRSS), a nationally representative cross-sectional survey, this study focuses on the adult population of Mississippi, segregated from the overall dataset. Employing CDC statistical guidelines, a summary measure for social determinants of health (SDOHs) was constructed from 10 determinants, categorizing respondents based on exposure to at least 1, 2, 3, or 4 or more SDOHs. The study estimated the weighted prevalence of stroke and employed a logistic regression model to identify correlates of stroke in Mississippi, with all findings presented alongside their 95% confidence intervals and a significance level of $p < 0.05$.

Result: In 2022, the weighted prevalence of stroke among adults in Mississippi was 4.54% (95% CI: 3.80 – 5.42). Noteworthy is the finding that approximately 37% of individuals with a history of stroke had been exposed to at least one social determinant of health (SDOH), with 25% experiencing exposure to multiple SDOHs. Individuals exposed to three SDOHs exhibited 1.3 times higher odds of stroke (95% CI: 1.1-1.5, p=0.007), while those exposed to four or more SDOHs faced a 1.9 times increased likelihood of stroke compared to those without any exposure (95% CI: 1.7-2.2, p=0.000). Significant associations were observed with age, with individuals in the 45–64-year and 65 and older age groups exhibiting 3.8- and 6.7-times higher odds of stroke, respectively, compared to the 18-44 years age group. Black adults demonstrated 1.2 times higher odds (95% CI: 1.1-1.4, p=0.000) compared to white adults. Lower household income levels (< $15000) were associated with elevated odds (OR=3.0, 95% CI: 2.5-3.5, p=0.000), as were income ranges of $15000-$25000 (OR=2.4, 95% CI: 2.1 -2.9, p=0.000), $25000-$35000 (OR=2.0, 95% CI: 1.1-3.0, p=0.000), and $25000-$35000 (OR=1.5, 95% CI: 1.3-1.7, p=0.000). Marital status also played a role, with being married associated with 1.2 times increased risk (95% CI: 1.1-1.4, p=0.001), while divorced/widowed/separated adults had 1.4 times higher odds of stroke compared to single adults (95% CI: 1.3-1.7, p=0.000). Interestingly, education did not emerge as a significant predictor for stroke in our analysis.

Conclusion: This study finds that stroke is concerningly prevalent within Mississippi and there exists a significant association between a higher risk of stroke and multiple exposures to social determinants of health (SDOHs). It emphasizes the imperative need for targeted interventions addressing SDOHs to mitigate the impact of strokes in the state. This is particularly crucial for vulnerable demographics, including the aged black population, individuals who are ever-married, and those belonging to lower-income group.

O7.12

3:00 HEALTH CONDITIONS AND COVID-19 MORTALITY TRENDS IN THE SOUTHERN UNITED STATES: A STUDY FROM 2020-2023 (Graduate Student)

Ebele Okoye1, Dr. Amal Mitra1, Jallah .M. Kennedy PhD2, Omar Dibba3

1Jackson State University, Jackson Mississippi, 2Road to Health, Galloway, New Jersey, 3Public Health AmeriCorps, Bronx, New York

The COVID-19 pandemic has presented a significant global health crisis, impacting populations worldwide in varying degrees of severity. Within the United States, the Southern region has emerged as a focal point, experiencing distinctive challenges in managing the spread and impact of the virus. Amid the complex landscape of the pandemic, the Southern region has faced distinct challenges, necessitating a thorough exploration into the factors influencing mortality trends. This study investigated the underlying health conditions that have contributed to COVID-19-related deaths in the Southern region of the United States during the period spanning 2020 to 2023. Focusing on prevalent health indicators such as obesity, diabetes, cardiovascular diseases, respiratory illnesses, immune disorders, hypertension, and kidney disease within the Southern demographic. Secondary data were used for this study. Through an analysis of demographic data and health indicators, the study revealed an association between the aforementioned health conditions and the observed mortality trends. This study will contribute to a deeper understanding of COVID-19 mortalities in the Southern United States, facilitating the development of tailored targeted interventions and strategies aimed at mitigating the impact of the virus within the Southern United States.

3:15 Health Science Division Business Meeting

Thursday, February 29, 2024
EVENING

3:30 DODGEN LECTURE/ AWARDS CEREMONY
THEATER
5:00 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

A RETROSPECTIVE STUDY ON THE DISPARITIES OF HEPATOCELLULAR CARCINOMA IN STRATIFIED SUBPOPULATIONS

Barrett Aldridge[1], Nazar Rahmanov[2], Zhirong Liu[2], Jinghe Mao[3], Neha Varshney[2]

[1]School of Medicine, University of Mississippi Medical Center, [2]Department of pathology, University of Mississippi Medical Center, [3]Department of Biology, Tougaloo College

Background: Hepatocellular carcinoma (HCC) is the most common type of primary liver cancer in adults and the third leading cause of cancer-related deaths worldwide. Studies report that the incidence of, and mortality from HCC vary significantly by age, sex, and race/ethnicity; however, disparities in the expression level of tumor biomarkers, liver functions, lipid profiles, and comorbidities have not been thoroughly investigated among subpopulations of patient with HCC.

Methods: A retrospective study was conducted to review 247 serial HCC cases enrolled in the University of Mississippi Medical Center during June 2000 to May 2023. The entire HCC population was stratified into subpopulations by race, gender, age and BMI. Then comparisons were performed between two corresponding subpopulations in the expression level of HCC-related biomarkers including Alpha-FP, liver functions including albumin, ALT, AST, and ALP, plasma lipid profiles including cholesterol, and comorbidity conditions including cirrhosis in benign liver tissues, smoking, alcohol using, and illness with viral hepatitis. Two-tailed Student's T-test was used to calculate the difference in mean values, and Chi-Square Test was used to compare the difference in rates or percentages. The significant p value was set at $p < 0.05$. Results: In total 247 HCC cases, males were 178 (72.1%) and females were 69 (27.9%) with a male to female ratio of 2.6:1; black patients were 108 (43.7%), white patients were 127 (51.4%), and others were 4.9%. The mean age was 59.6 years and mean BMI was 27.04. AFP was the only one of detected tumor biomarkers showing disparities: it was significantly higher in patients of male ($p=0.026$), younger age ($p<0.0001$), lower BMI ($p=0.039$), smokers ($p=0.0325$) and illness with viral hepatitis ($p=0.0007$). Disparities in liver functions included: 1) AST was significantly higher in Black HCC patients ($p=0.027$); 2) no statistical difference of liver functions in gender; 3) younger HCC patients had significantly lower level of Albumin ($p=0.006$), and higher levels of ALT ($p=0.014$) and AST ($p=0.0032$); 4) HCC patients with lower BMI also had lower level of Albumin ($p=0.015$), and higher levels of AST ($p=0.0480$ and ALP ($p=0.0057$). There was no statistical difference of plasma lipid profiles between subpopulations, Black HCC patients except that Black HCC patients had significantly higher levels of cholesterol ($p=0.0006$) and HDL ($p=0.048$). In comorbidity, Black HCC patients had higher rates of alcohol using and existence of cirrhosis; and male HCC patients had higher rates of smoking, alcohol usage and viral hepatitis.
Conclusions: HCC patients are greatly disparate in the expression level of tumor biomarkers, liver functions, plasma lipid profiles and comorbidity conditions between subpopulations stratified by race, gender, age and BMI. These results could provide useful information for clinical management and prognosis of patients with HCC.

P7.02

COMPASSION SATISFACTION, BURNOUT, AND SECONDARY TRAUMATIC STRESS AMONG RESPIRATORY THERAPISTS IN MISSISSIPPI: A CROSS-SECTIONAL STUDY

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The COVID-19 pandemic had an immense effect on the well-being of healthcare professionals. In this study, researchers utilized a quantitative cross-sectional study design to investigate the degree of compassion satisfaction and fatigue amongst respiratory therapists in the state of Mississippi as a result of providing care to patients during the COVID-19 pandemic. Quantitative data were collected using an anonymous online survey that assessed the well-being and satisfaction of licensed respiratory therapists in the state of Mississippi. More specially, survey responses ($n = 326$) were quantitatively evaluated to measure the association between demographic variables and compassion satisfaction (CS), burnout (BO), and secondary traumatic stress (STS). Ninety-seven percent of participants reported a medium to high CS level, while 74% indicated having a medium to high level of BO, and 69% reported a medium to high level of STS. Neither age nor gender had a significant difference in CS ($p = 0.504$; $p = 0.405$), BO ($p = 0.161$; $p = 0.285$), or STS ($p = 0.145$; p

= 0.252). Those working for more than 10 years at their current employer had higher CS (M=38.7) and lower BO (M=24.9) and STS (M = 24.8) scores. The number of hours worked, specifically overtime, had a significant impact on BO (= 0.09, p = 0.028) and STS (= 0.0.11, p = 0.019), but not CS (= 0.02, p = 0.655). These findings suggest that the number of years employed in the field impacts the level of compassion satisfaction and contributes to lower levels of burnout and secondary traumatic stress. The age of a patient may also affect levels of compassion and burnout. The results of this study highlight the importance of developing incentive plans in an effort to retain employees.

P7.03

MOLECULAR TOOLS FOR DETERMINATION OF POST-TRAUMA INJURY COMPLICATIONS

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Background: An assessment of applying transcript level of genes with differential expression and influential variability are powerful tools for sepsis biomarker determination during post trauma injury evaluation. Clinical characteristics associated with sepsis in combination with molecular markers are valuable tools to derive informative gene subsets for early determination and prediction of disease. Sepsis is a life-threatening response of the immune system to trauma induced complications which can potentially lead to tissue damage, organ failure, and death. Numerous risk factors in the context of inflammatory parameters such as Toll-like receptor signaling genes and cytokines contribute to an early inflammatory response to the damage associated molecular patterns (DAMPs) or pathogens associated with trauma injury. Methods: A panel of candidate risk factors associated with the innate immune response genes were evaluated using blood from trauma patients within the first 72 hours upon the admission to surgical intensive care unit (SICU). Leukocytes including monocytes/macrophages and neutrophils for mRNA transcript analysis of cytokines, and the TLR-signaling pathway genes (GEARAY protocol) were tested. The expression was confirmed by quantitative PCR and plasma specimen from patients by ELISA. Results: The study confirms an early upregulation of the innate immune response through monocytes/macrophages, extends to neutrophil functional dynamics. TLR-2 and TLR-4 transcripts were significantly increased comparing day 1 vs. day 3 in patients who later developed sepsis. The CD86 an HLA-Class II receptor molecule on monocytes and macrophages significantly increased in patients who later developed sepsis. The IRAK-1, a major mediator of the TLR-signaling pathway was reversibly increased (2.0- fold) in patients with sepsis vs. no sepsis. TOLIP gene, a Toll-like receptor inhibitory protein, also known as Cox-2 gene was increased 4-fold in patients with no sepsis. A hypothetical evaluation framework for risk factor assessment was developed. An accumulative score of >70% was considered a potential for determining the development of sepsis. Conclusions: Trauma induces first line of immune activation in macrophage/ monocyte series. This data support correlation between TLR-signaling molecules with the expression of pro-inflammatory cytokines in trauma induced sepsis. The performance of gene selection model by using genome wide arrays is likely to provide a broader dataset. An evaluation framework of risk factors is a useful tool for prediction of sepsis development.

P7.04

MACHINE LEARNING-BASED PATTERN ANALYSIS OF PERINATAL INFLAMMATION INVOLVEMENT IN HOMEOSTATIC RESPONSES TO SLEEP DISTURBANCES AND ATTENTION-DEFICIT/HYPERACTIVITY DISORDER (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. The objective of this study was 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. Histological

and molecular assessments for brain inflammation and neuronal damage were performed at P49. To ensure scientific rigor, molecular assays and histological assessments were evaluated in triplicate, and the sample sizes were calculated to reach a statistical power of at least 0.85 for a $p<0.05$. Data were analyzed by two-way ANOVA followed by the Student-Newman-Keuls test. 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. Additionally, LPS exposure induced brain changes at P49 depicted by chronic microglia (Iba1+) activation and loss of TH+ neurons in the locus coeruleus, and chronic astrocyte (GFAP+) activation and loss of immature neurons (DCX+) in the hippocampal dentate gyrus. 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.

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P7.05

AN EXPLORATION OF THE QUALITY OF ACADEMIC LIFE (QOAL) AMONG FACULTY IN MISSISSIPPI'S EIGHT FOUR-YEAR PUBLIC INSTITUTIONS AND ONE ACADEMIC MEDICAL CENTER OVER THE COVID-19 PANDEMIC ERA

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Background: Higher education institutions, including academic medicine, are experiencing significant transformation and financial strains. Work-related stress (WRS) and burnout among faculty members have increased due to these pressures, including growing productivity expectations, shrinking grant funding, increased teaching loads, and transitioning to fully online or virtual teaching. AMC faculty burnout has been linked to poor student engagement, early retirement, decreased research output, reduced patient outcomes and patient satisfaction, and diminished teaching quality, putting the higher education system under further financial strain. As a result, investigating faculty quality of academic life (QOAL) in Mississippi's four-year public institutions may aid administrators in identifying measures to improve faculty QOAL and reduce burnout and WRS. Objective: This study explored the QOAL among faculty in four-year public institutions in Mississippi, which includes clinical and non-clinical faculty employed by the state's only academic medical center. This study explored faculty resilience, well-being, positive meaning of work, general health, motivation, perceived stress, burnout, and role overload, as well as satisfaction with support services, using the Brief Resilience Scale, WAMI, Perceived Stress Scale, Reilly's Role Overload Scale, Kessler Psychological Distress Scale, An Index of Job Satisfaction, the MBI: EE, COPE, and the UCLA Loneliness Scale. Methods: Surveys were distributed to approximately 4,337 (1056, 24.35%) and 4,322 (546, 12.63%) full-time faculty among nine members of the Institutions of Higher Learning (IHL) of Mississippi, including the state's only academic medical center, through each institution's academic affairs office. Data were collected through web-based surveys using REDCap. Responses were received from a total of 1,602 faculty (373 AMC faculty; 23.2%) in two phases: Phase I data were collected from 1,056 faculty (221 AMC faculty, 20.9%) in the spring of 2018 as is considered pre-COVID-19, and Phase II data were collected from 546 faculty (152 AMC faculty, 27.8%) and is considered post-COVID-19.

Key Findings: Findings included the core theme that while over 88% of Mississippi's AMC faculty perceived feeling at least good about their overall health, over half (53%) reported feeling overloaded in their role, and nearly half (38% avg.) affirmed symptoms of burnout. In addition, AMC faculty reported increased feelings of meaningful work and better general health from 2018 to 2022; however, it indicated an increase in psychological distress (5% avg.) and perceived stress (6% avg.) and a decrease in job satisfaction (5% avg.) and resilience (2% avg.). Over half (55.34%) enjoy their work, and just under half (44.67%) report burnout or symptoms of burnout.

P7.06

IMPACTING THE KNOWLEDGE OF TOBACCO-RELATED HEALTH RISKS AND INTENTION TO QUIT TOBACCO USE AMONG AFRICAN AMERICAN COLLEGE STUDENTS IN MISSISSIPPI: A PILOT STUDY (Graduate Student)

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Background: Tobacco remains a leading cause of preventable disease and death in the United States, posing a severe public health concern. Tobacco use is associated with cardiovascular diseases, with a significant cardiovascular disease burden disproportionately seen

among African Americans. In Mississippi, the prevalence of tobacco use among young adults is alarming and the college environment creates opportunities for tobacco initiation and experimentation. Data examining the intention to quit tobacco use among college students in Mississippi is limited. This study aimed to increase participants' knowledge of the health risks associated with tobacco use and intention to quit tobacco among African American college students in Mississippi.

Methods: The study employed a quasi-experimental design, utilizing pre- and post-surveys from 55 participants without randomization. Participants were African American college students in Mississippi aged 18-30 years and residing in an on-campus dormitory of a university. An educational intervention was provided in March 2023, spanning four weeks. Paired Sample T-test was used to conduct this analysis.

Results: Findings indicated no significant increase in knowledge regarding the health risks of tobacco (p=0.513) and no significant changes in the intention to quit tobacco use (p=0.083) among participants. Additionally, no significant change was observed in participants' confidence levels regarding their ability to quit smoking (p=0.051).

Conclusion: As the sample was not targeted to African American college students using tobacco products, future studies should utilize a longer intervention and sample of targeted African American students for examining changes in knowledge on tobacco related health risks and intention to quit tobacco.

P7.07

MARIJUANA USE AS AN INDEPENDENT PREDICTOR OF "ATTEMPTED SUICIDES" IN ADOLESCENTS- INSIGHTS FROM THE 2021 ADOLESCENT BEHAVIORS AND EXPERIENCES SURVEY (Research Fellow)

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Background: Substance use disorder is a major public health crisis in adolescents in the USA. Research indicates that the legalization of marijuana, as a potential solution to the opioid crisis and a social justice reform for people, has resulted in frequent use of marijuana and an increased risk of cannabis use disorder in adolescents. Marijuana users are at an increased risk of mental health problems such as depression, social anxiety, psychosis and schizophrenia. Very limited data is available on the use of marijuana and suicidality in adolescents, given the burden of suicide in this age group. **Method:** We analyzed data from the 2021 Adolescent Behaviors and Experiences Survey (N= 7,705). We determined the prediction of attempted suicide using proc multiple survey logistic regression after adjusting for covariates. The adjusted odds ratio (aOR) with 95% CI was reported to predict attempted suicide**. Results:** Prevalence of current marijuana use, depression, and attempted suicide was 12.8% (CI: 11.0-14.6), 44.1% (CI: 41.5-46.8), and 9.0% (CI: 7.6-10.4), respectively. The aOR of attempted suicide with current marijuana use was 2.0 (CI: 1.4-3.0) after controlling for gender, electronic vapor use, current alcohol consumption, and depression. **Conclusion:** Our results show that marijuana use is an independent predictor of "attempted suicide "in adolescents. Our results are concerning for adverse public health impacts of cannabis legalization and carry crucial implications for optimizing substance use prevention and treatment to prevent unintended harm to public and tailoring suicide prevention strategies in adolescents.

P7.08

EFFICACY OF PROPHYLACTIC ANTIBIOTICS IN PREVENTING INFECTIOUS POST-ERCP COMPLICATIONS IN PATIENTS WITH PRIMARY SCLEROSING CHOLANGITIS: A NATIONWIDE STUDY (Graduate Student)

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Background/Aims: The American Society for Gastrointestinal Endoscopy recommends the use of prophylactic antibiotics to prevent post-ERCP infections in primary sclerosing cholangitis (PSC) patients, despite limited recent literature support. We assessed the effectiveness of this approach in a large, nationally representative cohort of patients with PSC. Methods: Using data from the 2016-2020 Nationwide Inpatient Sample and relevant ICD-10 codes, we analyzed adult hospitalizations for patients with PSC who underwent ERCP with and without the use of preprocedural antibiotics. Stepwise multivariable logistic regression analysis was used to assess the association between prophylactic antibiotics and infective post-ERCP outcomes.

Results: We included 42,972 hospitalizations for PSC, with 12,891 patients (30%) receiving antibiotics and 30,081 (70%) as controls. The mean age of the cohort was

64.2 years (SD: 3), predominantly comprising males (58.5%) and White Americans (65.3%), most of whom had a moderate comorbidity burden (69.5% with a Charlson score of 2 or less) and were hospitalized at urban teaching hospitals (82.9%). Following prophylactic antibiotic administration, we recorded 687 cases of post-ERCP sepsis (compared with 816 in controls), 971 cases of acute cholangitis (vs. 2,009 in controls), and 408 cases of acute pancreatitis (compared with 3,459 controls). After adjusting for patient- and hospital-level covariates, antibiotic prophylaxis did not significantly reduce the likelihood of post-ERCP sepsis (adjusted Odds Ratio [aOR]: 0.85; 95% CI: 0.77 - 1.09; P=0.07), or acute cholangitis (aOR: 0.87; 95% CI: 0.98-1.45; P=0.08). However, it was associated with a lower risk of acute post-ERCP pancreatitis (aOR: 0.61; 95% CI: 0.57-0.66; P<0.001).

Conclusion: The use of antibiotic prophylaxis did not improve the odds of infectious post-ERCP complications, except acute pancreatitis, in patients with primary sclerosing cholangitis.

P7.09

PERSISTENT GENDER AND RACIAL DISPARITIES IN DEPRESSIVE SYMPTOMS AND SUICIDAL TENDENCIES AMONG US ADOLESCENTS OVER TWO DECADES: RESULTS FROM YOUTH RISK BEHAVIOR SURVEILLANCE SYSTEMS: 1999-2019 (Graduate Student)

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Background: Depression is the fourth leading cause of morbidity and accounts for 10% of total non-fatal disease burden globally. 50% of mental disorders initiate in adolescents. Overlooking depressive symptoms in adolescents leading to worst outcome like suicide, the second leading cause of death among US teens. Prevalence of depression among females is almost double to male reflects the gender disparities. Racial/ ethnic disparities in adult depression were examined in many studies. There is limited data available regarding gender and racial disparities among US adolescents.

Objective: Aim of the study to investigate the trend of the depressive symptoms and suicidal tendency among US adolescents over 20 years by gender and race.

Methods: Data from Youth Risk Behavior Surveillance System by CDC were extracted and analyzed from 1999-2019 using SPSS complex sample module version 29.0. Depressive symptoms and suicidal tendency were assessed using survey questions “sad or hopeless”, “considered suicide”, “made a suicide plan” and “attempted suicide”. Crosstab analysis was performed to establish the associations of depressive symptoms and suicidal tendency by sex and race. **Results:**A total sample size 159,804. Among participants 48.9% were female and 51.1% were male adolescents. 60.8% White, 13.8% African American, 16% Hispanic/ Latino and 9.4% other races participated in study. The overall prevalence of depressive symptoms and suicidal tendencies (considered suicide, planned, attempted suicide) 29.4%, 16.8%, 13.7%, and 8.6% respectively. Female adolescents had almost double the prevalence rate than their male classmates. Hispanic/Latino and other races had highest prevalence of depressive symptoms and suicidal tendencies throughout the last two decades. 45.2% Hispanic female and 25.5% Hispanic male adolescents had depressive symptoms. 14.5% female adolescents from other races attempted suicide (once to six or more times). **Conclusion:** Health policies, future research and mitigation supports should be focused to reduce gender and racial disparities to curb the depressive symptoms and suicidal tendency among teens to prevent future epidemic.

P7.10

HEALTH HAZARDS OF ESCALATING TEMPERATURES IN MISSISSIPPI: VULNERABLE POPULATIONS

(Graduate Student)

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Introduction: The Environmental Protection Agency states that heat is the leading weather-related killer in the United States; however, most heat-related deaths are preventable through outreach and intervention (2006). Previous research has shown that extreme heat can worsen existing health conditions and has been linked to increased mortality and hospitalizations. Additionally, people living in the Southern U.S. States, such as Mississippi, will likely face some of the most dramatic changes over the next several decades. Understanding the health risks associated with rising temperatures is crucial for informing public health interventions and policy decisions. The purpose of this study is to investigate the health risks of rising heat in Mississippi and its impact on vulnerable populations. **Methods:** This cross-sectional study used retrospective data from the Research Data Warehouse containing de-identified patient data (>1,000,000 individuals) from all University of Mississippi Medical Center hospitals and clinics. Patients with a medical encounter for heat-related illness from January 2018 to December 2022 were included. International Classification of Diseases, Tenth Revision (ICD-10) codes were used to determine diagnosis of heat-related illness of a natural cause. Patients with a heat illness diagnosis of man-made origin were excluded. Use of this database does not meet the definition of human subject research (45 CFR 46) and does not require institutional review board approval. **Results**: A total of 805 patients with a natural heat-related encounter in Mississippi were included (median age, 35 [IQR, 18-53] years >1-87; 185 [22.98%] female; 492 [61.12%] black; 271 [33.66%] white; 17 [2.11%] Hispanic or Latino). Of

988 total encounters, the most common ICD-10 diagnosis codes were heat exhaustion (T67.5XXA): 22.86%, heat syncope (T67.1XXA): 22.73%, effect of heat and light (T67.9XXA): 10.56%, and exposure to excessive natural heat (X30.XXXA): 8.57%. Payment of medical expenses was majorly self-pay (31.18%), Medicaid (20.99%), or Blue Cross & Blue Shield (12.92%). The average hospital length of stay was 3.26 days (SD=4.34). Among these patients, 15 were reported to have died. Acute kidney failure (n=27) and rhabdomyolysis (n=12) were the most common comorbid conditions.**Conclusion:** This exploratory research revealed the most exposed population to natural heat-related illness are middle-aged, black men, contradicting other studies that reported the highest rates of heat mortality among white males. In addition, older adults are typically seen as high risk, but our research found that middle-aged adults are more often admitted for heat-related illnesses in Mississippi. These findings suggest that region-specific methods need to be designed to tackle heat-related illnesses and mortality. Heat-related illness was found to impact those paying out of pocket for medical expenses at higher rates, indicating those potentially without health insurance. Additionally, this research emphasizes creating protocols to deal with environmental heat for those with kidney failure and rhabdomyolois. While these statistics likely underreport the actual number of patients admitted for heat-related incidences in Mississippi, it highlights the significance of physician's recognizing the role of environmental heat in patient health outcomes. This research will guide policymakers and public health officials to develop strategies that promote the resilience of vulnerable populations in escalating Mississippi temperatures.

P7.11

DENGUE FEVER EPIDEMICS AND THE PROSPECT OF A VACCINE (Graduate Student)

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Dengue fever, a global health concern, poses severe risks and has led to the exploration of vaccines as a preventive measure. This systematic review and meta-analysis evaluated the efficacy, immune response, and safety of dengue vaccines in children through an analysis of clinical trials. The review followed PRISMA guidelines, searching databases for studies focused on dengue fever and vaccine potential. Eligible studies involved children (0-17 years), emphasizing vaccine efficacy, immune response, and safety. Cochrane Collaboration criteria assessed study quality, with thematic data synthesis and meta-analysis. Among 38 selected studies, dengue vaccines showed varying efficacy against all four serotypes. CYD-TDV and Takeda vaccines demonstrated strong protection against severe dengue, but their long-term efficacy varied. Vaccines triggered satisfactory immune responses, notably in those previously exposed to dengue. Safety profiles were mostly favorable, noting mild adverse events post-vaccination. Meta-analysis supported vaccine efficacy and immune response, but safety concerns warrant further exploration. Dengue vaccines demonstrated promising efficacy and immune response, particularly against severe manifestations. While generally safe, mild adverse events were observed, signaling the need for continued safety assessment.

P7.12

SIGNET RING CELL CARCINOMA OF THE COLON IN A 12-YEAR-OLD CHILD (Graduate student)

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Signet ring cell carcinoma of the colon, a rare aggressive tumor, is documented in the adult population, but has very low incidence in pediatric patients. A 12-year-old male presented with 2 months of persistent diarrhea, nausea, and unintentional weight loss. Imaging of the abdomen showed circumferential thickening and mucosal hyperenhancement of the colon and terminal ileum, enlarged abdominal or retroperitoneal lymph nodes, and sclerotic osseous lesions. Colonoscopy showed flat, thickened, circumferential, conical lesion leading into the stricture and distorted lumen. Subsequent biopsy of the descending colon revealed poorly differentiated signet ring cell carcinoma (Figures A. and B.) with immunohistochemical stain positive for CK20 (Figure C.) and SATB2 (Figure D.). While negative for CK7, staining for e-cadherin was retained in the tumor. This immunostaining profile favors a colorectal primary. The rarity of signet ring cell carcinoma in children represents a diagnostic challenge leading to delays and poorer prognosis as seen in this patient who presents late with metastases. This patient has a strong family history of cancer, and results to molecular and genetic testing are pending.

P7.13

LUPUS PERNIO WITH UNREMARKABLE PULMONARY FINDINGS: A CHALLENGING CASE OF SARCOIDOSIS

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Sarcoidosis is a multisystem disease that affects the skin, as well as the pulmonary, ophthalmologic, cardiovascular, musculoskeletal, and endocrine systems. Lupus pernio is a prominent dermatologic manifestation of sarcoidosis, characterized by indurated, reddish-purple papules and plaques affecting the tip of the nose and nasal ala, cheeks, and ears. We present a case of lupus pernio in a 63-year-old African American female. The diagnosis of systemic sarcoidosis was delayed due to the absence of characteristic systemic features of sarcoidosis, such as

dyspnea and an elevated ACE level. The presence of lupus pernio led to a skin biopsy demonstrating epithelioid granulomas. An elevated chitotriosidase level confirmed the diagnosis.

P7.14

HISTOLOGIC SPECTRUM OF CHONDROSARCOMA; A CASE REPORT (Graduate Student)

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Background: Dedifferentiated chondrosarcoma is a rare aggressive variant of chondrosarcoma with a poor prognosis. Approximately 10-15% chondrosarcomas develop dedifferentiated component with 90% involving the femur, pelvis, humerus, or scapula.

We report a case of a 30-year-old female with a history of hereditary multiple exostoses, pathologic fractures recently status-post biopsy for spinal tumor with epidural metastasis who presented with a left scapular mass. Physical exam revealed tenderness to palpation and restricted range of motion due to pain. MRI showed a large, lobulated mass and osseous destruction of the left scapular body with an additional lesion seen in the left humeral head (Figure B). Initial biopsy of the mass revealed hypocellular hyaline cartilage without bone invasion, cytologic atypia or necrosis. The differential diagnosis included enchondroma, low-grade chondrosarcoma. Wide resection of the scapula and humerus was performed for pain relief, and diagnostic clarity. Grossly, a tan-white lobulated mass with adjacent tan-brown mass, measuring 16cm total was identified in the scapula (Figure A). Additionally, a well circumscribed area was noted in the humeral head (Figure A). Macroscopically, mass involved muscle and bone. Microscopically, low to moderate grade chondrosarcoma was noted juxtaposed with abrupt transition to high grade pleomorphic sarcoma (Figure C, D). Metastatic focus of dedifferentiated component was identified in humeral head. Two of seven lymph nodes were positive for metastases with greatest focus of 2.5cm with extracapsular extension. Our case illustrates necessity of thorough sampling with correlative clinical and radiographic findings in cases of cartilaginous tumors.

Topics:
Clinical/Diagnostics/Molecular/Technology/Therapeutics

(Undergraduate Students)

P7.15

FINITE ELEMENT MODELING OF COLLAGEN BEAM DEFORMATIONS IN THE POSTERIOR EYE IN RESPONSE TO INCREASED INTRAOCULAR PRESSURE

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Glaucoma is a leading cause of blindness and vision impairment worldwide. Elevated intraocular pressure (IOP) is a primary risk factor. In this disease, damage to the axons of retinal ganglion cells begins at the lamina cribrosa (LC). The LC is a complex collagen network located within the optic nerve head in the back of the eye, and it provides mechanical support for the axons passing through the structure. The relationship between the damage of retinal ganglion cell axons and elevated IOP is yet to be fully understood. It is hypothesized that elevated IOP induces deformations of the collagen beams in the LC, subsequently affecting the adjacent axons and resulting in axonal damage. To test this hypothesis, it is critical to understand the deformations of LC collagen beams under elevated IOP, which is the goal of this work.

To achieve this goal, we will construct a 3D generic model representing the collagen network of the LC and subsequently simulate collagen beam deformations under elevated IOP using finite element analysis. This generic model will incorporate essential morphological characteristics obtained from literature, with an average beam thickness of 38.1 m, an average pore diameter of 27.9 m, and an average density of 2311 pores/mm³. Thus far, we have successfully developed a 2D generic model of the LC collagen network and obtained IOP-induced beam deformations through finite element analysis. Ongoing efforts involve extending this approach to the 3D generic model. The findings of this work hold the potential to provide insights into the mechanisms underlying retinal ganglion cell axon damage in glaucoma.

P7.16

DOES PREGNANCY RELATED-ACUTE KIDNEY INJURY LEADS TO THE PROGRESSION OF CHRONIC KIDNEY DISEASE IN THE POST-PARTUM PERIOD?

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Introduction: From 1999, rates of pregnancy related acute kidney injury (PR-AKI) have increased in the U.S from 2.4 to 6.3 per 10,000. Acute kidney injury (AKI) has been associated with the progression to chronic kidney disease (CKD) in nonpregnant animals and humans. Indoxyl sulfate (I.S.), a uremic toxin, has been found to be increased in circulation in the progression from AKI to CKD. Aim: We sought to test the hypotheses that PR-AKI leads to CKD and administration of I.S during pregnancy can lead to a CKD in the postpartum. Time Pregnant Sprague-Dawley rats arrive on gestational day (GD) 10. On GD 11, animals are randomly assigned to 6 groups: normal pregnant (NP), NP+AST, PR+AKI, PR+AKI+AST, NP+200 I.S, and NP+200 I.S+AST. From GD11-19, animals are given a 200 mg/kg dose I.S treatment via drinking water. On GD18, a renal bilateral ischemia reperfusion surgery is performed for 45 min to

generate PR-AKI. All animals are allowed to be delivered. AST (oral carbon absorbent for I.S accumulation) treatment is from postpartum weeks 2 to 8. Urine and fecal pellets are collected via metabolic cage during postpartum week 1 then once a month until postpartum month 4. Creatinine, indole, and protein concentration were measured in urine, and indole in fecal matter via assays. All results were analyzed via two-ANOVA using GraphPad Prism. Preliminary data has shown that in the immediate postpartum there are differences in urine output and urine creatinine of PR-AKI and 200 I.S groups, and more tests must be completed to see if persists.

P7.17

THE IMPACT OF ACUTE BEETROOT JUICE SUPPLEMENTATION ON RESTING CARDIOVASCULAR RESPONSES IN YOUNG WOMEN

E. Manuel Munoz II, Robert Herron

University of Montevallo, Montevall, AL

Hypertension is associated with cardiovascular disease and research specific to interventions that alter vascular function in young women is lacking. The purpose of this study was to investigate the influence of acute dietary nitrate, via beet root juice (BRJ) supplementation, on resting cardiovascular responses. A total of 11 (aged 18-22) women completed this protocol. A repeated-measures, placebo-controlled, counter-balanced, crossover design investigated the impact of dietary nitrate on the cardiovascular system's resting measurements after one hour. All participants completed three laboratory visits (Visit 1 = familiarization, Visits 2 and 3 = experimental). The experimental visits differed in the BRJ formula; whereas the placebo had dietary nitrate removed by the manufacturer. Regression results revealed no main effect of treatment when using daily baseline measures for all dependent variables (all $p > 0.40$) for HR, SBP, DBP, or MAP ($p = 0.33$, 0.55, 0.87, 0. 81, respectively). In conclusion, BRJ did not influence resting cardiovascular measurements when compared to placebo.

P7.18

NEUROPEPTIDE Y RECEPTOR ANTAGONIST REDUCES MATERNAL INFLAMMATION AND REDUCED UTERINE PERFUSION PRESSURE-INDUCED NEUROBEHAVIORAL DYSFUNCTION IN PREGNANT RATS AND REDUCTION IN FETAL WEIGHT

McKenzee Henson[1], Johnathon Lee[2], Madeline Harris [1], Norma Ojeda[3], Nilesh Dankhara [2], Lir-Wan Fan [2], Michelle Tucci [4]

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Pregnancy leads to increased uterine blood flow, which is crucial for healthy fetal development. The vasoconstrictive substance neuropeptide Y (NPY) elevation has been linked to preeclampsia. Research indicates a connection between maternal inflammation and reduced uterine perfusion pressure (RUPP). Elevated NPY levels in pregnant rats could impact fetal development. This study aimed to evaluate whether an NPY receptor antagonist alleviates maternal inflammation and RUPP-induced fetal development and neurobehavioral deficits in pregnant rats. In the study, pregnant rats received intraperitoneal lipopolysaccharide (LPS) (100 µg/kg) on day 13 of gestation (G13), followed by RUPP surgery on G14. Starting from G14, the rats were administered an NPY receptor antagonist via subcutaneous micro-osmotic pump infusion at a rate of 5 µg/kg/day for six days. Y maze and Plus maze tests were conducted on G13, G16, and G19, and the rats were euthanized on G20 for placenta and fetal tissue analysis. Results indicated that NPY receptor antagonist treatment reduced maternal inflammation and mitigated short-term memory deficits and anxiety, as demonstrated by the Y maze and Plus maze test outcomes. Furthermore, NPY receptor antagonist treatment alleviated maternal inflammation and the reduction in fetal and placental weight induced by RUPP on G20. These findings suggest that NPY receptor antagonization could potentially address vasoconstriction related to maternal LPS exposure and RUPP-induced neurobehavioral issues in pregnant rats. This approach may also normalize placental and fetal weights, making it a valuable tool for studying mechanisms involved in inflammation and RUPP-induced pregnancy neurobehavioral deficits, as well as exploring potential therapeutic strategies.

P7.19

PREVALENCE AND RISK FACTORS FOR CONDITIONS ASSOCIATED WITH RESPIRATORY HEALTH AMONG POPULATIONS IN COTTON PRODUCTION REGIONS IN THE UNITED STATES

Caleb Brown, Joharrison Rockett, Tony Newson, Stacy Jones

Coahoma Community College, Clarksdale, MS

Cotton is a multi-billion-dollar industry in the United States. The U.S. is the largest exporter of cotton in the world. Only two nations produce more cotton than the United States — China and India. Unlike other agricultural products that mainly use chemicals such as herbicides, pesticides, and fertilizers during the growth cycle, cotton also uses chemicals during the harvest cycle. Cotton plants must first be defoliated before harvesting. Historically, defoliants such as Agent Orange have been found to be carcinogenic. Although modern defoliants are

considered safer, no extensive studies on long-term health outcomes have been conducted.

The process of defoliating cotton involves exposure of leaves on the mature plants to chemical defoliants, usually in liquid form. These defoliates are aerosolized during distribution resulting in exposure to those in close proximity and larger exposure due to wind and diffusion. Aerosolized chemicals are directly inhaled and exposed to the lungs. Acute or long-term exposure of the lung to chemicals can result in physical changes to the tissue or increased sensitivity. Possible outcomes include asthma, chronic bronchitis, allergies, and emphysema. Additionally, exposure can occur after the initial distribution by disruption of soil that contains residual defoliate during the mechanical harvesting of cotton or during the subsequent burning to remove crop residue. This study looks at the impact on the health outcomes associated with respiratory illnesses for populations who are exposed to defoliating agents associated with cotton production at the state-level. Comparisons are made between states with different cotton production acreage to investigate correlations with specific health outcomes. States with little or no cotton production were compared to those with significant cotton production in the same geographical region to account for similarities in socio-economics and cultural practices. Disparities in gender, race, region, and socio-economics were investigated. Results indicated significant differences in outcomes for certain groups. Populations in areas supporting cotton growth showed decreased life expectancy, increased rates of diabetes and heart disease, among other outcomes. Data suggests that minority populations are impacted at a greater rate. Additional study is being pursued at the county-level to provide additional insight into causes of disparities among groups.

P7.20

THE Y1 RECEPTOR RESPONSE TO PAIN AND GAIT FOLLOWING CHRONIC CONSTRICTION NERVE INJURY IN A RAT MODEL

Katelyn Booker[1], Micheal Tucci[2],

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Chronic pain interferes with the patient's quality of life. Chronic constriction injury (CCI) of the sciatic nerve is widely used as a model of chronic pain. Disturbances in gait and balance follow CCI, and can be used to assess drug treatments. In previous work, we found increased serum neuropeptide Y (NPY)levels following CCI. The objective of our current study was to administer a NPY-1 antagonist to reduce pain and improve gait and evaluate the injured nerve histology. Methods: Twelve Sprague Dawley rats were divided into three groups. Baseline measurements for pain and gait were assessed prior to surgery. The sciatic nerve in all animals was exposed. Sham control group (n=4) no constriction was applied, and in the experimental groups four sutures were placed around the sciatic nerve. Results: Four days following surgery body weights, pain and gait were assessed, then animals in group 2 (n=4) and group 3 (4) were treated with either saline or NPY 1 receptor antagonist (5 ng) by injection for14 days. Pain was assessed every other day and gait and body weight weekly. Histology of the sciatic nerve was assessed at the end of 14 days and compared with naïve control (sham surgery), and saline treatment. Our data showed significant reduction in pain, a significant (25%) improvement in the sciatic functional index score (SFI), and changes in the number of Schwan cells in the group receiving the Y1R-ANT. Conclusion: The use of a selective Y1-R ANT may offer significant improvement for neuropathic pain following nerve injury.

P7.21

INTERGENERATIONAL DIFFERENCES ON THE PERSPECTIVES ON CONCERNS OF OLDER ADULTS AGING IN PLACE IN RURAL MISSISSIPPI

Mariah McGee, Porsha Brown

Alcorn State University Lorman MS

The purpose of this study was to understand the intergenerational differences on concerns of older adults aging in place in rural Mississippi. Three generations participated in the study including grandparents, adult parents, and grandchildren. Three generations included older adults (G1; n = 22), adult children (G2; n = 23), and young adult grandchildren (G3; n = 19). Semi structured interviews and questionnaires were conducted to gather data both qualitative and quantitative. Quantitative data were analyzed using SPSS Statistics, while qualitative data were managed with MaxQDA. The results indicated that three generations agreed on physical and mental problems exist among older adults. Older adults, G1 were less concerned about lack of transportation, affording basic needs, health care, and medications than adult parents and grandchildren. Generation three, grandchildren found more concerned about transportation than adult parents and older adults consecutively. Older adults noted that they were able to care for any other at home but described that they did not have enough caregivers for them to take care of. Implications for policy makers, caregivers, and family members included.

P7.22

MICROGLIAL SUPPRESSOR AZITHROMYCIN IMPROVES NEUROBEHAVIORAL PERFORMANCE AND REDUCES BRAIN INFLAMMATION AND OXIDATIVE STRESS FOLLOWING SYSTEMIC LIPOPOLYSACCHARIDE EXPOSURE IN NEONATAL RATS.

Jenna Hart[1], Jonathan Lee[1], Madison Klim[1], Rachel Palmer[1], Michelle Tucci[2], Norma Ojeda[3], Lir-Wan Fan[1]

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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 in the rats, neurobehavioral tests were performed, and brain inflammation and oxidative stress were examined. Our results showed that azithromycin significantly reduced LPS-induced neurobehavioral deficits such as allodynia, hyperalgesia, decreases in pre-social interaction (ultrasonic vocalization), and sensorimotor neurobehavioral deficits in righting reflex, negative geotaxis, wire hanging maneuver, and hind limb suspension tests in P6 rats. 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. These results suggest that microglial suppressor azithromycin may provide protection against systemic LPS exposure-induced brain 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.

P7.23

PREVALENCE AND RISK FACTORS FOR CONDITIONS ASSOCIATED WITH METABOLIC SYNDROME AMONG POPULATIONS IN SOYBEAN PRODUCTION REGIONS IN THE UNITED STATES

Kennedi Wagner, Joharrison Rockett, Tony Newson, Stacy Jones

Coahoma Community College, Clarksdale, MS

Soybeans are a major cash crop grown in the United States. In the past twenty years, the total amount of land dedicated to the growth of soybeans has increased by nearly twenty percent; currently about 87 million acres are dedicated to soybean growth. This mirrors the United States population growth over the same time period. With the increase in land use and the increase in population, more people are exposed to the chemicals both associated with the growth of soybeans (herbicides, pesticides, fertilizer, etc.) and those produced during their production and harvesting (dust, oils, exhaust, etc.). Some of these chemicals have extended lifetimes in the environment and other have substantial increases during the agricultural cycle that can impact the health of those who are exposed.

The chemical used during the production of soybeans have been demonstrated to target certain organ systems in humans who are exposed. Symptoms that develop include hypertension, diabetes, decrease heart function, and decreased liver function, among others. Collectively, these symptoms are referred to as metabolic syndrome and the number and severity can vary. Metabolic syndrome and its long term have been shown to impact both short-term illnesses and long-term health and wellness. This study looks at the impact on the health outcomes associated with metabolic syndrome for populations who are exposed to agricultural practices associated with soybean production at the state-level. Comparison are made between states with different soybean production acreage to investigate correlations with specific health outcomes. States with little or no soybean production were compared to those with significant soybean production in the same geographical region to account for similarities in socio-economics and cultural practices. Disparities in gender, race, region, and socioeconomics were investigated. Results indicated significant differences in outcomes for certain groups. Populations in areas supporting soybean growth showed decrease life expectances, increased rates of diabetes and heart disease, among other outcomes. Data suggests that minority populations are impacted at a greater rate. Additional study is being pursued at the county-level to provide additional insight into causes of disparities among groups.

The researchers would like to acknowledge the support of the All of Us program in making this research possible. In addition, the All of Us Research Program would not be possible without the partnership of its participants.

P7.24

THE EFFECTS OF SOLUBLE ST2 SUPPLEMENTATION ON PREGNANCY OUTCOMES

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Preeclampsia (PE) is characterized as new-onset hypertension in combination with end-organ damage manifesting after the 20th week of gestation and is a leading cause of fetal and maternal mortality. PE characteristics include maternal systemic vascular dysfunction, fetal growth restriction, and chronic immune activation. In clinical studies, PE women have been shown to have decreased levels of IL-33 signaling, a pleiotropic signaling pathway that has been found to be cardio protective. We hypothesized that inhibiting IL-33 signaling would increase maternal blood pressure and

cause fetal growth restriction. To test this hypothesis, we chronically infused soluble ST2 (a decoy receptor for IL-33 that blocks signaling) into normal pregnant rats. We measured maternal blood pressure, fetal weights, fetal crown to rump length, fetal abdominal circumference, placental weights, and placental efficiency. We used the following doses in our rats: 1 ng/kg/day, 500 ng/kg/day, 1 µg/kg/day, and 2 µg/kg/day. In normal pregnant rats, ST2 supplementation increased maternal blood pressure and decreased fetal weights at a dose at 1 µg/kg/day. These data demonstrate a role for IL-33 signaling in the pathophysiology of PE. The IL-33 signaling pathway may have potential as a therapeutic target for the management of PE. This work was supported by the following NIH grants: P20GM103476 (AM as part of the Mississippi INBRE program), F31HL165851 (XW) and R01HL151407 (DC).

P7.25

T-CELL RESPONSES AGAINST COVID-19 IN IMMUNOCOMPROMISED CHILDREN

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Children infected with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) experience milder disease and significantly lower mortality rate than infected adults. Although infected immunocompromised children secondary to cancer chemotherapy and allograft transplantation shed SARS-CoV-2 for prolonged periods, they usually have mild disease with much better outcomes than immunocompromised adults with COVID-19. The reasons for the better outcomes in children are unclear, but it was proposed that better innate and adaptive antiviral immune responses and frequent exposure to seasonal coronaviruses leading to some cross-protection could play a role. The aim of the study is to characterize SARS-CoV-2 specific T-cell responses in a cohort of children with malignancies and on chemotherapy. Longitudinal peripheral blood mononuclear cells (PBMCs) from 45 children enrolled in the study have been collected and will be analyzed utilizing an ex vivo enzyme-linked immunospot assay (ELISpot) to detect the production of interferon-gamma (IFN-) in response to stimulation with overlapping peptide pools of spike and nucleocapsid proteins. T-cells that secrete IFN- will be evaluated as spots. The responses will be compared with those in healthy children and adults with hematologic malignancies after SARS-CoV-2 infection and/or vaccination and healthy children. We expect that T-cell responses in immunocompromised children will be comparable to healthy children and better than those seen in adults. This information will provide us a better understanding of the cell mediated immune responses in immunocompromised children that could ultimately lead to the development of interventions and improve outcomes in those with COVID-19 infection in different population groups.

P7.26

INTERGENERATIONAL DISCOURSE ON PERCEIVED SERVICES FOR OLDER ADULTS AGING IN PLACE IN RURAL MISSISSIPPI IN THE NEXT FIVE YEARS

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This investigation explored intergenerational perspectives on perceived services needed for older adults aging in place in rural Mississippi in the next five years. Three generations including grandparents, adult parents, and grandchildren participated in the study. The sample included older adults (G1; n = 22), adult children (G2; n = 23), and young adult grandchildren (G3; n = 19). The data were collected using questionnaires and semi structured interviews; both quantitative and qualitative. Quantitative data were analyzed using SPSS Statistics, while qualitative data were managed with MaxQDA. The G3 grandchildren noted that services such as senior discount programs, home health care, help with chores, and repair services needed for them to age in place. Adult parents G2 noted services like home health care, senior discount programs, information and referral services, and repair services necessary for aging in place. Generation three, grandparents noted services like house chores, home health care, adult daycare, and transportation services needed for them to age in place. Recommendations for policy makers, caregivers, and family members were suggested for successful aging in place in Mississippi.

Friday, March 1, 2024

MORNING

Room TC 218

Session III

Moderators: Drs. Lance Keller, Larry McDaniel

University of Mississippi Medical Center

Topics:

Inflammation/Microbial Genetics/Cell Biology/Diagnostics

O7.13

8:30 MELATONIN AGONIST AGOMELATINE AMELIORATES LIPOPOLYSACCHARIDE-INDUCED BRAIN INJURY, INFLAMMATION, LIPID PEROXIDATION, AND PRE-SOCIAL INTERACTION IMPAIRMENTS IN NEONATAL RATS

Rachel Palmer[1], Jonathan Lee[1], Selby Ireland[1], Madison Klim[1], Nilesh Dankhara[1], Michelle Tucci[2], Norma Ojeda[3], Mary Kosek[1], Shuying Lin[4], Lu-Tai Tien[5], Lir-Wan Fan[1]

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Inflammation and oxidative stress play important roles in brain injury in neonatal human and animal models. Our previous studies showed that systemic administration of endotoxin lipopolysaccharide (LPS) induces brain damage and neurobehavioral dysfunction in neonatal rats, which is associated with producing pro-inflammatory cytokines and oxidative stress. 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 neurobehavioral dysfunction in neonatal 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. Control rats were injected (i.p.) with sterile saline. Neurobehavioral tests were performed, and brain inflammation was examined on P6 24 hours after LPS exposure. Our results showed that agomelatine reduced LPS-induced reduction in pre-social interaction (ultrasonic vocalization) and sensorimotor disturbances at P6. Agomelatine also reduced LPS-induced brain injury, including a reduction in white matter oligodendrocyte numbers, increases in microglia numbers, and an increase in levels of IL-1 and thiobarbituric acid reactive substances (TBARS) contents, suggesting anti-inflammatory and antioxidative effects. These results indicate that agomelatine may protect against systemic LPS exposure-induced brain injury, inflammation, lipid peroxidation, and neurobehavioral disturbances, and that the protective effects are associated with its ability to attenuate LPS-induced inflammation and oxidative stress.

07.14

8:40 MICROBIOLOGICAL AND FATIGUE PROPERTIES OF ANTIMICROBIAL GLASS FOR ZIRCONIA ABUTMENTS

Ana Carolina Silva[1], Larissa Márcia Martins Alves[2], Tiago Moreira Bastos Campos[2], Estevam Augusto Bonfante[2], Susana Salazar Marocho[3], Jason Alan Griggs[3], Renata Marques de Melo Marinho[1]

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Purpose: The periodontopatogenic microbiota located between the prosthetic abutment and implant cand lead a bone loss and induce periimplantitis. Thus, this study evaluated the application of boron-doped soda lime glass with and without silver on emergence profile of zirconia abutment as an alternative to decrease the microorganism infiltration between abutment and implant screw without mechanical performance be affected.

Methods: 5Y-PSZ zirconia abutments (UTML Katana, Kuraray Noritake) and incisor central crowns were fabricated and divided into three groups: 5Y-C (control group), 5Y- SL (zirconia with boron-doped soda lime glass) and 5Y-SLAg (zirconia with boron-doped soda lime glass with silver). The boron-doped soda lime glass powders (with and without silver) were mixed with propylene glycol, applied on the emergence profile of zirconia abutments with a brush and fired at two cycles: 1200°C for 20 min and 700°C for 30 min. The zirconia abutments were cemented on the metallic abutments and fixed to the implant screw. The CFU/mL analysis (n=8) between abutment and implant was performed through external to internal environment contamination. C. albicans (C.a), S. sanguinis (S.s) and E.coli (E.c) were collected between implant screw and metallic abutment after 7 days. Scanning electronic microscopy (SEM) was performed on the emergency profile of zirconia abutments after the CFU test. Thirty-six implant screw (n=18) were embedded in acrylic resin and the crowns were adhesively cemented on the zirconia abutments. The samples were subjected to a fatigue test (step stress) (started at 40 N, step 10 N (100.000 cycles each) 15 Hz, 30° angulation, under thermal water 37°C. Failure modes were analyzed under stereomicroscopy. Means of failure load and CFU analysis values were statistically analyzed at a significance level of $p<0.05$.

Results: The 5Y-SL group decreased the means value of colony growth for all microorganisms tested: 5Y-C (C.a: 5.16; S.s: 7.60; E.c: 7.54), 5Y-SL (C.a: 3.85; S.s: 6.63; E.c: 6.83) and 5-SLAg (C.a: 4.32; S.s: 7.42; E.c: 7.14). SEM images showed a reduction on microorganisms amount on 5Y-SL surfaces. Due to the absence of 5Y-SLAg group antimicrobial effect, the fatigue test of this group was excluded. The mean failure loads for 5Y-C was 628.078 cycles and 106,6N while for 5Y-SL group was 618.102 cycles and 110N, presenting no significant statistical difference ($p>0.05$). The predominant failure mode per group was on metallic abutment.

Conclusion: The boron-doped soda-lime glass application reduced the microorganism infiltration between abutment and implant screw without compromise its fatigue mechanical behavior.

O7.15

8:50 ANTIBIOTIC SUSCEPTIBILITY IS INCREASES THROUGH REGULATION OF CLPL EXPRESSION (Graduate Student)

Lucas R G Crosby, Larry S McDaniel, Lance E Keller

Department of Cell and Molecular Biology, University of Mississippi Medical Center

Background: The bacterial pathogen Streptococcus

pneumoniae causes several diseases, such as pneumonia, meningitis, and bacteremia. Clinical interventions of S. pneumoniae infections typically include antibiotics that target the cell wall, therefore research into novel mechanisms of resistance is required to determine appropriate clinical response. Some mechanisms that lead to resistance or persistence when exposed to antibiotics rely on increased gene expression of various proteins. One method of pneumococcal gene regulation occurs through the importation of oligopeptides through the Ami oligopeptide permease system.

Methods: Antibiotic susceptibility was tested through growth curve analysis of wildtype and mutant pneumococcal strains. Inducible expression vectors of clpL were used along with luciferase reporters for monitoring expression levels. Microscopy was performed to determine alterations in the cell wall structure in various mutants.

Results: We have observed that there is altered antibiotic susceptibility in S. pneumoniae when the oligopeptide transporters aliC and aliD are deleted. It has previously been shown that aliC and aliD alter clpL expression, which is a chaperone protein important to cell wall synthesis. Therefore, we hypothesize that clpL expression regulated by oligopeptide transporters alter susceptibility to cell wall targeting antibiotics. We observed changes in -lactam antibiotic susceptibility in wildtype compared to mutant strains. We also observed changes in clpL expression based on altered environmental conditions and oligopeptide transporter status.

Conclusion: Oligopeptide mutants had reduced peptidoglycan crosslinking compared to wildtype strains. As such, changes in clpL expression through the oligopeptide transporter system increases peptidoglycan cross linking and increases resistance to -lactam antibiotics. This resistance is not dependent upon mutants or gene acquisition but through changes in the environment sensed by oligopeptide transporters resulting in a novel mechanism that increases resistance to a common class of antibiotics.

O7.16

NOVEL NANOCOMPOSITE DRUG DELIVERY SYSTEM FOR SARS-COV-2 INFECTIONS (Graduate Student)

Shazeed-Ul Karim[1], Uday Chintapula[2], Priyanka Raghunathan Iyer[2], Biswas Neupane[1], Haritha Asokan Sheeja[2], Farzana Nazneen[1], He Dong[2], Kytai T. Nguyen[2], Fengwei Bai[1]

[1]University of Southern Mississippi, Hattiesburg, MS, [2]University of Texas at Arlington, Arlington, TX

To develop an inhalable drug delivery system, we synthesized poly (lactic-co-glycolic acid) nanoparticles with Remdesivir (RDV NPs) as an antiviral agent against SARS-CoV-2 replication, and formulated Remdesivir-loaded nanocomposites (RDV NCs) via coating of RDV NPs with novel supramolecular cell-penetrating peptide nanofibers to enhance cellular uptake and intracellular drug delivery. RDV NPs and RDV NCs were characterized using various techniques, including Transmission Electron Microscopy (TEM), Dynamic Light Scattering (DLS), and fluorescent microscopy. Cytotoxicity of RDV NCs was assessed in Vero E6 and primary human epithelial cells, with no significant cytotoxicity observed up to 1,000 g/mL. RDV NCs were spherically shaped with a size range of 300-400 nm and zeta potential of ~+9mV as well as indicated the presence of coated nanofibers. Reverse Transcription-Polymerase chain reaction (RT-PCR), immunofluorescence and plaque assays of SARS-CoV-2 infected Vero E6 treated with RDV NCs showed significantly higher antiviral activities compared to those of free drug and uncoated RDV NPs. RDV NCs exhibited high antiviral activity against SARS-CoV-2, and the nanocomposite platform has the potential to be developed into an inhalable drug delivery system for other viral infections in the lungs.

O7.17

9:10 ASSESSING PERCEPTIONS OF ANTIRETROVIRAL PRE-EXPOSURE PROPHYLAXIS USE AND HIV RISK AMONG YOUNG AFRICAN AMERICAN HBCU STUDENTS IN MISSISSIPPI: A QUALITATIVE STUDY (Graduate Student)

Precious Patrick Edet[1], Azad Bhuiyan[1], Austine Onyia[1]

[1]Jackson State University, Jackson MS

Background: Antiretroviral pre-exposure prophylaxis (PrEP) is an effective medication used in preventing HIV. PrEP utilization is disproportionately low among African American young adults aged 18-24. In addition, Mississippi ranks the 6th highest in HIV diagnoses in the United States, and young adults are the leading age group for new HIV cases in the state. Historically Black Colleges and Universities (HBCUs) have a high population of African American young adults, and university campuses provide opportunities for high-risk sexual behaviors. Studies investigating perceptions of HIV risk and PrEP use among college students in Mississippi are limited. We examined perceptions of HIV risk and PrEP use among young African HBCU students in Mississippi. **Methods:** We recruited fifteen young African American HBCU students aged 18-24 years old, consisting of seven males and eight females, in March and April, 2023. We collected data virtually and in person using in-depth interviews and a brief survey, which lasted approximately 30-45 minutes. Interviews covered PrEP knowledge, PrEP perceptions, and self-perceived HIV risk. Interviews were audio-recorded, transcribed, and analyzed thematically using an inductive approach. **Results:** Thematic analysis revealed that none of the participants currently used PrEP. However, all participants perceived PrEP as an effective drug for preventing HIV. Few participants (4 out of 15) perceived themselves as having a high HIV risk, while

most (13 out of 15) perceived a high HIV risk among young African-American HBCU students. **Conclusions:** PrEP use and self-perception of HIV risk is low in this population. Target interventions that educate young African American HBCU students about HIV risks and PrEP are needed in Mississippi.

O7.18

9:20 IDENTIFICATION OF PNEUMOCOCCAL PROTEINS THAT ALTERS CERULOPLASMIN BINDING THROUGH GENOME-WIDE ASSOCIATION STUDY (Graduate Student)

Md Fahim Khan[1], Faith Anderson[2], Rohinton Dossabhoy[3], Kathryn Hellmann[1], D Ashley Robinson[1], Lance E Keller[1]

[1]University of Mississippi Medical Center, Jackson, MS, [2] Mississippi College, Clinton, MS, [3] Millsaps College, Jackson, Mississippi

Background: Streptococcus pneumoniae, or the pneumococcus, is the primary cause of community-acquired pneumonia. It also causes other diseases such as meningitis, otitis media, and septicemia. Systemic infections caused by pneumococcus can vary in severity, but it is of increased concern in children and immunocompromised individuals. To establish a successful infection the pneumococcus must evade the innate immune response of the host. Innate immunity utilizes serum proteins to aid in bacterial clearance through multiple routes. 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. The purpose of this study is to determine how genotypic variations in pneumococcal strains alter the binding to serum proteins.

Methods: A library of 96 pneumococcal strains were sequenced and high throughput flow cytometry was used to study binding of seven serum proteins. A genome wide association study (GWAS) was performed to identify genetic variations that alter serum protein binding.

Results: Several targets were identified by GWAS and then genes of interest were chosen that were identified in multiple distinct lineages based on phylogenetic analysis. One gene of interest was the neuraminidase nanA, which was found to reduce binding to ceruloplasmin. Ceruloplasmin binding was validated through gene deletion and complementation.

Conclusion: Ceruloplasmin transports copper and increases local copper concentrations in the tissue resulting in bacterial clearance. This is the first described mechanism of ceruloplasmin interaction in 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 better understand the ability of bacteria to cause disease and aid in the development of new therapeutics.

9:30 Break

9:45 AM-11:15 AM

HEALTH SCIENCES DIVISION INTERACTIVE WORKSHOP

Room TC 218

Moderators:

Dr. D. Olga McDaniel, Professor,

Department Surgery, University of Mississippi Medical Center

Speaker: **Laura Godfrey Hendon**, MA, MS, CGC Associate Professor

Director of Prenatal Genetic Services

Department of Obstetrics and Gynecology, Division of Maternal Fetal Medicine

Department of Pediatrics, Division of Medical Genetics

University of Mississippi Medical Center

Topic: "**GENETIC COUNSELING/NON-INVASIVE PRENATAL TESTING/GENETIC TECHNOLOGY"**

10:00-11:00

Poster session II

(MAS High School Posters)

Hall/Room TC 3rd floor Ballrooms

Moderators:

Drs. Maricica Pacurari and Lamar Hamil

Jackson Stater University and Belhaven University

P7.27

THE ROLE OF HIPPOCAMPAL B-ADRENERGIC RECEPTOR SUBTYPES DRIVING RETRIEVAL, RETENTION, AND CONSOLIDATION OF COCAINE-ASSOCIATED MEMORIES IN FEMALES (Base-Pair)

Amy Kohtz[1, 2], Silvia Kelsen[1], Melanie Berry[1], Beau Miller[3], Kristen Rhodes[4]

[1]Department of Psychiatry and Human Behavior, Division of Neurobiology and Behavior Research, University of Mississippi Medical Center, Jackson, MS, [2]Center for Innovation and Discovery in Addictions, University of Mississippi Medical Center, Jackson, MS, [3]Mississippi College, Biology Department, Clinton, MS, [4]Murrah High School, Jackson, MS

Background: Exposure to environmental context and drug associated cues help maintain drug seeking behavior. -adrenergic receptors (-ARs) have a long-standing

historical implication in driving processes associated with contextual memory retrieval, retention, and consolidation that have been extended to contextual drug memories. The selective role of individual -ARs in drug memories remain untested in females, and thus is a focal question herein. Objective: To explore previously the role of -adrenergic receptors in contextual drug memories in a population previously unstudied; females. Method: We investigated the role of the -ARs in driving the retrieval, and retention of cocaine conditioned place preference (CPP) in female rats. CPP was conducted using a two compartment (black on one side, white on the other) chamber automatic door box. Using conditioning, rats were isolated to either the black or white side and administered 10mg/kg, IP cocaine. On test day, the preference for the cocaine-paired side was assessed as an indicator of drug memories. We used the antagonists ICI 118,551 (1), Betaxolol (2), and Propranolol (1 and 2) administered directly to the hippocampus prior to testing in CPP to test whether the retrieval and retention of cocaine-associated memories was driven by 1- or 2-ARs. Results: Administration of 1 but not 2, antagonists, reduced the expression of a CPP compared to the vehicle administration in female rats. Conversely, administration of B2antagonists prior to an initial test reduced cocaine-associated memory tested 2 weeks later. When antagonists were administered during the consolidation of CPP, only 2 or combined 1 and 2 antagonists attenuated the expression of cocaine-associated memories. These effects contrast with prior reports in males showing that 1, but not 2, ARs drive retrieval and retention of cocaine CPP. Conclusion: Exposure to the administration of 1- and 2-ARs, or 1- 2- ARs separately help maintain drug seeking behavior in memory retrieval and retention in females. Future studies will examine sex differences in the role of the -ARs in driving consolidation of cocaine-associated memories.

P7.28

COCAINE PERSISTENCE CRAVINGS DURING INITIAL ABSTINENCE (Base-Pair)

Gabriella Thames[1], Silvia Kelsen, Amy Kohtz[2]

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

Background: The inability to maintain abstinence is a trademark of addiction, yet effective maintenance therapies remain elusive. Craving during initial abstinence can predict long-term relapse outcomes in humans. Furthermore, promoting abstinence success may be particularly complex in women as psychological and biological responses to drugs of abuse differ in women compared to men. Several measures of cocaine dependence are greater in women, and can be paralleled in female rodents, yet the biological mechanisms for these sex differences remain unclear. Thus, understanding circuit and molecular signatures that drive increased cocaine seeking among females is critical to the development of effective SUD therapies. **Objective:** We have previously shown that the dorsal hippocampus plays a significant role in driving sex-specific engagement in cocaine-seeking behavior on ED1. We used whole-transcriptome sequencing analysis to identify sex-specific gene expression patterns elicited by exposure to the cocaine self-administration context on ED1 that correlate with cocaine seeking behavior. **Methods:** Fresh-frozen whole dorsal hippocampus from male and female Sprague-Dawley rats were sacrificed as naïve, in 24hr withdrawal from cocaine (WD1), or immediately following ED1 testing. **Results:** We identified 101 transcripts in females and 121 transcripts in males that had fold-change differences on WD1 compared to naïve rats. We also identified 22 transcripts in females and 149 transcripts in males that had fold-change differences on ED1 compared to WD1 controls. Interestingly, only three targets overlapped between the sexes. Furthermore, five genes identified in females, and one in males, significantly correlated to cocaine-seeking behavior on ED1 with R2 values > 0.70. **Conclusion:** There are few sex differences in the hippocampus between naïve males and females that are not sex-chromosome dependent. Sex specific transcriptomics only emerge after challenge, e.g. cocaine self-administration (WD1) or ED1 challenge. Multiple transcripts of interest correlate to ED1 cocaine-seeking behavior in females only and are in interest for future studies.

P7.29

BODY WEIGHT AND BLOOD PRESSURE OUTCOMES FOLLOWING SWIM EXERCISING IN OBESE HYPERTENSIVE PREGNANT RATS (Base-Pair)

Harper Golder[1], Anna Wilson[2], Shanise Rouser[3], Ana Palei[3], Frank Spradley[3]

[1]William B. Murrah High School, University of Mississippi Medical Center, Jackson, MS, [2]School of Medicine, University of Mississippi Medical Center, Jackson, MS, [3]Department of Surgery, University of Mississippi Medical Center, Jackson, MS

With obesity is a leading risk factor for hypertensive disorders of pregnancy, it is critical to identify interventions, such as lifestyle modifications, that effectively reduce the risk for hypertension during pregnancy. Although there have been studies to suggest that moderate forms of exercise, like swimming, are safe and reduce the risk for hypertension during pregnancy, less is known about how swimming exercise impacts body weight, fat mass, and blood pressure levels in obese pregnancies. We previously characterized a rat model that is obese and hypertensive during pregnancy, namely the heterozygous melanocortin-4 receptor (MC4R)-deficient pregnant rat. Deficiency of MC4R causes hyperphagia and increased fat mass and body weight. Using this model, we tested the hypothesis that the physical exercise of swimming reduces body weight, fat mass, and blood

pressure to a greater extent in obese versus lean pregnant rats. Rats were trained for ~5 days to the exercise protocol consisting of voluntary swimming for 20 min/day in water that was 32-35C. Rats were either allocated to the SWIM group from gestational day 1-19 or remained in the sedentary (SED) group. It was found that swimming significantly reduced ($P<0.05$) gestational weight gain in MC4R-def pregnant rats (SWIM: 37.2±17.6 g, N=11 vs. SED 53.5±14.9 g, N=13) but not wild-type (WT) controls (SWIM: 52.2±4.5 g, N=9 vs. SED: 51.4±11.7 g, N=11). Swimming slightly, but not significantly ($P>0.05$), increased cumulative food intake in both MC4R-def (SWIM: 346±59 g vs. SED: 311±22 g) and WT controls (SWIM: 343±29 g vs. SED: 314±23 g). The remaining outcomes were examined on gestational day 19. It was detected that swimming reduced ($P<0.05$) the elevated % total body fat mass (Echo MRI) in MC4R-def (SWIM: 14.7±2.1 % vs. SED: 17.7±2.3 %) but not WT controls (SWIM: 9.9±1.0 % vs. SED: 12.1±2.1 %). Furthermore, swimming reduced the higher circulating levels of the pro-hypertensive adipokine, leptin, only in MC4R-def (SWIM: 3.6±0.2 ng/mL vs. SED: 7.9±1.1 ng/mL) and not WT controls (SWIM: 2.2±0.2 ng/mL vs. SED: 3.4±0.3 ng/mL). Conscious blood pressure was determined using carotid catheters implanted on gestational day 18. The elevated absolute mean arterial blood pressure (MAP) levels were numerically, but not significantly ($P>0.05$), lowered by swimming exercise in MC4R-def (SWIM: 111±2 mmHg vs. SED: 120±12 mmHg) but not WT controls (SWIM: 109±9 mmHg vs. SED: 110±7 mmHg). However, it was determined that the % blood pressure lowering effect of swimming exercise was significantly greater ($P<0.05$) in MC4R-def (-7±1 %) compared to the WT controls (-1±2 %). Average fetal weights were not significantly different ($P>0.05$) between any of the groups for MC4R-def (SWIM: 1.9±0.2 g vs. SED: 2.0±0.1 g) or WT controls (SWIM: 1.9±0.2 g vs. SED: 2.1±0.2 g). Overall, these data support that swimming exercise is effective to reduce body weight and fat mass as well as having a greater impact to lower blood pressure in obese hypertensive pregnancies.

P7.30

TOWARDS NEW THERAPEUTICS FOR PREVENTION AND TREATMENT OF INFLUENZA

*(*Base-Pair)

Avery Clayton[1], Luz Luna[1], G Lee Bidwell, III[2], Stephen Stray[3]

[1]Murrah High School and University of Mississippi Medical Center, Jackson, MS, 39216, [2]Department of Neurology, University of Mississippi Medical Center, Jackson, MS, 39216, [3]Center for Immunology and Microbial Research, Department of Cell and Molecular Biology, University of Mississippi Medical Center, Jackson, MS, 39216

Influenza A, B, C, and D all infect humans, with influenza A and B showing Neuraminidase (NA) and Hemagglutinin (HA) activity. Since 1900, influenza A has been responsible for five viral pandemics, including the "Spanish 'flu" of 1918, which is thought to have caused up to 100 million deaths worldwide. Due to the segmented nature of the influenza genome. Influenza A can undergo antigenic shifts, which exchange the major surface antigens with homologs not previously seen in human viruses. Such antigenic changes would render existing immunity next to useless. While effective antiviral drugs targeting influenza exist, the virus can develop resistance, limiting their efficacy. We wish to develop a new class of influenza antiviral, based on the fusion apparatus of influenza HA. HA must undergo conformational change between the fusion-inactive high pH form and the fusion active low-pH form. We will synthesize peptides based on HA sequences which we believe may inhibit this transition or the process of membrane fusion. We will test the effectiveness of these peptide in in vitro infection. We will also develop elastin- like polypeptide (ELP)s containing fusion inhibitor peptides of interest. ELP- conjugated proteins can reduce the rate of turnover of peptides in the body, increasing bioavailability, and may also allow the temperature-dependent retention of ELP complexes at specific body sites. New antiviral treatments that may be used prophylactically in the context of a novel influenza may help reduce the spread and severity of an influenza pandemic.

P7.31

IDENTIFYING UNKNOWN MATERIALS BY MEASURING THEIR LINEAR ATTENUATION COEFFICIENTS

Corbin Bass[1], Jermiah Billa[2], John Adjaye[2]

[1]Porters Chapel Academy, [2]Alcorn State University

Unknown Materials can easily be identified by measuring their densities (ratio of mass to volume). However, Industrial radiographers identify materials by measuring their Linear-Attenuation Coefficients of materials to identify the materials. Specifically, 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 analysis was 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 were not in pure form and may be in the form alloys, which resulted in a deviation from the expected/standard values of LAC for the three researched materials. As expected, lead was found to be better shielding material compared to the other two materials.

P7.32

RADIOLOGICAL HEALTH IMPLICATIONS OF WATER SOFTENERS

Joey Courville[1], Jermiah Billa[2], John adjaye[2]

[1]Porters Chapel Academy, Vicksburg, MS, [2]Alcorn State University

Water sustains life. In the U.S., citizens living in the urban areas completely rely on municipal water supply, whereas a vast majority of rural Americans rely on ground water. Depending on the location, water sources may contain salts and to remove salts present in water sources, consumers add water softeners prior to using water. 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 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 variable amounts of radioactive (K-40). In this context, a pilot study was proposed with a goal of theoretically estimating and experimentally measuring K-40 via the gamma spectroscopic analyses. Further, a safety assessment study on handling water softeners was performed by computing Radiological Health Hazard indicating parameters such as Gamma Index, External Hazard, and Annual Effective Dose were computed and compared to the world-wide accepted levels.

P7.33

CROP BASED RADIOACTIVITY INTRODUCED INTO FARMLANDS DUE TO FERTILIZATION

Benjamin Billa[1], John Adjaye[2], Kwabena Agyepong[2], Erol sarigul[2]

[1]Mississippi School for Mathematics and Sciences, [2]Alcorn State University

Fertilizers are part of the farming industry and have been helping mankind in improving plant growth and crop yields. Available as Nitrogen-Phosphorous-Potassium (N-P-K) in the market, the concentrations of these key elements in fertilizers are extensively varied. Depending on the plant health, farmers tend to add these fertilizers to obtain maximum yields. Phosphorous and Potassium fertilizers are derived from Phosphate and Potassium rocks which are cored from earth's crust. The presence of radioactivity is apparent as rocks are cored from earth's crust. Often, producers enhance potassium and phosphate levels in the fertilizers, and this may result in enhancing concentrations of Ra-226 (Phosphate) and K-40 (Potash) fertilizers. A study was performed on locally available fertilizers (0-46-0 and 0-0-60) by performing gamma spectrometric analyses using a high purity germanium detector. Based on the measured radioactivity values, radioactivity introduced into farmlands was estimated per acre of farmland. Measured concentrations of key isotopes of Ra-226, Th-232, and K-40 are 7.02 ±1.5, 8.9 ±1.12, & 47.3± 9.2 respectively, in 0-0-46(Phosphate) and1.32± 0.12, 0.45± 0.13, & 15102±98, respectively in 0-0-60 (Potash). Estimated radioactivity introduced into farmlands indicated that tomatoes and cucumbers production will result in adding 1,246,619.86 and 1,061,681.75 Bq acre^{-1} of radioactivity.

P7.34

ISOTOPIC TRANSFER FACTORS FROM SOIL TO EDIBLE PARTS OF SELECTED ROOT PRODUCTS

John McGee[1], Jermiah Billa[2], John Adjaye[2], Kwabena Agyepong[2]

[1]Porter Chapel Academy, Vicksburg, MS, [2]Alcorn State University

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. The 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.

P7.35

ADOPTIVE TRANSFER OF CD4+ T CELLS FROM PREGNANT DIABETIC WOMEN CAUSE HYPERTENSION, INCREASED GLUCOSE, AND ENDOTHELIAL DYSFUNCTION IN A RAT MODEL OF GESTATIONAL DIABETES MELLITUS

LaBrenda Bell[1], Jan Michael Williams[1], Baoying Zheng[1], Owen Herrock [1], Nathan Campbell[1], Babbette LaMarca[1], Evangeline Deer[1]

[1]University of Mississippi Medical Center, Jackson, MS

Gestational diabetes mellitus (GDM) is a major medical complication in pregnancy that is characterized by hyperglycemia, -cell dysfunction, and insulin sensitivity during pregnancy, and is associated with increased T cell activation. Furthermore, there is limited information of the importance of inflammatory cells, cytokines, and

additional placental factors in causing the pathophysiology of GDM. We hypothesize that CD4+ T cells play a role in the pathophysiology of GDM by stimulating antibodies leading to beta cell destruction causing glucose intolerance, renal injury, and hypertension during pregnancy. Therefore, we examined the effect of adoptive transfer of pregnant GDM patients' placental CD4+ T cells (GDM) to cause destruction/dysfunction through mt dysfunction/ROS in pregnant athymic nude rats. CD4+ T cells were isolated from placentas collected from diabetic pregnant women and injected into NP athymic nude rats on GD 12. On GD19, mean arterial pressure (MAP) values and blood/tissue samples were collected and glucose levels were measured from both GDM-CD4+ T cell recipients and NP nude controls. To evaluate endothelial oxygen utilization, human umbilical venous endothelial cells (HUVECs) were grown and serum starved prior to incubation with sera from GDM-CD4+ T cells or pregnant control rats and collected for respiration measurement for flow cytometry. A student's t-test was used for statistical analysis. On GD19, MAP was increased in GDM-CD4+ T cell rat recipients (121±3 mmHg, n=8, $p<0.05$) compared to NP controls (105±3 mmHg, n=8). Blood glucose was elevated in GDM-CD4+ T cells rats (201±46 mg/dl, $p<0.05$) compared to NP rats (82±9 mg/dl). Mitochondrial ROS was increased in the sera of GDM CD4+ T cells recipient rats (72±2% gated, $p<0.05$) compared to NP athymic nude rats' sera (49.54±6% gated). These data indicate placental CD4+ T cells from diabetic women cause characteristics of GDM such as increased glucose and HTN in response to circulating factors during pregnancy and introduces a new model to investigate diabetes during pregnancy and additional mechanisms of pathogenesis of gestational diabetes.

P7.36

ZBTB6 AS A TRANSCRIPTION FACTOR FOR GATA3 (Base-Pair)

Sylvia Kassoff[1, 2], Vineel Vanga[1], Sumana Gosh[1], Bradley Walters[1]

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

Background: Hearing loss is a widespread issue. It is largely caused by the death or loss of hair cells which do not naturally regenerate in mammals. There are many proteins in the ear that help in the development of the cochlea. GATA3 is one of these critical transcription factors that is essential for generating sensory hair cells in the ear. ZBTB6 is predicted to be a transcriptional repressor for GATA3, this means it would be crucial for maintaining precise control over the gene's expression in cells. This control is crucial for the proper development of the ear.
Objective: We hypothesize that binding of ZBTB6 to human-specific GATA3 regulatory sequence results in GATA3 repression in human IHCs. We have been running gel electrophoretic mobility shift assays (EMSAs) and Western Blots to test this hypothesis. Methods: Reactions for EMSA are created using different combinations of DNA Human, Mouse, and consensus DNA; ZBTB6 protein; nuclear extract; and other necessary factors to run a gel. Each reaction has varying amounts of protein added to see how it will affect the DNA. Then, the sequence is incubated before being run on the gel at a voltage of 80-100 for approximately an hour. Afterwards, we transfer it onto a blot which undergoes a process to elicit enhanced chemiluminescence (ECL) which is used to visualize the presence and quantity of protein separated by the gel. We can then look at it through a gel documentation imager. Blots containing ZBTB6 overexpression lysate are further blocked and incubated in ZBTB6 primary and AlexaFluor546-conjugated secondary antibodies to see where the protein is on the blot. Results: Increasing amounts of purified ZBTB6 protein results in increased binding of ZBTB6 to consensus DNA as indicated by more intense shifted bands. ZBTB6 binding to consensus DNA is more disrupted by Human GATA3 competition than by Mouse GATA3 competition. Nuclear extracts caused shifts of consensus DNA at all concentrations tested. The shifted band for the consensus DNA matched the size of the band indicated by western blotting of ZBTB6 overexpression lysate. Middle and upper concentrations of nuclear extract shifted similar sized bands for human GATA3 DNA, whereas only the highest concentration of nuclear extract revealed a visible band of similar molecular weight for mouse GATA3 DNA. Shifted GATA3 DNA with lower molecular weight were visible in the middle and upper concentrations of nuclear extract, while bands at this lower molecular weight were only visible at the highest concentrations for consensus and human DNA probes. Discussion: ZBTB6 binding to putative cis-regulatory elements of GATA3, suggests that ZBTB6 could regulate the expression of GATA3. This would lead to reduced levels of GATA3 protein in hair cells, impacting its functions like regulating cells and responding to its environment. Moving forward we plan to conduct Western blotting of ZBTB6 overexpression lysate compared to wild type lysate using a GATA3 antibody. We also want to test to figure out why our EMSAs have been creating multiple bands in the gel when the protein shifts.

P7.37

UNDERSTANDING THE MECHANISM OF INHIBITION OF GLIOBLASTOMA CELL LINES BY INFLUENZA VIRUS

(Base-Pair)

Luz Luna[1], Avery Clayton[1], Stephen Stray[2]

[1]Murrah High School and University of Mississippi Medical Center, Jackson MS 39216, [2]Center for Immunology and Microbial Research, Department of Cell and Molecular Biology, and Cancer Center and Research Institute, University of Mississippi Medical Center, Jackson, MS 39216

Glioblastoma (GB) is the most common primary cancer of

the adult brain. Despite decades of research, GB remains difficult to treat, and has a poor long-term survival rate. Influenza A, B, C, and D all infect humans, with the virus targeting cell surface sialic acid for binding and entry. Influenza A and B carrying Neuraminidase (NA) and Hemagglutinin (HA) activity. Influenza C shows esterase activity (EA) but no NA activity. In a previous study, it was shown that two influenza isolates, A/NWS-Tok (Tok) and C/BHA$_2$, inhibited GB cell lines in vitro cells. Preliminary data suggested that the effect of may have been related to Tok's NA activity, rather than due to viral infection. We will determine whether the NA or EA activity is required for this inhibition by testing the effect of NA inhibitors on the ability of Tok to affect GB cells. For C/BHA$_2$, we will test the inhibition of GB cells under both virus-permissive and non-permissive conditions, for example whether or not we observe an effect of C/BHA2 on GB cells grown in media containing FBS, which is a potent inhibitor of viral infection. We hypothesize that the effect of the virus may be due to digestion of sialic-acid containing cell-surface molecules such as gangliosides, leading to growth interruption or cell death. Understanding the mechanism behind this observation may help us develop new modalities to treat this devastating disease.

P7.38

CARDIAC LIPOTOXICITY AND APOPTOSIS UNDERLIE IMPAIRED CONTRACTILITY IN A MOUSE MODEL OF METABOLIC DYSFUNCTION-ASSOCIATED STEATOTIC LIVER DISEASE (MASLD)

Karis McGowan[1], Olufunto Badmus[2], Andrew Wasson[2], David Step[2]

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

Background: Cardiovascular disease (CVD) is the leading cause of mortality in metabolic dysfunction-associated steatotic liver disease (MASLD). Previously, we observed cardiovascular dysfunction in hepatocyte-specific PPAR knockout mice (Ppara HEPKO), a mouse model that exhibits hepatic steatosis independent of obesity and insulin resistance.
Aim: To determine the mechanisms underlying hepatic steatosis-induced cardiac dysfunction.

Methods: Experiments were performed in 30-week-old male Ppara HepKO and littermate control mice fed regular chow. Mice were subjected to graded maximal exercise endurance test. Cardiac lipid accumulation was determined by Oil Red O (ORO) and triglyceride levels. Cardiac apoptosis and fibrosis were determined by TUNEL and picrosirius red staining, further confirmed by western blot. Cardiac natriuretic peptides were determined by real-time PCR. Liver fat was determined by Echo MRI, ORO staining and hepatic triglyceride levels.

Results: We observed decreased cardiomyocyte contractility (0.17 ± 0.02 vs. 0.24 ± 0.02 μm, P<0.05), increased cardiac triglyceride content (0.96 ± 0.13 vs. 0.68 ± 0.06 mM, P<0.05), and collagen type 1 (4.65 ± 0.25 vs. 0.31 ± 0.01 AU, P<0.001). These changes were associated with increased apoptosis as indicated by TUNEL staining (30.9 ± 4.7 vs. 13.1 ± 0.8 %, P<0.006) and Western blots showing increased cleaved caspase-3 (5.4 ± 1.5 vs. 0.5 ± 0.3 AU, P<0.02), BAX (0.68 ± 0.07 vs. 0.04 ± 0.04 AU, P<0.001), and reduced BCL-2 (0.29 ± 0.01 vs. 1.47 ± 0.54 AU, P<0.05). We further observed elevated circulating natriuretic peptides and exercise intolerance in Ppara HepKO mice when compared to controls. Conclusion: Our data demonstrated that lipotoxicity, apoptosis and remodeling underlie cardiac dysfunction in MASLD.

P7.39

VARIATIONS IN CHLORIDE, TOTAL PHOSPHORUS, TOTAL NITROGEN, AND ALKALINITY IN RIVER WATERS IN YAZOO RIVER BASIN, MISSISSIPPI

Ryan Heydari[1], Ezat Heydari[2]

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

The Yazoo River Basin (YRB), also known as the Alluvial Plain of Mississippi or the Mississippi's Delta region, is a geographically low area in the northwest part of the State of Mississippi. The area has fertile soil that makes it a major agricultural area in the state. The YRB is bounded on the eastern side by the steeply dipping Bluff Hills and on the western side by the Mississippi River. Major south-flowing rivers such as the Big Sunflower River, the Tallahatchie River, and the Yazoo River flow in this region. These rivers merge just north of the city of Vicksburg and drain into the Mississippi River. The United States Geological Survey in Mississippi conducted a major investigation on physical and chemical composition of the rivers and bayous in this region. Waters were collected by standard procedure and delivered to Mississippi's Department of Environmental Quality laboratory in Pearl, Mississippi, where the analysis was conducted. Only river water data is considered for this study. We specifically evaluate variations in chloride, total phosphorus, alkalinity, and total nitrogen in river waters of the YRB.

Chloride concentrations vary from 121 mg/L to 4 mg/L. Total phosphorus levels differ from 4.6 mg/L to 0.07 mg/L. Total nitrogen changes from 19.9 mg/L to 0.36 mg/L. Alkalinity is measured as total $CaCO_3$ and varies from 501 to 21. However, variations in concentrations of chloride, total phosphate, total nitrogen, and alkalinity are not randomly distributed in the YRB. The highest concentrations occur in the Little Tallahatchie River that originates from Sardis Lake. These values gradually decrease as the water flows southward. The lowest values are located along the Bluff Hills and increase westward from that location. These systematic trends indicate the river water compositions in the YRB are controlled by two factors: anthropogenic and natural causes. Extreme water composition in the river that flows from Sardis Lake,

which is surrounded with recreational facilities, indicates a major anthropogenic contribution. Systematic increases in concentrations of chloride, total phosphorus, total nitrogen, and alkalinity from east to west is attributed to natural causes as ground and surface water flow from the highlands of the Bluff Hills to the lowlands of the Delta. The ground water will interact with rock and sediment along its flow path, particularly loess deposits. Agricultural activity does not seem to be as prominent of a contributor to chloride, total phosphate, total nitrogen, and alkalinity in river waters as previously thought.

P7.40

STRETCHING THE BOUNDARIES OF GENETICS: UNDERSTANDING THE COMPLEXITY OF MARFAN SYNDROME

Nicholas Pride[1], Jim Sullins[1], Michelle Tucci[2],
[1] Northwest Rankin High School, [2] University of Mississippi Medical Center

The purpose of this project breaks down the current body of knowledge on Marfan Syndrome (MS), the current research on Marfan, and the encounters of MS over the past ten years at the University of Mississippi Medical Center (UMMC) from 2013-2023. MS is rare, happening in about 1 in 5,000 people. It is a genetic condition that, at the cellular level, affects the nucleus. It is a connective tissue disorder associated with a mutation in a gene called fibrillin-1 (FBN1). The mutation limits the body's ability to make proteins needed to build connective tissue. The heart and blood vessels, skeletal, and eyes are most often affected. Major symptoms include overgrowth of the long bones of the arms and legs, scoliosis, pectus deformity, ectopia lentis, dissection of the aorta, mitral valve prolapse and aortic and mitral regurgitation. Recognizing the signs of MS is important for prevention and/or treatment of serious and even life-threatening complications. People with MS are often tall and thin, with very long arms, legs, fingers, and toes, along with flat feet. It isn't always easy to diagnose MS because it affects everyone differently. Some people with MS doesn't show signs of it until later in childhood or adulthood. The diagnostic workup for MS includes: medical history, physical exam, echocardiogram, CT, or MRI to check for dural ectasia, which helps support the diagnosis, and genetic testing to look for changes in the FBN1 gene. While there is no cure for MS, treatment focuses on preventing the various complications of the disease. An aortic aneurysm may be treated with medicine or medicine plus surgery. Medicine is used to lower blood pressure to help prevent an aneurysm from rupturing and causing a dissection of the aorta. Severe scoliosis and breastbone problems may require surgery. Eye conditions may also require surgery. In the past, the life expectancy for patients with MS was 32 years. Today, some people with the disease can live past age 72. Diagnosis at a young age is best because the disease can progress and pose many risks. Current clinical trials are exploring stem cell therapy, the effects of moderated dynamic exercise in young adults, and personalized exercise rehabilitation program. Future research should be focused on the psychological wellbeing of Marfan patients.

12:00 (HSD Program Adjourned)

History and Philosophy of Science

Co-Chair: Gregory Johnson
Mississippi State University
Co-Chair: Robert Waltzer
Belhaven University
Vice-Chair: Paula Smithka
University of Southern Mississippi

Thursday, February 29, 2024
MORNING
Room TC 229

8:50 **Welcome and Introduction**

O8.01

9:00 THE EXPLANATORY FECUNDITY OF SYSTEMS BIOLOGY FOR UNDERSTANDING THE FUNCTIONAL ORGANIZATION OF BIOLOGICAL SPECIES

Paula Smithka
University of Southern Mississippi, Hattiesburg, MS

While there has been historical tension between mechanistic explanations on the one hand and functional/organizational explanations or evolutionary explanations on the other (e.g. Brigandt, Green, O'Malley, 2018; Green, Fagan, Jaeger, 2015), systems biology—systems theory applied to biology (Mesarovi 1968)—offers a potential framework for integrating both types of necessary explanations for biological systems. Bechtel and Abrahamsen (2010) coin the phrase 'dynamic mechanistic explanation' for models in systems biology that extend mechanistic explanation "by mathematically or computationally capturing the dynamical operation of the system and its parts across time" (Brigandt, Green, O'Malley, 2018). They use such mathematical models to explain circadian rhythms. But systems biology also models the functional aspects of the organization of dynamic biological systems. Kauffmann (1993, 1995) showed that systems are self-organizing; order emerges out of chaos. Large network models reveal organizational schemes or 'design principles', as they are called by systems biologists. These explanations account for *why* the same basic principles describe functions in different biological systems, for example at the level of the organism or species. The explanatory value of these

organizational schemes comes with revealing 'topological properties' of systems, such as homeostasis, robustness, and vulnerability of systems, focusing on the generalizability of certain constraints and perturbations to the system. Two important and explanatorily fecund applications of systems biology are: characterizing biological species as homeostatic property cluster kinds (HPCKs) and the homeorhesis—the stable developmental trajectory (Waddington, 1957)—of species. Since such systems modeling can offer some predictive value of trajectories over time, this may serve as a useful tool in some conservation efforts.

O8.02

9:30 NATURAL KINDS: TOWARDS A THIRD APPROACH

Michael Zahorec

Florida State University, Tallahassee, FL

In the past few decades, attention has shifted from Kripke-Putnam essentialism (Kripke 1972; Putnam 1973, 1975) to property cluster theories of natural kinds (Boyd 1988, 1991, 1999, 2019; Slater 2015; Crane 2021; Samuels and Ferreira 2010; Machery 2004). In addition to arguing that these theories are competing answers to the same questions, I offer a handful of reasons to doubt that either is an adequate theory of natural kinds. First, Kripke-Putnam essentialism suggests that there is, at least roughly and in general, a one-to-one, highly explanatory correspondence between natural kinds and unique compositions or internal structures. But philosophers of science (see, e.g., Crane 2021 and Weisberg 2003) have convincingly argued against the existence of such a correspondence. Recent consensus is that natural kinds do not, after all, generally have intrinsic, structural, or compositional essences. This casts serious doubt on Kripke-Putnam essentialism. Turning next to the more recently popular approach to understanding natural kinds, I argue that property cluster theories generate problematic regresses and ultimately do not satisfy the explanatory demands which they are supposed to satisfy. Along the way, I argue that Kripke-Putnam essentialism generates a similar problematic regress. More specifically, both of these theories, in their various guises, rely on appeal to further natural kinds when analyzing natural kinds. Finally, doubt about the adequacy of both of these approaches is, I argue, reaffirmed by their reliance on untenable pictures of reference. Kripke-Putnam essentialism includes a problematic picture of our reference to natural kinds and property cluster theories include a problematic picture of our reference to objects. I develop these charges by bringing some of Wittgenstein's (1953) remarks about reference and ostensive definition to bear on each of these theories. Avoiding these many issues, I argue, means adopting a third approach to theorizing about natural kinds. However this third approach is filled out, we should recognize that, in our conceptual and linguistic practices involving natural kinds, we rely on much richer conceptions of objects and their kinds than are recognized by either property cluster theorists or Kripke-Putnam essentialists. To end, I advocate for a discipline-relativity about natural kinds, though for much different reasons than have become standard in philosophy of science and, more specifically, in defenses of property cluster theories of natural kinds. Accordingly, I advocate for careful attention to actual uses of natural kind concepts and terms in various scientific practices and disciplines.

10:00 Break

O8.03

10:15 DARWIN, LYELLIAN UNIFORMITARIANISM, AND EVOLUTIONARY REALISM

Daniel Swaim[1]

[1]*Kansas State University, Manhattan, KS*

That Darwin drew significant inspiration from Lyell in the crafting of his theory of evolutionary change is no secret. Darwin appeals directly to the influence of Lyell in many of his writings. A key source of influence from Lyell onto the work of Darwin's thought is Lyell's uniformitarian methodology (see Currie 2019). This just amounts to the now familiar claim that causal reasoning about the past should be done by reference to causes now in operation. Nature is (at least by and large) regular in its operations, and this insight should govern all of our scientific reasoning, even in such cases as it involves things like reconstruction of deep stretches of natural history.

A source of some controversy, however, involves how we should interpret Darwin's commitment to Lyell's uniformitarianism (Sloan 2003). Should it be read as an ontological commitment (Desmond and Moore 1992)? Or perhaps as something more strictly methodological, carrying minimal ontological baggage (Currie 2019)?

What seems clear, in any case, is that Darwin meant for his theory to be understood in basically *realist* terms: the theory laid out in *On The Origin of Species* (1859) and elsewhere is to be understood as at least approximately true. If uniformitarianism, as laid out in *Principles of Geology* (1830), plays a major role in the development of Darwin's theory, perhaps the natural presumption is that Darwin had a realist attitude toward uniformitarianism itself.

I will argue that this is not the case. Indeed, Lyell *himself*, arguably, understood uniformitarianism as a methodological tool, and not as something demanding ontological commitment (Page 2022). There are reasons, from the works of Darwin and Lyell, to think that uniformitarianism is, in fact, playing a chiefly methodological role. But, for Darwin, it does so in an interesting way: the methodological role played by uniformitarianism allows for the possibility of Darwin developing the pieces of theoretical machinery that *do* demand our realist commitments. So, this is a case where false assumptions provide a scaffolded framework for

theorizing in a way that can ultimately come to place important demands on the way we understand the structure of the natural world.

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O8.04

10:45 THE EARLY DEVELOPMENT OF MISSISSIPPI GEOLOGICAL SURVEY

Renee Cleary and David Dockery

Mississippi State University, Mississippi State, MS, and MDEQ Office of Geology, Jackson, MS

12:00 General Session

Thursday, February 29, 2024

AFTERNOON

Room TC 229

O8.05

1:00 HEALTH, HARM, AND DISPOSITIONS

Ian Dunkle

University Of Southern Mississippi, Hattiesburg, MS

A popular approach to defining health in philosophy of medicine focuses on the causal link between biological processes and harms to the bearer. This broad approach seems particularly well suited to provide normative guidance on questions of distributive justice and moral-clinical practice. On Aas and Wasserman's (2017) refined version, health is the absence of disease and a disease is any biological process in virtue of which its bearer is intrinsically disposed to incur harm directly involving bodily conditions. While promising, it is not possible to assess this refined view without further specifying the notion of intrinsic disposition. The aims of this paper are, first, to develop this view more fully by drawing on recent work on dispositions and, second, to subject it to rigorous scrutiny.

Such a view, specifically, requires a clear distinction between intrinsic and extrinsic dispositions. Otherwise, biological processes that just happen to lead to harms in a society like ours will come out as diseases. To develop such a distinction I follow Contessa (2012) and propose that what matters is whether a subject's disposition to harm, possessed by virtue of their biological process, can be removed without altering the biological process in question. If it can, the disposition is extrinsic and that process is not a disease.

Moreover, on a simple counterfactual-conditional analysis of dispositions, paradigmatic diseases (like coronary heart disease) will come out as extrinsically disposing harms and so not diseases. The reason is that heart disease's disposition to heart attack can be "masked" (e.g. by nitroglycerin). A reverse issue ("mimicry") arises when we observe that freak heart attacks sometimes occur to those we would not intuitively consider disposed to such (much less diseased). To resolve these problems with the proposed analysis of health, I draw on Manley and Wasserman's (2008) influential proportional counterfactual analysis of dispositions, which I show is particularly well-suited to describing biological dispositions. On the resulting view, a subject is intrinsically disposed by virtue of her biological process to incur harm (=is diseased) iff a relevant form of harm would occur in a suitable proportion of relevant stimulus cases and this disposition could not be removed without a change to the biological process itself.

Lastly, I assess the elaborated account of health. It handles cases like Sickle Cell Trait better than Aas and Wasserman originally hoped. But it faces two significant challenges. The first is that it is far too broad. Without further restriction, those biological processes responsible for disposing us intrinsically to feel pain, to asphyxiate in the presence of large amounts of CO, and to sleep poorly after ingesting too much caffeine are all incorrectly identified as disease-states. I argue, however, that the restriction most commonly invoked in the literature results in the view inheriting a number of problems this view was designed to avoid. The second challenge is that the context-sensitivity of the disposition-ascription renders the account ill-suited to provide the normative guidance we had hoped for.

O8.06

1:30 ETHICAL ISSUES IN PRECISION MEDICINE

Gary Hamil[1], Kenneth Butler[2]

[1]Belhaven University, Jackson, MS, [2]University of Mississippi, Jackson, MS

Increased funding and excitement surrounding precision medicine's enormous potential have led to a paradigm shift. Precision medicine is an approach to disease management that considers individual variability in environment, lifestyle, and genes to tailor a treatment that may work best for them. Although the term is relatively new the concept has been a part of medicine for many years. In the area of blood transfusions, blood is not given

to random recipients; instead, the recipient's and donor's blood types are matched. Many oncology treatments are now based on treatment for cancer on a per-patient basis, depending on one's genes and the unique DNA fingerprint of a patient's cancer. Several advantages to precision medicine include prevention, targeted treatment, patient empowerment, and the potential to reduce healthcare costs in the long run. Although precision medicine is filled with the hope of patient-specific prediction, diagnosis, and prevention for disease we cannot avoid the complex ethical, moral, and legal consequences raised. This review will enlighten the concepts of precision medicine and related terms, and share a plethora of ethical, moral, and legal issues related to its use including privacy, informed consent, shared decision-making, disclosure, social justice, valuation practices, and regulation on human subjects. Should hopes for precision medicine's benefits be fulfilled, then the many risks and ethical concerns associated with precision medicine require further attention.

2:00 Divisional Business Meeting

Thursday, February 29, 2024
EVENING

3:30 DODGEN LECTURE /AWARDS CEREMONY
THEATER
5:00 GENERAL POSTER SESSION
(immediately following Dodgen Event)

Friday, March 1, 2024
MORNING
Room TC 229
O8.07
9:00
30 IDENTITY AND AUTONOMY: AN EXAMINATION OF METHODOLOGICAL INDEPENDENCE

Gregory Johnson

Mississippi State University, Starkville, MS

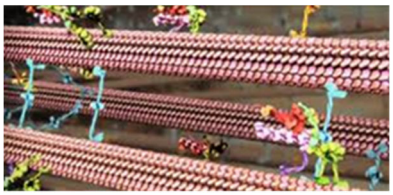
Shapiro offers three arguments for the autonomy of psychology (2017, 2019, and Polger & Shapiro 2016). Here, I examine his argument that psychology is autonomous because it is methodologically independent. Intuitively, methodological independence does yield autonomy, and Shapiro's central example, Sternberg's investigation and model of memory scanning, appears to demonstrate this independence. Shapiro's argument encounters several difficulties, however. (1) Having rejected the prevalence of multiply realized mental states, Shapiro cannot offer a principled reason why methodological considerations lead to the autonomy of psychology. (2) Sternberg himself rejects methodological independence and uses neurobiological evidence to evaluate and support his model. And (3), Polger and Shapiro's mind-brain type identity theory is based, in part, on cognitive psychology and neurobiology not being methodologically independent (2016).

O8.08

10:15 THE AUTOMATIC NATURE OF THE CELL: REALITY OR ILLUSION

Robert Waltzer

Belhaven University, Jackson, MS



Cells from living organisms are extremely complex and can be compared to miniature versions of factories or manufacturing plants. Videos of cellular processes (such as Animations of Unseeable Biology, Drew Berry, 2012) show amazing interactions among cellular machines, leading Biochemist Michael Denton to refer to the cell as "the third infinity" (Miracle of the Cell, 2020, p.16). But do all of the activities within the cell occur automatically and run by themselves and, if so, how can this be explained? In a review written by Richard Lewontin, he says, "we are forced by our *a priori* adherence to material causes to … produce material explanations" (New York Review 1997). Such a view is widely accepted by the mainstream scientific community. The purpose of this talk is to 1) to consider whether cellular processes are really automatic and 2) if so, what explanation can account for it. For instance, the assembly line-like image included with this abstract involves stick figures loaded with cargo carrying it (walking!) to destinations somewhere in the cell. (Shown at 7:51 in the link). Multiple things must go right for this to work effectively. This is all going on at the nanoscale level in most every living cell. How do we know this is automatic? Any alternative to automaticity would multiply explanatory entities and might possibly be outside of a naturalistic framework, which complicates the argument presented here. Nevertheless, there are problems with both the identification and sufficiency of information. First, the information in the cell is hard to differentiate because it takes multiple forms, including a distributed form where the sum of multiple conditions and substances at any given time provides the trigger (often probabilistically) for the next state. Second, every substance and/or condition in the cell requires information to produce it, get it in the right location, and in the right amounts. But the system turning it on requires information. And that information itself requires information. This quickly leads to an infinite regress. I will call this second issue "the source problem". This will be explored in more detail. The other matter being considered here is a possible explanation of automaticity (or at least what looks like it). An unguided process does not seem consistent with the production of such seemingly miraculous activities. To

suggest this is a category error. Numerous structures display goal-directed behavior (that are beyond our current ability to understand) and do not seem to fit with blind, unguided natural law and require a more detailed explanation. In conclusion, the automaticity of the cell is a sticky problem that is difficult to unravel. And an explanation of this "third infinity" is a complex issue that natural law has not accounted for. Both of these issues are intertwined and an answer may involve a paradigm shift greater than what is currently considered within science.

Marine and Atmospheric Sciences

Co-Chair: Duanjun Lu

Jackson State University

Co-Chair: Courtney Roper

University of Mississippi

Vice-Chair: Remata Reddy

Jackson State University

Vice-Chair: Francis Tuluri

Jackson State University

Thursday, February 29, 2024

MORNING

Room Union D

8:15 Welcome and Remarks

O9.01

8:30 UNDERSTANDING, RAPID INTENSIFFIATION AND IMPACTS OF TROPICAL CYCLONES/HURRICANES: USING PREDICTIVE MODELS, HIGH WINDS AND HEAVY PRECIPITATION VARIABILITY

Remata Reddy[1], Mia Robinson1[1], Natalie Courtney[1], Makanna Collins[1], Francis Tuluri[1], Brian Blanton [2]

[1] Jackson State University, Jackson, MS, [2] Coastal Resilience Center, University of North Carolina at Chapel Hill (UNC), NC

Under the U.S. Department of Homeland Security (DHS) 2023 Program for Minority Serving Institutions, the study investigates the air-sea interactions, high winds, and precipitation variability associated with Hurricane Harvey and Matthew using satellite and RADAR data. Hurricane Harvey was a category 4 storm that made landfall in Texas near the Gulf of Mexico on august 25, 2017, with a low pressure of 938 millibar and with wind highest wind speed of 58.1 m/s, which caused up to $125 Billion Dollars of damage across portions of Texas and Louisiana. Harvey started off as a tropical storm on August 17, 2017. Tropical storm Matthew reached its peak strength as a category 5 hurricane, and by the time it reached Haiti on October 4, 2016, it was an extremely powerful category 4 hurricane with torrential rain and winds up to 145 mph. Matthew caused catastrophic damage to Haiti, as well as widespread devastation in the southeastern United States. Matthew was the largest humanitarian emergency due to the death tolls. Hurricane Matthew was the first Category 5 Atlantic storm since Hurricane Felix in 2007. With an estimated 546 deaths and $1.9 million in damages. We used Satellite (BUOY), and RADAR data from NOAA and NWS for collecting wind speed, air pressure, air and sea temperatures, and precipitation levels. We developed an empirical model, Hurricane Predictive Index (HPI), for predicting hurricane intensity using the above data with high wind speeds, heavy precipitation. The difference between air and sea temperatures was the highest at 7.1^0 C and heat fluxes were high using bulk models. When Hurricane Harvey's pressure was 943 millibars and HPI of -24.97 and was unstable which constitutes an early warning system. For Matthew, during rapid intensification, the large-scale heat fluxes strongest reaching 7170 J/m^2 and there is an inverse relationship between pressure and large-scale heat fluxes. This predictive model establishes an early warning system for hurricane prediction and rapid intensification and impacts.

O9.02

8:50 AIR QUALITY MODELING STUDY IN EL PASO, TX

Duanjun Lu[1]

[1]Jackson State University, Jackson, MS

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 1-km 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 investigate the inherent spatial and temporal PM variations. The data collected will contribute to a comprehensive report aimed at developing strategies to optimize healthy behaviors and address air quality issues in the region. This study is significant in understanding the impact of poor air quality and developing effective solutions to mitigate its effect.

O9.03

9:10 ASSOCIATION OF REGIONAL MOBILITY AND AIR QUALITY ON HEALTH IMPACTS

Francis Tuluri[1], Remata Reddy[1], Wilbur Walters[1], Ariana Dunlap[1]

[1]Jackson State University, Jackson, MS

Lockdown measures of different levels were implemented soon after WHO declared COVID-19 as a pandemic on the 11th of March 2020. The need for lockdown was a mitigation effort to control the then increasing COVID-19 incidence in different places worldwide. The large-scale implementation of lockdown has affected almost every area of business including the normal life. In the scientific community, there was an increase in the study of the effect of the COVID-19 pandemic lockdown on air quality and health. The mechanism of interplay between weather and air quality is complex, and similarly their impact on health. Most of the research studies did show an improvement in air quality using several methods - some based on controlled experiments, and some based on machine learning modeling. In the present study examines the study of environmental factors, mobility, and air quality in the region of Mississippi, USA. The variables of study consider primarily temperature, pressure, humidity, wind speed for the weather; and Particulate Matter (PM2.5 and PM10), Ozone (O3), and Nitrogen dioxide (NO2) for the air quality over the period of last 10 years. The data of interest is collected from NOAA, Weather Underground, and EPA. Python programming and Statistical methods will be used to analyze the data. We will present the results of cross correlation between the variables of study to estimate the impact of lockdown on air quality and health in the region of study.

O9.04

9:30 ZOONOTIC SURVEILLANCE IN WILDLIFE OF CENTRAL MISSISSIPPI

Scoty Hearst and Trent Selby

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

The World Organization for Animal Health (WOAH) is a global intergovernmental agency with members including the United States and 180 other counties with the goal to control and prevent the spread of epizootic diseases. WOAH estimates that new human infectious diseases will emerge from animal reservoirs. Global surveillance of infectious diseases, including zoonoses, is required to prevent future outbreaks and global pandemics. For this reason, we have begun zoonotic surveillance in wildlife throughout central Mississippi. Our studies range from surveillance of SARs-CoV-2 in white-tailed deer to parasitic infections in raccoons to fish species. In this talk, we will discuss ongoing zoonotic surveillance projects throughout central Mississippi, potential zoonotic transmission routes, how zoonotic surveillance is an excellent tool for training research students, and future directions for our zoonotic surveillance projects.

9:50 Divisional Business Meeting

Thursday, February 29, 2024

EVENING

3:30 DODGEN LECTURE /AWARDS CEREMONY

THEATER

5:00 GENERAL POSTER SESSION

(immediately following Dodgen Event)

P9.01

AIR-SEA INTERACTION LARGE-SCALE HEAT FLUXES, HIGH WINDS, HEAVY PRECIPITATION ASSOCIATED WITH HURRICANE MATTHEW USING RADAR AND SATELLITE DATA

Natalie Courtney, Zion Murphy, Mia Robinson, Makanna Collins, Remata Reddy, Francis Tuluri

Jackson State University, Jackson, MS

Under the U.S Department of Homeland Security (DHS) 2023 Follow up Program for Minority Serving Institutions, the investigates air-sea interactions, large-scale heat fluxes. high winds, heavy precipitation variability associate with hurricane Matthew. Hurricane Matthew reached its peak strength as a category 5 hurricane, and by the time it reached Haiti on October 4, 2016, it was an extremely powerful category 4 hurricane with torrential rain and winds up to 145 mph. Matthew caused catastrophic damage to Haiti, as well as widespread devastation in the southeastern United States. Matthew was the largest humanitarian emergency due to the death tolls. Hurricane Matthew was the first Category 5 Atlantic storm since Hurricane Felix in 2007. With an estimated 546 deaths and $1.9 million in damages. We developed the predictive model by using the ideal gas law and bulk model to calculate the large-scale heat fluxes associated with hurricane Matthew. 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 the Hurricane Matthew reaching maximum strength heat fluxes 7170 J/m2, 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 early warning system for rapid changes of hurricane intensity

P9.02

AIR-SEA INTERACTIONS, HEAT FLUXES, HIGH WINDS, AND PRECIPITATION VARIABILITY AND HURRICANE PREDICTIVE INDEX (HPI) ASSOCIATED WITH HURRICANE HARVEY BY USING RADAR AND SATELLITE DATA

Mia Robinson, Natalie Courtney, Makenna Collins, Remata Reddy, Francis Tuluri

Jackson State University, Jackson, MS

Under the U.S. Department of Homeland Security (DHS) 2023 Program for Minority Serving Institutions, the study investigates the air-sea interactions, high winds, and precipitation variability associated with Hurricane Harvey using satellite and RADAR data. Hurricane Harvey was a category 4 storm that made landfall in Texas near the Gulf of Mexico on august 25, 2017, with a low pressure of 938 millibar and with wind highest wind speed of 58.1 m/s, which caused up to $125 Billion Dollars of damage across portions of Texas and Louisiana. Harvey started off as a tropical storm on August 17, 2017. Although Harvey did not intensify much during August 17-August 23rd, once it entered the Gulf of Mexico, it rapidly intensified from 40 miles mph tropical storm to a 130 mph Category 4 Hurricane. It affected 180 billion dollars' worth of property damage and caused a total of 82 fatalities. We used Satellite (BUOY), and RADAR data from NOAA and NWS for collecting wind speed, air pressure, air and sea temperatures, and precipitation levels. We developed an empirical model, Hurricane Predictive Index (HPI), for predicting hurricane intensity using the above data with high wind speeds, heavy precipitation The difference between air and sea temperatures was the highest at 7.1^0 C and heat fluxes were high using bulk models. When Hurricane Harvey's pressure was 943 millibars and HPI of -24.97 and was unstable which constitutes an early warning system.

P9.03

RANDOM FOREST REGRESSION MACHINE LEARNING MODEL, AND PREDICTION OF TORNADOS - AN EDUCATIONAL PROJECT UNDER DHS STEM ENHANCEMENT PROGRAM, 2023

Eyole. W. Wuno, Reddy Remata, Francis Tuluri

Jackson State University, Jackson, MS

Mini projects by undergraduate students were carried out using data analytics and Machine learning modeling were carried out to understand analyzing tornado data sets available on open sources. The objective of performing mini projects is to facilitate students becoming familiar with computer programming, big data and data science, data analysis and visualization, and prediction. As an example of a case study, we demonstrate a mini project on tornadoes in the USA to predict Enhanced Fujita scale (EF) as an early warning tool using machine learning. The required datHistorical data of tornadoes for the past 50 years was collected from NOAA website. Python programming and Statistical data analysis were used to understand the general pattern of occurrence, frequency distribution of tornadoes as a function EF scale, month, year, and Beginning day of the year were drawn. Visualization tools were also used to study the spatial distribution of tornadoes, and their tracks. Using machine learning modeling, 48 features were generated including tornado length, tornado width, damages, deaths, beginning date, beginning time. Random Forest model was used to predict EF scale. The study describes analyzing the results by using model metrics. The work is a part of DHS Summer Research Program for Minority Serving Institutions to promote STEM education (DHS-SRTMSI-2022-FacultyProposa101).

P9.04

INVESTIGATING THE DIFFERENT CHARACTERISTICS OF HURRICANES TO IMPROVE HURRICANE WARNINGS

Harvana Laing[1], Mari Tye[2], Agbeli Ameko[2]

[1]Jackson State University Jackson, MS , [2]National Center for Atmospheric Research

As someone aspiring to be a broadcast meteorologist, I tend to think about ways I can help in the future. Having experienced so many hurricanes helped in the development of this project, as I am aware of the destruction caused. As hurricanes are becoming more intense and stronger, I want to look at ways forecasters and broadcast meteorologists can communicate the imminent risks from approaching hurricanes better to the public. I want the public to be fully aware and more informed about the extreme effects that hurricanes can bring. Factors such as how rapidly a hurricane forms (intensification) or moves (translation speed) play a major role in the effects experienced on the ground. I believe there are ways for broadcasters to educate the public on the severity and risks of these factors. This project focuses on rapid intensification and slow translation speed and associated impacts such as total rainfall. I started with Hurricane Dorian, of which I had firsthand experience, then considered three other hurricanes that traversed the Bahamas (hurricanes Irma, Maria and Matthew). All four hurricanes were classified as rapidly intensifying and I noticed that the slower translation speed from Hurricane Dorian exacerbated the storm surge experienced compared to the other hurricanes.

P9.05

THE USE OF THE AOML HURRICANE MODEL VIEWER FOR UNDERSTANDING HURRICANE ANALYSIS AND FORECAST SYSTEM (HAFS) FORECASTS

Cameron Bennett[1], Lewis Gramer[2], Tamara Battle[2], Segayle Thompson[2], Sundararaman Gopalakrishnan[2], Aaron Pratt[2], Christopher Spells[2], Krishna Kumar[2]

[1]Jackson State University, Jackson, MS, [2]OAR-WPO & AOML, National Oceanic and Atmospheric Administration (NOAA)

Hurricanes have caused over $1 trillion in damage and have taken nearly 6900 lives in the US between 1980 and 2023. These tropical weather systems are very hard to predict because the atmosphere and ocean are changing all the time at a range of spatial scales. Meteorologists working within the National Oceanic and Atmospheric Administration (NOAA) use forecast models to inform and protect people around the world. More specifically, NOAA's Atlantic Oceanographic and Meteorological

Laboratory (AOML) uses different models to forecast the storm's track, intensity, and sea-to-atmosphere interactions. These include global (e.g., European model, NOAA's Global Forecast System) and high-resolution hurricane models, including the Hurricane Analysis and Forecast System (HAFS) jointly developed by NWS/EMC and AOML.AOML/HRD in particular completed real-time experiments with the HAFS-B configuration spanning the years 2020-2022 Using AOML's Hurricane Model Viewer (https://storm.aoml.noaa.gov/viewer/), I will be identifying cases in which the HAFS-B forecast model was unable to correctly predict the storm's intensification and provide feedback on why the storm strengthened or weakened more than the forecast. Importantly, the goal of this research is to help improve NOAA forecasting, so more lives can be saved and more property protected. Some preliminary results show that air-to-sea interaction is the reason for rapid storm intensification change; others may indicate the temperature of the ocean has a significant effect on a storm's intensification.

P9.06

MAPPING STORM SURGE BY USING ArcGIS Pro IN TAMPA, FL

Danasia Sproles, Duanjun Lu

Jackson State University, Jackson, MS

Storm surge is one of the most harmful result from a tropical system, which causes flooding, homelessness, destroyed businesses. Many vulnerable groups including children, lower income families, and the elderly can be impacted the most by storm surge flooding. In this study we aim to study how many disadvantaged individuals and businesses residing in a coastal region (Tampa, FL) are at great threat due to storm surge caused by a hurricane landing (Hurricane Ian, 2022). The results of this study can be used to predict the best option to prepare the citizens located in the Tampa, Florida area for the next potential storm. The software ArcGIS Pro was utilized to study flooding in an area that was impacted by the storm. High resolution terrain data (1-ft) from ESRI (Environmental Systems Research Institute)Living Atlas was applied to map different flooding scenarios: 1-ft, 2-ft, 1-m, 3-m, and 5-m. We investigated flooding influences through analysis of some social economical parameters including: age, population, household income, and businesses.

P9.07

DEVELOPING AN EFFECTIVE SET OF QUESTIONS TO EXTRACT PARTNER NEEDS FROM NWS IDSS

Daphne LaDue[1], Zakiya Johnson[2]

[1]OU Center for Analysis and Prediction of Storms (CAPS) Norman, OK, [2]Jackson State University, Jackson MS

The National Weather Service (NWS) provides Decision Support Services (DSS) to "core partners," including emergency managers. Other local officials in sectors such as Schools, Fire Departments, Law Enforcement, and Public Works or Transportation Departments, also need decision support information to help them decide when to open/delay/close, prepare specialized rescue equipment, plan for staffing, or anticipate challenges in keeping roads clear and open during and after storms or winter precipitation. This study is simultaneously exploring how local officials make these decisions while also building and testing a method by which NWS Weather Forecast Offices (WFOs) can obtain this type of information for themselves.

Our student-led team created and tested a set of questions by which to understand partner needs. The question set first inquired about the background of participants and proceeded with DSS-specific questions via interviews and focus groups to learn about their decision-making thought processes. These questions were tested in two Integrated Warning Team exercises. The first exercise tested the utility of a new weekly webinar during the winter season; the second exercise tested event-specific DSS briefings for a fictional warm season convective severe and flooding event. Both exercises were conducted with the same question set; some modifications were made through development. Based on the goals of each exercise, questions were pulled from our set to learn what information participants used, or would use, from the DSS. Those interviews and focus groups were audio recorded and transcribed for analysis.

Responses were analyzed to understand how different sectors use DSS, and comparisons were made across officials in each sector to understand their information needs and how their responsibilities and experiences drove those needs. Using thematic analysis, we are examining participants' responses to identify how officials understood and used DSS. To assist NWS WFOs in simultaneously meeting the needs of diverse partners, we seek to make connections across sectors to help us make recommendations for improvement. Regarding our effort to create a method NWS WFOs can use to elicit helpful feedback, our team is analyzing the relative success of alternate wordings of questions, their composition, and how the context of each question may have affected how participants responded. Responses to each question and its variants were compiled together in one document. Organizing our data in such a way is revealing similarities and differences in responses across participants to help us gain insight into which questions were more informative when discussing the DSS and participant's information needs.

This talk will report on NWS partner's needs from forecast information for slower-timescale winter weather and faster-timescale warm season convective severe weather. We will also discuss planned improvements to our question set, which will be tested in additional WFOs before being shared with the NWS.

P9.08

HSL CHECK SURVEY OF APRA HARBOR - GUAM, POST-TYPHOON MAWAR

Austin Lowery

Naval Oceanographic Office

On 24 May 2023 Super Typhoon Mawar made landfall on the island of Guam as a strong Category 4 storm. Effects of the storm were felt over the entire island with strong winds, storm surge, and heavy rains. A significant amount of debris was present throughout the island, including roadways, beaches, and harbors. Apra Harbor, located on Guam's west coast, is home to both Naval Base Guam (NBG) and commercial shipping at the Port of Guam. The Port of Guam handles over 90% of total imports to the island and is accessible through Outer Apra Harbor. Two of the permanent tenants located within Inner Apra Harbor at NBG are U.S. Navy Submarine Squadron 15 and U.S. Coast Guard Station Apra.

P9.09

INTERPOLATION CONSISTENCY-BASED ACTIVE LEARNING FOR FISH SPECIES IDENTIFICATION

M M Nabi[1], Chiranjibi Shah[2], Simegnew Yihunie Alaba[1], Robert Moorhead[2], John E. Ball[1], Farron Wallace[3]

[1]Mississippi State University, Mississippi State, MS, [2]Northern Gulf Institute, Starkville, MS, [3]NOAA Fisheries, Galveston, TX

The deep neural network has gained popularity for object detection due to its high accuracy. However, the performance heavily depends on the availability of a substantial volume of accurately labeled data which can be both time-consuming and costly. To reduce labeling dependency, various active learning models have been proposed. Nevertheless, these approaches tend to exhibit biases toward high-performing classes or a higher number of sample classes, resulting in datasets that inadequately represent the testing data.

In this work, we propose interpolation-consistency-based Active Learning (ICAL), which resolves issues caused by applying conventional Interpolation Regularization (IR) directly to object detection. This approach can be interpreted as a form of data augmentation technique that seeks to construct additional training samples by combining two or more samples. The output of the model is categorized into two types based on their objectness score between the original image and mixed image with IR. Separate loss functions are applied depending upon their IR mixed criterion. The proposed loss function notably improves the performance of supervised learning and active learning. This unified framework considers both the uncertainty and the robustness of the detector, ensuring that the network performs well in all classes.

For our experiment, we employ the Southeast Area Monitoring and Assessment Program Dataset 2021 (SEAMAPD21), comprising 130 fish species classes with 28,328 image samples. The dataset presents challenges such as multiple fish in a single image, an underwater low-light environment, occlusions caused by other fish or vertical bars, and unbalanced fish distribution. The results show that our model consistently outperforms the existing approaches and significantly reduces the annotation cost. Furthermore, we benchmark our model's performance against a public dataset (PASCAL VOC07), showcasing its effectiveness in comparison to existing methods. This comprehensive framework not only advances the field of active learning in object detection but also provides a practical solution for real-world applications, ensuring accurate and cost-effective results across diverse object classes.

P9.10

NAVOCEANO NP321 REMOTE SENSING BRANCH PRODUCTS

Danielle Carpenter, Paul Lyon, Valinda Kirklan[1], Michelle Little, Eric Bordelon, Jessica Schroeder, Alyssa Silvas

Naval Oceanographic Office

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 US Navy, as well as other government agencies. With developmental assistance from the Naval Research Lab (NRL), numerous sets of satellite data and in-situ observations are processed in-house for input to the Navy's Global Ocean Forecast System (GOFS) and the Navy Global Environmental Model (NAVGEM).

Multi-Channel Sea Surface Temperatures (MCSST) is the primary producer of satellite-derived SST observations for the Navy, especially for the FNMOC METOC models. MCSST also provides these observations to the National Oceanic and Atmospheric Administration (NOAA) and our international partners in the Group for High Resolution Sea Surface Temperature (GHRSST). Real-time ocean prediction systems readily assimilate SST, along with other oceanographic measurements, to generate mesoscale ocean forecasts for operational maritime activities.

The Altimetry Data Fusion Center (ADFC) project is responsible for providing timely, accurate, and quality-controlled Sea Surface Height anomaly (SSHa) observations for assimilation by the Navy's Global Ocean Forecast System (GOFS), Regional Navy Coastal Ocean Model (RNCOM), Wave Watch 3, (WW3), Earth System Prediction Capability (ESPC), and Coupled Ocean/Atmosphere Mesoscale Prediction System (COAMPS).

Satellite-derived ocean optics products are created using three different processing systems, Automated Optical Processing System (AOPS), Global Optical Processing System (GOPS), and Ocean Optics Climatology System (OOCS). AOPS produces near real-time products which

are updated each time a satellite pass covers an area of interest (AOI). GOPS produces global 1 km resolution cloud filled maps. OOCS is used to process "climate data record" quality satellite derived water-leaving radiance from multiple satellite.

The Real Time Data Handling System (RTDHS) provides in-situ observational oceanographic data to the numerical models and to in-house databases. RTDHS is the primary in-situ oceanographic observation data provider for NAVOCEANO forecasting models, and provides a method to ingest, process, perform gross quality control, and distribute in-situ data for model ingest 24 hours a day.

The newest project in the branch is the Ice Concentration Processing System (ICPS), which was implemented in FY16 to add more model inputs and data processing capabilities. Currently, ICPS uses level one Sensor Data Records (SDRs) from the Advanced Microwave Scanning Radiometer 2 (AMSR2) sensor, which flies aboard the Global Change Observation Mission - Water (GCOM-W1) satellite to make level two Environmental Data Records (EDRs) near-real-time sea ice concentration (SIC) products for both the northern and southern hemispheres.

Mathematics, Computer Sciences and Statistics

Co-Chair: Ping Zhang

Alcorn State University

Co-Chair: Jamil brahim

Independent Scientist

Thursday, February 29, 2024

MORNING

Room Union Hall of Honors

8:20 **Welcome**

O10.01

8:30 MeScheR: A DATA ABSTRACTION FOR BIG DATA STORAGE AND RETRIEVAL

Rachel Jordan, Barry White, Reena Patel, Matthew Bray[1]

Engineering Research & Development Center, Vicksburg, MS

Physical modeling procedures, with intermediate data, are being developed for the large-scale generation of synthetic imagery for automated target recognition (ATR) machine learning (ML) algorithms. This imagery is typically combined with field-collected data for generating robust training sets. This data needs a systematic method of data storage and retrieval. We propose a data abstraction for storing and organizing the resulting data from the engineering processes in the workflow. This method will generate a set of data reservoirs with their own metadata for each data item. In particular, our goal is to provide a method for users to manage and locate data using metadata after the data's ingestion into the database. To this end, the Metadata Schema Reservoir (MeScheR) was developed to partition the data into reservoirs with schemas that describe the type of metadata contained for each data item. Search queries leverage the metadata to identify specific data, its location, and reservoir in the database. Functions using the resulting data add, change, or remove data and metadata from the database. Use cases have been developed for data ingestion, queries, alterations, and removals. These use cases have all be tested using the data abstraction code MeScheR. MeScheR functionality has been coded and tested using test data from the engineering processes. This abstraction can be used for large image data set retrieval of information for ATR training.

O10.02

8:50 - BRUISED FRUIT DETECTION USING DEEP MACHINE LEARNING ALGORITHM

D'ana S. Prieto[1], Puneeth Kumar Bolugallu Padmayya[1], Ping Zhang[1], Babu Patlolla[2]

[1]Department of Mathematics and Computer Science, Alcorn State University, [2]Department of Biological Sciences, Alcorn State University

In a study, it was found that bruised fruits (apples) were found in around 16% of harvests with hand-picking method, and this number increased when mechanical pickers were applied. Therefore, identification of bruised apples is commonly used in the production line of fruits to improve the quality of fruits served to the market. Manual identification of bruised apples has many limitations, such as high time cost, affected by human bias, and so on. To overcome such problems, many efforts have been made to develop automatic bruise detection systems. Among those systems, image processing technologies are commonly used to identify bruised apples. Most proposed methods are using 2D imaging technology, however, the average accuracy of the current identification approaches is from 62% to 82% using NIR infrared spectroscopy. Besides, applying 2D imaging technology also introduces new limitations, including low accuracy, sensitive to the lighting condition as well as the viewpoint of the camera, and incapable of measuring depth information of bruise regions. 3D imaging technologies have become more attractive in recent years. Compared with 2D technologies, 3D imaging technologies can collect accurate shape information for any object it scans. In addition, they can obtain in-depth information which may contribute to bruise grading. Moreover, the 3D imaging systems are more user-friendly due to their insensitivity to the viewpoint of the camera as well as lighting conditions. The 3D near infrared (NIR) imaging technology with certain wavebands is found to be harmless to human beings and foods. This technology has been applied for 3D human tissue measurement. All those advantages of 3D near infrared

imaging technology make it perfectly suited for bruise detection on fruits. Therefore, in this presentation, we propose a fruit bruise identification algorithm. Convolutional Neural Networks (CNN) are one type of deep learning architectures, which extract hierarchical features through multiple convolutional layers to learn the deep representation of image data. CNNs have shown its state-of-art performance in ImageNet benchmark, and many of their variants have been proposed in recent studies for object recognition, segmentation. In our algorithm, we design a CNN, which is based on AlexNet, to identify bruised apples from 3D mesh data. In this paper, we propose an algorithm for recognizing bruised apples based on surface shape information. For classification, we propose to build a convolutional neural network to extract deep hierarchical features from the 2D feature maps that are optimal for the identification of bruised apples. Experimental results show that the proposed algorithm is better than the algorithm developed previously, which indicates the potential of the proposed algorithm for the identification of bruised apples.

This project was sponsored by USDA/NIFA. Award No: 2014-38821-22394

O10.03

9:10 STATISTICAL PROPERTIES OF STRUCTURED RANDOM MATRICES DEFINED BY MATRIX SUBSTITUTIONS

Zheng Chen, D'ana Prieto, Christavious McCain

Department of Mathematics and Computer Science, Alcorn State University, Lorman, MS

Research on random matrices spans various fields, including mathematics, physics, statistics, and computer science. Random matrix theory (RMT) is a branch of mathematics that studies the statistical properties of matrices whose entries are random variables. Structured random matrices are matrices with a specific pattern or structure, but with entries that incorporate an element of randomness. These matrices play a crucial role in various fields, including probability theory, statistics, numerical analysis, and information theory. The introduction of randomness into structured matrices often serves to model uncertainty, noise, or variability in real-world scenarios. Among structured random matrices, we are particularly interested in the ones defined by matrix substitution, which is pretty new and some challenging topics are related to them. Here, the structure of the random matrices is given by deterministic matrices—the skeletons of the random matrices—built with an algorithm of matrix substitutions with entries in a finite field of integers modulo some prime number. We will explore the properties, applications, or mathematical aspects of structured random matrices defined by matrix substitutions. As in more general cases, we will investigate the spectral properties, eigenvalue distributions, and other statistical characteristics of these matrices to gain insights into the underlying processes they model. We especially plan to do some numerical experiments and investigate the statistical characteristics of these matrices, as well as the algorithms to do this. The interplay between structure and randomness in matrices is a rich area of study with diverse applications across disciplines, from which we can learn and make efforts to investigate and present some statistical and numerical results in the structured random matrices defined by matrix substitutions.

O10.04

9:30 LEVERAGING UNITY, UNREAL ENGINE, AND UBUNTU FOR COST-EFFECTIVE DRONE SIMULATION IN AGRICULTURE

Kasey Jones, Alyssa Krajnik, A.J. McClain, Brandon McGrew, Vinay Panchal

The University of Southern Mississippi, Hattiesburg, MS

In recent years, the agricultural sector has undergone a significant transformation thanks to the advent of drone technology. Unmanned aerial vehicles (UAVs), or drones, have emerged as powerful tools in precision agriculture, offering the potential to change how crops are monitored, pests are controlled, and farms are managed. It is necessary, however, to thoroughly test and fine-tune drone capabilities, control algorithms, and coordination in various agricultural scenarios before fully realizing these benefits. It can be costly and challenging to conduct real-world tests.

This proposal puts forth a strategic approach that harnesses the capabilities of Unity, Unreal Engine, and the Ubuntu operating system to create a cost-effective and efficient solution for drone simulation in agricultural applications. By leveraging these established tools, we can simulate real-world drone operations without constructing a new platform. For replicating complex dynamics of drone flight and various agricultural scenarios, Unity and Unreal Engine provide realistic 3D environments and physics simulations. By utilizing these game development engines, we can create highly realistic simulations that replicate the challenges drones face in the real world, such as diverse weather conditions, different terrains, and varying crop types. These simulations are invaluable for refining control algorithms, testing drone behavior in different contexts, and developing robust and responsive drone systems.

Open-source Linux operating systems such as Ubuntu provide a stable platform for Unity and Unreal Engine to run smoothly. Its reliability and versatility ensure that the simulations operate consistently and predictably, which is critical for creating a dependable and efficient drone testing environment. This integrated approach has several distinct advantages, including cost-effective testing, a wide range of scenarios to conduct comprehensive evaluations, algorithm refinement within a safe and controlled environment, and interoperability testing of multiple drone models and sensor configurations.

By implementing this strategy, we aim to bridge the gap between drone simulations and their practical use in agriculture. We aim to improve agricultural productivity,

sustainability, and the overall success of drone technology through cost-effective and safe drone testing and algorithm refinement. This approach will enable farmers to harness the full potential of drones for improved crop management, pest control, and precision agriculture, ultimately contributing to a more efficient and sustainable agricultural future.

O10.05

9:50 UTILIZING READILY AVAILABLE STATISTICAL APPLICATIONS TO ANSWER RESEARCH QUESTIONS AND PERFORM DATA ANALYSES EFFICIENTLY AND EFFECTIVELY

Jamil Ibrahim[1], Ibrahim Ibrahim[2], SAJA Ibrahim[3], Hidaya Ibrahim[4], Waseem Ibrahim[2]

[1]UMMC, [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, West Bank, Palestine

There are many statistical applications that statisticians or data analysts can use effectively to perform sophisticated data analyses efficiently and derive meaningful insights from their data. Evidence-based decision making requires transforming raw data into useable information. Data analysts can convert data to vivid and interactive visualization in a timely manner without having sophisticated programming skills. One readily available and affordable tool is Excel. Everybody uses Excel, but not everyone uses it to its potential. As research questions become more and more complex, the presenter will introduce techniques for simplifying analytic results without losing data and without the need for a full written report. The attendees will receive examples of describing data in different formats such as heat maps, geographic maps, and dashboards that go above and beyond the standard charts. Although not as sophisticated as SPSS, SAS, R, Python, or the others, Excel has become a tool essential for mastering the four data-driven tasks: data access, management, analysis and presentation. In Excel, simplifying analytic results without losing data often involves summarizing or condensing large datasets while retaining key insights. Excel provides several tools to simplify your analytic results while maintaining the integrity and accuracy of the information without losing essential data such as Pivot Tables, filtering and sorting options, Visual representations like charts and graphs, data validation, various functions, and Data Grouping. Excel is accessible and user-friendly for basic data analysis, but specialized statistical software provides more powerful, advanced, and customizable features suitable for handling complex statistical analyses, large datasets, and specialized research needs. Statisticians often choose specialized statistical software based on the complexity of their analysis requirements and the need for advanced statistical methodologies. The presenter will address the advantages and disadvantages of using Excel to accomplish these tasks.

O10.06

10:10 DOES THE INTERVENTIONAL METHOD, MINI-CLINICAL EVALUATION EXERCISE IMPROVE MEDICAL STUDENT'S' LEARNING AND PERFORMANCE IN THEIR CLINICAL SKILLS TRAINING COMPARED TO TRADITIONAL METHODS?

Jamil Ibrahim[1], Ibrahim Ibrahim[2], Saja Ibrahim[3], Hidaya Ibrahim[4], Waseem Ibrahim[2]

[1]UMMC, [2], Arab American University, School of Dentistry, Jenin, Palestine , [3]University of Jordan Medical School, Amman, Jordan; , [4]Hidaya Ibrahim, Al-Najah University, School of Pharmacy, Nablus, West Bank, Palestine

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 before-and-after study sought to find out if M3 students' scores improved after utilizing mini-CEX. A total of 456 students participated in this study. The pre-test group consisted of 339 medical students assessed in various clinical settings with a diverse set of patients. The post-test group consisted of 115 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 20 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.

There is no doubt that the learning and performance of medical students during their third-year clinical skills training are crucial in shaping their clinical competence and readiness for patient care. Several factors may contribute to their learning and performance in this phase of their medical education such as clinical exposure, practical application of clinical skills including physical examination, history-taking, professional and interpersonal skills, and basic procedures. 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.

O10.07

10:30 HOW ENVIRONMENTAL, LIFESTYLE, AND GENETIC FACTORS CONTRIBUTE TO DIABETES SUSCEPTIBILITY IN A MINORITY SCHOLARLY CLIMATE IN MISSISSIPPI

Mikayla Chandler

Jackson State University, Jackson, MS

In the realm of preventive healthcare, this project studies

the effectiveness of proactively monitoring activity levels through the use of Fitbit devices by mitigating the progression from prediabetes to advanced stages of diabetes mellitus in adult populations, with a particular focus on Historically Black Colleges and Universities (HBCU), specifically Jackson State University (JSU). All of Us Research aims to incorporate a diverse data set that the researchers aspire to aid in the information presented from this project. The objective is to provide insights regarding how one's lifestyle plays a role in diabetes vulnerability by utilizing wearable technology as a preventative measure. By contributing to a profound understanding of the relationship and correlation of susceptibility to diabetes with information from Fitbit data provided by the All of Us Research, this research holds a distinctive position within the scientific landscape by uniquely focusing on proactive intervention. The proposed research questions delve into the interplay between exercise parameters, lifestyle interventions, and diabetes susceptibility, fostering a holistic understanding of the preventive measures under scrutiny. By leveraging the All of Us research workbench, the study aligns with cutting-edge practices in data analysis and machine learning, epitomizing a modern approach to scientific inquiry within the context of JSU. The functional requirements outline a comprehensive framework, ranging from user authentication and data integration to machine learning algorithms and user interface design, ensuring a secure platform for the execution of the research. In essence, this research represents a convergence of technological innovation, scientific rigor, and a proactive stance toward public health, ushering in a new paradigm for diabetes prevention anchored in wearable technology and modern research methodologies, specifically tailored to the needs and nuances of HBCUs.

O10.08

10:50 DRONE WAVE: A DEEP STUDY OF OPTIMIZING VIRTUAL ENVIRONMENTS TO IMPROVE REAL WORLD DRONE USAGE

Khadichabonu Valieva, Richard Swilley, Yaju Shrestha, Ta'Mya Tate, Uyen Tran, Philip Vu, Yaswanth Repakula

University of Southern Mississippi, Hattiesburg, MS

Drones have become normal in everyday life with them being used in various day-to-day functions from real estate to farming. In this paper, we will discuss what we have learned in software engineering class and apply these principles to work with virtual drones. This paper examines drones used in augmented reality with realistic physics and visuals within multiple software applications that allow us to test and operate digital drones in a simulated environment. Our drone project 'Drone Wave' incorporates numerous methods such as flight controls, terrain mapping, camera surveys, and data collection which are coded in our simulation to test the drone in a safe virtual environment in the hopes our drone operations can be transferred to the real world. Our aim is focused on building a functional virtual drone that can successfully fly and land, automatically survey the farm terrain to capture images, and collect information on the environment's conditions within the simulation. Through the combined forces of the software applications, we used including Unity, VMware, Gazebo, and AirSim, we were provided with multiple tools, ROS files, assets, and objects that were used to create our drone and terrain as well as input scripts of code that allowed us to move and operate the drone that would interact with the environment. Incorporating many scripts of code into our drone will exhibit many different directions and functions it can perform during the simulation. The simulation provides the perfect setting to run these virtual drone operations so we can closely test our drone capabilities in the digital plane before translating these actions into the real-world setting. Finally, the paper will explore diverse applications of drone simulation in the context of our daily lives. As drone technology progresses, it becomes increasingly evident that this innovation will permeate various aspects of our surroundings. Whether for surveillance or delivery purposes, drones are poised to enhance the convenience of human daily life.

O10.09

11:10 A 3D HIGH-DENSITY RATIO TWO-COMPONENT LATTICE BOLTZMANN METHOD FOR CAPTURING COMPLEX FLUID DYNAMICS AND ITS APPLICATION IN DROPLET DYNAMICS

Caixia Chen[1], Yonghua Yan[2], Yong Yang[3], Dania Zein[1], Matthew McKee[1], Dwight Ross[1], Raven Lee[1]

[1]Tougaloo College, [2]Jackson State University, [3]Western Texas A & M

In this study, an advanced high-density ratio sharp interface lattice Boltzmann method (LBM) for three-dimensional simulations were presented. It is specifically focusing on capturing intricate fluid behaviors with complex interface. By harnessing the LBM's unique ability to compute solely within the fluid phase, our enhancements not only boost computational efficiency but also offer in-depth insights into complex fluid dynamics. An algorithm for the interaction among fluid, air and wall boundary was also proposed in this study.

A series of numerical simulations of water droplet dynamics - including the collision of water droplets under various initial conditions, the impact of water droplets on the water surface and the wall, the flow of water droplets on the wall, etc. were carried out using the proposed sharp interface method, and the numerical results were analyzed and discussed.

O10.10

11:30 A STUDY OF PLAGIARISM CHECKER FOR COMPUTER SCIENCE CODING ASSIGNMENT

Cyrus Kunwar, Jasmine Leflore, Lixin Yu

Alcorn State University, Lorman, MS

Plagiarism in student assignment submission has become

more serious with the available resources on the Internet and the development of Artificial Intelligence This study focuses on analyzing the problem in computer science coding assignments, comparing results from three popular anti-plagiarism software, and suggesting an innovative approach based on weighted match technology. The literature study shows that there is no universal definition on the standard to detect plagiarized homework. The survey of the three-plagiarism checkers also reveals the fact that the software only gives the probability of plagiarism by checking the similarity of a work against other submissions in the same group or against the sources on the Internet. Establishing plagiarism standards is challenging, especially in specific fields such as computer science coding assignment, where questions complexity, nature, and instructor's perspective play an important role. Therefore, this research studies how to make a customizable standard for instructors to use. In addition to the literature search research, this study used three sets of real homework submissions and three selected plagiarism checkers to get the firsthand experience of plagiarism detection. The three sets of assignment submissions were checked by two researchers individually and independently to find the plagiarized work. Assignments that received different judgements are discussed by all the researchers to reach an agreement. This procedure made a standard set of plagiarized work. The homework submissions are then assessed by the three software, and the results are analyzed using recall and precision measurements. Recall is the percentage of the plagiarized work that are detected by the software. The value represents how inclusive the software can find the plagiarized work. Precision is the percentage of the real plagiarized work found among all the findings that are labeled as plagiarized work. The value represents the accuracy of the software. After testing the three-plagiarism checkers, this study proposed a framework to develop an anti-plagiarism software only for computer science coding assignments. Key considerations, including variable name, spaces between words, coding style, relationship with the content taught, and other issues, are presented. The study proposes a weighted method in which instructors can allocate weights to issues depending on their own assessment of plagiarism for each assignment. For example, the instructor may set the system in a way that 5 points are deducted if variable names are the same as another submission; 10 points are deducted if spaces between words are the same and a submission is considered as a plagiarized work if more than 20 points are deducted. A software prototype demonstrating the practical application of this concept will be presented to illustrate the framework's capability.

Thursday, February 29, 2024

AFTERNOON

Room Union Hall of Honors

O10.11

1:10 EXPLORING SLEEP DEPRIVATION AMONGST HISTORICALLY BLACK COLLEGES AND UNIVERSITIES (HBCU) STUDENTS USING FITBIT DATA

Miah Robinson

Jackson State University, Jackson, MS

Sleep deprivation amongst scholastic students has become a prevalent issue due to stress, sweeping responsibilities, and lack of nutrition or social environments. Research offered by the Center for Disease Control and Prevention (CDC) states that "... at least 60% of college students have poor quality sleep and garner on average seven hours of sleep per night." The American Academy of Sleep Medicine and Sleep Research Society (AASMARS) guidelines state that young adults need seven to nine hours of sleep per night. Insufficient sleep can lead to diminished attention, impaired memory, and a lack of problem-solving skills. Specifically, restless scholars may experience difficulties in focusing and attaining attention, which can affect their academic performance at a university. Sleeplessness has also been linked to a decrease in the use of memory capacity, making it difficult for students to retain and recall information. Furthermore, lethargic individuals may struggle with complex tasks such as decision-making, which leads to mediocre judgments that can have a negative impact. This research delves into the cognitive difference and well-being between students suffering from sleep deprivation and those who obtain seven to nine hours regularly using Fitbit data gathered by the All of Us Research. By facilitating minority health issues as far as diseases, lifestyles, and social determinants of health are concerned, All of Us research participants play a vital position. By understanding the differences between deprived individuals with a lack of sleep in comparison to monotonous underachievers as it relates to university success, the importance of promoting healthy sleep habits can be emphasized and illustrated to students with effects by utilizing the data from similar dispositions.

O10.12

1:30 ELEVATING CYBERSECURITY CONSCIOUSNESS IN ORGANIZATIONS: A PARADIGM SHIFT FROM RISK DENIAL TO PROACTIVE PREPAREDNESS

Zachary Simons, Bilal Abu Bakr

Collin College - Frisco Preston Ridge Campus, TX

In today's digital landscape, businesses of all sizes face the constant threat of cyberattacks. Yet, many executives deny the need for robust cybersecurity measures, citing reasons such as "It will not happen to us" or "We have nothing of value to steal." This abstract delves into the imperative need for a paradigm shift at the executive level of

organizations, emphasizing the transformation from a mindset of complacency to proactive readiness in the face of cyber threats. The traditional approach of providing generic cybersecurity training to employees is challenged here, questioning the practicality of such initiatives. A call needs to be made to engage security professionals or the internal IT team to conduct targeted, comprehensive training sessions. Highlighting the devastating impact of even a successful phishing attack, the abstract emphasizes the importance of ensuring that every organization member understands the efforts required to mitigate these threats. The consequences of cyber breaches are multifaceted, ranging from financial losses and reputational damage to legal ramifications. Executives are urged to recognize the vulnerabilities of their organizations, with emphasis on the potential shutdown of seemingly impervious companies. The narrative shifts from mere compliance with regulations to proactive preparedness, challenging executives to invest in robust cybersecurity resources. The most effective and suggested approach is proactive testing through ethical hacking, where white hat hackers attempt to breach the company's systems. The abstract advocates for this practice to expose vulnerabilities, emphasizing that being over-prepared for a security incident is a far superior narrative than merely meeting minimum security requirements. Despite the challenge of measuring Return on Investment in cybersecurity, the abstract argues that the costs of investing in cybersecurity resources are far outweighed by potential fines imposed by regulatory bodies like the Federal Trade Commission. Moreover, these investments can yield a competitive advantage, instilling confidence in customers and partners who prefer conducting business with secure organizations. In conclusion, this abstract underscores the urgency of changing the narrative around cybersecurity from denial to preparedness by embracing the notion that cyber threats are not a matter of 'if' but 'when; ' organizations can adopt proactive measures, ensuring their resilience against ever-evolving cyber risks. Executives are encouraged to invest in comprehensive training, ethical hacking practices, and robust cybersecurity resources, ultimately fostering a secure environment that bolsters financial stability, protects reputation, and secures the trust of stakeholders.

O10.13

1:50 AN APPROACH DESIGNED FOR NON-TECHNICAL USERS TO SIMPLIFY DATA BACKUP

Remzon Mascardo, Bilal Abu Bakr

Collin College - Frisco Preston Ridge Campus, TX

In an era defined by rapid technological advancement, the digitalization of our lives has become increasingly prevalent, with personal and irreplaceable information stored virtually on our computers. As our reliance on technology grows, the importance of backups cannot be overstated. Safeguarding our data against potential loss is crucial, but this task is often daunting, especially for individuals needing more technical expertise. The complexities of modern backup systems, from dealing with corrupted repositories to ensuring proper drive assignment, pose significant challenges for those with limited technological know-how. Consequently, many users need help to effectively back up their data, leaving them vulnerable to devastating losses in hard drive failures or data corruption.This abstract addresses this critical issue by proposing a user-friendly solution tailored for individuals with low to no technical experience. The proposed solution involves the development of a specialized hard drive designed exclusively for data backup purposes. Unlike conventional backup methods that demand intricate technical knowledge, this innovative approach streamlines the backup process, making it accessible to users of all levels of expertise.The key feature of this user-friendly backup solution is its intuitive graphical user interface (GUI), which guides users through the entire backup process seamlessly. Upon connecting the specialized hard drive to their computer, users are greeted with a straightforward interface that eliminates the complexities associated with traditional backup procedures. The system automatically handles tasks such as formatting, drive assignment, and specifying the files or even entire computer images to be backed up. The GUI is meticulously crafted to be people-friendly, ensuring that users can effortlessly navigate through the backup process with minimal effort and without the need for technical intervention.This innovative solution empowers individuals with limited technical abilities to protect their valuable data effectively by simplifying the backup process into a series of user-friendly steps. The specialized hard drive is a reliable guardian, ensuring that users' files and memories are securely preserved. This approach addresses the challenges faced by non-technical users and promotes the adoption of good technological hygiene among a broader audience.In conclusion, the proposed user-friendly backup solution offers a promising path toward enhancing data protection for individuals needing more technical expertise. By eliminating the complexities associated with backups, this innovation bridges the gap between advanced technology and non-technical users, providing a seamless and effortless method to safeguard their digital lives.

O10.14

2:10 SECURE CISLUNAR COMMUNICATION ARCHITECTURE: CRYPTOGRAPHIC CAPABILITIES AND PROTOCOLS FOR LUNAR MISSIONS

Michael Hamblin, Bilal Abu Bakr

Collin College - Frisco Preston Ridge Campus, TX

The surge in lunar missions propelled by nation-state rivalry and commercial ventures has spurred concerns regarding congestion and potential conflicts in lunar space and radio channels. This abstract delves into the imperative need for a robust cislunar communication architecture to

facilitate reliable communication channels across diverse missions and partners. Developing such an architecture is crucial to addressing these challenges and ensuring confidentiality, integrity, availability, safety, and data segmentation for various tasks. This study explores the required cryptographic capabilities and protocols for establishing a native IPv6 cislunar transit and routing system, navigating the complexities of real-time communication in cislunar space. The research initiates an extensive review of internet technologies and space-based communication advancements, emphasizing the necessity of a secure cislunar communication network, as exemplified by the proposed LunaNet project. A dependable data transit bus equipped with robust encryption algorithms is indispensable to establish a common cross-mission communications infrastructure. The study highlights the limitations of traditional cryptographic protocols, particularly in real-time protocols, due to latency issues. Focusing on the Confidentiality-Integrity-Availability (CIA) Triad, this abstract underscore the need for encryption to ensure confidentiality, emphasizing the simplification of cryptographic implementation for end-users. Integrity is maintained through cryptographic message authentication codes, guaranteeing the authenticity of communication across the network. Availability challenges are tackled by minimizing latency, ensuring multiple redundant paths, dynamic re-routing, and upholding network reliability. A novel Cislunar Relay Architecture is proposed, comprising Pitcher and Catcher satellite constellations. Pitcher satellites in Earth orbit establish uplink connections between ground stations and commercial networks, utilizing a mesh network for continuous communication. Catcher satellites in lunar orbit mirror this function on the moon's side, offering downlink connections to lunar distribution satellites and ground stations. This combination ensures uninterrupted line-of-sight communication, enhancing network availability. The study explores inter-satellite communication methods, considering the shortcomings of VPN tunneling technologies in dynamic virtual environments. Optical Inter-Satellite Links (OISL) and Inter-Satellite Laser Links (ISLLs) are suggested as alternatives, providing enhanced security and immunity to interference. In conclusion, this Abstract comprehensively analyzes the cryptographic and protocol requirements for a secure cislunar communication architecture. The proposed Cislunar Relay Architecture offers a dependable solution for future lunar missions, guaranteeing seamless communication in the intricate and dynamic Cislunar space environment by tackling challenges associated with confidentiality, integrity, and availability.

Thursday, February 29, 2024

EVENING

3:30 DODGEN LECTURE /AWARDS CEREMONY

THEATER

5:00 GENERAL POSTER SESSION

(immediately following Dodgen Event)

P10.01

SOLVING DISORGANIZATION IN TABLE-TOP ROLE PLAYING GAMES

Jamaal Davis, Marcus Brumfield

Tougaloo College, Tougaloo, MS

Disorganization in tabletop role playing games is prevalent within the hobby. In part due to the diversity of stats, numbers, and descriptions to keep track across different games. The problem of disorganization in tabletop role playing games and how my program is built to remedy said problem. There are various approaches in the way of filing systems for stats, or visual aids for placement of in game entities. Each fulfilling one need at a time. The program approaches the filing side. Being able to fill and delete elements as needed. Being constructed in a plug and play format so it can adapt to any numbers-based systems.

P10.02

AUTOMATED FACT-CHECKING SIMPLIFIES: USING TECHNOLOGY TO VERIFY INFORMATION

Jennifer Fleming, Marcus Brumfield, Sharon Streeter

Tougaloo College, Tougaloo, MS

The information age has ushered in unprecedented access to knowledge and the rapid dissemination of news and information. However, this digital deluge has also given rise to thep roliferation of misinformation and "fake news," posing significant threats to the accuracy and integrity of online content. Automated Fact-Checking Systems have emerged as a crucial technological advancement in response to this challenge.

This project delves into the multifaceted landscape of Automated Fact-Checking Systems. These systems employ advanced technologies such as machine learning, natural language processing, and data analytics to systematically assess the veracity of claims and statements, offering the potential to enhance the credibility of online information sources. They can analyze vast volumes of textual and multimedia data, providing real-time assessments of the accuracy of news reports, social media posts, and other digital content.

While the potential of these systems to combat misinformation is substantial, they also face inherent challenges. Ethical concerns regarding privacy, algorithmic biases, and the implications of automated content moderation require careful consideration. Furthermore, Automated Fact-Checking Systems are most effective when they work with human fact-checkers,

highlighting the necessity of a collaborative approach that leverages machine and human intelligence.

This project underscores the significance of Automated Fact-Checking Systems in the digital age, their methodologies, and their potential to safeguard the truth. It also emphasizes the critica lresearch required to address these systems' ethical, technical, and societal complexities and fully realize their transformative potential in preserving the integrity of information in our interconnected world.

P10.03

THE USE OF RECTANGLES TO GENERATE AN APPROXIMATE VALUE FOR pi

Tashira Chapman, Alexius Hudson (contributed equally to the project)

Mississippi Valley State University, Itta Bena, MS

The purpose of this investigation is to demonstrate how simple calculations can produce fairly advanced results. We further show how the use of integrals can be used to find the area or region under a curve that is bounded and continuous on a specified interval by using formulas for computing area of a rectangle and/or trapezoids. Finding integrals and interpreting the results make use of one of the oldest computer programming languages (FORTRAN) created by programmers at IBM in 1957. The codes used in the preparation of this lengthening process is possible with a knowledge of just elementary algebra. Partitioning the major interval up into multiples subintervals until the largest subinterval gets extremely small is the key to establishing our desired result.

P10.04

PREDICTING COVID-19 PREVALENCE USING DEEP NEURAL NETWORKS: INSIGHTS FROM THE COPE SURVEY

Dania Zein[1], Xiuquan Wang[2]

[1]Jackson Heart Study UTEC Scholar, Tougaloo College, Tougaloo, MS, [2]Department of Mathematics and Computer Science, Tougaloo College, Tougaloo, MS

The COVID-19 pandemic, caused by the SARS-CoV-2 virus, has posed unprecedented global health challenges since its outbreak. Recognized as a pandemic by the World Health Organization in March 2020, it necessitated rapid advancements in epidemiological monitoring and predictive analytics. This study harnesses the All of Us Research Program's COVID-19 Participant Experience (COPE) survey data, provided by the National Institutes of Health (NIH). The COPE survey, conducted from May 2020 to February 2021, collected extensive data from over 100,000 diverse participants across the United States, aiming to capture the multifaceted impact of the pandemic. Leveraging this rich dataset, we deployed a deep neural network (DNN) designed as a Fully Connected Network, with the goal of predicting the number of positive COVID-19 cases within the surveyed population. Our methodology commenced with the meticulous transformation of qualitative survey data into a numerical format amenable to deep learning applications. This pivotal step involved preprocessing tasks such as feature encoding, handling missing values, and implementing feature scaling and normalization to ensure data comparability. In the pursuit of model optimization, significant emphasis was placed on feature weighting, hyperparameter tuning, and regularization to enhance the model's predictive capabilities. The fine-tuning process was iterative, systematically refining the network architecture to optimize the number of hidden layers and the regularization parameters to mitigate the risk of overfitting. The culmination of these methodological advancements was reflected in the model's accuracy. After extensive optimization of model parameters and variable standardization, our DNN achieved an accuracy of 0.86, demonstrating a robust predictive ability in estimating COVID-19 positivity rates. This high level of accuracy, gauged using the Root Mean Squared Error (RMSE) metric, provides promising evidence of the DNN's efficacy as a predictive tool in public health. This study not only illustrates the potential of deep learning in epidemiological research but also sets a precedent for future studies to build upon using large-scale health survey data.

P10.05

COVID-19 DETECTION FROM CHEST X-RAYS WITH TRANSFORMER-BASED APPROACH

Xiuquan Wang, Dwight Ross

Tougaloo College, Tougaloo, MS

This research explores the application of Transformer-Based Deep Learning to detect COVID-19 from chest X-ray images amid the ongoing challenges presented by the pandemic. The study harnesses the combined strengths of Cohen's COVID Chest X-ray Dataset and Paul Mooney's Chest X-ray Dataset to form a balanced aggregate, mitigating the risk of overfitting. Recognizing the typical bias towards healthy samples in medical image datasets, data augmentation was utilized to create additional synthetic data, promoting model robustness. The curated dataset was stratified into training and validation subsets for thorough model assessment against novel data. Employing a Transformer-based Decoder architecture built on PyTorch, the model's performance was measured using cross-entropy loss, and the outcomes were graphically represented through a confusion matrix. Training extended over 50 epochs, contrasting the accuracy progression with a CNN-Based Model. Interestingly, while the CNN model initially exhibited superior accuracy, the Transformer model outpaced it after 40 epochs, showcasing the latent potential of Transformer models in medical diagnostics. This comparative analysis highlights the transformative capabilities of Transformer-based approaches in enhancing diagnostic accuracy over prolonged training, marking a significant stride in leveraging artificial intelligence to combat the effects of COVID-19.

P10.06

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 innovative alumni engagement platform that facilitates seamless interactions between alumni, students, and professors, cultivating a supportive network that opens doors to a wide spectrum of professional opportunities.

Our platform is designed with user-centricity at its core, featuring an intuitive interface, non-sophisticated personalized matching algorithms, and a comprehensive mentorship program integrated into the platform's messaging system. These features empower alumni, students, and professors to navigate the job market effectively, fostering a culture of knowledge sharing and professional growth. By bridging the gap between these three key stakeholders, we aim to empower the next generation of professionals to achieve their full potential.

P10.07

PHYSICAL THERAPY: FIGHT AGAINST CARDIOVASCULAR DISEASE

Matthew McKee[1], Clifton Addison[2]

[1]American Heart Association HBCU Scholar - Tougaloo College, [2]Jackson Heart Study Graduate Training and Education Center, Jackson State University, School of Public Health

Atherosclerotic cardiovascular disease (ASCVD) is a major cause of death and illness in the United States, including coronary artery disease, ischemic stroke, transient ischemic attack, and peripheral artery disease. The American College of Cardiology and American Heart Association (ACC/AHA) published updated treatment guidelines in 2013 for secondary prevention of ASCVD, recommending statin therapy and lifestyle counseling for all adults with known ASCVD, regardless of low-density lipoprotein cholesterol levels. This guideline expansion was projected to increase the number of adults eligible for statin therapy by 12.8 million. Low-dose aspirin use has also been recommended for secondary prevention in patients with ASCVD. Frailty is prevalent among older patients with acute decompensated heart failure (ADHF) and is linked to poor quality of life and higher risk of clinical events. Frailty can hinder recovery and response to interventions. The REHAB-HF trial showed that an early, tailored, multidomain physical rehabilitation intervention improved physical function and quality of life compared to usual care in older patients with ADHF over a 3-month period. In this project, we will see how people with cardiovascular disease and frailty use physical rehabilitation to help assist their recovers.

P10.08

A LOCALIZED HERMITE METHOD OF APPROXIMATE PARTICULAR SOLUTIONS

Kwesi Acheampong

University of Southern Mississippi, Hattiesburg, MS

The localized method of approximate particular solutions (LMAPS) is a popular meshfree method for solving partial differential equations. In this talk we present a novel localized Hermite method of approximate particular solutions (LHMAPS), which improves the accuracy of LMAPS with a small amount of extra computational cost. Numerical experiments validate the superior accuracy of the proposed method to the LMAPS on solving the Poisson equation and the Helmholtz equation.

P10.09

CAR SALESMAN

Michael Anthony

Mississippi Valley State University, Itta Bena, MS

My objective of this project is to use Database Management to create a payroll system for a car payroll system that could be implemented specifically for dealerships that sell their own brand of car, like Toyota for example. An objective is to create entities and relationships that have entity integrity and referential integrity. I would also want to use certain attributes within a table to calculate other attributes within the same table. I will have a multitude of attributes that would be used to calculate those attributes. A goal that I want to achieve also but I'm not sure if I can is to keep a constant track of what their pay was at any given time. I'm sure it is possible for this to be done but I'm just not sure if I know how to do it at this time. A few things in this project is to inquire the salary of each employee after a certain period of time, tell the amount of cars sold after a certain period of time, show who made the most money from commission after a certain period of time, who is the employee of the month by a condition that takes into account the amount of commission that they have made that month also takes into account the amount of cars someone has sold in a month by using the database. This project also can be used to show who has been promoted based on the employee of the month.

P10.10

TUTORING BOKKING SYSTEM

Ayomide Olasupo

Mississippi Valley State University, Itta Bena, MS

This database will be tailored to design the process of the booking of tutoring sessions between students. This database will contain entities such as Tutors, Students, Sessions/Bookings, and Subjects. These entities will store their respective attributes, for example, the Tutors table

stores information about tutors, including their unique identification (Tutor ID), contact details, subjects offered, classification, bio, experience, and availability. Students' details, like student identification, name, contact information, and classification, are stored in the students' table. Sessions/Bookings table manages booked tutoring sessions, details such as session ID, dates, duration, subject, along with respective foreign key connections to the Tutors and Students tables. Subjects table defines various subjects and their descriptions. This database will facilitate the organization and tracking of tutors, students, their sessions, and subjects within an online tutoring platform, which supports efficient data management for the system.

P10.11

STUDENT MARKETPLACE

Abdul Baqiy Diyaolu

Mississippi Valley State University

The goal of my project is to create a vibrant and easy-to-use online marketplace where students may trade goods and services with other students in their school. The platform encourages economic activity and builds community inside the school by providing a convenient and safe space for kids to transact. Our platform guarantees smooth interactions between student sellers and buyers by offering a reliable and secure database, which makes it easier to exchange a variety of goods and services. With the help of this platform, students may learn new skills, and develop their entrepreneurial interests.

P10.12

PHARMACY MANAGEMENT SYSTEM

Don Brown

Department of Mathematics, Computer, and Information Sciences, Mississippi Valley State University, Itta Bena, MS

The project I will be presenting will a pharmacy database system. The purpose of the database system will be log certain things like Patient Name, Billing,Drug Order,etc. This information will be displayed through the use of tables showing the relationship shared between each table. The system will involve keys in order to establish relationships between. In a business sense this database will be offered to pharmacies who need management system or who are tired of the one they are currently using. The goal of this project is to showcase to the class how the management systems is able to relate and store the information inputted in the system. It also serves the purpose of showing what the business who would be using this would be doing and how the management system looks to them. Another goal of this project is to show the class the different relationships we have learned in class being displayed in the system.

P10.13

EVALUATION OF TEXT CLASSIFICATION ALGORITHMS ON SENTIMENT ANALYSIS

Arianna Dunlap, Katia Sutton, HuiRu Shih

Jackson State University, Jackson MS

Sentiment analysis is a method for examining text data to extract emotions and opinions. Sentiment analysis has numerous applications across diverse domains. Particularly, machine learning-based sentiment analysis has been increasingly prominent. Natural Language Processing (NLP) enables machines to break down and comprehend human language. Analyzing sentiments is a task of NLP. We use various machine learning classifiers to analyze text data and help gauge public sentiment on specific subjects.

Sentiment analysis includes several essential steps. Initially, the raw data is unstructured in nature. We need to clean the data. This phase involves tasks such as punctuation removal, stop word removal, tokenization, stemming, among others. Subsequently, the dataset exhibits various distinctive properties. Once the data has been cleansed, we proceed to extract features from the processed dataset. Various methods for feature extraction are available for text data, including the Bag of Words (Count Vectorizer) and TF-IDF (Term Frequency - Inverse Document Frequency) techniques.

The extracted features after preprocessing the data are then classified using a range of text classifiers, such as Logistic Regression, Linear Support Vector Machine (Linear SVC), Naïve Bayes, Decision Tree, and Random Forest. This study entails a thorough assessment of classifier performance in sentiment analysis. It seeks to investigate which text classification algorithm is the most effective for this purpose. Furthermore, the effects of various feature extraction methods on the performance of text classifiers are also studied. The assessment of classifier performance is based on the classification metrics, such as accuracy, precision, recall, and F1 score.

P10.14

BUSINESS MODEL DEVELOPMENT USING ARTIFICIAL INTELLIGENCE

Ayomide Olatunde

Mississippi Valley State University

This project will involve the use of machine learning algorithms to train the model on historical data. The model will learn patterns from this data and use them to make predictions on new data. The purpose of this project is to create an A.I model that will help business men or women, determine the best price for a particular product. It can also be used by customers to determine if they are getting a product at a decent price or not. This project is a significant one because it can enable a business to maximize their profit, adapt quickly to the change in market based on recent data used, and so many more benefits. In order to achieve this, it's important that I do more study on machine

learning, and possibly some other Artificial Intelligence branches; this is to give the model its functionalities.

P10.15

EFFICIENCY OF A SOLID-STATE DETECTOR USING EXPERIMENTAL AND COMPUTATIONAL METHODS

Samuel Bunga, Kwabena Agyepong, Jermiah Billa[1], Erol Sarigul

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.

P10.16

AN INVESTIGATION OF REWARD HACKING

Edwin Campbell, Khalid Abed, Andrew Overton, Abdulghani Arlwari

Jackson State University, Jackson, MS

Reward signals are fundamental for machine learning agents to learn a task. They provide crucial feedback for the agent to adapt its behaviors to improve over time. However, previous experiments have shown that agents can use loopholes to increase the reward signal without actually improving their behavior as the researchers intended. This happens when an agent is instructed in a way that causes it to simplify (or otherwise modify) its original reward function. Working toward this different reward function creates worse performance with respect to the original, true reward function. This is called reward hacking. Obviously, this is dangerous in real world environments as agents may take unexpected actions that might have dangerous consequences. This paper explores reward hacking through two environments created in Unity using its MachineLearningAgentToolkit(ML-Agents). These experiments aim to show how certain reward functions and their configurations can exacerbate or mitigate hacking tendencies in an agent. This paper present solutions to deal with these tendencies before they manifest. Specifically, this paper show that using a blocker (whether it be human or automated) and carefully crafting reward functions can lessen (or outright prevent) the prevalence of reward hacking.

Friday, March 1, 2024

MORNING

Room

7:45 Welcome

O10.15

8:00 OFFLINE REINFORCEMENT LEARNING IN COMBAT SIMULATION

Indu Shukla, Haley Dozier

U.S. Army Engineer Research and Development Center

Reinforcement learning (RL) is a machine learning (ML) paradigm that has produced systems capable of performing at or above a professional-human level. This research explored the ability of RL to train AI agents to achieve best possible offensive behavior in a small tactical engagement resembling a simple 1D military simulation. Battlefield environment is complex domain, therefore, planning and building combat simulation is challenging. Therefore, it has been an ongoing interest in offline learning approaches. Most advances in offline RL have been evaluated on standard RL benchmarks using available datasets. These datasets are either replay buffers of the training run or trajectories collected by a snapshot from somewhere in training field. But question remains whether these algorithms are ready to address the real-world problems that motivate research in offline RL in the first place? In this study, we implemented model-based and model-free offline RL in an incremental approach in 1-D, aggregate-level military constructive simulation. We used a hand-designed, scripted policy developed under expert supervision to collect offline dataset using random policy for single task. Our offline dataset is represented as a series of transition tuples where state consist of position of SAM, jammer, and reward obtained. Actions contain agent positions. We concluded that advances in data collection methods are as important as algorithmic advances for offline RL. RL agents can effectively learn offline with carefully designed offline RL algorithms.

O10.16

8:20 POD ANALYSIS OF FLOW STRUCTURE IN MVG CONTROLLED HYPERSONIC BOUNDARY LAYER

Demetric Baines[1], Yonghua Yan[1], Caixia Chen[2], Shala Ruttley[1]

[1]Jackson State University, Jackson, MS, [2]Tougaloo College, Tougaloo, MS

This study conducts an extensive analysis of flow structure evolution in hypersonic boundary layers controlled by micro vortex generators (MVGs). To delve into this, we employed the proper orthogonal decomposition (POD) method alongside a newly developed, high-fidelity vortex identification method called Liutex. This combination allowed a detailed investigation into the flow structure, enabling the assessment of energy contributions from each mode according to the vortex intensity.

Furthermore, we compared the POD outcomes of the hypersonic boundary layer with those observed in supersonic boundary layers at Mach 2.5 and 3.5. Notably, the findings indicate a distinctive impact on the relative intensity of spanwise vortices at hypersonic speeds, with a prevalence of streamwise vortex structures dominating the hypersonic boundary layer.

O10.17

8:40 NUMERICAL STUDY ON THE FLOW STRUCTURES IN SUPERSONIC BOUNDARY LAYER FLOW CONTROLLED BY MVGS IN TANDEM ARRANGEMENT AT DIFFERENT SPACINGS

Yonghua Yan[1], Yong Yang[2], Caixia Chen[3]

[1]Jackson State University, Jackson, MS, [2]West Texas A&M University, Canyon, TX, [3]Tougaloo College, Tougaloo, MS

The micro vortex generator (MVG) is a slender passive control tool utilized in managing supersonic boundary layer flows. It's particularly effective in mitigating shock-induced separation zones by generating ring-like vortices. This study involved Large Eddy Simulation (LES) of a supersonic flow controlled by two tandemly arranged MVGs with varying spacings.

Previous research indicated a substantial mutual influence between the vortex structures produced by these tandem MVGs. Both spanwise and streamwise vortices underwent numerous merging processes, leading to a reduction in vortex intensity. To delve deeper into the impact of different tandem arrangements of MVGs on flow structures, a series of LES was conducted with MVGs placed at varied spacings.

The findings revealed a consistent decrease in vortex intensity across all arrangements. Additionally, closer proximity between the MVGs resulted in a swifter weakening of downstream vortices. On the other hand, the spacing between MVGs had almost no impact on the momentum deficit downstream of the second MVG.

O10.18

9:00 NUMERICAL AND MACHINE LEARNING APPROACH OF THE EVOLUTION OF THE VELOCITY PROFILES IN A TRANSITIONAL BOUNDARY LAYER FLOW

Shiming Yuan[1], Yonghua Yan[1], Yong Yang[2], Caixia Chen[3], Shala Ruttley[1]

[1]Jackson State University, Jackson, MS, [2]West Texas A&M University, Canyon, TX, [3]Tougaloo College, Tougaloo, MS

This research aims to comprehensively explore the application of machine learning methodologies in understanding the complex evolution of flow structures within the late transitional boundary layer. We employed a Multi-Layer Perceptron (MLP) feed-forward back-propagation Artificial Neural Network (ANN) to model the intricate nonlinear dynamics observed in velocity profile pairs derived from numerical results of compressive fluid flow at Mach 0.5 over a flat plate, using only TS waves as input at the inlet.

Direct Numerical Simulation (DNS) was utilized to obtain the velocity profiles within the late transitional boundary. These profiles, with fixed streamwise distance or evolution time, were employed to test, validate, and train the ANN model. Encouragingly, our findings demonstrate that the ANN model effectively predicts the time-averaged profiles with high accuracy.

O10.19

9:20 PRELIMINARY INVESTIGATION IN MODELLING AND SIMULATION OF POWER GRID BY USING PANDAPOWER

Saikrishna Sravanam, Ping Zhang, Ramakrishna Dileep Kotagiri

Alcorn State University, Lorman, MS

Power system analysis tools are software applications used by engineers, researchers, and other professionals to simulate, analyze, and optimize power systems. These tools help in designing, testing, and maintaining electrical grids, ensuring their efficiency, reliability, and safety. One of the open-source tools that has gained prominence is Pandapower.

There are different steps to model a power grid by using pandapower: firstly, the network is created to supply the power, and then the buses are created according to the input given; then the external grid is created with maximum and minimum resistance values; and then the transformer is to be selected from the standard libraries or to be given by experimental values. The type of line and the distance between the lines need to be created. The above is the basic type of grid, but for a typical type of grid, we can also give the switches, generators, loads, different types of cables, etc.

From this investigation (survey) results, we can conclude that our preliminary investigations into the use of pandapower for grid calculations have demonstrated its potential as a valuable tool for analyzing and modelling the power grid. The flexibility and ease of use offered by pandapower will enable us to simulate various scenarios, optimize grid performance, and identify areas for improvement. While the tool has some limitations, particularly in modelling dynamic phenomena such as the Ferranti effect, we are optimistic that future developments

and enhancements will address these challenges. As a result, the use of pandapower in future research will contribute significantly to the advancement of the power grid, paving the way for a more efficient, reliable, and sustainable energy infrastructure in a region.

O10.20

9:40 UNVEILING INJURY ANALYSIS IN HEALTHCARE: TABULAR DATA EXTRACTION VIA COMPUTER VISION

Puneeth Kumar Bolugallu Padmayya, Ping Zhang

Alcorn State University, Lorman, MS

In the realm of healthcare, data-driven insights play a pivotal role in understanding and improving patient outcomes, resource management, and overall system efficiency. The advent of computer vision and its application in medical imaging has opened new avenues for extracting valuable information from diverse sources. This research delves into the transformative potential of harnessing computer vision to extract structured data from unstructured medical images, specifically for injury analysis.

Traditionally, the process of extracting structured data from medical images has been labor-intensive and prone to errors. Healthcare professionals and researchers have relied on manual data entry or rudimentary software solutions to perform this task. However, the digital era has ushered in a paradigm shift, introducing the capability to employ advanced computer vision algorithms to automatically identify and extract tabular data embedded within medical images.

Amidst the ever-changing tech landscape, AI emerges as a transformative force, led by IBM's pioneering work in AI research and development. IBM's impact spans various sectors, particularly in healthcare, thanks to Watson, their cognitive computing system. Watson's prowess in understanding natural language and processing extensive healthcare data is globally acknowledged. This AI innovation extends well beyond its Jeopardy win, showing exceptional promise in healthcare, where it's set to revolutionize medical research, diagnosis, and treatment.

The core objective of this research is to develop and evaluate a system that seamlessly integrates computer vision techniques with medical image analysis, with a particular emphasis on injury-related data. By implementing state-of-the-art algorithms, machine learning models, and image recognition technologies, this project aspires to streamline the extraction of tabular data from various types of injury-related medical images.

O10.21

10:00 DIGITAL ANATOMY VIEWER: A NOVEL APPROACH TO MEDICAL EDUCATION

Puneeth Kumar Bolugallu Padmayya, Ping Zhang

Alcorn State University, Lorman, MS

In the ever-evolving landscape of healthcare, the key to progress and precision lies in the transformative power of digitization. The traditional methods of conveying anatomical knowledge through textbooks and two-dimensional illustrations have limitations in effectively conveying the three-dimensional complexity of the human body. In response to this challenge, this study aims to develop and assess the effectiveness of a Digital Anatomy Viewer as an innovative and immersive educational platform.

The Digital Anatomy Viewer leverages state-of-the-art digital technologies, including 3D modeling and virtual reality, to provide students and educators with an interactive and dynamic tool for exploring the intricacies of the human body. This research project encompasses the design, development, and evaluation of the Digital Viewer, with a particular focus on its impact on anatomy education.

The research methodology involves the creation of a comprehensive digital anatomical library, featuring interactive 3D models of the human body, including organs, systems, and their physiological functions. The Digital Anatomy Viewer will be evaluated through a series of user studies, surveys, and educational assessments to measure its effectiveness in enhancing students understanding of anatomy and improving their retention of anatomical knowledge.

The anticipated outcomes of this research include a better understanding of the educational benefits of the Digital Anatomy Viewer and its potential to transform the way anatomy is taught and learned. The study aims to highlight the Digital Anatomy Viewer's role in facilitating engagement, interactive learning, and knowledge retention, ultimately offering a novel and exciting approach to anatomy education that may pave the way for improved medical training and healthcare education.

O10.22

10:20 IMPLEMENTATION OF CONVOLUTIONAL NEURAL NETWORKS-MACHINE LEARNING SYSTEM

Yuzhong Huang, Ping Zhang

Department of Mathematics and Computer Science, Alcorn State University, Lorman, MS

Artificial Intelligence (AI) refers to the development of algorithms that enable computers to simulate human intelligence. Machine Learning (ML) is one aspect of AI. Deep Learning is a type of ML that involves multiple layers of learning and can be applied to many complex recognition problems, which were previously unsolvable. Some typical applications include automatic driving, natural language processing and understanding, object and image automatic recognition and processing, etc. One popular deep machine learning framework (system) is Google's TensorFlow.

The main purpose of this research project is to implement a deep learning platform on a local computer and to validate the differences of application environments

between the proposed scheme and a network-based deep learning platform. The research work in this project involves installing a Python platform software in a local computer, configuring the TensorFlow library, processing samples, training models, and finally, recognizing images. Another study in the research project aims to enhancing image recognition accuracy by exploring the process of establishing a deep learning system on the Window platform and implementing and better configuring Convolutional Neural Networks (CNNs) settings.

The CNN-based object and image recognition experiments have been conducted on both the MNIST and The Dogs vs. Cats Databases. The recognition performance comparisons between web-based CNNs and locally implemented CNNs are reported in this report. It is concluded that the local recognition system is more secure with faster processing speed and is easily implemented on a PC for research and teaching in the labs.

O10.23

10.40 Nim GAME IMPLEMENTATION

Javid Ibrahimov, Shovkat Zeynalli

Mississippi Valley State University, Ita Bena, MS

Nim, a classical combinatorial game, has been a captivating subject of study for mathematicians, game theorists, and computer scientists. This academic abstract thoroughly explores Nim, elucidating its formal rules, mathematical intricacies, and wide-ranging applications.

Nim is a two-player, sequential game wherein participants take turns removing objects from distinct piles to compel their opponent to claim the last object. While the game may appear elementary, it conceals profound mathematical complexities. This abstract delves into the foundational strategies of Nim, encompassing the nim-sum, winning positions, and applying the Sprague-Grundy theorem, elucidating the game's strategic and mathematical depth.

Nim's pertinence extends beyond recreational interest; it is a valuable model for decision-making processes within various academic and practical domains. Within this abstract, we expound upon Nim's contributions to combinatorial game theory, algorithmic complexity, and discrete mathematics, accentuating its utility in real-world problem-solving scenarios, from optimizing resource allocation to enhancing network security.

O10.24

11:00 AUTOMATIC SCHEDULE BUILDER

Chinedu Chinedu

Mississippi Valley State University, Starkville, MS

This computer science project aims to address the challenge of efficiently generating student schedules for the next semester, specifically tailored to computer science majors at MVSU based on their academic history and departmental course offerings. This project is essential because it streamlines the course selection process for students and academic advisors, ensuring that students take the right courses to progress in their degree while meeting academic requirements. By automating this process, it aims to reduce errors, save time, and improve students' academic experiences.

The main objective of this project is to create a website, for computer science majors at MVSU, that automates the academic scheduling process. This includes analyzing students' academic history to determine eligibility of classes, using a database for data storage, implementing algorithms for personalized schedules while adhering to academic policies, and providing an intuitive interface for students and advisors to access schedules.

To achieve the project objectives, I'll start by designing an efficient database to store course details, student data, and grades. After which I will develop a user-friendly website using web technologies and implement secure login systems. Next, I'll create algorithms to analyze student data, determine academic eligibility, and generate optimal schedules; I will also design an intuitive user interface for students and provide administrative access for advisors. Finally, thorough testing and debugging will be done to ensure accuracy and compliance with academic policies throughout the project.

O10.25

11:20 USING R TO CREATE DIGITAL QUESTION BANKS FOR MATHEMATICS COURSES

Qingwen Hu

The University of Texas Permian Basin

R and its relevant packages including {\tt exams} are powerful tools to create randomized online questions in batch to be used on learning management systems such as Canvas and Blackboard, which significantly reduce faculty's workload for writing and grading the traditional homework assignments and exams on paper. We illustrate the complete process of using R to create question banks of mathematics courses. We also showcase the R package {\tt Tex4exams} which is useful to convert the output of R functions to \LaTeX\, code for display in mathematical formulas.

O10.26

11:40 ASSESSING THE GHANAIAN HIGH SCHOOL STUDENTS' FAILURE IN MATHEMATICS IN GHANA

Clement Yeboah [1], Kwasi Nimo Kwarteng [2]

[1]University of Southern Mississippi, [2]Opoku Ware School, Kumasi, Ghana

The purpose of this quantitative survey research was to explore the Ghanaian Senior High Schools Students' failure 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 assessing students' attitude toward mathematics and the influence of the teacher-student's

relationship on students' performance in mathematics. The questionnaire was chosen as a tool used to collect data from participants - teachers and students. The study findings indicated that students' attitude toward Mathematics was strongly influenced by teachers' relationship with students. The study highlights the importance of adopting innovative teaching methods to make Mathematics more engaging and interactive 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 emphasizes the need for personalized support to help students who are struggling with Mathematics. Teachers can provide one-on-one tutoring or extra homework to help 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 supporting 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' failure in Mathematics and implementing general solutions to improve their performance, we can support their academic success and improve their future prospects.

Friday, March 1, 2024

AFTERNOON

Room Union hall of Honors

O10.27

1:00 MULTI-FACTOR AUTHENTICATION AS A TOOL FOR IMPROVING ONLINE VOTING SYSTEM DIGITAL IDENTITY VERIFICATION

Timothy Interrante, Bilal Abu Bakr

Collin College - Frisco Preston Ridge Campus, TX

The concept of online voting, aimed at bolstering voter turnout and democratic participation, has garnered significant attention. However, the current technology landscape presents substantial challenges in ensuring the security and authenticity of online ballots. One critical issue, highlighted by the University of California Berkeley Center for Security in Politics, revolves around the absence of digitally deployed credentials. The lack of a foolproof method to verify a person's identity digitally exposes the electoral system to potential fraudulent activities, thus undermining the integrity of the voting process. In this study, we propose a robust solution to this problem by introducing a multi-factor authentication approach that combines hardware identification, social security numbers, and personalized security questions. Our approach significantly enhances the complexity of casting a fraudulently submitted vote, mitigating the risks associated with digital identity verification. This innovative method involves using a person's social security number as a unique Personal Identification Number (PIN), bolstered by incorporating a customized security question. Our proposed system allows registered voters to pre-register a designated device for a specific election. During the registration process, the hardware of the chosen device is meticulously recorded, ensuring that only the pre-registered device can be utilized for casting a ballot. Furthermore, the voter must create a personalized security question, the correct answer to which is an additional layer of authentication. We establish a robust multi-factor authentication system by combining these elements - the device's hardware identification, the social security number-based PIN, and the security question. This multifaceted approach provides a comprehensive solution to the challenges of digital identity verification, minimizing the risk of fraudulent votes. It is essential to acknowledge that while our proposed multi-factor authentication system addresses a crucial aspect of online voting, several other challenges, such as client-side malware and voter confidence, demand equal attention. Addressing these issues comprehensively requires establishing a secure, reliable, and trustworthy online voting system. As the evolution of technology continues, it is vital for researchers, policymakers, and technologists to collaborate closely, ensuring that the democratic process remains resilient, transparent, and accessible to all citizens.

O10.28

1:20 FACIAL RECOGNITION IN POLICING: ADVANCING LAW ENFORCEMENT THROUGH ETHICAL INTEGRATION

Ryan Vernon, Bilal Abu Bakr

Collin College - Frisco Preston Ridge Campus, TX

Face recognition technology represents a paradigm shift in biometrics, finding multifaceted applications, notably law enforcement. The challenges officers face in locating individuals identified by victims or witnesses are exacerbated in bustling or swiftly changing environments. Traditionally criticized for their methods, law enforcement officers now grapple with intensified scrutiny spanning the globe, thanks to the pervasive reach of social media and mobile technology. These platforms facilitate real-time criticism and analysis of law enforcement actions, creating an intricate web of accountability and public opinion. This study strongly advocates integrating facial recognition technology into police body cameras, offering a groundbreaking approach to law enforcement. By tethering these cameras to a global facial recognition database, officers gain the ability to swiftly and accurately

identify individuals during interactions. This seamless process expedites threat assessments and enables more effective emergency responses. Crucially, integrating facial recognition software into police operations refines identification, ensuring a targeted and precise approach to suspect apprehension. Officers can make informed decisions by cross-referencing captured footage with databases of known criminals or suspects, averting wrongful arrests, and ensuring accountability for law enforcement actions. Additionally, facial recognition proves invaluable in crowd control and large-scale events, enabling proactive identification of individuals with outstanding warrants or security risks, thereby ensuring public safety. For communities, the benefits of facial recognition in police body cameras are substantial. The technology is an unbiased identification tool, effectively reducing racial profiling while fostering trust and transparency between communities and law enforcement. Responsible use of facial recognition technology enhances community-police relations and encourages positive engagement with law enforcement agencies. Nonetheless, to fully harness these benefits, it is essential to establish rigorous regulations and policies prioritizing protecting citizens' civil liberties and privacy. Clear, comprehensive guidelines must govern the legitimate use of this technology in law enforcement, ensuring robust data security and responsible handling.

O10.29

1:40 TRUST IN TECHNOLOGY: A DOUBLE-EDGED SWORD IN MODERN SOCIETY

Christopher Quinn, Bilal Abu Bakr

Collin College - Frisco Preston Ridge Campus, TX

In the contemporary landscape, technology has seamlessly integrated into our daily lives, shaping work, school, and home routines. Society's dependence on technology has fostered a pervasive trust in the devices surrounding us. However, this reliance on technology increases opportunities for malicious actors to exploit this implicit trust. Trust, a fundamental component in cybersecurity and day-to-day activities, is often assumed within professional environments, leaving individuals vulnerable to exploitation. This abstract delves into the intricate relationship between trust and technology, shedding light on how threat actors manipulate this trust and emphasizing the importance of awareness and caution in an era of escalating cyber threats. Trust decisions are made routinely in various aspects of life, from trusting fellow automobile drivers to placing confidence in food handlers. Particularly pertinent is the trust people invest in technology with their personal information and livelihoods. Cybersecurity, as a field, grapples with the exploitation of trust through social engineering attacks like phishing and the manipulation of the Internet of Things. Threat actors exploit the natural inclination of users to trust, making it imperative for cybersecurity professionals to design policies that recognize the inherent untrustworthiness of users and focus on raising awareness about the potential avenues for exploitation. This abstract seeks to heighten awareness regarding the omnipresent trust decisions made whenever individuals interact with technology or integrate new devices into their environments. With the integration of new technologies comes a dual responsibility and risk. The focus is shifted towards caution and mindfulness when interacting with technology, akin to the careful considerations made in real-world scenarios. As the online realm proves to be a more potent ground for manipulation, the abstract emphasizes the need for individuals to exercise prudence and consider the potential risks associated with their actions. Instead of denying inherent trust instincts, this abstract encourages individuals to be aware of their trust decisions and to weigh their actions wisely when engaging with technology. Given society's widespread reliance on technology, the trust invested in these devices should be approached with gravity and a keen awareness of the potential consequences. By recognizing the delicate balance between trust and risk in the technological landscape, individuals can navigate this terrain more securely, safeguarding their personal information and preserving the integrity of the digital ecosystem.

O10.30

2:00 ENHANCING ROAD SAFETY THROUGH SENSOR-BASED INTERSECTION MANAGEMENT

Sumaira Chaudhry, Bilal Abu Bakr

Collin College - Frisco Preston Ridge Campus, TX

Intelligent transportation systems hinge on the seamless interaction between vehicles and road infrastructure to enhance traffic efficiency and safety. A prevalent road safety challenge revolves around intersection accidents, predominantly from drivers misjudging the duration of yellow traffic lights. Such incidents result from drivers often needing to be made aware of the brief transition from yellow to red, leaving them uncertain about whether to proceed or stop, thereby elevating collision risks. This abstract proposes a sensor-driven solution to mitigate this issue and bolster road safety. Our approach involves integrating advanced sensors within vehicles to provide real-time information to drivers regarding their proximity to traffic lights and whether it is safe to traverse the intersection before the light transitions to red. These in-vehicle sensors accurately measure the distance between the vehicle and the traffic light and the vehicle's approach speed to the intersection. These sensors link directly with the traffic light infrastructure, enabling the traffic lights to transmit data about the remaining time on the yellow light phase to approaching vehicles. As a vehicle approaches an intersection displaying a yellow light, the in-vehicle system calculates, based on the vehicle's current speed and distance from the light, whether it is safe for the driver to proceed or if they should prepare to stop. Suppose the system determines that crossing before the light turns red is unsafe. In that case, it promptly issues a clear visual warning on the vehicle's dashboard and an audible alert,

guiding the driver to stop safely. This real-time information empowers drivers to make informed, safety-centric decisions when approaching intersections with yellow lights. It substantially diminishes the likelihood of red-light violations and abrupt stops, reducing accident risks. Implementing this sensor-based system necessitates close collaboration between automobile manufacturers and traffic management authorities. Furthermore, it entails the development of standardized communication protocols between vehicles and traffic light infrastructure. Nevertheless, the prospective benefits of accident reduction and enhanced road safety underscore its significance. By adopting this sensor-driven solution, we anticipate a considerable reduction in accidents stemming from misjudging yellow lights, thereby fostering safer roads for all, including drivers and pedestrians.

O10.31

2:20 NAVIGATING THE SHADOWS OF SOCIAL MEDIA: UNVEILING THE PRIVACY IMPLICATIONS OF LOCATION METADATA IN DIGITAL IMAGING

James Gbolahan Omotoyinbo, Bilal Abu Bakr

Collin College - Frisco Preston Ridge Campus, TX

In the contemporary era of digital connectivity, social media platforms have become integral to documenting and sharing individuals' lives. Users frequently upload images to these platforms, offering glimpses into their experiences, locations, and activities. However, the proliferation of location metadata embedded within these images raises profound concerns about privacy and personal security. This abstract delves into the multifaceted implications of such metadata, exploring its collection, dissemination, and potential consequences. Unbeknownst to many users, the images they share on social media often contain hidden metadata, encompassing a diverse range of information about the images and the devices used to capture them. Including Global Positioning System (GPS) coordinates is of particular significance, offering precise location data. Once uploaded, this metadata becomes accessible to data mining companies with authorized access from social media platforms. Despite the potential benefits of data-driven insights, these companies' exact purposes and practices remain ambiguous, triggering profound privacy apprehensions among users. A glaring concern emanates from inadvertently sharing user location data with other platform users, frequently transpiring without adequate notification or consent. This violation of personal privacy materializes through posting images that inadvertently contain location metadata or the routine sharing of real-time location information. Alarmingly, many users need to be made aware of these processes and their inherent risks. Furthermore, mounting evidence links these unwitting disclosures to instances of physical harm and, in extreme cases, even violence and loss of life. In response to these challenges, this abstract proposes adopting an "implicit deny" paradigm by social media companies. This approach would require explicit user consent for each instance of location information being attached to photo posts or shared with selected contacts in real time. The complexity of online relationships is acknowledged, underscoring that not all connections equate to real-life friendships. Consequently, implementing measures to restrict access to live location data for specific contacts becomes imperative. While some platforms offer features like the "ghost mode" to address these privacy concerns, all users must receive comprehensive and readily accessible notifications about the implications of enabling such features. Presenting this information directly to users, rather than only within the depths of rarely-read privacy policies, would empower individuals to make informed decisions about their data-sharing practices .In conclusion, the ubiquity of location metadata in social media images demands a proactive approach to safeguarding user privacy. As the digital landscape continues to evolve, social media companies must prioritize transparent communication, granular user controls, and robust privacy safeguards to ensure that individuals can enjoy the benefits of connectivity without compromising their security and well-being.

O10.32

2:40 ETHICAL SHADES OF HACKING: WHITE, BLACK, AND THE MURKY GREY

Aleesha Haris, Bilal Abu Bakr

Collin College - Frisco Preston Ridge Campus, TX

In the intricate world of computer security, categorizing hackers based on their intent and impact has been a widespread practice. This categorization often revolves around the metaphorical hats' hackers wear—white, black, and grey, symbolizing ethicality and intentions in cybersecurity. A white hat hacker embodies integrity and ethical conduct. These professionals are employed by organizations to safeguard computer systems from cyber threats. Their expertise is utilized for the public good, focusing on protecting entities and ensuring the security of sensitive information. Their actions are within legal boundaries, operating under the explicit goal of enhancing existing security measures. In contrast, a black hat hacker operates maliciously, engaging in unauthorized security breaches. These individuals exploit system vulnerabilities to steal sensitive data, spread malware, and cause extensive damage. Their actions are driven by economic gains, reputation destruction, and the disruption of computer operations, operating outside lawful regulations and moral boundaries. Between these extremes lies the grey hat hacker, a figure operating in morally ambiguous territory. Grey hats exploit system weaknesses without explicit permission but do so to inform the affected parties and aid them in fixing security vulnerabilities. They navigate a delicate balance, aiming to enhance security while operating outside conventional ethical norms. This Abstract delves into the ethical dilemmas posed by grey hat hacking. Grey hats justify their actions as a public

service, believing they are ethically correct in enhancing the security of other parties' computer systems. However, their unauthorized intrusions raise concerns and ethical objections. Despite their purported good intentions, grey hat hackers engage in unauthorized activities akin to black hat hackers, leading to potential legal consequences. By accessing systems without permission, black hat and grey hat hackers violate legal statutes such as 18 USC 1030, subjecting themselves to imprisonment and litigation. In conclusion, we highlight the ethical complexities surrounding grey hat hacking. While the intentions might be noble, the unauthorized intrusion into computer systems poses legal and moral challenges. To resolve this ambiguity, we propose removing the term gray hat since gray hat and black hat function without authorization. Still, there is mere consideration for the purpose behind gray hat activities. Addressing these ethical nuances as the cybersecurity landscape evolves becomes imperative to balance security enhancement and adherence to legal and ethical norms. The exploration of these moral shades enriches the discourse on hacking practices and underscores the need for a nuanced understanding of hacker motivations and actions in the digital age.

O10.33

3:00 IMPROVING DeepFake DETECTION WITH MACHINE LEARNING AND BACKWARDS IMAGE SEARCH

Dillon Waisner, Bilal Abu Bakr

Collin College - Frisco Preston Ridge Campus, TX

In recent years, the proliferation of free mobile applications leveraging Artificial Intelligence (AI) and deep learning techniques has given rise to a concerning phenomenon: DeepFake videos, wherein realistic facial exchanges are convincingly created and superimposed onto existing footage. While traditional video editing techniques have long been employed for enhancing visual effects, AI-driven DeepFakes presents a unique challenge due to their authenticity and accessibility. Distinguishing between genuine and fake content in DeepFake videos remains daunting, as these AI-engineered media often leave minimal traces for detection. This abstract proposes a comprehensive solution to the DeepFake dilemma by introducing a novel approach combining automated reverse image searching and AI-based analysis. The primary objective is to enhance accessibility and automate the detection of DeepFake images, ultimately curbing the spread of misinformation and protecting individuals from potential harm.The proposed tool incorporates a robust reverse image search mechanism, akin to the means employed by credit bureaus to scour the dark web for sensitive personal information. This tool, tailored for DeepFake detection, analyzes images to identify alterations or manipulations. By comparing the suspect image with an extensive database of original photos, the device determines the authenticity of the content, even if it has been edited or tampered with. This reverse image search functionality empowers users to track down the origin of DeepFake images, bolstering their ability to discern truth from falsity. Moreover, the proposed solution integrates advanced AI models trained on a comprehensive dataset comprising real and fake images/videos. These AI models utilize machine learning algorithms to scrutinize images' metadata, such as their source and creation date. By identifying patterns indicative of DeepFakes, the AI models can automatically flag suspicious content, enabling swift and accurate detection. Upon detecting a DeepFake, the system sends instant notifications to users, alerting them to the manipulated nature of the image. This proactive approach prevents the dissemination of false information and safeguards individuals, particularly high-profile executives vulnerable to public humiliation, from potential reputational damage .In summary, this abstract presents a pioneering approach that harnesses the power of automated reverse image searching and AI-based analysis to enhance the accessibility and accuracy of DeepFake detection. By combining these technologies, the proposed solution provides a robust defense against the proliferation of deceptive media, thereby fostering online safety and preserving the integrity of digital content in an increasingly AI-driven world.

O10.34

3:20 LEVERAGING AI TO ENHANCE THE SECURITY POSTURE OF AN ORGANIZATION

Gabriel Perez, Bilal Abu Bakr

Collin College - Frisco Preston Ridge Campus, TX

Artificial Intelligence (AI) is a potent tool that may be utilized for both good and harm. Recent examples of AI-powered malware published by Check Point Research and CyberArk demonstrate that bad actors can use AI to discover vulnerabilities or create new malware. As technology progresses, it becomes easier to envision how much more powerful AI could be deployed to attack systems. To counter this, the cybersecurity community must emphasize using AI as a tool, such as in endpoint protection and network security solutions. Automated employee training using AI can effectively improve an organization's cybersecurity position. Many systems today provide staff training on avoiding common attacks. Still, AI can take this to the next level by automating the detection of actual malware and using it for personalized employee training. In this Abstract, we propose an AI system that could scan incoming emails, flag any containing a virus, turn off the malware, and then use the email to educate employees on how to identify such threats in the future. By automating this process, AI can ensure employees receive focused, individualized training tailored to their needs.AI-powered employee training is scalable and can be provided to staff in multiple departments and locations, regardless of their job function. This can ensure that all employees receive the same training, improving an organization's security posture. In addition to automated training, AI can be used for

penetration testing to detect security vulnerabilities humans may miss. AI will not replace humans in this capacity, but it can be used as a supplement to ensure that penetration testers do a thorough job.AI-powered education is not a panacea but can be valuable to a business's cybersecurity arsenal. Invest in additional security measures, such as robust passwords, two-factor authentication, and frequent security assessments. By combining these measures with AI-powered training, organizations can reduce the risk of cyberattacks and improve their security posture overall. As technology develops, AI will unquestionably become a fundamental component of cybersecurity, making it imperative for enterprises to employ it as a tool.

O10.35

3:40 ENHANCING DIGITAL SECURITY: THE IMPERATIVE SHIFT TO PASSWORD-LESS AUTHENTICATION WITH FIDO2 AND ASYMMETRIC CRYPTOGRAPHY

Bilal Abu Bakr, Kevin Lee

Collin College - Frisco Preston Ridge Campus, TX

In the evolving digital security landscape, traditional password-based authentication methods are becoming increasingly ineffective and vulnerable to cyber threats. This abstract delves into the significance of password-less authentication, mainly focusing on FIDO2 and asymmetric cryptography, as a robust alternative to single-factor passwords and other multi-factor authentication (MFA) forms. Historically, passwords have served as the primary means of authenticating digital identities. However, with the rise of cloud computing and remote work, they still need to be improved to ensure robust security. Prominent players in cloud services face many daily fraudulent login attempts, highlighting the pressing need for more advanced authentication mechanisms. Multi-factor authentication has emerged as a solution, combining something you are, know, and have. However, not all MFA methods offer the same level of security. Standard methods like email, SMS, and voice-based authentication have shown vulnerabilities, paving the way for more robust, phish-resistant approaches. Password-less authentication, employing asymmetric cryptography and public/private key pairs, stands out as a highly secure and resilient solution. In this approach, public keys are stored with the identity provider, while private keys are securely stored on devices like mobile phones or FIDO2 security keys. The private keys are further safeguarded by requiring a Personal Identification Number (PIN) or biometric authentication, ensuring the user's digital identity remains intact. Unlike passwords, PINs are unique to cryptographic keys and are never stored centrally, making them substantially more secure. One of the critical advantages of password-less authentication lies in its immunity to common attacks such as credential stuffing, brute force, and weak password exploits. As organizations transition towards zero-trust architectures, the need for a strongly vetted digital identity paired with multi-factor authentication becomes pivotal. Password-less authentication aligns seamlessly with this security paradigm, offering a robust defense-in-depth strategy. Moreover, the technology's relevance is underscored by the shifting regulatory landscape, which increasingly mandates the adoption of multi-factor authentication using risk-based approaches. Password-less authentication, with its foundation in asymmetric cryptography, meets these regulatory requirements and provides a future-proof solution against emerging threats. In conclusion, this abstract emphasizes the critical importance of password-less authentication in enhancing digital security. By adopting FIDO2 and asymmetric cryptography, organizations can significantly reduce their attack surface, bolster their cyber defenses, and foster a culture of healthy cyber hygiene in an increasingly interconnected world.

Neuroscience

Chair: Harry Pantazopoulos

University of Mississippi Medical Center

Co-Chair: Barbara Gisabella

University of Mississippi Medical Center

Thursday, February 2 , 2024
M RNIN
Room: TC218

O11.01

8:30 TEST-SPECIFIC THREAT DISRUPTS ATTENTIONAL CONTROL DURING REORIENTING IN TEST ANXIOUS STUDENTS AS MEASURED WITH ELECTROENCEPHALOGRAPHY

Erick Bourassa

Mississippi College, Clinton, MS

The attentional control theory of anxiety posits that anxiety is due to an imbalance between bottom-up (salient) attentional capture relative to top-down (goal-directed) attentional control. Test anxiety, although reported to be common, is poorly studied from a neuroscience perspective and is currently not recognized as a distinct clinical entity. Previous work in my lab using the Attention Networks Task showed that students with test anxiety had increased alerting scores (expected), decreased executive control scores (expected), and decreased orienting scores (unexpected). In fact, the difference in orienting score was the largest effect seen in that experiment. To further characterize the decreased orienting function of attention, two experiments were performed. First, twenty-five

students with high-levels of test anxiety (HTA) and twenty-nine students with low-levels of test anxiety (LTA) performed a dot-probe task (DPT) while 9-lead electroencephalography (EEG) was recorded. The DPT consisted of 50 trials each for neutral-neutral word pairs, general threat-neutral word pairs (GT), and test-specific threat-neutral word pairs (TST). One word is later replaced with a probe (i.e. target) and the participant indicates its location. Although HTA did not have an attentional bias towards TST (which was an unexpected finding), event-related spectral perturbations (ERSPs) from the frontal/central midline/right side showed that LTA had decreased theta-power and increased beta-power on discordant TST trials (when reorienting of attention is required), but not on the other trial types. HTA, on the other hand, had an increase in theta-power and decrease in beta-power on discordant TST trials. In a separate experiment, 11 LTA and 9 HTA completed a modified Posner cuing task with EEG. In the Posner task, a 1 s central fixation period is followed by a spatial cue; 0.1, 0.2, 0.4, or 0.8 s following the cue, the target appears (usually on the same side as the cue). The modification was that the fixation could either be a central cross (CCFix), a non-threatening word (NTFix), or a TST word (TSTFix). On CCFix and NTFix trials, EEG showed that HTA had lower theta-power (200-400 ms post-target) than LTA, but otherwise these trial types were all similar. On concordant TSTFix trials, the pattern was similar as with CCFix and NTFix, although HTA had lower beta-power. On discordant TSTFix trials, LTA had a significant decrease in theta-power and increase in beta-power, whereas HTA had an increase in theta-power and decrease in beta-power. As the ratio between theta- and beta-power (theta/beta ratio, TBR) is a known marker of attentional control, these results suggest that reorienting attention, particularly in the presence of a test-specific threat (but not GT or NT), causes an increase in attentional control in LTA, but a decrease in attentional control in HTA

O11.02

8:50 ELASTIN-LIKE POLYPEPTIDE MEDIATED DELIVERY OF NF-KB INHIBITOR FOR TREATMENT OF MILD TRAUMATIC BRAIN INJURY IN JUVENILES

Jacob Haskell, Allie M. Smith, John Aaron Howell, Bernadette E. Grayson, Gene Lee Bidwell

University of Mississippi Medical Center, Jackson, MS

Treatments for traumatic brain injury (TBI) have remained elusive due to the heterogeneous array of neural damage produced consequent to the initial force-induced injury. TBI disproportionately affects juveniles, who are at higher risk for TBI as a result of increased recreational activities. Each year, TBI accounts for over 500,000 emergency department visits and 15,000 hospitalizations involving children under the age of 14. In parallel, US children consume a diet high in sugars and saturated fats, which is known to contribute to neuroinflammation. Partly due to redundancy in the acute inflammatory response, treatment of TBI through targeted inhibition of cytokines and select inflammatory factors has proven ineffective in preclinical and clinical studies. Nuclear factor kappa B (NF- B) is a transcription factor that regulates multiple inflammatory pathways and consequently serves as a promising therapeutic target for TBI. The objective of the current study was to determine the biodistribution and pharmacokinetics of an NF- B inhibitor (p50i) fused to an elastin-like polypeptide (ELP) and a cell-penetrating peptide (SynB1). ELPs are thermally responsive, non-immunogenic polypeptides derived from human tropoelastin, with numerous potential functions in drug delivery. The study further sought to determine if treatment with SynB1-ELP-p50i is sufficient to rescue the TBI-induced acute cognitive deficits. Post-natal day 20 (PND20) male Long Evans rats were assigned to chow (CH) or high-fat (HF) diet groups. On PND30, mild TBI (mTBI) or sham injury (SHAM) was induced using the closed-head impact model of engineered rotational acceleration (CHIMERA) device. For the biodistribution and pharmacokinetic experiments, subjects were treated 90 minutes following TBI with rhodamine-labeled Synb1-ELP-p50i, and plasma was collected at regular intervals over a four-hour period to determine half-life. Following plasma collection, organs were collected and imaged with the In Vivo Imaging System (IVIS) to determine SynB1-ELP-p50i organ concentration. Although there were no differences between groups in plasma clearance of SynB1-ELP-p50i, increased accumulation of SynB1-ELP-p50i was detected at brain impact foci in TBI subjects compared to SHAM, p(injury) < 0.05. Furthermore, elevations in accumulation at impact foci were measured in HF compared to CH subjects, p(diet) < 0.01. Separate groups of SHAM and TBI subjects fed CH and HF diets were treated with either Synb1-ELP-p50i or vehicle 10 minutes following receipt of a mTBI. Cognitive assessments were performed using the Morris water maze (MWM) 4 and 24 hours post-injury. All TBI animals performed poorly in the MWM probe test 4 hours post-injury, however, SynB1-ELP-p50i treated TBI subjects showed significant improvements 24 hours post-injury compared to vehicle-treated controls in the MWM platform shifting task, $p <$ 0.05. Taken together, CHIMERA-induced mTBI in juvenile rats disrupts the BBB sufficiently to allow parenchymal deposition of a large peptide therapeutic (SynB1-ELP-p50i) adjacent to the injury impact site, and preliminary studies suggest improvements to cognitive function post-TBI with SynB1-ELP-p50i treatment in juvenile rats. NF- B inhibition therefore represents a promising target for treatment of TBI in the pediatric population.

O11.03

9:10 NEURO-IMMUNE CHANGES FOLLOWING RODENT JUVENILE TRAUMATIC BRAIN INJURY

Allie Smith, Erin Taylor, Ashley Thompson, Christiano Dos Santos E Santos, Bernadette Grayson

University of Mississippi Medical Center, Jackson, MS

Traumatic brain injury (TBI) is one of the leading causes of death and disability in the juvenile population. TBI is associated with elevations in inflammatory signaling. However, the temporal changes in immune and inflammatory markers following TBI, particularly in juvenile studies utilizing the Closed Head Injury Model of Engineered Rotational Acceleration (CHIMERA), have not been fully elucidated. The current study aimed to determine the time course of changes to immune cell expression throughout the first four days following juvenile TBI via the CHIMERA. Male Long Evans rats sustained either a TBI or a Sham TBI via the CHIMERA on post-natal day (PND) 30. Sham animals were euthanized at 3 hours (h) post-injury. TBI animals were euthanized at 0, 3, 6, 12, 24, or 96 h post-injury. Hippocampus samples were collected for use in QRT-PCR. The mRNA expression of cytokines IL1b and TNF- was significantly elevated at 6 h, and C1q C chain (C1QC), a dendritic cell marker, was significantly elevated at 24 h. The mRNA expression of CD68, a marker for macrophages, was significantly elevated at 6, 24, and 96 h post-injury compared to Sham. CD3G, a marker for T cells, was significantly elevated at 6 hours post-injury. However, the mRNA expression of PTPRC, a marker for leukocytes, was not significantly altered throughout the time periods evaluated. To follow up on these studies, juvenile rats were injured and brains and blood were harvested 48 h post-injury comparing Sham and TBI. Peripheral blood lymphocytes were obtained and sorted by marker-specific antibodies. In the peripheral blood, there was a significantly higher number of CD3+ total T cells, CD3+/CD8 cytotoxic T cells, and CD3+/CD4+ helper T cells in the TBI group compared to the Sham, but CD45R+ total B cells and natural killer (NK) cells were not significantly different. Superior hemi-sected cortices were also used for immune cell extraction. There was a significantly lower number of NK cells and CD45R+ total B cells in the TBI group compared to the Sham, but CD45+ leukocytes and CD3+ total T cells were not significantly different. Further work is needed to understand the relationship between the reduction of specific cells in the brain with the elevation of cells in the peripheral blood.

O11.04

9:30 SEX DIFFERENCES IN THE ROLE OF ESTRADIOL ON RECOVERY AFTER CEREBELLAR LESION IN THE ZEBRA FINCH

Mathew Thibodeaux, Chyna Rae Dearman, Lainy Day

University of Mississippi, Oxford, MS

Aromatase and Estradiol-17 (E_2) play a conserved role in neuroprotection with aromatase inducing reactive gliosis, and local synthesis of E_2 from androgens reducing apoptosis, neuronal degeneration, and inflammation. Aromatase and E_2 are known to improve recovery of function after a variety of neural insults in mammals. More recently, E_2 and aromatase were shown to ameliorate behavioral deficits in zebra finches after cerebellar lesion. The songbird cerebellum (CB) is an excellent model for steroid-mediated neuroplasticity as the songbird brain is highly plastic, CB aromatase and E_2 levels are intrinsically low, and all other steroidogenic molecules necessary for synthesizing androgens are present at moderate to high levels with translocator protein (TSPO), side chain cleavage enzyme (SCC), and aromatase being dramatically upregulated after CB injury. In vertebrates, the cerebellum plays a role in timing and sequencing of coordinated movement with evidence accumulating over the last few decades for a similar role in mammalian cognitive functions, such as learning the procedures required to acquire spatial information. Previous work in the Day lab showed that in a spatial task, aromatase inhibition paired with cerebellar lesions impairs spatial learning and administering exogenous E_2 ameliorates these effects. Interestingly, the reaction of injury-induced steroidogenic molecules is different in quantity and timing between male and female zebra finches. Although circulating E_2 levels are similar between sexes, females have been shown to upregulate aromatase after CB injury faster than males. It has been hypothesized that this is because males have higher androgen levels, suggesting females may need to increase aromatase at a higher rate in order to synthesize similar levels of estradiol. My purpose is to test whether males compared to females will be more negatively affected by a cerebellar lesion plus aromatase inhibition on a postural control test and spatial learning test, since males do not upregulate aromatase as much as females. These results will confirm and expand on previous studies of injury-induced steroidogenesis, specifically on aromatase-mediated neuroprotection relevant to behavioral recovery after cerebellar damage. These results may also provide insight into the marked sex differences seen in disease progression and recovery after injury in human neurodegenerative diseases and traumatic brain injury respectively.

O11.05

9:50 EFFECT OF REDUCED UTERO-PLACENTAL PERFUSION AND ACUTE SEIZURE EXPOSURE ON COGNITIVE FUNCTION AND TAU PROTEIN IN MICE AT 2 MONTHS POSTPARTUM

Simranjit *Kaur, Mia McFadden, Maria Jones-Muhammad, Tyranny Pryor, Qingmei Shao, Junie P. Warrington*

University of Mississippi Medical Center, Jackson, MS

Background: Preeclampsia (PE), a hypertensive pregnancy disorder, is characterized by new-onset hypertension after 20 weeks of gestation with symptoms impacting many

organ groups. With the addition of new-onset seizures, PE can progress to eclampsia. Though PE is thought to resolve after the fetus is delivered, studies have shown increased risk of vascular dementia and mortality from Alzheimer's disease in women with a history of PE. Objective: The goal of this study was to determine whether a mouse model of preeclampsia (the reduced uteroplacental perfusion (RUPP)) and eclampsia (pentylenetetrazol (PTZ, 40mg/kg) to induce seizures), display learning and memory deficits and Alzheimer's disease markers at 2 months postpartum. Methods: Pregnant C57BL/6 mice underwent sham or RUPP surgery on gestational day 13.5 and injected with PTZ or left untreated on GD 18.5. Two months after delivery, cognitive function was assessed using the Barnes Maze, a circular dry maze, where mice are trained to locate an escape box hidden under 1 of the 20 holes. Training is done over 4 trials per day for 4 days. Results: Mice exposed to RUPP during pregnancy took a longer distance to the escape box on Day 1 of learning compared to Sham-exposed dams. All mice eventually learned the task, resulting in no significant effect of RUPP or Seizure on short-term memory. Using ELISA, we found that seizure exposure led to increased total Tau in the cortex ($p=0.018$) with a significant increase in sham group. Conclusion: Together, these results indicate that a history of RUPP leads to modest learning impairments and seizure exposure during pregnancy increases cortical Tau postpartum. Ongoing and future studies will assess changes in other Alzheimer's disease markers and determine whether increased postpartum time will lead to exacerbate learning impairment.

O11.06

10:10 CHANGES IN THE HYPERTENSIVE BPH/5 MOUSE COMPARED TO NORMOTENSIVE C57BL/6 MICE AT 2 MONTHS POSTPARTUM

Qingmei Shao, Tyranny Pryor, Maria Jones-Muhammad, Shanise Rouser, Frank T. Spradley, Junie P. Warrington, Aspen Treadwell

University of Mississippi Medical Center, Jackson MS

Background: Studies have shown that women who were diagnosed with hypertensive disorders of pregnancy, have a higher risk of developing Alzheimer's disease and vascular dementia later in life. Superimposed preeclampsia is one hypertensive disorder of pregnancy that develops in women with chronic hypertension who develop preeclampsia symptoms. The blood pressure high (BPH/5) mouse has been described as a superimposed preeclampsia model. While the pregnancy-related changes have been described in the BPH/5 mouse, whether there are pregnancy-related and postpartum cerebral complications are not known. Hypothesis: We hypothesized that the postpartum BPH/5 mouse will have regional changes in cerebral perfusion compared to the normotensive, postpartum C57/BL/6 mouse. Methods: Timed-pregnant C57BL/6 mice (n=5) underwent sham abdominal surgery on GD13.5 and were allowed to deliver normally. BPH/5 mice went through a single pregnancy/delivery. At 2 months postpartum, dams were weighed, and baseline cerebral perfusion was measured using laser Speckle Imager for 5 minutes under 1.5% isoflurane. Regions of interest (ROI) were drawn in the regions overlying the left and right cortices, cerebellum, transverse sinus, and whole brain. Mean perfusion measurements (over 5 minutes recording) were normalized to the area of the region of interest. Heart rate was measured using a paw sensor connected to a SomnoSuite. After cerebral perfusion, blood and organs were collected for further processing. Results: Compared to postpartum C57BL/6 mice, BPH/5 mice had increased body ($p=0.002$)left ($p=0.048$) and right kidney ($p=0.032$), and heart weight ($p<0.001$), reduced heart rate($p=0.008$) and hematocrit ($p=0.004$). BPH/5 mice had a significant reduction in perfusion of the cortical region ($p=0.005$), an increase in cerebellum ($p=0.020$), and transverse sinus ($p=0.030$),and no difference in the whole brain ($p>0.05$). Conclusion: Together, these results indicate that a history of superimposed preeclampsia-likeconditions results in physiological and cerebrovascular changes at 2 months postpartum.Ongoing studies will determine whether changes in cerebral perfusion are due to vascularrarefaction in the cortex, and whether learning and memory impairments occur in the BPH/5postpartum mouse.

O11.07

10:30 SEXUALLY DIMORPHIC NEUROBEHAVIORAL EFFECTS OF GESTATIONAL EXPOSURE TO THE ORGANOPHOSPHATE INSECTICIDE CHLORPYRIFOS IN THE RAT

Elizabeth Hawkins[1, 2], Melanie Berry[2], Tara Krishna[3], Dennis Kim[3], Silvia Kelsen[2], Gary Aston-Jones, Ph.D.[3], Amy S. Kohtz, Ph.D.[2, 3]

[1]Department of Biochemistry, Millsaps College, [2]Department of Psychiatry, Division of Neurobiology and Human Behavior, University of Mississippi Medical Center, [3]Brain Health Institute, Rutgers University

The organophosphate Chlorpyrifos (CPF) is classified as a moderately toxic agent. As a pesticide that took off en masse in 1965, CPF was most notably used to treat 50 different nut, fruit, vegetable, and cereal crops. Despite evidence suggesting significant health risks, a federal ban on CPF usage 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. Here, we tested the effects of subthreshold (non-detectable in fetal tissue) exposure to CPF during gestation on neurobehavioral outcomes in adult rats. Pregnant Sprague-Dawley rats were given 6mg/kg/day CPF or safflower oil vehicle administered on cookies (readily eaten) daily during gestational day (GD) 6-20. Offspring were raised to adulthood (post-natal day 55), and CPF or vehicle rats were tested for addiction-like behavior, sucrose-seeking,

anxiety-like, and depressive-like behavior. Reinstatement behavior (context, cued, cocaine primed and stress) was tested following cocaine acquisition on an FR-1 schedule. CPF exposure resulted in shorter periods of cocaine acquisition, greater cocaine intake, and exacerbated extinction resistance compared to vehicle-administered controls in males. Further, CPF-exposed females exhibited a decrease in sucrose-seeking and depressive-like behavior while males displayed an increase in anxiety and depressive-like behaviors but a decrease in sucrose-seeking. We then performed immunohistochemistry to determine if CPF exposure affects locus-coeruleus norepinephrine (LC-NE), ventral tegmental area dopamine (VTA-DA), or dopamine beta-hydroxylase fiber (DBH) densities in the prefrontal cortex. CPF increased cortical DBH fiber densities 4-fold in both sexes. LC-NE fiber density was diminished slightly in both sexes, yet LC-NE neuron count remained insignificantly changed compared to controls. There was no significant change in cell density for either sex vs controls in VTA-DA neuron count or density. This data indicates that enhanced DBH fiber densities in the cortex were likely not due to an increased number of forebrain-projecting NE neurons. Stress responding was inversely predicted by DBH fiber density in females, whereas impulsivity measures were inversely predicted by fiber density in males. Together, these data indicate that increased NE innervation of the cortex by CPF may both promote stress resilience, particularly in females, while also impairing behavioral flexibility in both sexes.

O11.08

10:50 EARLY-LIFE SLEEP DISRUPTION (ELSD) ALTERS INHIBITORY INTERNEURONS AND PERINEURONAL NETS IN THE HIPPOCAMPUS OF ADULT PRAIRIE VOLES

Jobin Babu[1, 2], Carolyn Jones-Tinsley[3], Noah Millman[3], Lindsay Rexrode[1], Joshua Hartley[1], Barbara Gisabella[1], Miranda Lim [1], Harry Pantazopoulos [1]

[1]Univeristy of Mississippi Medical Center, [2]Program in Neuroscience , [3]Oregon Health and Science University

Background: The pathogenesis of Autism Spectrum Disorder (ASD) remains poorly understood, limiting therapeutic and preventative strategies. Our recent gene expression profiling study on the hippocampus of children with ASD implicates gene expression pathways involved in extracellular matrix processing and synaptic signaling. REM sleep is critically involved in shaping brain circuitry early in life, and multiple lines of evidence indicate early life sleep disturbances are associated with ASD. Our recent studies demonstrated that early life sleep disruption (ELSD) results in impaired social behaviors in adult prairie voles (*Microtus ochrogaster*), including reduced affiliative behavior and partner preference. Perineuronal nets (PNNs) are extracellular matrix structures involved in neuronal maturation and synaptic plasticity that have been implicated in neurodevelopmental disorders. We tested the hypothesis that adult voles with ELSD display alterations in PNNs and parvalbumin (PVB), a marker for the inhibitory neurons that PNNs surround. We also examined co-expression of PNNs and PVB neurons with MEF2C, a marker associated with ASD that is involved in PVB neuron maturation. **Methods:** Hippocampal sections from adult voles (P150-160) with ELSD (n=8) and controls (n=6) were used for histochemistry for PNNs and immunofluorescence for PNNs, PVB, and MEF2C. Stereology based microscopy was used to quantify PNNs and colocalization with PVB neurons and MEF2C neurons. We conducted QRT-PCR and Western blotting for MEF2C on hippocampal brain samples from children (ages 3-14) with ASD and age matched controls (n=8 per group). **Results**: Densities of PNNs were significantly decreased in CA1 stratum oriens of ELSD voles ($p<0.04$). Neurons triple-labeled for PNNs, PVB and MEF2C were significantly decreased in CA1 stratum oriens ($p<0.02$), CA1 stratum pyramidale ($p<0.005$), and CA4 ($p<0.01$). MEF2C mRNA ($p<0.05$) and protein expression ($p<0.03$) was decreased in the hippocampus of children with ASD. **Conclusion:** Our data suggest that ELSD may contribute to molecular changes observed in the hippocampus of children with ASD. Decreases of neurons co-labeled with PVB, MEF2C and PNNs indicate that ELSD contributes to impairment in inhibitory signaling and synaptic plasticity in the adult hippocampus of voles with behavioral deficits. ELSD may interfere with the critical role of REM sleep in brain development, contributing to changes in neural circuitry that persist throughout adulthood. Our data suggest that MEF2C signaling and sleep promoting strategies may be promising therapeutic targets for preventing or alleviating neurodevelopmental changes involved in ASD.

O11.09

11:10 EFFECTS OF ACUTE COCAINE ON OXYTOCIN-PROGESTERONE INTERACTIONS

Carlee Cockrell[1], Silvia Kelsen[2], Amy Kohtz[2]

[1]William Carey University, Hattiesburg, MS, [2]University of Mississippi Medical Center, Jackson, MS

Cocaine is a widely used drug with the number of users on the rise. While extensive clinical data indicate that women are particularly susceptible to cocaine use disorder, limited preclinical studies as to the mechanisms exist. It has been proposed that ovarian hormones, especially estrogen, make females more susceptible to the use of cocaine due to these hormones being a crucial biological substrate in facilitating the response to this drug. During the menstrual cycle, women fluctuate from the luteal phase, which is when the levels of estradiol and progesterone in the body are elevated, and the follicular phase, which occurs when estradiol is present and progesterone is absent. Clinical reports suggest cocaine cravings increase during the follicular phase compared to the luteal phase, indicating estrogen increases cravings while progesterone decreases. In rodent models, these effects are relatively recapitulated,

as estradiol can increase cued reinstatement and cocaine self-administration, and demand for cocaine, whereas progesterone decreases demand for cocaine in intact and ovariectomized hormone replaced female rats. We further showed that over time, cocaine exposure in fact decreases progesterone levels persistently, leading to the loss of estrus cyclicity, and increased cocaine demand over time. Our preliminary data shows that the neural peptide, Oxytocin, can stimulate the estrus cycle, and thereby decrease demand for cocaine over time. Herein, we investigated the mechanism of these effects, as it is widely unknown how oxytocin and progesterone interact with cocaine. Our studies used a within-subjects sampling design, to investigate the interaction between progesterone and oxytocin on cocaine (2x2x2 design) in ovariectomized rats and in intact cycling rats. Each rat was sampled via tail vein blood draw for a total of eight times. Ovariectomized (OVX; exogenous progesterone) rats were sampled after given progesterone (4mg/kg, SC, 4hr) or safflower oil vehicle, Oxytocin (OXT, 0.3mg/kg, IP, 30m) or saline vehicle, and cocaine (10mg/kp, IP, 10min) or saline vehicle. Intact rats (endogenous progesterone) proestrus (high progesterone) or diestrus (low progesterone) phase of their cycle and similarly administered Oxytocin (0.3mg/kg, IP, 30m) or saline vehicle, and cocaine (10mg/kp, IP, 10min) or saline vehicle. The series consisted of vehicle or cocaine, vehicle or oxytocin, and vehicle or progesterone. After these procedures were completed, serum was extracted from blood using ethyl ether. We used an enzyme linked immunosorbent assay (ELISA) to measure circulating levels of plasma progesterone, estradiol, corticosterone and oxytocin within subjects in each rat. As predicted, rats in proestrus had greater OXT, progesterone, and estradiol compared to rats in diestrus. Similarly, OVX females administered progesterone had greater circulating progesterone. Our results indicated there was a significant interaction between OXT, cycle phase, and cocaine to affect circulating progesterone levels in intact rats. Cocaine acutely increased progesterone, estradiol, and corticosterone effects that were suppressed when OXT was on board. In fact, circulating OXT levels significantly predicted circulating progesterone (R2=0.40), indicating a strong relationship between OXT and progesterone. Thus, we conclude that OXT protects against the endocrine disrupting effects of cocaine, thereby diminishing its long-term consequences.

O11.10

11:30 COCAINE PERSISTENCE CRAVINGS DURING INITIAL ABSTINENCE

Gabriella Thames, Silvia Kelsen

University of Mississippi Medical Center, Jackson, MS

Background: The inability to maintain abstinence is a trademark of addiction, yet effective maintenance therapies remain elusive. Craving during initial abstinence can predict long-term relapse outcomes in humans. Furthermore, promoting abstinence success may be particularly complex in women as psychological and biological responses to drugs of abuse differ in women compared to men. Several measures of cocaine dependence are greater in women, and can be paralleled in female rodents, yet the biological mechanisms for these sex differences remain unclear. Thus, understanding circuit and molecular signatures that drive increased cocaine seeking among females is critical to the development of effective SUD therapies. **Objective:** We have previously shown that the dorsal hippocampus plays a significant role in driving sex-specific engagement in cocaine-seeking behavior on ED1. We used whole-transcriptome sequencing analysis to identify sex-specific gene expression patterns elicited by exposure to the cocaine self-administration context on ED1 that correlate with cocaine seeking behavior. **Methods:** Fresh-frozen whole dorsal hippocampus from male and female Sprague-Dawley rats were sacrificed as naïve, in 24hr withdrawal from cocaine (WD1), or immediately following ED1 testing. **Results:** We identified 101 transcripts in females and 121 transcripts in males that had fold-change differences on WD1 compared to naïve rats. We also identified 22 transcripts in females and 149 transcripts in males that had fold-change differences on ED1 compared to WD1 controls. Interestingly, only three targets overlapped between the sexes. Furthermore, five genes identified in females, and one in males, significantly correlated to cocaine-seeking behavior on ED1 with R2 values > 0.70. **Conclusion:** There are few sex differences in the hippocampus between naïve males and females that are not sex-chromosome dependent. Sex specific transcriptomics only emerge after challenge, e.g. cocaine self-administration (WD1) or ED1 challenge. Multiple transcripts of interest correlate to ED1 cocaine-seeking behavior in females only and are in interest for future studies.

Thursday, February 29, 2024

AFTERNOON

Room TC 218

1:00 Divisional Business Meeting

O11.11

1:30 RELATIONSHIP BETWEEN SLEEP PARAMETERS AND INTRA-DIMENSIONAL /EXTRA-DIMENSIONAL SET-SHIFTING IN MALE RHESUS MONKEYS

Daniel Borgatti[1, 2], Ashley A. Smith[3], James. K Rowlett[2, 3], Lais F. Berro[2, 3]

[1]School of Graduate Studies in Health Sciences, [2]Center for Innovation and Discovery in Addictions, University of Mississippi Medical Center, Jackson, MS, USA, [3]Department of Psychiatry and Human Behavior

Background: The importance of sleep to healthy physical

functioning has long been understood; however, the impact of insufficient sleep on cognitive functioning has not been fully elucidated. Most preclinical sleep studies pertaining to cognition have been conducted in rodents, which have sleep-wake cycles different than humans. While non-human primates share a similar sleep-wake cycle and sleep architecture with humans, to our knowledge, no previous studies have systematically investigated the relationship between sleep and cognition in monkeys. This study sought to investigate the relationship between baseline actigraphy-based sleep quality and an executive function task in male rhesus monkeys. **Methods:** Four male rhesus monkeys (*Macaca mulatta*) were trained on an intra-extra dimensional set-shifting (ID/ED) task using the Cambridge Neuropsychological Test Automated Battery (CANTAB) apparatus. The ID/ED task has been proposed as a measure of executive functioning that evaluates attentional set-shifting (i.e. the ability to switch between arbitrary internal rules guiding behavior) and perseverative responding. Actigraphy-based sleep parameters were recorded during baseline (dark phase from 18h to 6h), and baseline sleep parameters were compared to the subjects' performance on a baseline ID/ED task conducted between 11h and 15h at least 2 months after initial training. **Results**: Our findings show that % wake and sleep efficiency, but not other sleep measures, were significantly correlated with total errors and total trials to completion in the ID/ED task, with increased % wake and decreased sleep efficiency being associated with greater errors and higher number of trials to completion. Sleep latency, on the other hand, was significantly correlated with average accuracy during the task, with longer time to fall asleep (greater sleep latency) being associated with lower task accuracy. **Conclusions:** These findings show that sleep quality directly influences performance on an executive functioning task in rhesus monkeys. Different sleep parameters correlated with different cognition-related measures, suggesting that the relationship between sleep and cognition is complex. Using the approach from the present study as a translational model, future studies in our laboratory will investigate the relationship between sleep disruption and cognition under other experimental conditions (e.g. methamphetamine-induced sleep impairment).

O11.12

1:50 IMPACT OF SLEEP DISRUPTION ON HIPPOCAMPAL DENDRITIC SPINES IN A CONTEXTUAL FEAR MEMORY CIRCUIT

Molly Henson[1], Matthew Tennin[1], Hunter Matkins[1], Lindsay Rexrode[1], Ratna Bollavarpu[1], Jake Valeri[1], Tanya Pareek[1], Daniel Kroeger[2], Harry Pantazopoulos[1], Barbara Gisabella[1]

[1]University of Mississippi Medical Center, [2]Auburn University College of Veterinary Medicine

Introduction: Sleep and memory dysfunction are key features across a broad range of psychiatric disorders including PTSD, substance use disorders and mood disorders. However, our understanding of how synapses are modified during sleep is still limited. A growing number of studies support the theory that infrequently used dendritic spines are pruned during sleep, thus improving memories by enhancing the signal to noise ratio of frequently reinforced synaptic connections. However, several other studies also claim that sleep disruption impairs memory strength and results in decreased dendritic spines. These studies suggest that sleep may be necessary to strengthen some synapses while others are pruned. Recent studies suggest that specific subsets of dendritic spines are increased during sleep in selective neurons such as those in the hippocampus that have been involved in recent learning. We tested the hypothesis that dendritic spines that participated in encoding contextual fear memory are strengthened during sleep in the presence of broad synaptic downscaling. Furthermore, we tested how sleep following re-exposure to the fearful stimulus impacts these spines during memory reconsolidation. **Methods:** We used ArcCreER^{T2} mice which allow for permanently labeling neurons that expressed Arc during contextual fear learning. We used dual AAV viral vector labeling of dendritic spines in these mice to label Arc positive (Arc+) and Arc negative (Arc-) neurons. Dendritic branches were sampled from Arc+ and Arc- neurons using confocal imaging, and dendritic spine densities and spine properties were quantified using three-dimensional (3D) image analysis from sleep deprived and control C57/B16 mice (n=6/group). **Results:** We observed an overall decrease of dendritic spine density in sleep deprived mice which was selective for mushRoom spines, reflecting previous reports that mushRoom spines are increased following fear conditioning. Arc+ dendrites representing the fear memory trace showed no overall difference in spine density between sleep deprived and control mice. However, mushRoom spines in Arc+ branches showed the largest decreased density in sleep deprived mice, indicating that the upscaling of mushRoom spines during sleep following fear learning is driven by neurons that encoded the recent contextual fear memory. In comparison, Arc- branches showed a decreased spine density of thin spines in sleep deprived animals, indicating upscaling during sleep in these neurons that did not encode fear memory is driven by increases in immature plastic spines. Furthermore, we observed similar changes in dendritic spines in mice with sleep disruption following re-exposure to the fearful stimulus, suggesting that sleep further strengthens fear memory during reconsolidation. **Discussion:** Our findings indicate that sleep strengthens dendritic spines in neurons that recently encoded fear memory. Sleep disruption following a traumatic experience thus may be a viable strategy in weakening the strength of contextual memories associated with the trauma and alleviate PTSD and reward memories. Furthermore, similar effects of sleep disruption are observed during reconsolidation. Understanding the molecular pathways that regulate this memory trace selective process may allow for development of novel

therapeutic strategies for memory consolidation in psychiatric disorders.

O11.13

2:10 DIFFERENTIAL SERUM LEVELS OF CIRCADIAN RHYTHM AND STRESS RESPONSE MOLECULES IN SUBJECTS WITH BIPOLAR DISORDER: ASSOCIATIONS WITH GENETIC AND CLINICAL FACTORS

Obie Allen IV[1], Brandon Coombes[2], Barbara Gisabella[1], Joanna Biernacka[2], Mark Frye[2], Matej Markota[2], Harry Pantazopoulos[1]

[1]University of Mississippi Medical Center, Jackson, Mississippi, [2]Mayo Clinic, Rochester, Minnesota

Rationale: Patients with bipolar disorder (BD) respond inconsistently to currently prescribed pharmacotherapies. Thus, in the past decade, there has been increasing interest in precision medicine techniques, such as the use of genetic markers and blood biomarkers as predictors of treatment responsiveness. Genetic studies have identified an association of polymorphisms in clock genes with BD. Clock molecules regulate diurnal expression of a broad range of processes including neurotransmitter and stress signaling molecules, which have been implicated in BD. For example, the neurotransmitter somatostatin (SST) and the stress signaling molecule corticotrophin releasing hormone have been implicated in BD pathophysiology, and preclinical studies suggest that elevated serum levels of SST may be a predictor for susceptibility of developing depression from chronic stress. We tested the hypothesis that serum levels of clock molecule and stress signaling proteins are altered in subjects with BD, and that serum protein levels are associated with genotypes, symptom severity and treatment response. Ongoing work is also examining these molecules in the hypothalamus of subjects with BD. **Methods:** The present study measures the expression of clock proteins and stress signaling molecules in the blood between control (n=100) and BD (n=100) subjects. Blood samples were obtained from the Mayo Clinic Biobank. We used ELISA to identify differential protein-level expression of ARNTL, PER2, CRH, SST, and CACNA1C between control subjects and subjects with BD. Genotype and clinical histories were used to examine relationship of serum protein levels with symptom severity, treatment responsiveness, and genotypes. **Results:** We observed significantly increased SST ($p < 0.01$)and CACNA1C ($p < 0.003$) serum protein levels in of subjects with BD vs. control subjects. Further, we observed significantly decreased serum levels of the clock protein ARTNL ($p < 0.03$) and the stress signaling factor CRH ($p < 0.001$) in subjects with BD compared to control subjects. Significant associations of CACNA1C protein levels were observed with CACNA1C genotype, ARNTL and CRH with DEC1 genotype, and SST with SSTR5 genotype. Serum protein level associations were observed with lithium response, EVENING chronotype, and alcohol dependence. **Conclusions:** Serum protein levels may have implications for new and currently existing treatment options for BD patients. Increased SST levels may assist in identifying people who are more vulnerable to developing depression, and decreased ARNTL levels point to circadian rhythm dysfunction in people with BD. These markers along with CRH may allow for prediction of patients who do not response to lithium treatment and may allow for identifying subgroups of patients who may benefit from chronobiology-based therapies and calcium channel blocker therapies. Ongoing studies examining these molecules in the hypothalamus of subjects with BD may help identify the core neurocircuitry involved in these systemic alterations.

Thursday, February 29, 2024

EVENING

3:30 DODGEN LECTURE /AWARDS CEREMONY

THEATER

5:00 GENERAL POSTER SESSION

(immediately following Dodgen Event)

P11.01

THE ROLE OF HIPPOCAMPAL B-ADRENERGIC RECEPTOR SUBTYPES DRIVING RETRIEVAL, RETENTION, AND CONSOLIDATION OF COCAINE-ASSOCIATED MEMORIES IN FEMALES

Amy Khotz[1, 2], Silvia Kelsen[1], Melanie Berry[1], Beau Miller[3], Kristen Rhodes[4]

[1]Department of Psychiatry and Human Behavior, Division of Neurobiology and Behavior Research, University of Mississippi Medical Center, Jackson, MS, [2]Center for Innovation and Discovery in Addictions, University of Mississippi Medical Center, Jackson, MS, [3]Mississippi College, Biology Department, Clinton, MS, [4]Murrah High School, Jackson, MS

Background: Exposure to environmental context and drug associated cues help maintain drug seeking behavior. -adrenergic receptors (-ARs) have a long-standing historical implication in driving processes associated with contextual memory retrieval, retention, and consolidation that have been extended to contextual drug memories. The selective role of individual -ARs in drug memories remain untested in females, and thus is a focal question herein.Objective: To explore previously the role of -adrenergic receptors in contextual drug memories in a population previously unstudied; females.Method: We investigated the role of the -ARs in driving the retrieval, and retention of cocaine conditioned place preference (CPP) in female rats. CPP was conducted using a two compartment (black on one side, white on the other) chamber automatic door box. Using conditioning, rats were isolated to either the black or white side and administered 10mg/kg, IP cocaine. On test day, the preference for the cocaine-paired side was assessed as an indicator of drug memories. We used the antagonists ICI

118,551 (1), Betaxolol (2), and Propranolol (1 and 2) administered directly to the hippocampus prior to testing in CPP to test whether the retrieval and retention of cocaine-associated memories was driven by 1- or 2-ARs.Results: Administration of 1 but not 2, antagonists, reduced the expression of a CPPcompared to the vehicle administration in female rats. Conversely, administration of B2antagonists prior to an initial test reduced cocaine-associated memory tested 2 weeks later. When antagonists were administered during the consolidation of CPP, only 2 or combined 1 and 2 antagonists attenuated the expression of cocaine-associated memories. These effects contrast with prior reports in males showing that 1, but not 2, ARs drive retrieval and retention of cocaine CPP.Conclusion: Exposure to the administration of 1- and 2-ARs, or 1- 2- ARs separately help maintain drug seeking behavior in memory retrieval and retention in females. Future studies will examine sex differences in the role of the -ARs in driving consolidation of cocaine-associated memories.

P11.02

IDENTIFYING THE DISTRIBUTION OF PEPTIDE HORMONES REGULATING ADRENAL AND GONADAL STEROIDS IN THE BRAINS OF DIPLOID AND POLYPLOID TREEFROGS

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Polyploidization can drive phenotypic change by altering gene expression patterns and/or by increasing mutation rates that alter the gene products. How these genetic effects potentially alter the endocrine physiology of extant polyploids is understudied. We are investigating regulation of adrenal glucocorticoids and gonadal steroids in the gray treefrog complex, which consists of three tetraploid lineages collectively referred to as *Hyla versicolor* and its diploid ancestor, *H. chrysoscelis*. We hypothesis that polyploidization in these treefrogs altered the relative expression levels of hormone receptors, which impacts regulation of circulating hormone levels and influences hormone interactions, e.g., high glucocorticoids inhibit gonadal steroid production via negative feedback on receptors. Alternatively, polyploidization may promote mutation of duplicate genes coding for receptors. To examine these alternatives, RNA-seq will be used to compare expression levels and transcript sequence identity of receptors in brain regions regulating the hypothalamic-pituitary-gonadal (HPG) and hypothalamic-pituitary-adrenal/inter renal (HPA/I) axes. Gonadal steroids are regulated by the HPG axis; hypothalamic kisspeptin (KISS) stimulates gonadotropin releasing hormone (GnRH) triggering the pituitary to release luteinizing hormone (LH), which stimulates gonadal steroid production. Adrenal glucocorticoids are regulated by the HPA/I axis; hypothalamic corticotropin releasing hormone (CRH) stimulates pituitary release of adrenocorticotropic hormone (ACTH), which stimulates production of adrenal glucocorticoids. Negative feedback of the HPA/I axis involves glucocorticoids binding to glucocorticoid and mineralocorticoid receptors in the medial pallium, the hippocampal homolog. Medial pallium boundaries are clear, but the location of homologs to mammalian hypothalamic and pituitary nuclei expressing HPA/I and HPG regulatory peptides and the CNS distribution of these peptides varies among amphibians. Thus, we are using immunohistochemistry to identify hypothalamic and pituitary immunoreactivity for KISS, GnRH, LH, CRH and ACTH to guide excision for RNA-sequencing and to characterize CNS distribution of these peptides. We used primary antibodies with avidin-biotin-complexing visualized by Novared or fluorescent secondaries. We performed immunohistochemistry for CRH, GnRH, and KISS (n=3/species).CRH immunoreactive cells were located in preoptic and paraventricular nuclei as in other vertebrates. Other CRH-positive regions differed from those previously reported in Xenopus and Rana. GnRH and KISS immunoreactivity is still being mapped, but distribution patterns do not overlap completely with distributions seen in other amphibians. The basic pattern of CRH, GnRH, and KISS immunoreactivity is similar between *H. chrysoscelis* and *H. versicolor*... Diverse expression patterns within amphibians and/or across taxa suggest the possibility for functional diversity in neuroendocrine networks. The peptide hormone immunoreactive regions of the hypothalamus and pituitary identified by immunohistochemistry will be used for RNA-seq to determine whether expression levels or changes in transcript sequences have impacted steroid-receptor-complexes in polyploid gray tree frogs.

P11.03

SEX DIFFERENCES IN THE ROLE OF AROMATASE ON RECOVERY AFTER CEREBELLAR LESION IN THE ZEBRA FINCH (Taeniopygia castanotis)

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Following neurotrauma, aromatase upregulation in glia increases local testosterone synthesis of Estradiol (E2), which reduces apoptosis, neural degeneration, and inflammation that may reduce behavioral deficits. Injury-induced steroidogenic responses are sexually dimorphic. In zebra finches, which are well known for neuroplasticity and neurosteroidogenesis, circulating and neural E2 are similar between sexes. However, aromatase upregulation post-cerebellar injury is higher and lasts longer in females than in males, possibly to compensate for less testosterone substrate. The behavioral consequences of these sex-specific neural responses are unknown, but the cerebellum is known to be involved in spatial learning and posture and we have previously shown that aromatase inhibition impairs spatial learning post-cerebellar lesion compared to lesion only birds, but aromatase inhibition had no impact

on postural deficits post-lesion. We performed stereotaxic surgery to produce puncture lesions in the lateral cerebellar nucleus of adult (1-3 yo) male and female zebra finches. Lesion+Letrozole birds were administered the aromatase inhibitor, letrozole, at the lesion site, Lesion+Saline received the vehicle, and Shams underwent surgical procedures but no lesion (n=12/group). Birds were given 48 hours to recover and were then tested in the "escape maze", a Morris water maze analog that tests spatial learning and memory, and the "log-roll", a rotorod analog that measures postural deficits. We predicted no sex differences in spatial learning in the Lesion+Saline group since females compensate for a lack of testosterone by upregulating aromatase at the lesion site. In Lesion+Letrozole birds we predicted that males would be less impaired in learning than females, since the female compensatory up-regulation of aromatase would ostensibly be reduced. We do not expect sex differences in Shams as there is no ecological reason to suggests greater spatial skills in one sex or the other. We do not expect any sex differences in postural deficits and predict, based on our previous studies, that all lesion groups will have similar postural deficits. However, we have not previously tested the same subjects in both the log roll and the escape maze, nor used both males and females in the same experiment. Thus, this experiment provides greater clarity in interpreting sex differences and task differences compared to our previous experiments. Final analyses are still being performed, but we expect results will confirm and expand previous studies of injury-induced steroidogenesis, specifically expanding aspects related to aromatase-mediated neuroprotection relevant to behavioral recovery after cerebellar damage and how sexes may differentially regulate these processes. These results may also provide insight into the marked sex differences seen in disease progression and recovery after injury in human neurodegenerative diseases and traumatic brain injury respectively.

P11.04

INFLUENCES OF DIETARY ENRICHMENT IN JUVENILE AND ADULT MALE ZEBRA FINCH (Taeniopygia castanotis) CHEEK PATCH GROWTH AND COLOR

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Protein is vital in vertebrate diets, particularly during development. Wild seed eating birds, such as zebra finches breed after rainfalls when seeds are young and proteinaceous. In captive zebra finches, maternal and nestling protein supplements, compared to standard diets, result in larger eggs and clutches, increased growth rates, lower stress levels, and improved cognition. Nestling males given protein supplements compared to seed only males, have larger and redder cheek patches as adults, a trait preferred by females in mating studies. Captive zebra finches are fed low protein mature seeds, but supplemental bread and chicken eggs are standard dietary enrichments. Yet, it is unclear whether post-nestling egg supplements provide benefits . We tested the effects of 90 days of egg supplementation in post-nestling juveniles (~36 days old) as well as in adults (>1 year old) of both sexes (n=5-7/group). All groups received standard seed and bread diet with the egg groups receiving 20 grams/day of boiled chicken eggs. We previously completed analyses showing that egg supplementation increased body mass in juvenile females and decreased stress reactivity in juveniles. We have yet to complete analyses of cognitive performance for both age groups and for adult growth and stress responses. Here, we are measuring the size and redness of check patches in adult and juvenile males . We took photos of cheek patches next to a ruler on days 0, 14, 50, and 90 of egg/no egg treatments in adults and every 5 days up to day 30 and then every 10 days up to day 60 in juveniles. We are using FIJI software to measure the size of check patches. Thresholding is used to isolate the red cheek patch and an automatic wand tool is used to find the area of the patch. Red chroma and brightness will be ranked from light orange to dark red by comparison to Munsell color chips. Because juveniles were developing cheek patches during egg supplementation, we expect larger impacts of dietary treatment in juveniles than adults. However, protein could also contribute to maintenance of traits indicating "good-genes" even in captive non-breeding adults, particularly given that zebra finches are opportunistic breeders. Adults may channel dietary resources to constantly maintaining traits seen as attractive by mates. If the egg supplement enhances color and size of both adult and juvenile cheek patches, we can conclude that protein supplementation should be the standard for captive zebra finches over the lifetime. Additionally, this would indicate that even vertebrates with generally low protein diets, like seed eating birds, depend on protein supplementation for development and maintenance of attractive plumage.

P11.05

NOVEL TESTS FOR MOTOR AND SPATIAL DEFICITS IN ZEBRA FINCHES VERIFY A ROLE FOR AROMATASE AND ESTRADIOL IN IMPROVING SPATIAL BUT NOT MOTOR OUTCOMES POST-CEREBELLAR LESION

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Aromatase is upregulated post-neurotrauma increasing

neuroprotective estradiol (E2) synthesis from testosterone, which has mainly been studied after hippocampal damage. Aromatase impacts on behavioral recovery are poorly studied. We used a song bird model, the zebra finch, which has relatively high levels of neuroplasticity and neurosteroidogenesis compared to mammals, to test the role of E2 in behavioral recovery post-cerebellar lesions. The cerebellum has distinct contributions to spatial learning and contains estrogen-beta receptors. We developed a Morris water maze analog, the "escape maze", to test spatial ability and a rotorod analog, the "log roll", to test balance. The escape maze consists of a lidded plexiglass cylinder (30cm D) with a side exit hole (5.5cm D). It is placed on a heated tile (50°C) to motivate flight into an black-curtained enclosure (148.6x71.1x188.2cm) with a colored shape (11.1-17.3cm L, 14.1-15.2cm W) on each wall. Birds are released in the center of a quadrant along the wall of the arena, searching for two mins and resting for one min. Ethovision software calculates escape latency, distance traveled, and velocity. After 7 acquisition days, two probe trials were completed. In both probes, the acquisition cylinder is replaced with a no-escape cylinder and birds search for two minutes. In probe two, the distal cues are rotated 180°. Ethovision calculates time and distance covered in each quadrant of the maze. Search in the prior location of the goal shows escape arena cues did not guide escape. In probe two, searching in the quadrant 180° from the original indicates distal cue use. For the log roll, a free-spinning perch (8.9cm from floor) was mounted in a plexiglass arena (25x17x26cm) set on a hotplate (50°C). Postural compensatory movements are indicated by tails dipping beyond a setpoint, as does gait after excess alcohol consumption. For the log roll, stereotaxic surgery targeting the medial cerebellar nucleus was performed 48 hours after groups received subdermal implants containing E2 or blank implants and 72 hours after being fed letrozole, an aromatase inhibitor, or corn oil (vehicle), which continued daily for 14 days of testing in n=5-7 females/group. For the spatial maze (n=4-6 males/group) treatments were injected locally during lesions of the lateral cerebellar nucleus. Thus, for both experiments treatment groups were: sham+vehicle, lesion+ vehicle, lesion+ letrozole, and lesion+ letrozole +estradiol. Lesion+letrozole birds were slower to acquire the escape maze compared to other groups, but all birds used distal cues demonstrating spatial learning. Interfering with E2-mediated neuroplasticity by inhibiting aromatase was necessary to reveal cerebellar deficits in spatial acquisition. E2 supplementation was sufficient to ameliorate this deficit. In the log-roll, all lesioned groups had more tail dips/second than shams and exogenous E2 did not improve balance. Results provide novel tests of cerebellar function, support aromatase dependent estradiol-mediated mechanism of neuroplasticity in the songbird cerebellum, and highlight a difference in sensitivity to E2/aromatase-mediated protection/repair in upstream (cognitive) and downstream (motor) processes.

P11.06

THE EFFECTS OF ESTRADIOL AND GENISTEIN ON CEREBELLAR NEUROPROTECTION IN ZEBRA FINCHES

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When neurons or glial cells die due to injury, apoptotic signals sent to surrounding cells cause a secondary wave of degeneration. Glia cell aromatase upregulation increases estradiol (E_2) synthesis from local and gonadal testosterone. E_2 is neuroprotective, limiting apoptosis and necrosis. However, exogenous E_2 can increase cancer and stroke risk and reduce testis mass & spermatozoa number. Phytoestrogens may be neuroprotective without the harmful effects of E_2, which are mainly due to E_2 binding to alpha receptors. Genistein (GEN) is a soybean phytoestrogen with a strong affinity for estrogen beta receptors, which are abundant in the cerebellum. We used a songbird model, the zebra finch, to determine if GEN is similarly neuroprotective to E_2 without impacting testes, because these birds have high neuroplasticity. We implanted silastic ropes subdermally into adult males (E_2 500ug, GEN 1000ug, or silastic only (CON)) for 12 days before stereotaxic surgery to produce a 21g puncture lesion in the cerebellum. Given that aromatase converts testosterone to E_2 but would not affect GEN, we isolated the impact of aromatase versus its conversion to E_2 by limiting this conversion locally. We injected either 50 g of 1% letrozole in saline (LET) or saline (S) at the lesion site. This created six treatment groups (n=6): E_2+LET, E_2+S, GEN+LET, GEN+S, CON+LET, and CON+S. Seventy-two hours later, birds were sacrificed, brains removed, cut at 30um in the cryostat, and mounted on slides. We labeled apoptotic cells with Terminal Deoxynucleotidyl Transferase dUTP Nick End Labeling and degenerating cells with FluoroJade. We used Caviliari point counting in Stereologer (Stereological Resource Center, St. Petersburg, FL) to estimate lesion volume. Additionally, birds were weighed on implant day 0, 5, 12, and 14 and testes weighed at sacrifice. Testes were sliced and stained with hematoxylin/eosin to quantify spermatozoa number and laminarity. We found E_2 and CON birds displayed reduced body mass as do most birds when handled regularly. However, birds given GEN maintained their body mass, possibly due to the lipogenic effect of genistein. E_2 birds had reduced testis mass compared to CON and GEN birds, which did not differ. All E_2 birds showed a decrease in spermatozoa production and laminarity when compared to CON & GEN, which did not differ. Compared to controls, GEN decreased the extent of degeneration as expected and there was a trend towards LET increasing this degeneration, suggesting independent effects of E_2 and aromatase in neuroprotection. While not significant, we were surprised to find E_2 birds showed more secondary degeneration than CON birds. To confirm that implants remained in place and treatments were effective,

we will use high-performance liquid chromatography to assess circulating levels of E_2 and GEN from plasma samples taken midway and at the end of treatment. Additionally, 18 additional subjects will be incorporated into the study (n=3/group) in order to increase statistical power. Overall, genistein appears to be a promising alternative to estradiol, encouraging further investigation of phytoestrogens as neuroprotective agents following brain injury. All procedures followed IACUC protocol 13-024.

P11.07

ASSESSMENT OF DOXYCYCLINE AS A POTENTIAL THERAPEUTIC FOR SPINOCEREBELLAR ATAXIA TYPE 1

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Spinocerebellar ataxia type 1 (SCA1) is a fatal neurodegenerative disease caused by a polyglutamine mutation in the ataxin-1 protein. Currently, there is no treatment for SCA1. SCA1 mice display similar neurodegeneration as SCA1 human patients and are the model of choice for exploring treatments for the SCA1 disease. Matrix metalloproteases (MMPs) are present in many cells of the central nervous system. MMPs are endopeptidases that once activated participate in the regulation of diverse physiological and pathological processes. MMPs have gained much attention as therapeutic targets in neurodegenerative disorders due their key role in neuroinflammation, and their destructive degradation of the blood brain barrier. MMPs have been shown to be a therapeutic target in other polyglutamine diseases such as Huntington's disease. MMPs have been shown to degrade the Huntingtin protein contributing to the neurodegenerative pathology. In this study, we explored the role of MMPs in the SCA1 disease using cell culture and the SCA1 mouse model. Cell culture experiments revealed a possible role of MMPs in the proteolysis of mutant atxin-1 aggregates. Transcriptome analysis of the SCA1 mouse cerebellum revealed significant upregulation of destructive MMPs as compared to WT mice. Currently, we are testing the efficacy of MMP inhibitor Doxycycline in SCA1 mice. As this study progresses, we will test for improvements in neurodegenerative behavior deficits, changes in key neuronal proteins, and a reduction in histological markers of SCA1 neurodegeneration. Completion of this study may reveal that MMPs are possible therapeutic targets that may play a pathogenic role in the SCA1 disease and support Doxycycline as a new therapeutic for SCA1.

P11.08

A NOVEL SPATIAL TASK: THE ESCAPE MAZE TESTS FOR SPATIAL COGNITION IN ZEBRA FINCHES (*Taeniopygia castanotis*)

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Quantifying spatial cognition is important, because navigating to goals, like food, mates, or burrows is essential for survival and reproduction. Additionally, brain areas crucial to spatial cognition are sensitive to neural diseases and a variety of learning- enhancing and -impairing drugs. No method currently exists to assess spatial cognition in small birds like zebra finches. Thus, we created the "escape maze" (EM), an analog of the Morris water maze used in rodents. The EM requires birds to exit a clear plexiglass cylinder (30.5cm H & 30cm D) motivated by the cylinder sitting on a tile heated to ~45C°. This "arena" is placed in a large enclosure (148.6x71.1x188.2 cm) with four distal cues (colored geometric shapes, ~30cm square) attached to each black-curtained wall. No cues are spatially contiguous with the escape hole. During acquisition, motor pattern learning is discouraged; the clear top is opened, and birds are released from multiple locations. The escape latency and distance covered decreases as the escape location is learned. A "probe trial" tests spatial cognition with the use of distal cues. The escape-arena is replaced with a no-escape arena, distal cues turned 180°, and the bird allowed to search the maze for 1 min. Distal cue use is demonstrated by the bird searching for the goal in the area 180° from the original goal location. Our experiments validate use of the EMs for assessing spatial cognition including tests of natural products, environmental and dietary enrichment, neural insults, and steroid-mediated neural repair.

P11.09

ZBTB6 AS A TRANSCRIPTION FACTOR FOR GATA3

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Background: Hearing loss is a widespread issue. It is largely caused by the death or loss of hair cells which do not naturally regenerate in mammals. There are many proteins in the ear that help in the development of the cochlea. GATA3 is one of these critical transcription factors that is essential for generating sensory hair cells in the ear. ZBTB6 is predicted to be a transcriptional repressor for GATA3, this means it would be crucial for maintaining precise control over the gene's expression in cells. This control is crucial for the proper development of the ear.Objective: We hypothesize that binding of ZBTB6 to human-specific GATA3 regulatory sequence results in GATA3 repression in human IHCs. We have been running gel electrophoretic mobility shift assays (EMSAs) and Western Blots to test this hypothesis. **Methods:** Reactions for EMSA are created using different combinations of DNA Human, Mouse, and consensus DNA; ZBTB6 protein; nuclear extract; and other necessary

factors to run a gel. Each reaction has varying amounts of protein added to see how it will affect the DNA. Then, the sequence is incubated before being run on the gel at a voltage of 80-100 for approximately an hour. Afterwards, we transfer it onto a blot which undergoes a process to elicit enhanced chemiluminescence (ECL) which is used to visualize the presence and quantity of protein separated by the gel. We can then look at it through a gel documentation imager. Blots containing ZBTB6 overexpression lysate are further blocked and incubated in ZBTB6 primary and AlexaFluor546-conjugated secondary antibodies to see where the protein is on the blot. **Results:** Increasing amounts of purified ZBTB6 protein results in increased binding of ZBTB6 to consensus DNA as indicated by more intense shifted bands. ZBTB6 binding to consensus DNA is more disrupted by Human GATA3 competition than by Mouse GATA3 competition. Nuclear extracts caused shifts of consensus DNA at all concentrations tested. The shifted band for the consensus DNA matched the size of the band indicated by western blotting of ZBTB6 overexpression lysate. Middle and upper concentrations of nuclear extract shifted similar sized bands for human GATA3 DNA, whereas only the highest concentration of nuclear extract revealed a visible band of similar molecular weight for mouse GATA3 DNA. Shifted GATA3 DNA with lower molecular weight were visible in the middle and upper concentrations of nuclear extract, while bands at this lower molecular weight were only visible at the highest concentrations for consensus and human DNA probes. **Discussion:** ZBTB6 binding to putative cis-regulatory elements of GATA3, suggests that ZBTB6 could regulate the expression of GATA3. This would lead to reduced levels of GATA3 protein in hair cells, impacting its functions like regulating cells and responding to its environment. Moving forward we plan to conduct Western blotting of ZBTB6 overexpression lysate compared to wild type lysate using a GATA3 antibody. We also want to test to figure out why our EMSAs have been creating multiple bands in the gel when the protein shifts.

P11.10

EFFECTIVENESS OF INTRANASAL ADMINISTRATION OF A NOVEL THERAPEUTIC FOR TREATMENT OF TRAUMATIC BRAIN INJURY

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Traumatic brain injury (TBI) is one of the most frequently occurring injuries with approximately 69,000 deaths and 250,000 injuries taking place annually in the United States. TBI occurs when a forceful blow or whiplash induces damage in the brain. After the injury occurs, the timing of the treatment can be crucial to how well an individual will recover. Delayed treatment can have drastic physical, cognitive, and socioeconomic effects. The availability of therapeutics for TBI that can be rapidly administered post-injury is crucial for individual recovery. Thus, the purpose of this research is to develop novel therapeutics to treat TBI that can be administered via a nasal spray formulation thereby allowing rapid administration quickly after diagnosis of a concussion. A user-friendly weight-drop injury device was used to induce TBI in an anesthetized rat without surgical or pre-injury manipulations. Post-impact, the rats were given pain medication and an anti-sedative. Preliminary testing of various impact levels (0.5J, 1.0J, 1.5J, 2.0J, or 2.5J) was conducted to determine the impact level required to optimally increase markers of damage in the brain. At an impact level of 2.0J, the levels of neuron-specific-enolase (NSE), a marker for neuronal damage, and of glial fibrillary acidic protein (GFAP), a marker for astrocyte activation, were optimally increased in the cerebral cortex (CC) and hippocampus (HP). For therapeutic drug testing, rats were either subjected to a 2.0J impact or not (Sham) as described above. At 1.5 hours following impact and then every 24 hours until the day before sacrifice, rats were intranasally administered vehicle (TBI+V) or the novel therapeutic drug (TBI+D). In the CC, the levels of both NSE and GFAP were significantly increased on days 3 and 6 in the TBI+V group as compared to Sham. In the TBI+D group, NSE levels on day 6 and GFAP levels on days 3 and 6 were significantly decreased as compared to the TBI+V group. In the HC, the levels of NSE and GFAP were significantly increased on day 6 in the TBI+V group as compared to Sham. In the TBI+D group, the levels of both NSE and GFAP were significantly decreased on day 6 as compared to the TBI+V group. Our data suggest that daily intranasal administration of the novel therapeutic drug can reduce the abnormal increase in markers of damage induced by TBI.

P11.11

ATTENTION SHIFTING IN ADOLESCENT RATS EXPOSED REPEATEDLY TO THE ORGANOPHOSPHATE INSECTICIDE CHLORPYRIFOS AS JUVENILES

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At high level exposures, chlorpyrifos (CPF) exerts its toxicity through the inhibition of acetylcholinesterase (AChE). At low level exposures, CPF does not inhibit AChE but inhibits fatty acid amide hydrolase (FAAH) resulting in the accumulation of the endocannabinoid anandamide. If this altered endocannabinoid signaling

occurs during brain development, it can lead to long-term altered function. Developmental CPF exposure is suspected to cause cognitive deficits and increase behaviors associated with ADHD (impulsiveness and inattention). Using the Attentional Set-Shifting Task (AST), a behavior that requires both attention and cognitive function, the ability to switch between sets of information quickly and efficiently was investigated. Male and female rat pups were orally administered daily either corn oil, CPF (0.25, 0.5, or, 0.75 mg/kg), or 0.02 mg/kg PF-04457845 (PF), a specific inhibitor of FAAH, from 10-16 days of age. On day 32, rats were trained to dig in bedding for a food reward. Behavioral testing involved learning to associate the location of the food with a relevant cue whether it be a specific scent or a type of digging media and ignore any irrelevant cues and then measured the ability of the rat to recognize and learn that the relevant cue has changed or that the irrelevant cue is now relevant. There were no treatment effects when the rats were faced with simple discriminations between either two scents or two types of digging media. When switched to a compound discrimination test involving both scents and media simultaneously, no effects were observed. However, when the relevant cue and irrelevant cue were reversed, CPF- and PF-treated males, but not females, had difficulty learning this change in discrimination suggesting that developmental CPF exposure of males disrupted their ability to shift their attention in order to learn a new reinforcement contingency.

P11.12

INHIBITION AND RECOVERY OF CHOLINESTERASE ACTIVITY IN JUVENILE RAT BRAIN AND SERUM FOLLOWING ACUTE EXPOSURE TO A NERVE AGENT SURROGATE

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The most toxic chemical warfare agents are organophosphates (OP) that are commonly referred to as nerve agents or nerve gases. These compounds exert their toxicity through the inhibition of acetylcholinesterase (AChE), leading to the neurotransmitter acetylcholine accumulating and inducing hyperactivity in the peripheral and central cholinergic systems with death resulting from respiratory function loss. Exposure can produce prolonged repetitive seizures and status epilepticus, a medical condition causing high morbidity. While frequently considered a primarily military threat, nerve agent exposure in events such as Japan in the 1990s and Syria in the 2010s have clearly demonstrated the targeting of civilian populations as well. A component of this population thought to be the most susceptible is the pediatric population. However, the effects of nerve agents on juveniles have not been studied to a great extent. The majority of studies involving the exposure of preclinical models to OP nerve agents or their surrogates have been at lethal dosages and accompanied by the co-administration of therapeutics against OP-induced lethality (i.e., atropine and 2-PAM). Less is known, however, about the persistent effects of high sub-lethal OP exposures. In this study, we used the sarin surrogate NIMP (nitrophenyl isopropyl methyl-phosphonate) to investigate the sub-lethal effects of nerve exposure. Male and female 16-day old rat pups were exposed subcutaneously to either the vehicle multisol or 0.175 mg/kg NIMP. The rats were sacrificed at 4 hours, 1, 4, 7, and 14 days post-exposure. Brain (cerebral cortex) AChE and serum ChE activities were then determined. NIMP-treated rats exhibited episodic seizure-like signs and had significant inhibition of serum ChE at 4 h (80%) with recovery at 1 day (57%) and at 4 days (17%). Recovery to normal activity was evident by 7 days. Brain AChE was also inhibited at 4 h (65%), 1 day (57%), 4 days (31%) and 7 days (23%) with recovery to normal activity by 14 days. These data suggest that NIMP exposure can elicit episodic seizure-like signs at moderate levels of brain AChE inhibition.

P11.13

IMPACT OF LEMONGRASS EXTRACT CITRAL ON MOUSE MOTOR COORDINATION, FEAR, AND ANXIETY

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Lemongrass has a scent similar to lemons and is cultivated as culinary and medicinal herbs. Citral is an acyclic monoterpene aldehyde and is the major component of lemongrass oil. Lemongrass tea is used as a folk remedy to help promote sleep and relaxation, relieve pain, reduced anxiety, and boost immunity. Recent studies in mice found that citral activates both GABA and serotonin 5-HT receptors. In this study, we extracted citral from lemongrass oil using steam distillation and validated purity using FTIR. We then treated mice with 20mg/kg citral via IP injection and performed motor coordination, fear, and anxiety behavioral testing. Using the accelerating rotorod test, we found not significant difference between citral and control treatments. However, citral treatment significantly reduced anxiety in the anxiety chamber test. Also, citral treated mice significantly improved on the static bar test, suggesting citral reduced fear of heights. Overall, our data suggests that citral reduced fear and anxiety in mice, which supports the herbalist claims of lemongrass herbal teas as a calming relaxant and anxiety reducer.

P11.14

EXPLORING THE IMPACT OF LOW pKa FLUORINATED FENTANYL ANALOGS FF3 AND NFEPP: A COMPREHENSIVE STUDY OF EFFECTS ON ANTINOCICEPTION, RESPIRATORY DEPRESSION, AND REINFORCEMENT

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Intro: Today's unparalleled clinical efficacy of opioids in providing analgesia has led to a global increase in availability, contributing to surges in abuse, overdoses, and fatalities, dampening their clinical utility. This epidemic has inadvertently led to the undertreatment of pain, particularly for individuals with terminal illnesses, as a means to reduce the risk of addiction and overdose. Notably, recent studies suggest that low pKa fluorinated fentanyl analogs (LPFFAs) offer a new avenue for injury-restricted analgesia with reduced risk of overdose and abuse. However, available literature is limited in that LPFFA's effects have not been investigated at higher doses and there is a notable lack of exploration into the safety margins of these compounds in relation to fentanyl. The present study compared the inflammatory antinociceptive, respiratory-depressant, and reinforcing effects of fentanyl and LPFFAs of intermediate (FF3) and low (NFEPP) pK_a values in terms of potency and efficacy in male and female Sprague-Dawley rats. **Materials/Methods:** Electronic Von Frey testing was employed in eight subjects (n=4 per sex) by a blinded experimenter via a cumulative dosing procedure to assess inflammatory antinociception following hind paw injection of Complete Freund's Adjuvant (CFA). Respiratory depression was assessed in eight subjects (n=4 per sex) using whole-body plethysmography following cumulative dosing via automatic externally placed syringe pumps. Reinforcing effects were measured in twenty-two subjects (n=4 males per agonist, n=3 (NFEPP and fentanyl) or 4 (FF3) females) via self-administration test using a progressive ratio schedule of reinforcement. All drugs were administered intravenously, and dose ranges were selected to encompass no effect to full effect. Median effective dose (ED50) was calculated from dose response curves and used as an estimate of potency. **Results**: FF3, but not NFEPP, produced antinociception with fentanyl-like potency. The minimum dose required to depress minute volume varied based on ligand pKa (0.032 mg/kg fentanyl, 0.18 mg/kg FF3, 0.32 mg/kg NFEPP.) Similarly, reinforcing potency, but not efficacy, differed with pKa. FF3 showed a substantial shift in potency between antinociception and unwanted effects, while NFEPP and fentanyl displayed similar potency windows between effects. **Conclusion**: Low pK_a fentanyl analogs offer potential for injury-targeted antinociception while displaying a diminished risk of adverse effects when compared to fentanyl. Continued experimentation into other molecules across the pKa continuum is critically necessary to continue to draw conclusions on the utility of LPFFAs.

P11.15

EFFECTS OF TREATMENT WITH PLEUROTUS MUSHROOM ON LOCOMOTOR ACTIVITY, DEPRESSIVE-LIKE BEHAVIOR AND LEARNING AND MEMORY IN OLD MALE MICE

Gerson Alves[1, 2], Marcus Bezerra[1], Hitalo da Silva[1], Kaio Ferreira[1], Laynne Barbosa[1], Maria Clara Moreira[1], Roberta Catherine Costa[1], Eduardo Marinho[1], Ana Paula Uetanabaro[1], Lais Berro[1, 2]

[1]Universidade Estadual de Santa Cruz, [2]University of Mississippi Medical Center

Pleurotus mushRooms have been used as a dietary supplement due to their pre- and probiotic potential, ability to promote pathogenic microbial inhibition, and positive effects on nutritional recovery and immune function. They also have antioxidant effects, which can help delay the effects of age-related memory and learning decline. However, no systematic studies to date have investigated the effects of *Pleurotus* mushRooms on behavioral animal models. The aim of the present study was to evaluate the effects of treatment with *Pleurotus* mushRooms on locomotor activity, depressive-like behavior and learning and memory in older male mice (11 months of age). Animals were treated daily for 23 days intragastrically (gavage) with saline or different concentrations of *Pleurotus* suspension. Animals were exposed to open field tests (OFT) on days 0, 1, 6, 11 and 16 of treatment, to a forced swim test (FST) on the 17th day of treatment, and to a discriminative avoidance task (DAT) training session on the 23rd day of treatment, with a test session 24 hours later. Our findings show that treatment with *Pleurotus* suspension had no effects on locomotor activity in the OFT or immobility time during the FST. In the DAT test, during the training session animals spent a significantly greater amount of time in the non-aversive closed arm compared to the aversive closed arm regardless of treatment, indicating that animals learned the task during the session, and that treatment with *Pleurotus* mushRoom did not affect that learning. During the test session, a significant effect of arm (aversive vs non-aversive) was observed, indicating that overall animals remembered the task by spending a greater amount of time in the non-aversive closed arm. However, no significant differences were observed between or within groups. In conclusion, our findings show that administration of *Pleurotus* mushRoom did not change general behavior in old mice. We did not observe improvements in learning and memory with the duration of treatment used in this study. Therefore, further studies are needed to investigate whether longer treatment periods would have beneficial effects on behavioral assays, including cognitive measures.

P11.16

METHAMPHETAMINE-INDUCED SLEEP DISRUPTION IN MALE RHESUS MONKEYS

Ashley A. Smith[1], Daniel Borgatti[2, 3], James K. Rowlett[1, 3], Lais F. Berro[1, 3]

[1]Department of Psychiatry and Human Behavior , [2]School of Graduate Studies in Health Sciences, [3]Center for Innovation and Discovery in Addictions

Background: Studies from our laboratory have shown that acute MORNING administration of methamphetamine impairs actigraphy-based sleep measures in male monkeys; however, this effect has not been demonstrated in male monkeys receiving an AFTERNOON administration of methamphetamine. The aim of the present study was to investigate the sleep-disrupting effects of acute AFTERNOON methamphetamine administration on actigraphy-based sleep parameters in male rhesus monkeys. **Methods:** Actigraphy-based sleep parameters for male rhesus macaques (n=4) were recorded under baseline and acute test conditions, in which they received AFTERNOON (15h) intramuscular injections of saline or methamphetamine (0.03, 0.01, and 0.3 mg/kg). **Results:** Our initial findings show that methamphetamine dose-dependently disrupted sleep in male rhesus monkeys, with the dose of 0.3 mg/kg significantly increasing sleep fragmentation and % wake, while decreasing sleep efficiency. **Conclusions:** These findings suggest that AFTERNOON acute administration of methamphetamine induces sleep impairment in male monkeys. Future studies will investigate the role of methamphetamine-induced sleep disruptions in other facets of methamphetamine use disorder, particularly cognitive functioning.

P11.17

AZITHROMYCIN AMELIORATES HYPOXIA-ISCHEMIA-INDUCED SENSORIMOTOR IMPAIRMENTS AND BRAIN INFLAMMATION IN NEONATAL RATS

Madison Klim[1], Jonathan Lee[1], Jenna Hart[2], Nilesh Dankhara[1], Shuying Lin[1], Norma Ojeda[1], Michelle Tucci[1], Rachel Palmer[1], Lu-Tai Tien[1], Lir-Wan Fan[1]

[1]University of Mississippi Medical Center Jackson, MS, [2]UMMC Summer Program

Brain inflammation associated with hypoxic-ischemic (HI) exposure and its subsequent neurobehavioral deficits have been associated with the release of cytokines from activated microglia. Our previous studies have demonstrated that the tetracycline antibiotic minocycline has the potential to alleviate HI-induced brain inflammation and brain injury in juvenile rats. This experiment aims to determine whether azithromycin, a putative suppressor of microglial activation and clinically used in pregnant women and neonates, reduces the brain inflammatory response and neurobehavioral consequences of hypoxia-ischemia in neonatal rats. To induce ischemia, postnatal day 5 Sprague-Dawley rats (P5) underwent bilateral carotid artery ligation (BCAL). After the BCAL procedure, the rats were placed in hypoxic conditions of 8% oxygen for 15 minutes. Following the HI procedures, azithromycin (45 mg/kg) was administered intraperitoneally to treated rats, while vehicle (PBS) was administered as a control. Twenty-four hours later, neurobehavioral exams were conducted on the P6 rats. As anticipated, the data showed that hypoxia-ischemia led to an increase in microglia activation-related pro-inflammatory cytokines including interleukin-1 (IL-1) in the P6 rat brain. In addition, neurobehavior and sensorimotor deficits were observed in the P6 rats. Treatment with azithromycin significantly improved neurobehavioral performance in righting reflex, negative geotaxis, wire hanging maneuver, and hind limb suspension tests in P6 rats. Azithromycin also reduced hypoxia-ischemia-induced brain inflammation as evidenced by the decreases in the contents of IL-1 in the P6 rat brains. The overall results suggest that reduction in microglia activation-related pro-inflammatory cytokines may protect neonatal brain and neurobehavioral performance from HI injury.

This work was supported by NIH-NIGMS-P20GM121334-MSCEPR-COBRE, and Newborn Medicine Funds from the Department of Pediatrics, University of Mississippi Medical Center.

P11.18

ENHANCED EXPRESSION OF MATRIX METALLOPROTEINASES IN BRAIN RESULTS IN DEFICITS IN LOCOMOTOR ACTIVITY IN A DROSOPHILA MODEL OF SPINOCEREBELLAR ATAXIA TYPE 1

Emma Palmer, Madelyn Hunter, Sydey Davis, Natraj Krishnan

[1]Mississippi State University, Starkville, MS

Matrix metalloproteinases (MMPs) are a family of zinc- and calcium-dependent endopeptidases that are responsible for degrading extracellular matrix (ECM) proteins. Dysregulation of MMPs has been implicated to be the proximal factor in many diseases and disorders including neurodegenerative diseases. The fruit fly Drosophila melanogaster with only two MMP genes, dMMP1 and dMMP2 offers an excellent model system to investigate the role MMPs in age related motor deficits and also in neurodegenerative diseases where motor dysfunction is a common symptom. The yeast two hybrid system (GAL4/UAS) was used to develop a Drosophila model of spinocerebellar ataxia Type 1 (SCA1), a polyglutamine disease causing neurodegeneration. P{UAS-Hsap\ATX1.82Q}M6 which expresses humanAtaxin1 (ATX1 or SCA1) with a long PolyQ repeat of 82 amino acids under control of UAS was crossed to elav-GAL4, a pan-neuronal driver (elav-GAL4/UAS-ATX1.82Q) for driving gene expression throughout the nervous system. dMMP1 and dMMP2 expression was found to increase in an age dependent manner in controls

(UAS-ATX1.82Q/+ and elav-GAL4/+) but was significantly enhanced in SCA 1 flies (elav-GAL4/UAS-ATX1.82Q). Concomitant with increased expression of dMMP, a marked decline in negative geotaxis activity was recorded in SCA1 flies. Additionally, a dampening of daily locomotor activity rhythm was recorded in SCA1 flies compared to controls. It has been shown previously from transcriptomic analysis that dMMP1 expression is a bonafide biomarker of aging in motor neurons. While expression of tissue inhibitor of matrix metalloproteinase (dTMP1) was enhanced in SCA1 flies, we found that enhanced expression of dMMP2 could have a negative regulatory effect on dTIMP1. Taken together, our results support the idea that matrix metalloproteinase 1 is acting as a downstream effector of antagonistic pleiotropy in motor neurons and is deleterious when reactivated/ enhanced in SCA1 flies.

P11.19

THE ORGANOPHOSPHATE INSECTICIDE CHLORPYRIFOS DISRUPTS COGNITIVE PERFORMANCE IN A GO/NO-GO SUCROSE REWARD TASK

Helena Roe[1], Elizabeth Hawkins[1], Sylvia Kelsen[2], Melanie Berry[2], Amy Kohtz[2]

[1]Millsaps College, Jackson, MS, [2]University of Mississippi Medical Center, Jackson, MS

Deemed a moderately toxic agent, Chlorpyrifos (CPF) is an organophosphate known to target the brain and nervous system of humans and other organisms. This pesticide rose in popularity in 1965, used mostly on farms to treat a variety of nuts, fruits, vegetables, and cereal crops, and although the health risks were made very clear quite quickly, a federal ban on CPF did not happen until 2021, but was recently reversed. Due to this extended period of exposure, CPF and its effects have become widespread, likely to result in many neurobehavioral deviations. Given widespread domestic exposure, it is critical to characterize the long-term neurobehavioral and neurobiological effects of exposure to this pesticide. Studies in human subjects indicate that developmental CPF exposure can results in behavioral changes, that may resemble attention deficit hyperactivity disorder (ADHD)-like symptoms. We have previously shown effects in rats across a multitude of behaviors, and our results implicated decision making, in particular, as perturbed. Decision making can be well modeled in rats using a go/no-go sucrose-reward driven task that reflects phenotypic behavior in humans. Furthermore, norepinephrine (NE) receptors and transporters are involved in decision making behavior and ADHD pathophysiology, including GNG tasks. We tested the hypothesis that selective NE reuptake blockade and NE receptor antagonism improves decision making and response inhibition in CPF-exposed rats. Rats were bred and exposed to CPF during gestation. Rats were first trained to self-administer sucrose, then trained for go trial learning, and finally for go/no-go rule acquisition. Once they reach stabilization criterion, they were within-subjects tested in a counterbalanced order for the behavioral response to NE receptor antagonists (; Prazosin and ; Propranolol) or NET transport inhibitors (e.g. Methylphenidate). Results show that developmental CPF exposure negatively impacted cognitive performance in a GNG task. The -adrenergic antagonist Propranolol impaired performance in controls and to a greater extent in CPF exposed rats. Methylphenidate improved performance consistently in controls but had variable effects in CPF rats. Future studies will look at norepinephrine fiber density in cortical regions to determine if the degree of norepinephrine dysfunction correlates to variability in MPH efficacy.

P11.20

DECISION-MAKING DEFICITS AFTER SOCIAL STRESS AND CORTICAL INHIBITORY NETWORKS: CHANGES IN EXTRACELLULAR MATRIX AND GABA INTERNEURONS

Alexandra Childers[1], Del Arco Alberto[1], Ruofan Cao[2], Gregg Roman[2], Emily Stephens[3], Jacob Garteiser[3], Barbara Gisabella[3], Harry Pantazopoulos[3]

[1]Department of Exercise Science, School of Applied Sciences, University of Mississippi, Oxford, MS;, [2]Department of BioMolecular Sciences, School of Pharmacy, University of Mississippi, Oxford, MS;, [3]Department of Psychiatry and Human Behavior, School of Medicine, University of Mississippi Medical Center, Jackson, MS

We have recently shown that the intermittent exposure to social defeat (ISD) stress in rats produces deficits in value-based decision-making (i.e., choice impulsivity). Previous studies have demonstrated that chronic social stress alters the extracellular matrix and the activity of cortical GABA interneurons and that these alterations are associated with stress-related behavioral deficits. The present study investigated whether ISD alters perineuronal nets (PNNs)and parvalbumin GABA interneurons (PVs) in the medial prefrontal cortex (mPFC). PNNs are structural elements of the extracellular matrix that regulate the activity of GABA interneurons. Male Long Evans rats (3 months of age) were trained in a decision-making task (i.e., delay discounting task). After stable performance, rats were divided into two groups (Control, n= 11;Stress, n= 11) and exposed to ISD (or handling) once every three days for ten days (four stress episodes in total). After completion of behavior experiments, 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 PNNs and with antibodies for PVsand c-fos, as a marker of neuronal activity, in the mPFC. The results show an increased density of PNNs in the mPFC of stressed rats compared to controls (Stress= 32.90 ±6.75, Control=56.40 ±4.65 PNNs/mm 2 ; mean ±SEM, n= 4-6, $p < 0.01$, t-test). This increase was observed in superficial (L2/3), but not

deep (L4/5), cortical layers. These results suggest that a history of intermittent social stress alters the extracellular matrix in the mPFC and that these alterations are associated with deficits in value-based decision-making. Our results did not show changes in the number of PVs after ISD. However, to further investigate whether ISD alters the activity of PVs in this area of the brain, ongoing analysis is evaluating double labelling c-fos-PVs in brain slices from both stressed and control rats. Supported by NIH/NIGMS P30GM122733,NIH/NIGMS P20GM103460, NIMH MH125833, and NIH 1P20GM144041.

Physics and Engineering

Chair: Umar Iqbal

Mississippi State University

Co-Chair: Yuanyuan Duan

University of Mississippi Medical Center

Thursday, February 29, 2024

MORNING

Room Union H

8:15 Welcome and Opening

O12.01

8:30 GENETIC ALGORITHM FOR DESIGN OPTIMIZATION OF DENTAL IMPLANTS

Jason Griggs[1], Hakan Yaserer[2], Yacoub Najjar[2]

[1]University of Mississippi Medical Center, Dept. of Biomedical Materials Science, 2500 N State Street, Room D528, Jackson, MS 39216-4505, [2]University of Mississippi, Dept. of Civil Engineering, 208 Carrier Hall, University, MS 38677-1848

Objectives: We previously reported on cyclic loading of 4 commercially available reduced-diameter implant systems to determine which design features are associated with fatigue resistance (Loeb *et al.,* 2014), using finite element modeling software to predict the fatigue limits of reduced-diameter implant designs (Satpathy *et al.,* 2021), training an artificial neural network (ANN) to predict the fatigue limits of implants (Satpathy *et al.,* 2022), and guiding the ANN towards an optimal design using a Latin hypercube to generate points in the 16-dimensional design space vs manual searching (Griggs *et al.,* 2023). The current study was aimed at more efficient design optimization by using genetic algorithm method and ANN in tandem. **Methods:** The 16 design parameters of implant designs were coded as 16 genes in a virtual genome. Successive generations of designs were created by random crossover between the parent genomes with 125 offspring per generation, point mutation rates ranging from 1% to 20%, and 2 to 10 parents per generation. The previously trained ANN was queried regarding the fitness (fatigue limit) of each offspring, and the fittest offspring were chosen to be parents of the next generation. Design parameters were constrained to be within either 20% or 40% of the commercially available implant (Biomet 3i external hex). **Results:** Regardless of the genetic algorithm parameters chosen, the implant designs rapidly evolved with the fatigue limit reaching 264 N, which is 128% higher than the best of the commercially available products that we have tested (116 N). This also exceeded the performance of designs found by Latin hypercube (228 N) and manual search (254 N). The speed of convergence on the optimal design was directly related to the point mutation rate and was independent of the number of parents per generation. **Conclusions:** Genetic algorithm method is more efficient than Latin hypercube and manual search in optimizing the fatigue limit of reduced-diameter dental implants. However, these results still need to be validated by cyclic loading of physical prototypes.

O12.02

8:50 INVESTIGATING MOLECULAR STRATEGIES FOR TARGETED OPTOGENETIC MANIPULATION OF FUNCTION-SPECIFIC NEURONAL POPULATIONS AFTER SPINAL CORD INJURY

Brandon Fisher[1,2]; Viet Dang[1,2]; Rich Henderson[1,2]; Chet Mortiz[1,2,3,4]; Sarah Mondello[1]

[1]Department of Electrical Engineering, Jackson State University, Jackson, MS, [2]Department of Rehabilitation Medicine, University of Washington, Seattle, WA, [3]University of Washington Center for Neurotechnology, Seattle, WA, [4]Department of Electrical and Computer Engineering, University of Washington, Seattle, WA, [5]Department of Physiology and Biophysics, University of Washington, Seattle, WA

The innovative findings about using a specific viral vector may point to a new and transformative method for controlling neurons, offering significant potential for improving the treatment of spinal cord injuries. The research targets understanding neurons activated by rehabilitation and spinal stimulation therapies. Investigating the effectiveness of the AAV-RAM-d2TTA-TRE-ChR2 viral vector in converting spinal cord neurons in female Long Evans rats is the central focus. Carrying Yellow Fluorescent Protein (YFP) and Channelrhodopsin-2 (ChR2) genes, the viral vector enables tracking specific neurons. Four rats, divided into groups with varying doxycycline (dox) chow levels for gene control, received viral injections and specific therapeutic tasks, including Irvine Beattie Bresnahan, and Forelimb Reaching Tasks. After perfusion, their spinal cords were dissected, and frozen tissue sections were scrutinized under a microscope to determine the location and quantity of neurons labeled with green fluorescence at spinal segment C6. During the experiment, observations emerged from different rat groups. One rat, with dox chow removed 48 hours before and engaged in an

hour of Irvine Beattie Bresnahan (IBB) task, showed several YFP-labeled neurons on the experimental side of the spinal cord, hinting at potential IBB-specific neuron labeling. Conversely, another rat, with dox chow removed and followed by 10-minute electrical stimulation (E-Stim), displayed numerous YFP-labeled neurons, suggesting non-task-specific neuron labeling. However, rats with dox chow removal and subsequent cage rest exhibited very few to no YFP-labeled neurons, indicating that general cage activity might not trigger activity-dependent transduction. Interestingly, a rat consistently on dox chow and performing an hour of IBB showed some neuronal labeling, possibly due to insufficient dox chow intake to halt transduction. Further experimentation is required to confirm this. Arrows were used to highlight YFP-labeled neuron presence. As this study unveils AAV-RAM-d2TTA-TRE-ChR2's potential, it prepares spinal cord injury treatment for revolutionary interventions through enhanced neuron control and activation strategies.

O12.03

9:10 ENHANCING ENGINEERING INNOVATION PRESENTATIONS THROUGH PECHA KUCHA

Gerardo Gomez[1], *Umar Iqbal*[2]

[1]*Mississippi Gulf Coast Community College,* [2]*Mississippi State University, Starkville, MS*

Pecha Kucha, a presentation format from Japan, limits each talk to 20 slides, with 20 seconds per slide, fostering a brief yet impactful narrative in a mere 6 minutes and 40 seconds. For the engineering field, where the translation of complex ideas into digestible information is critical, Pecha Kucha offers a dynamic way to condense comprehensive data and concepts into key takeaways. This method not only facilitates the clear demonstration of engineering processes and technologies but also emphasizes the stories that propel innovations from conception to reality.

The integration of Pecha Kucha into engineering presentations serves multiple purposes. It encourages engineers to hone their communication skills, ensuring that the essence of their work is conveyed efficiently. With this structured approach, presenters are tasked with meticulously selecting visuals that align with their spoken words, enhancing comprehension and retention among the audience.

The potential of Pecha Kucha extends beyond simplifying presentations; it enriches the audience's understanding by providing a clear, visual sequence of engineering challenges and breakthroughs. For presenters, the preparation process is rigorous, demanding a well-orchestrated balance between content, timing, and visual aids. The end goal is a presentation that not only informs but also inspires, driving forward the collaborative spirit essential for innovation in engineering.

The presentation will highlight the utility of Pecha Kucha for illustrating the interdisciplinary nature of autonomous systems, revealing how distinct disciplines converge to forge a unified solution. By dividing the talk into sections that concentrate on each specialty's input, the format demonstrates the collaborative effort required to realize functional autonomous systems.

By harnessing the power of Pecha Kucha, engineering presentations can transform into a compelling platform for showcasing advancements in engineering systems, setting the stage for future innovations and interdisciplinary collaboration.

O12.04

9:30 RENOVATION TO THE ATHLETIC WING OF MVSU

Chanelle Houston

Mississippi Valley State University, Itta Bena, MS

One of the critical steps to improving collegiate sports performance is providing top-tier facilities that will motivate the athletes to compete to the best of their abilities. This project focuses on making recommendations for renovating the Athletic Wing at MVSU to transform it into a state-of-the-art hub for athletic achievement. The project will address critical questions, including surveying the current state of MVSU's sports facilities, considering what can be done to turn them into state-of-the-art facilities, and investigating how current athletes and coaches describe the current state of the facilities. Generally, the project will propose a comprehensive renovation project to address the problems the MVSU is facing. The primary methodology in the project to collect information supporting the renovation program is Focus Group discussions based on targeted surveys. The project's main participants include the Athletic Department workers and the coaching staff of various teams. A convenience sampling approach will be applied in the project to ensure the researcher can collect information from the most knowledgeable people who understand the direction the renovation program should take. The researcher presented a survey to multiple participants to discuss the Athletic Department's budget, material costs, and alternative ways of enhancing the aesthetics of the targeted sports facilities. The targeted outcome is to have feedback from key stakeholders to incorporate the proposed renovations.

To investigate the current state of the facilities another researcher and I decided to conduct a site observation for each area in question. Through site analysis and CADD-based mapping, the information that was collected was documented for analysis. This included evaluating the status of seats at the soccer fields, the lack of lavatories for the soccer team, the lack of bullpens in the baseball field, shades for teams and fans, and dugout storage. The researcher projects that addressing these problems will create an environment where athletes can thrive and give fans the best environment for spectating the sport. Ultimately, the project will seek to transform the Athletic Wing of Campus into a reputable sports institution for the University and the larger community. In closing, the study report will recommend future research to be done to define

and support the recommended improvements specific to MVSU sports facilities.

O12.05

9:50 VISUALIZATION OF ENERGY STATES OF SPIN GLASS SYSTEMS ON A SNUB ARCHIMEDEAN LATTICE.

Anil Katwal, Katja Biswas

University of Southern Mississippi, Hattiesburg, MS

We employ a disconnectivity graph to visualize the accessibility of the ground state energy of small spin systems confined to a two-dimensional Snub Archimedean(3^2,4,3,4) lattice. This graph provides insights into both local and ground-state minima. The minima are classified into regular minima, type-1 dales, type-2 dales, and type-3 dales. The dales represent extended structures on the energy landscapes. We will compare three systems differing in the value of their spin to spin interaction, and discuss differences and similarities of their energy landscape as well as their implications for standard optimization routines.

O12.06

10:10 TRAFFIC LIGHT RECOGNITION AND V2I COMMUNICATION BETWEEN THE AUTONOMOUS CAR AND TRAFFIC LIGHTS USING MAVS SIMULATION AND YOLOv8

Mahfuzur Rahman, John Ball, Christopher Goodin

Mississippi State University, Starkville, MS

Intersection Navigation is one of the most significant tasks in autonomous vehicle technology for a safe operation. For effective and accurate intersection navigation, an autonomous car needs to identify the traffic lights accurately, and at the same time, it needs to understand the time and phase of the traffic lights. This paper presents a comprehensive research initiative focused on enhancing the intersection navigation capabilities of autonomous vehicles through the integration of advanced computer vision and Vehicle-to-Infrastructure (V2I) communication systems simulating the scenarios in a high-fidelity automotive simulator. The research unfolds in two distinct yet interconnected parts. In the first phase, V2I communication, establishing seamless connectivity between autonomous vehicles and traffic lights, is simulated within a simulated Mississippi State University Autonomous Vehicle Simulation (MAVS) environment resembling a small city with multiple intersections. We have designed a small city with multiple intersections with traffic lights in the MAVS simulator and developed a traffic light control system enabling the transmission of Signal Phase and Timing (SPaT) messages to vehicles. These messages encompass traffic light phases and timing details for phase changes, allowing autonomous vehicles to autonomously adjust their speed and behavior in real-time. The simulation result demonstrates that the autonomous car detects the traffic light accurately and at a certain distance closer to the nearest intersection, it receives a short message indicating the current phase of the light and the time to change into the next phase. In the second phase, an approach utilizing YOLOv8, the latest iteration of the YOLO deep learning model, is proposed to meticulously detect and recognize the status of traffic lights. This process commences with the utilization of real-time local images to develop and test the YOLO network. A custom dataset has been developed from our MAVS simulation and the model undergoes intensive training on this custom dataset to ensure robust and precise recognition of traffic light states. The result has been compared among different versions of YOLOv8. The research extends to simulating multiple intersections, simultaneously observing the interactions between the vehicle and traffic light infrastructure.

O12.07

10:30 DISCONNECTIVITY GRAPHS OF SPIN GLASSES ON KAGOME LATTICES

Richard Richardson, Katja Biswas

University of Southern Mississippi, Hattiesburg, MS

The minima of the energy landscapes for three different spin systems constrained to a Kagome lattice are examined with enhanced disconnectivity graphs. In the Kagome lattice, each spin is connected to four nearest spins, and the three systems examined differ in the range of their bond values with values of {±1}, {±1, ±2}, and {±1, ±2, ±3}. Each model shows a distinct difference in the structure, with the most obvious difference existing within the {±1} model. The {-±1} model exhibits a structure with no more than three energy levels for the minima, and the ground states are typically connected within large dales. The disconnectivity graphs are then further evaluated according to types, sizes, and distributions of the minima. These results can help in understanding potential difficulties that could occur in optimization routines used to evaluate compounds with the Kagome lattice structure.

11:00 KEYNOTE

Dr. John Ball

Thursday, February 29, 2024

AFERNOON

Room Union D

O12.08

1:00 VISUALIZATION OF ENERGY LANDSCAPES OF SPIN GLASSES

Katja Biswas

University of Southern Mississippi, Hattiesburg, MS

I will talk about the application of visualizations of potential energy landscapes to spin glasses. Spin glasses exhibit extended structures on the energy landscape that can be classified into different types based on similarity and accessibility arguments. Using this classification the

information about the structures can be merged into single representations allowing to draw coarse grained representations. These representations greatly aide the intuitive understanding of the systems, allow for further analysis. This will be illustrated in the talk on various examples of spin systems. Focus will be given on the effects of the lattice structure and spin-to-spin interaction strength on the energy landscape.

O12.09

1:30 MODIFICATION OF COULOMB POTENTIAL FOR S-WAVE RELATIVISTIC SCHRODINGER EQUATION

Khin Maung, Shwe Oo, Sung Lee, Partha Biswas

The University of Southern Mississippi, Hattiesburg, MS

In calculating meson mass spectra in the quark-antiquark bound state model, a linear potential plus a Coulomb-like potential are usually used. But when one uses relativistic kinematics, the S-wave wavefunction becomes singular at the origin. In order to remedy this, we use a modified Coulomb-like potential and show that it is possible to avoid the wavefunction singularity and still enjoy the usual phenomenological success in meson mass spectroscopy. We will demonstrate our results for the Bottomonium and the Charmonium systems.

O12.10

2:00 THE AI REVOLUTION: SHAPING THE FUTURE OF STEM EDUCATION

Umar Iqbal[1], Areejah Umar[2], Javier Gerardo Gómez[3]

[1]Mississippi State University, [2]University of Mississippi Medical Center , [3]Mississippi Gulf Coast Community College

The STEM education landscape is undergoing a significant transformation driven by artificial intelligence (AI) integration. This paper explores how AI innovations are reshaping STEM education, emphasizing the need for effective teaching and personalized learning experiences. It discusses the current landscape of STEM education and highlights the role of AI in enhancing teaching effectiveness and addressing specific challenges faced by educators in STEM disciplines.

AI's diverse educational applications are examined, including personalized learning, data analytics, and automated assessment. The paper illustrates how AI supports customized learning by adapting instruction to individual needs and providing targeted feedback. Furthermore, it explores the use of AI in data collection and analysis for assessing student performance, identifying at-risk students, and offering early interventions.

Addressing the challenges and considerations of AI integration, the paper underscores potential limitations, ethical concerns, and privacy issues. It advocates for developing blended learning models that merge traditional and online elements and stresses the importance of restructuring STEM programs to incorporate contemporary technological advancements. The integration of design thinking, innovative assessment methods, and active learning strategies are discussed as essential components of an enriched learning experience.

Additionally, the paper delves into curriculum development, highlighting new AI-related courses and modules in machine learning, medicine, data science, robotics, and AI ethics. It emphasizes the importance of AI-powered tools in facilitating personalized learning experiences and enhancing research opportunities. The role of AI in automating grading, supporting virtual labs, and curating learning materials is also explored.

Thursday, February 29, 2024

EVENING

3:30 DODGEN LECTURE /AWARDS CEREMONY

THEATER

5:00 GENERAL POSTER SESSION

(immediately following Dodgen Event)

P12.01

INDENTATION METHOD FOR POLYMERIC ELASTIC MODULUS MEASUREMENT: VALIDITY ASSESSMENT

Riya Titus[1], Kartikeya Singh Jodha[1], Megha Satpathy[1], Jason A. Griggs[1], John J. Mecholsky[2], Nader Abdulhameed[2]

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Introduction: The ultrasonic pulse apparatus, which requires the Archimedes principle for density measurement, is the standard (ASTM D2845) for calculating Young's modulus of elasticity (E) of materials. The search for a more straightforward method is prompted by the limited availability of the ultrasonic pulse apparatus in research laboratories. **Objective:** The purpose of the study was to assess the applicability of microhardness indentation techniques, typically used for calculating the elastic modulus in brittle materials, to determine the elastic modulus of thermoplastic polymers, specifically Teflon and Nylon 11. **Hypothesis:** The hypothesis of this study was that the indentation method accurately measures elastic modulus in polymeric materials. **Materials and Methods:** Square plate specimens of Teflon (n=4) and Nylon 11 (n=4) were prepared, polished to a 30-micron surface finish, and gold sputter coated. The Microhardness Tester (Vickers/Knoop) underwent calibration, a process in which a standard sample supplied by the manufacturer was employed as a reference for ensuring accurate and reliable measurement outcomes. Indentations (n=6 each) were made with 500 g and 100 g loads for Vickers and Knoop indentations respectively, with a 15-second dwell time using the Microhardness Tester. Vickers hardness (H), along with the Knoop indentation residual in-surface minor diagonal ($2b_R$) and major diagonal ($2a^*$), were

recorded. Young's modulus (E) of the thermoplastic samples was determined using (1) the indentation technique, originally developed for ceramics (Marshall et al., 1982) and (2) an ASTM D2845-compliant Ultrasonic pulse apparatus (Panametrics 25DL PLUS). Sample density was measured using Archimedes' principle density apparatus (Denver Instruments). **Results:** Building on the prior approach by Marshall et al. for ceramics, research by Satpathy et al. (2019) and Nader et al. (2020) was successful in establishing a linear regression equation from the plotted b_R/a^* vs H/E graph for rigid polymers and resin composites. The ultrasonic analysis of these materials was performed in our laboratory at UMMC. Our b_R/a^* vs. H/E graph demonstrated that thermoplastic materials align with this trend. However, Nylon 11 displayed slight deviation, potentially due to measurement challenges with Knoop indentation dimensions. C**onclusion:** In conclusion, microhardness testers can effectively determine the Young's modulus of unfilled polymeric materials, offering an alternative to the standard ultrasonic pulse apparatus (ASTM D2845). This research underscores the utility of microhardness techniques for characterizing the mechanical properties of thermoplastic polymers, with implications for material testing in various academic laboratory settings.

P12.02

DEEP NEURAL NETWORK LOCATION OF CHIPLESS RFID TAGS

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In certain businesses, it is important to track the location of equipment within a storeRoom environment. Failure to track these materials can lead to severe business losses. While one might expect that radio frequency identification (RFID) systems exist to address this problem, the reality is that few such systems have moved past the theoretical stage to become commercially viable. To address this, this paper explores the use of a chipless RFID system with a deep neural network to perform localization and identification of RFID tags. A typical RFID system consists of a reader and tags. Through an exchange of RF energy in a process known as backscattering, the reader is able to determine the identity of a queried tag from information contained in the backscattered signal. Other efforts have proposed numerous methods to determine location from the backscattered signals using time-of-arrival, received signal strength, and phase information. These methods typically rely on complex signal processing methods that suffer from non-line-of-sight and multipath effects common in most indoor environments. These downsides have resulted in few commercial offerings of solutions. To enable commercially viable systems, the deep learning method proposed has the potential to alleviate the signal processing complexities of previous methods and the possibility for non-line-of-sight and multipath effects within a specific environment to be "learned away".

To perform the localization task, a deep neural network is proposed, that has been previously proven to excel at the interpretation of time series data for classifying power quality events. This project explores the use of this neural network to bridge the link between the received backscattered signals and the identifying and location information. The proposed network uses fully connected, 1D convolution, and long-short-term memory (LSTM) neurons, which have been shown to be excellent at feature extraction, classification, and regression tasks for one-dimensional data like that of the backscattered signals. This project represents a work-in-progress in which this neural network structure, along with the backscattered waveforms from the FEM modeling effort, are used to investigate the feasibility of determining both location and identification information from the backscattered waveforms. The intent of this study is to demonstrate the potential of this approach, while future work will include the generation of sufficient data to train and validate the proposed neural network.

P12.03

LEVERAGING NEURAL NETWORKS FOR ENHANCED LOCALIZATION IN AUTONOMOUS VEHICLES: WORK IN PROGRESS

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This research paper aims to demonstrate the potential of neural networks to enhance Global Positioning System (GPS) localization in autonomous vehicle navigation. A reliable and safe autonomous navigation system is paramount in self-driving cars. Autonomous driving can offer social and individual benefits by reducing driver stress and anger, improving road safety, and enhancing travel comfort. The potential environmental advantages include reduced traffic accidents, enhanced road capacity, decreased congestion, lower energy consumption, and reduced pollution emissions. The primary purpose of this research is to implement an Artificial Neural Network (ANN) to correct GPS positioning navigation errors for applications in autonomous vehicles and robotics. It addresses a critical issue of autonomous vehicles and their safe and reliable navigation. GPS signals are interrupted by buildings, tunnels, or the weather, and in those cases, a standard solution is the use of Inertial Measurement Units (IMU) to estimate the position. However, IMUs are susceptible to cumulative drift that increases their positioning error. This research paper describes the ANN architecture, training, and testing data. Compared with the Least-squared estimation method with a Root Mean Squared Error (RMSE) of 0.00062882, the proposed ANN architecture RMSE of 0.0004688 shows the trained ANN's ability to reduce the positioning error. However, this study utilized a limited dataset based on simulation data. Real-time testing and comparison with other estimation techniques are the future directions of this research.

P12.04

USING CONVOLUTIONAL NEURAL NETWORKS FOR INTEGRATED GPS/INS NAVIGATION

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Global navigation satellite systems (GNSSs) like the U.S. Global Positioning System (GPS) can provide accurate navigation information. However, there are situations that can cause the degradation or even complete blockage of these satellite signals. These situations are especially common in cities that contain underpasses, tunnels, parking garages and tall buildings creating urban canyons that cause signal multipath propagation issues. Some studies have shown errors of 50-60 meters and outages ranging from a few seconds to 100s of seconds. A common approach to mitigate this is to use low-cost microelectromechanical system-based inertial navigation systems (INS) in conjunction with a GNSS and a mechanism for sensor fusion. However, these low-cost INSs are susceptible to large sensor errors including noise, bias, and drift errors that grow proportional to the INS errors.

This paper proposes the use of a convolutional neural network (CNN) to bridge the integrated GPS/INS system during a GPS outage to minimize the errors from the INS. The INS data can be obtained and structured into data "images" that a CNN can get trained on. The data image is constructed by concatenating and structuring sequential raw inertial measurement unit (IMU) vector data and then converting that data to a 16-bit grayscale image. These images are then correlated with the GPS data to label the data sets for CNN training. This study uses an initial 7 layer, 64 filter CNN with two-dimensional convolution and rectified linear unit (ReLU) activation. CNNs typically work well with image data because they can determine spatial relationships within a large set of images and are often used for image recognition, object classification and pattern recognition. The spatial relationships in the data image would consist of the actual signal data over time, and would also include the non-linearities, drift, and bias errors. So, rather than attempt to model and account for the INS errors, the intent is to use a trained CNN to account for those errors and determine the next GPS step during an outage based on the raw IMU/INS and odometer data.

MATLAB computer simulations were run on real-world GPS and IMU/INS data collects from a previous field test trajectory. The IMU data was pre-processed into data images and labeled to train the CNN. Two test cases were conducted, and initial results provided limited success for GPS outages lasting 10 seconds. One potential implication and use case for this work could be to reduce the need for performing precise IMU/INS calibrations to determine error values. An approximate calibration could be performed and then the CNN could be trained to account for the other errors. Future work could include further research into various CNN architectures, investigations into IMU/INS data image de-noising techniques, and additional real-world road tests. The final conclusions of this proposed method are still a work in progress.

P12.05

A SIMULATED INVESTIGATION INTO THE EFFECTS OF JAMMING ON A GPS SYSTEM

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Navigation in the modern world relies heavily on satellite-based positioning systems. Global Navigation Satellite Systems (GNSS) are used in all forms of transportation and are indispensable to critical infrastructure systems such as emergency response and law enforcement. Unfortunately, GNSS have several vulnerabilities such as susceptibility to multipath and degraded performance in urban environments. Previous testing has illustrated signal reception issues faced by GNSS receivers in everyday traffic scenarios such as crossing metal truss bridges, navigating through dense forests, and driving under overpasses on otherwise clear roadways. Additionally, many GNSS share similar frequency bands allowing those seeking to jam navigation signals the ability to do so by jamming one frequency band shared by multiple GNSS. Although there are devices that generate GNSS and GNSS jamming signals, these are costly and unavailable to many users. In order to reduce GNSS vulnerability to jamming, it is crucial to understand how jamming interrupts signal reception. Previous works have utilized either simulation or real-world testing which provides an incomplete investigation into the multiple variables that can impact GNSS receiver performance. The purpose of this research is to bring real-world and simulated environments together to provide a more complete study on variables that affect GNSS. In this research, a method for testing various receivers' susceptibility to jamming, without transmitting over the air, is given. The proposed MATLAB simulation allows the user to define jammer position and heading, antennas for both jammer and receiver, and waveform type for jammer to transmit allowing the user to generate a customizable jamming environment tailored to their specific needs. The simulation operates by calculating the azimuth and elevation between the jammer and receiver from both objects' reference frames. It then uses an antenna lookup table to find the expected antenna gains at the azimuth and elevation and begin calculating the expected received jammer power at the antenna. This is compared to the expected Global Positioning System (GPS) power level at the receiver and the jammer-to-signal level is reported. In a simple environment (i.e., no tall, solid structures around to cause line-of-sight or multipath issues), this simulation creates a realistic jammer-to-signal measurement that can be compared to the specifications of the receiver to test receiver performance. An example scenario entails placing a GNSS receiver in a vehicle,

connecting a signal generator controlled by this simulation in the radio frequency (RF) network, and placing a simulated jammer along the intended path. The anticipated results would show the jammer-to-signal level experienced by the device under test and demonstrate how the sensor performs after being jammed. Using a simulated environment that is fieldable on a multitude of platforms in real-world scenarios allows researchers to test receiver performance in response to intentional GNSS jamming. Future developments may lead to more hardened navigation systems as researchers investigate new methods of capturing GNSS signals in artificially increased noise, develop methods of counteracting jamming with intelligent reception of signals, and augment sensors in urban areas with shared measurements to combat multipath or satellite obstruction. WIP.

P12.06

DEVELOPMENT OF AN INTEGRATED INTERSTELLAR NAVIGATION SYSTEM: ENHANCING PRECISION WITH DOPPLER SHIFT, IMU, AND ELECTROMAGNETIC TECHNIQUES

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The development of an interstellar navigation system is driven by humanity's growing aspiration to extend its reach beyond our solar system. This venture is not only a significant leap in space exploration but also a critical step in our quest to understand the universe and our place in it. The limitations of existing navigation systems, which are confined to the boundaries of our solar system, necessitate the development of more advanced technologies to tackle the challenges of interstellar distances and conditions. This research is aimed at creating a navigation framework capable of precise and reliable operation in the vastly different environment of interstellar space. It’s not just an academic pursuit but is closely aligned with the practical objectives of organizations such as the Space Force and companies like SpaceX, which are increasingly focusing on ambitious missions to Mars and beyond, necessitating navigation solutions robust enough for the complexities of interstellar travel.

Our study methodically compared and integrated three key navigation technologies using MATLAB simulations: Doppler Shift methodologies for velocity measurement, advanced Inertial Measurement Units (IMUs) for spatial orientation, and electromagnetic phenomena-based methods for positional accuracy. These technologies, selected for their proven capabilities in space navigation, albeit within a different context, were integrated through a tightly coupled multi-sensor fusion system. This system was designed to harmonize the diverse data types and operational characteristics of these technologies.

For manageable yet realistic simulations, several assumptions were made. We assumed a constant interstellar medium density for signal propagation, a simplified model of stellar and cosmic radiation sources for electromagnetic phenomena-based methods, and a standardized noise model for sensor data. These assumptions were essential to focus on the core objectives of the study while acknowledging the complexities of space scenarios.

The MATLAB simulations demonstrated that our tightly coupled fusion system significantly enhanced navigational capabilities. The Doppler Shift technique, while effective for velocity data, was further enhanced by the IMUs' orientation data and the electromagnetic methods' positioning accuracy. This integration yielded a 40% improvement in positional accuracy and a 30% increase in signal integrity, compared to traditional methods. Additionally, the system showed greater resilience to sensor errors and environmental perturbations, which are crucial factors in the unpredictable realm of interstellar travel.

This proposed navigation system represents a significant advancement in the field of interstellar travel. It's not just a scientific breakthrough but a necessary step towards realizing the dream of exploring distant star systems. This system provides new possibilities for the Space Force in terms of extended-range surveillance and operation and for SpaceX and similar entities in pursuing their vision of interplanetary and potentially interstellar exploration. The MATLAB models and simulations have provided invaluable insights into the integration and performance of diverse navigation technologies in a space context. However, transitioning these simulations to real-world applications will involve overcoming significant challenges, such as managing computational demands and ensuring long-term system reliability in the harsh conditions of space. This research lays the groundwork for these future endeavors, marking a critical milestone in humanity's journey to the stars.

P12.07

PATH PLANNING ALGORITHM FOR EDGE-ENHANCED NAVIGATION OF AUTONOMOUS SEARCH AND RESCUE VEHICLES

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Search and rescue operations play a crucial role in addressing emergencies and disasters, where efficient path planning is essential for guiding autonomous agents through complex environments. Efficient path planning is crucial for autonomous agents in search and rescue operations, especially in dynamic and complex environments. The urgency in improving these operations becomes apparent when considering scenarios where timely and optimal paths are vital, revealing the limitations of traditional algorithms in time-sensitive scenarios. This project focuses on developing an advanced path-planning algorithm for autonomous rescue vehicles, aiming to enhance real-time navigation and obstacle avoidance. By

reducing reliance on remote servers, the algorithm facilitates quicker decision-making and enables effective navigation in challenging conditions. The primary goal is to design a robust algorithm that empowers autonomous vehicles to navigate dynamically changing environments while avoiding obstacles.The proposed hybrid algorithm for robot point-to-point path planning creatively combines the strengths of Artificial Bee Colony (ABC) and Particle Swarm Optimization (PSO) due to their mutually beneficial attributes. The selection of these optimization methods is driven by their distinctive characteristics. Through experimental evaluations, it became evident that PSO outperforms ABC in terms of accuracy, computational efficiency, and convergence capability. PSO's global search strategy proves instrumental in addressing ABC's challenges, particularly its tendency for early convergence and limited exploration capabilities. Additionally, the introduction of the ABC search-based WAPSO (F-WAPSO) algorithm, fusing ABC with an enhanced PSO variant (WAPSO), significantly enhances matching accuracy in terrain-aided navigation systems. It's important to note that our hybrid algorithm primarily focuses on advancing path planning rather than navigation as a whole, setting it apart as an innovative and sophisticated solution compared to existing state-of-the-art methods.With the aim of decreasing the overall traveled distance and avoiding obstacles while taking the autonomous vehicle mobility limits into account, the hybrid ABC-PSO algorithm, combining Particle Swarm Optimization and Artificial Bee Colony, outperforms traditional ABC and PSO algorithms in robot path planning. Through meticulous parameter tuning, including iterations, population size, and the Inertia Weight Damping Ratio in our various experiments, the algorithm consistently refines its path planning, achieving a superior balance between exploration and exploitation for optimal solutions. Its adaptive nature and efficient convergence, along with the ability to avoid local optima, position it as a robust tool for optimizing robot path planning in complex environments. The demonstrated superiority of the algorithm makes it a promising solution for challenges in search and rescue operations and scenarios requiring agile and adaptive autonomous agents. This method is significant because it can help autonomous vehicles perform better in a variety of applications, including autonomous cars, industrial robots, and unmanned aerial vehicles. The suggested algorithm can improve these systems' productivity, dependability, and safety by offering a more effective and efficient path-planning technique. The hybrid algorithm that has been suggested shows that it is possible to combine various optimization techniques to get better outcomes overall. Subsequent investigations might go into additional improvements to the system, including integrating machine learning or reinforcement learning methodologies to better its flexibility in evolving surroundings.

P12.08

CHALLENGES AND REQUIREMENTS FOR TOMORROW'S SMART GRID READINESS IN ACCOMMODATING LARGE-SCALE ELECTRIFICATION OF ROAD TRANSPORTATION

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Climate change poses a major challenge for countries throughout the world, with nations like the U.S. rapidly seizing on opportunities to identify carbon-free sources to meet the energy demand and reduce their carbon footprint. This project focuses on analyzing the current demand and capabilities of the U.S. electrical grid, as well as considering the effect of a rapid increase in electric vehicles, and what may be necessary to support such a shift. It will provide key recommendations in primary areas such as: an assessment of EV charging infrastructure, design of operational measures to integrate EVs as an energy resource, and power system planning and future requirements.

P12.09

EVALUATING PRECISION IN DRONE NAVIGATION: STANDARD GPS VS. RTK TECHNOLOGY

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In the pursuit of enhanced precision for drone navigation, this study investigates a comparative evaluation of drone navigation precision using Standard GPS and the Here3+ Real-Time Kinematic (RTK) system. The research addresses the critical gap in precision that current GPS technologies present, particularly in applications where such deficits can drastically affect operational outcomes, like in precision agriculture and urban development projects. The motivation stems from the critical need for accuracy in drone operations, which are increasingly pivotal in agriculture, urban planning, and surveying. The research centers on empirically assessing the positioning accuracy of drones using these two navigational methods under comparable conditions. The methodology entails a series of controlled flights along a predetermined linear trajectory, with drones equipped with both standard GPS and Here3+ RTK system. The selection of the Here3+ model was based on its integration capabilities with the ArduPilot Mission Planner and the need for high-fidelity data logging. The first set of flights employs standard GPS, where the drone's coordinates are logged throughout the flight. The second set utilizes RTK, where the drone receives corrections from an RTK base station, aiming to enhance navigational accuracy. Coordinates from both flights are recorded for comparative analysis. The study is designed to transform the captured GPS data into a local coordinate system, which will enable an accurate assessment of the drones' deviations from their intended

path. By analyzing the deviations' average and standard deviation for each navigation method, the research seeks to quantify the precision improvements that RTK technology may provide over standard GPS. The required apparatus includes a GPS-enabled drone, an RTK base station for real-time corrections, and a robust data logging system to record the navigational data. The significance of this study is underscored by the potential benefits that improved navigational precision can unlock, particularly in the agricultural domain. Enhanced accuracy can revolutionize precision farming practices, facilitating more effective crop monitoring, irrigation management, and pesticide distribution. Preliminary analyses suggest a marked improvement in positioning accuracy with the Here3+ RTK system compared to Standard GPS. This research is expected to provide a foundational understanding of the benefits and limitations of RTK technology in drone navigation, setting the stage for its broader adoption in various industrial applications. Through this exploration, the study will contribute valuable insights to the ongoing discourse on the advancement of drone technologies and their integration into current and future operational frameworks.

P12.10

SDR-BASED ROBUST GPS RECEIVER

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This paper focuses on a comprehensive strategy for the creation of a resilient Global Positioning System (GPS) receiver, integrating the capabilities of affordable RTL-SDR (Software-Defined Radio) hardware and the sophisticated signal processing capabilities of GNU Radio software. The primary motivation behind this effort is to address a critical concern in the field: the vulnerability of GPS receivers to deliberate or inadvertent radio frequency interference, commonly referred to as jamming.

Our innovative approach harnesses the inherent adaptability and versatility of software-defined radio technology to fortify the GPS receiver against a spectrum of jamming attacks. The implementation involves deploying real-time signal processing techniques with the specific goals of detecting, characterizing, and effectively counteracting jamming signals. This meticulous approach ensures the GPS receiver's ability to consistently deliver precise and reliable position and timing information, even when confronted with formidable interference. The core technological components encompass RTL-SDR as the hardware front-end, GNU Radio as the robust software framework for signal processing, and cutting-edge algorithms designed for anti-jamming, signal tracking, and position estimation using Extended Kalman Filtering (EKF). A distinctive aspect of our design lies in its dynamic adaptability to evolving jamming scenarios, a feature that we aim to substantiate through a rigorous series of laboratory tests and field trials. It is crucial to note that this paper represents an ongoing project, and the results of these tests will contribute valuable insights to the effectiveness and adaptability of our proposed GPS receiver. Anticipated outcomes suggest that our GPS receiver prototype can maintain stable and accurate positioning performance in the presence of various jamming signals, ranging from simpler continuous wave interference to more sophisticated spoofing attacks. Moreover, the cost-effectiveness and open-source nature of the RTL-SDR and GNU Radio platform further enhance the accessibility of our solution, catering to a diverse user base including researchers, hobbyists, and industries with a demand for resilient GPS solutions. This research significantly augments the existing body of knowledge on mitigating jamming impacts on GPS systems. By offering a detailed and practical solution with a strong emphasis on adaptability and cost-effectiveness, this paper aims to serve as a pivotal resource for individuals and industries striving to ensure unwavering GPS reception in challenging and dynamic environments.

P12.11

IMPROVED DISTANCE ESTIMATION IN DYNAMIC ENVIRONMENTS THROUGH MULTI-SENSOR FUSION WITH EXTENDED KALMAN FILTER.

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Accurate distance estimation between vehicles in a dynamic environment is a critical component of advanced driver-assistance systems (ADAS) and autonomous vehicles. In this research, we explore the power of multi-sensor fusion with an Extended Kalman Filter (EKF) which is commonly applied in sensor fusion for estimating the state of dynamic systems, combining noisy sensor measurements. Multisensor fusion is important because using a single camera or radar can limit depth perception, object detection, and performance in adverse conditions, while combining both enhances reliability, adaptability, and object recognition in various scenarios. For this research, we start working by individually collecting data from camera and radar sensors, comparing the results to ground truth values to assess the performance of each sensor. Subsequently, we employ sensor fusion algorithms to combine data from these sensors, with the aim of minimizing the error between the measured and actual distances. The first step in our evaluation process involves collecting raw data from sensors and ground truth information. We utilize the Mississippi State University Autonomous Vehicular Simulator (MAVS) to create a controlled environment for data collection and MATLAB for data analysis. Initial results indicate that the combined sensor data yields more accurate distance estimates when compared to the data from individual sensors. To assess the performance of our sensor fusion approach, we utilize both qualitative and quantitative metrics. Qualitative metrics involve visualizing the fused sensor data in comparison to

the ground truth values. On the quantitative front, we employ standard metrics such as root mean square error (RMSE) and mean absolute error (MAE) to calculate the absolute distance errors, providing a numerical measure of the system's accuracy. Our findings demonstrate that the fusion of camera and radar sensor data with the Extended Kalman Filter yields promising results of plant noise variance as high as 0.8. The qualitative comparisons between the fused data and ground truth values showcase the enhanced accuracy and reliability of our approach. We plan to extend our research (Work in Progress) by incorporating real-world data collected from the Cadillac Lyriq (by collaborating with the team of EcoCAR EV Challenge). This transition from controlled simulation data to real-world data is a critical step in validating the effectiveness and robustness of our approach. We will compare the performance of the EKF algorithm on real-world data from the Cadillac Lyriq to its performance on synthetic MAVS data, highlighting the novelty of our approach. We anticipate that real-world data may introduce challenges such as noise and environmental variations, which we aim to address to further enhance distance estimation accuracy. Beyond vehicle autonomy, this enhanced distance estimation technique using EKF and multi-sensor fusion holds promise for advancements in robotics automation, unmanned aerial vehicles, intelligent transportation systems, virtual and augmented reality, wearable technologies, and other fields. In summary, our research leverages multi-sensor fusion with an Extended Kalman Filter to improve the accuracy and robustness of distance estimation in dynamic environments.

P12.12

A ZERO SHOT DETECTION BASED APPROACH FOR FISH SPECIES RECOGNITION IN UNDERWATER ENVIRONMENTS

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Identification of fish species is vital for fisheries management, stock assessments, protection of endangered species, and ecosystem management. Image based surveys often deployvideo cameras that are used to collect large image datasets that are reviewed by a human observer to identify species and generate a numerical count at each station. One main challenge in labeling or annotating such a large dataset is that it requires a huge amount of time, cost, and human effort. Recently, general adversarial network (GAN) based generative techniques have drawn much attention in zero-shot object detection (ZSD) because of superior performance in localizing and simultaneouslyrecognizing objects without training a model on unseen (few target) classes. In this work, a zero-shot detection for Fish Species Recognition (ZSD-FR) in underwater environments is utilized for object detection. This approach can localize and recognize objects when the model is not trained on "unseen" classes. Generative models like GAN can be trained on data with "seen" classes for generating unseen class samples depending upon the semantics (attributes) learned from data with seen classes. The results obtained on SEAMAPD21 illustrate that the zero shot detection (ZSD) based approach of object detection can successfully transfer knowledge from seen classes to unseenclasses with better detection accuracy.

P12.13

HYBRID PATH PLANNING FOR WILDERNESS TRAVERSAL BASED ON LINEAR PROGRAMMING AND VFH+

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As the demand for intelligent and automatic vehicle systems has risen in recent years, procedures allowing for autonomous navigation through unknown environments, including off-road environments, have similarly emerged as a focus for investigation. The ability to automatically navigate and survey wilderness areas, potentially including physical sampling, is vital for continued development in a number of academic, commercial, and humanitarian endeavors. Impacted areas include the study and preservation of ecosystems, biodiversity, and natural resources; search and rescue operations in wooded regions; and the efficiency, safety, and cost-effectiveness of forestry, construction, or mining operations in complex and challenging terrain.

Here, we propose a hybrid path planning algorithm, leveraging the strengths of local and global path planning, to allow for efficient, autonomous navigation to several points of interest in a partially explored region of wilderness. In the global approach, the targeted locations and large scale obstacles are treated as objective locations for multi-modal optimization via linear programming, similar in nature to addressing a traveling salesmen problem (TSP) with obstacles. In the local approach, we suggest the integration of the vector field histogram plus algorithm (VFH+). The hybridization of these two approaches is done through hierarchical planning, with global planning generating high-level waypoints and local planning addressing the immediate pathing required to navigate the vehicles immediate surroundings, which contains obstacles unmapped at the onset of navigation. The inclusion of adaptive planning in the hybridization strategy is also explored, as permitted by the terrain utilized for evaluation.

Synthetic LiDAR sensor data is generated to evaluate the proposed approach in a scenario where it is desired by geoscience researchers to perform physical sampling at a number of discrete locations throughout a targeted region. For the purposes of this study, the targeted locations in the data are known only as coordinate positions and the overall region is mapped only with the positions of large-scale obstacles, such as bodies of water, and areas not allowed for traversal, such as governmental property. Through this

evaluation, the proposed method is shown to be of significant utility during the navigation to all targeted locations, successfully traversing the synthetic wilderness while ensuring effective obstacle avoidance. These findings suggest that, especially with the integration of more sophisticated terrain mapping, the proposed method or its descendants may be directly applicable in data acquisition efforts across a multitude of disciplines.

P12.14

HARNESSING VEHICLE-TO-EVERYTHING (V2X) FOR INTELLIGENT NAVIGATION: AN EXAMINATION OF COMPOSITION AND UTILITY

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Vehicle-to-Everything (V2X) communication, evolving rapidly with the advent of technologically advanced vehicles, is realizing its significant potential. Maturing infrastructure and advanced computing integrations into vehicles enable real-time information exchange between vehicles (V2V) and various traffic systems (V2I). These systems aim to send and receive critical data to facilitate intelligent navigation choices, increasing overall safety and efficiency. This can include systems such as avoiding congestion through route planning, signaling future maneuvers to nearby vehicles, obtaining accurate positioning in GPS-challenged areas, and receiving emergency information from authorities, among others. For example, V2X could revolutionize lane merging, a major traffic issue in large cities. By artificially assigning an order for cars to merge, it could eliminate a significant source of traffic congestion. This work was constructed from a variety of sources such as standard research papers, conference presentations, V2X survey papers, commercial resources, and even government documents setting up standards and regulations. Our survey thoroughly coalesces disparate V2X research, providing a consolidated resource that enhances understanding and guides future innovation. This survey will help researchers grasp the evolving impact of V2X on navigation, as technology and smart road infrastructure continue to advance.

P12.15

LOOSELY COUPLED INTEGRATED VISUAL NAVIGATION SYSTEM UNDER GPS-DENIED CONDITIONS (VISUAL/INS/GPS)

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Accurate and reliable localization is fundamental to operating various autonomous systems, including unmanned aerial vehicles (UAVs), self-driving cars, and robotics. However, achieving precise localization becomes a significant challenge in GPS-denied environments where satellite signals are obstructed or unavailable such as tunnels, inside parking garages, and underpasses. In such areas, another system such as Inertial Navigation Systems (INS) is commonly used to provide localization. However, despite the fidelity of INS in short-term usage, INS systems are vulnerable to drift errors due to IMU-associated errors, resulting in positioning errors in areas of prolonged GPS outage such as indoor parking garages. In navigation systems, INS/GPS integration is one of the most popular approaches being used to address the shortcomings of GPS outages with auspicious results. However, in scenarios of extended outage, this integration scheme becomes less accurate due to the drift errors introduced by the INS. Therefore, to address this problem, the role of computer vision becomes paramount in determining the position and orientation of a vehicle. The integration of computer vision and other sensory inputs like INS and GPS enhances the capabilities of navigation systems, mitigating the impact of sensor noise and drift. This project presents a comprehensive approach to visual localization in GPS-denied environments by combining camera, INS, and GPS technologies. This is done via a loosely coupled integration technique using Extended Kalman Filter (EKF) with a unique and dynamic tuning approach for reliable and uninterrupted navigation. In scenarios where GPS signals are unreliable or unavailable, this integrated system leverages visual information from cameras for localization. The EKF operates in training mode when enough GPS satellites are present and in prediction mode in areas of GPS outage, providing uninterrupted navigation solutions. To test the effectiveness of this method, NaveGo, an open-source MATLAB/GNU-Octave toolbox was used together with a Canada planetary dataset comprising of camera, INS, and GPS data was utilized. To assert the effectiveness of this method a prolonged simulated GPS outage of 100s was introduced. The results show a major improvement for Visual/INS/GPS integration, compared to INS/GPS-only integration. By harnessing the power of computer vision, sensor fusion, and advanced algorithms, this system can be extended to other applications requiring accurate navigation such as remote sensing, and search and rescue. This enables autonomous vehicles and robots to navigate with confidence and precision, unlocking new frontiers in GPS-independent autonomy.

P12.16

ENHANCING VELOCITY CONTROL: INTEGRATING ATTENTION MECHANISM AND DEEP DETERMINISTIC POLICY GRADIENT (DDPG) FOR OPTIMIZING SAFETY AND COMFORT

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Mississippi State University, Starkville, MS

The transportation system is moving towards higher levels of autonomy. Longitudinal speed control, or adaptive cruise control (ACC), is intended to provide driver assistance by controlling vehicle speed and maintaining a safe distance from the preceding vehicle. Artificial

intelligence (AI) and machine learning (ML) paved the way for robust navigation and decision-making in complex environments. In this paper, we propose a comprehensive framework for speed control using a deep reinforcement learning algorithm for safety and comfort. We incorporate the deep deterministic policy gradient (DDPG) framework with an attention mechanism for this. Many works achieved smooth vehicle control output from the DDPG algorithm with different network structures, but we demonstrate that adding an attention mechanism improves the overall performance. The baseline DDPG framework is based on fully connected layers. However, when we bring the attention mechanism to the DDPG model, it helps to increase focus on the most important features and enhances the overall model effectiveness. We also designed a custom reward function as our priority is to improve overall safety and comfort. The efficacy of our model is evaluated in comparison to the baseline DDPG model, emphasizing the influence of the attention mechanism. We have performed an ablation study to determine the impact of the number of layers and neurons in the hidden layer. In addition, we tested this model on diverse datasets (simulated and real), including some unknown scenarios in the testing datasets. We demonstrate that our architecture has outperformed the state-of-the-art model, and is quite robust across different datasets.

P12.17

EVALUATION OF THERMAL PROPERTIES OF NOVEL PLANT FIBER-BASED MATERIAL *WORK IN PROGRESS*

Brock Breedlove

Department of Mechanical Engineering, University of Mississippi, Oxford, MS

Eco-friendly materials are becoming more popular as an alternative to petroleum-based materials. The interest in various applications of natural composites is rising. The Department of Mechanical Engineering at the University of Mississippi and The Department of Sustainable Bioproducts at Mississippi State University focused on developing new bio-composites from agricultural materials. This work focuses on the thermal properties of newly developed bio-composites to evaluate their suitability for an insulation material; the R-value of various natural fiber-reinforced materials is measured both computationally and experimentally.

P12.18

VIRTUAL REALITY CAD COLLABORATION

Tarisha Moncrief

Mississippi Valley State University, Itta Bena, Mississippi

This research paper primarily pursues revolutionizing the CAD design process that allows many users to collaborate simultaneously in a shared digital reality space. Virtual reality is a technology that helps to revolutionize the design process. Virtual reality generation creates a new platform that allows designers to design collectively regardless of geographical constraints. One of the vital problems research addresses is the limitations associated with conventional CAD software (Keane, 2019). One of the restrictions is real-time collaboration and dynamic model manipulation. To give you more accurate results locating, the venture involved deep research and evaluation of the present VR and CAD integration strategies and the improvement of a prototype VRCAD collaboration. The project ambitions to validate the effectiveness of the VR-primarily based collaborative environment through user testing and iterative design improvements. The anticipated substantial outcomes include successfully introducing a functional VR CAD collaboration platform and demonstrating its effectiveness in improving team collaboration, design conversation, and overall productivity (Keane, 2019). The research findings have implications for various industries heavily counting on CAD design, including architecture, engineering, and product improvement. By addressing the space in collaborative CAD environments, this study contributes to advancing design practices and underscores the cost of embracing emerging technology. Moreover, the study envisions that these industry benefits will propel the new collaboration advancement to its pinnacle development stage. In conclusion, this research paper aims to transcend the existing limitations by enabling collaboration not only within the hardware systems but also simultaneously within the software, marking a significant stride towards a more integrated and seamless design process in virtual reality environments.

P12.19

DISCONNECTIVITY GRAPHS OF SPIN GLASSES ON KAGOME LATTICES

Richard Richardso, Katja Biswas

University of Southern Mississippi, Hattiesburg, MS

The minima of the energy landscapes for three different spin systems constrained to a Kagome lattice are examined with enhanced disconnectivity graphs. In the Kagome lattice, each spin is connected to four nearest spins, and the three systems examined differ in the range of their bond values with values of {±1}, {±1, ±2}, and {±1, ±2, ±3}. Each model shows a distinct difference in the structure, with the most obvious difference existing within the {±1} model. The {-±1} model exhibits a structure with no more than three energy levels for the minima, and the ground states are typically connected within large dales. The disconnectivity graphs are then further evaluated according to types, sizes, and distributions of the minima. These results can help in understanding potential difficulties that could occur in optimization routines used to evaluate compounds with the Kagome lattice structure.

P12.20

INDIRECT MOLECULAR RECOGNITION OF SIALOGLYCAN FROM PHYSIOLOGICAL FLUIDS VIA SURFACE ENHANCE RAMAN SPECTROSCOPY

Triand McCoy, Godisgreat Okeke, A Singh

Department of Chemistry and Physics, Alcorn State University, Lorman, MS

Sialic acid is an anionic monosaccharide and one of the main terminals' components of the glycan chain. Glycanes attached to glycolipids on the cell membrane are known to act as pathological coordinators and managers and play a key role in molecular recognition, cellular differentiation and immune response. Due to complicated structures, dynamic expression, cognizing and understanding its expression level, make it challenging for in situ investigation in physiological medium. In this work we present a 4-mercaptophenylboronic acid conjugated nanostructure-based surface enhanced Raman scattering platform for in situ recognition of sialoglycan level at physiological condition. This nanosensor is designed by 4-mercaptophenylboronic acid decorated gold nano particle which is unique and multifunctional because of its three-in-one role involving the Raman signal enhancer, the sensing reporter of 4-mercaptophenylboronic acid and the target reporter based the recognition of phenylboronic acid and sialoglycans. When this nano platform binds to sialoglycans, the molecular vibrational modes of 4-mercaptophenylboronic acid will change, which can be traced by ultrasensitive SERS technique. The superiority of this study is that we build the relation between the spectral change on 4-mercaptophenylboronic acid in molecular recognition with the sialoglycan dynamic expression of cell. SERS spectral response to change in sialidase concentration built a dependable relationship between intensity and the presence of Sialic acid indicating the detection limit is about 7.8 μg/mL. Therefore, this method could be used to evaluate glucose and sialidase level and activity which is of importance in understanding the crucial physiological process that are regulated by sialidase and the early stages that the sialidase activity are damaged in cancer cells and primary tumors. A detailed nanostructure synthesis mechanism, experimental design and strategies will be discussed.

P12.21

ε-POLY-L-LYSINE CONJUGATED GNR PROBE TO MONITOR ANTIMICROBIAL ACTIVITY AND MECHANISM OF ACTION BY SURFACE ENHANCED RAMAN SPECTROSCOPY

Godisgreat Okeke, Triand McCoy II, A Singh

Department of Chemistry and Physics, Alcorn State University, Lorman, MS

Antimicrobial peptides have been demonstrated to display an immediate response to a large set of pathogenic activity against viruses, bacteria, and fungi by virtue of their local binding with phospholipid phosphatidylserines to exert cytotoxic effect. Plasmonic nanostructures are particularly appealing in medical diagnostics and therapeutics owing to their biocompatibility and ease of surface modification. Current work reports a development of -poly-L-lysine modified gold nanorod (PLL-GNR) Raman active system that can be used to target pathogenic bacteria along with rapid monitoring of antimicrobial action from environmental samples. Our result indicates a remarkable change in Raman enhancement factor from 1.49 x 10^4 to 2.17 x 10^7 after adding Salmonella, Bacillus Subtilis and E-Coli bacteria in PLL-GNR colloid, enabling a large optical window to monitor the process of pathogenic action. Antimicrobial assay with PLL-GNR reveals significantly high cytotoxic values of ~ 92 % in E-Coli, ~ 90 % in Bacillus Subtilis and ~ 87 % in Salmonella compared to their respective responses in bare PLL which shows ~37 % in E-Coli, ~32 % in Bacillus Subtilis and ~27 % in Salmonella which proportionally collaborates with change in SERS intensity beyond 10 minutes of incubation time. Major experimental design parameters and possible mechanism which relates unusual plasmonic enhancement and antimicrobial action of PLL-GNR system will be discussed.

P12.22

ENHANCED ENERGY DENSITY IN MULTI-LAYERED PVDF/MICA HETEROSTRUCTURE NANOCOMPOSITES

Sumit Ber, Rukshan Thantirige, Nihar Pradhan

Jackson State University, Jackson, MS

The ongoing demand for energy storage devices with ultra-high storage capacities and improved efficiencies has motivated researchers to explore novel materials and designs to reach beyond current limitations of widely used polymer based capacitors. Incorporating 2D materials based nanofillers within the polymer matrix is one of the strategic ideas to improve the dielectric and energy storage performance in thin film capacitors. In this work, mechanically exfoliated 2DMica nanofillers were incorporated with poly(vinylidene fluoride) (PVDF) polymer to fabricate PVDF-Mica-PVDF (PMP) multilayered heterostructure with single exfoliated Mica layers interfaced and PVDF-Mica-PVDF-Mica-PVDF (PMPMP) bilayer heterostructures where two exfoliated Mica layers interfaced between PVDF layers . An average enhancement of dielectric constants of 100 % and 170 % were calculated for PMP (av ~ 22.9) and PMPMP (av ~ 30.8),respectively compared to that of the pure PVDF (av ~ 11.4) film. The highest discharged energy of PMP and PMPMP nanocomposite films reached to 27.5 J/cm 3 (E = 670 MV/m) and 40 J/cm 3(E = 562 MV/m), compared to 11.2 J/cm 3 (E = 396 MV/m) for pure PVDF. This work reveals that both the integration of 2D material with polymers and the utilization of multilayer thin film design can significantly improve energy storage capabilities for device applications at a largescale.

P12.23

PROPOSED ISO-EFFECT CURVES FOR PROTRACTED RADIATION EXPOSURE

Sanqnetta Givens, John Adjaye, kwabena Agyepong

Alcorn State University, Lorman, MS

If a high intensity radiation source (sometimes referred to as a radiation emitting device or RED) is misplaced or intentionally hidden, it may take considerable time (weeks or months) before the source is discovered. Under these conditions, many persons could be exposed to the source continuously or intermittently over time. Though human biological responses to acute radiation exposure events (i.e., a single large dose delivered in a period of only minutes or hours) and fractionated high dose exposure events (i.e., repeated acute exposures over days, weeks or months as with radiation therapy) are well defined, little research has been done on human biological responses to protracted (or prolonged) exposure events (i.e., exposures delivered over days, weeks or months at variable rates). Clinicians treating these patients, therefore, have no clear cut guidance on how to proceed. For fractionated exposures, radiologists have developed empirical models (iso-effect relationships) over the years to equate fractionated exposures into effective (or equivalent) acute exposures. In the future, such iso-effect relationships could be developed for protracted exposure conditions to aid clinicians treating these patients. In the meantime, the authors propose the application of an iso-effect equation once used for fractionated exposures (the Kirk Equation) to provide a reasonable estimate of the effective whole body acute dose for protracted exposure events.

Friday, March 1, 2024

MORNING

Room: TC 228

9:00 Student Awards & Business Meeting with 2024 Chairperson Elections (Attendance required for award or nomination)

Psychology and Social Sciences

Chair: Shaila Khan
Tougaloo College

Co-Chair: Justin Kelly
Belhaven University

Vice-Chair: Terry Drake
Mississippi College

Vice-Chair: Chinnika Crisler
Tougaloo College

Thursday, February 29, 2024

MORNING

Room TC 228

8:15 Welcome and Opening

O13.01

8:30 HOW WEEKLY CHAPEL MEETINGS IMPACT STRESS IN UNDERGRADUATE STUDENTS

Chase Ezell, Drake Terry

Mississippi College, Clinton, MS

Research has shown that church attendance may affect one's levels of stress and overall mental well-being. However, such research has typically been conducted using a broad sample, with participants varying in age. In addition, existing research with a focus on college students has placed more emphasis on prayer itself than church attendance. As such, the potential effects of church attendance on college students requires further investigation. This is especially true when one considers that the stress-reducing effects seen in other populations may also occur in students. This study investigated a possible relationship between attending weekly school chapel meetings and stress levels, as well as if attending additional church services outside of chapel meetings has any effect on this relationship. It was hypothesized that students who attend chapel would report significantly lower perceived stress levels than those who did not. It was also hypothesized that participants who attend more than one worship service in a week (including weekly chapel meetings) would report significantly lower stress levels than those who do not. To evaluate the possibility of such a relationship, a sample of 54 undergraduate students from a southeastern Christian college in the U.S. completed a survey which contained three items: Cohen's Perceived Stress Scale, a questionnaire where participants indicated their frequency of worship service attendance, and demographic questions. The data obtained was then quantified and evaluated using descriptive statistics. Both hypotheses were evaluated using one-tailed two-sample t-tests with assumed equal variances. Participants who

attended chapel showed no significant difference in perceived stress levels when compared to those who did not, $t(52) = -1.01$, $p = .16$. In addition, there was no significant difference in perceived stress levels between participants who attended more weekly worship services (including chapel) than those who attended fewer weekly worship services, $t(52) = .60$, $p = .28$. Thus, both hypotheses were not supported. The present study did not find a significant difference in stress levels between undergraduate college students who attended weekly chapel meetings and those who did not. However, the door remains open for future research into the effect of religiosity on this demographic. A future study might examine student stress levels over the course of a semester to determine if these results vary as students deal with different stressors. Furthermore, future research might examine the impact of a student's personal faith on perceived stress.

O13.02

8:50 THE IMPACT OF DEPENDENT DISABILITY ON PARENTAL BURNOUT

Aspen Powell, Amy Cox

Belhaven University, Jackson, MS

The purpose of this study is to investigate the impact of caring for a dependent with a disability has parental burnout. Participants will complete a demographics page, the Barthel Index, and the Parental Burnout Assessment. The researchers hypothesize that increased severity of disability will be correlated with parental burnout. The researchers also hypothesize that increased severity in disability will result in higher levels of parental burnout. Data is still being collected at this time; however, the research will be completed by the time of the conference. A new abstract of printing can be provided.

O13.03

9:10 THE RELATIONSHIP BETWEEN THE ANXIETY LEVELS AND EMPLOYMENT STATUS OF HBCU STUDENTS

Ninoshka Munoz-Deleon, Shaila Khan

Tougaloo College, Tougaloo. MS

Strangely, given the enormous body of literature, there is a conspicuous lack of studies examining the relationship between anxiety and work, especially in the period from 2012 to 2022. Many of the studies in this area mainly focus on the stress induced by long careers such as nursing or teaching. None focus on the balance of school and work as a student, which one would think would be an extremely important topic being that students' grades are on the line. Stress, an inescapable aspect of life, permeates our experiences with differing effects. For certain people, its impacts can be positive, encouraging development and adaptability, but for others, it presents a serious risk to their well being. For several individuals traversing the world of academia, college life is the height of stressful surroundings. On the other hand, the world of professional obligations, like having a job, can often pose an equally difficult obstacle. When the two are combined into one lifestyle, some people can maneuver it while others succumb to the pressures of balancing the two. For college students, the perfect situation would be to concentrate completely on their studies without any outside obligations. However, the harsh realities of the outside world quickly overshadow this idea's pragmatism. Although a few lucky individuals may be able to go through school debt-free thanks to scholarships or family financial assistance, a sizable portion of students are forced to look for work. Getting a job becomes more than just a dream for many people; it is their only means of supporting daily needs and important costs like tuition. The luxury of choosing not to work is out of reach for many students. Some college students do not have the financial freedom to attend school without having to work to pay for their expenses. This can lead to them missing certain aspects of their social life and can even lead to a strain on their personal and familial relationships. Such possibilities can cause stress and anxiety to develop, which is not beneficial to their health. The current correlational study addresses this issue by examining the potential correlation between employment status and anxiety symptoms in HBCU students. It was hypothesized that the more a student works, the higher the frequency of anxiety symptoms they experience. Eighty students at a HBCU institution between 18 and 28 years of age were recruited via social media invitation, the College GroupMe school chat, and student emails that will contain a link to the questionnaire located on Microsoft Forms. Participants completed demographics, an employment questionnaire, and the Generalized Anxiety Disorder 7-Item (GAD-7). To test the research hypothesis a correlation coefficient was conducted. This correlational study is important as it will provide information on how significant working while in college is in developing anxiety symptoms. The Research is in progress.

O13.04

9:30 HOW ARE OVERCOMMITMENT AND SATISFACTION WITH LIFE CORRELATED WITH STRESS, ANXIETY, AND DEPRESSION IN COLLEGE STUDENTS?

Elise Lewis

Mississippi College, Clinton, MS

Life as a college student carries with it many challenges and unique experiences that can drastically affect many areas of life for individuals. There is a unique amount of pressure that comes from academic, professional, and social expectations that can be directly or indirectly communicated to those who are living and studying at a university. There have been countless studies conducted on stress, anxiety, and depression symptoms in this age bracket, and considerable evidence points to the fact that students are far more susceptible to mental health issues. It is hypothesized that a large contributing factor to these

issues is the tendency for college students to over-commit. Evidence has led to the possibility that lower satisfaction with life could be a risk factor for over-commitment. To contribute to this research, a study was conducted of 100 or more undergraduate participants at Mississippi College through a Google Survey format. This survey was administered to test the hypothesis that students with lower satisfaction with life will show results for greater overcommitment, anxiety, and depression symptoms in addition to the hypothesis that individuals with high satisfaction with life will show results for lower overcommitment and lower stress, anxiety, and depression. Research suggested that there is a correlation between stress, anxiety, depression, and overcommitment in college students, with the most significant relationship being stress. However, this is not related to overall satisfaction with life nor the level of campus involvement, suggesting that over-commitment may be relative to the specific student.

O13.05

9:50 THE IMPACT OF SOCIETAL AND INTERPERSONAL MATTERING ON JOB SATISFACTION IN RESIDENT ASSISTANTS

Abigail Shook

Belhaven University, Jackson, MS

The purpose of this study is to investigate the impact societal and interpersonal mattering impact job satisfaction on resident assistants, as well as to see if one form of mattering has a more significant impact on job satisfaction. Researchers will gather results from multiple universities across the Southeast. A survey comprised of the Work Mattering Scale, Societal Mattering Scale, and University Mattering Scale will be sent out to the RAs via email. A multiple regression analysis will be used to analyze the data obtained from the research. The research will be completed prior to the conference.

O13.06

10:10 THE EFFECTS OF POOR SLEEPING HABITS ON ANXIETY IN COLLEGE STUDENTS

Kanecia Holmes, Shaila Khan

Tougaloo College, Tougaloo, MS

Inadequate sleep among college students is extremely prevalent. Approximately 70% of college students report insufficient sleep, 50% reporting daytime sleepiness, and more than 30% reporting severe sleep difficulties (Baroni et al., 2014). Research into college student sleeping habits discovered there is a prominent relationship between anxiety levels and inadequate sleep hygiene (Gurera, 2018). A positive relationship has been found between frequent insufficient sleep and depressive/anxiety disorders, and the odds increase to this problem of becoming a sleep disorder when both psychiatric disorders are diagnosed (Boehm et al.,2016). Poor sleeping and their effect on anxiety published between 2012 and 2022 have primarily focused on mental health indicators, such as anxiety and depression that influence one's sleep hygiene. In this proposed study, the effects of poor sleeping habits and anxiety in college students will be examined. It is not known if and to what degree a relationship exists between poor sleeping habits and anxiety in college students in Mississippi. The present study will fill this gap in research by examining if, and to what degree, a relationship exists between poor sleeping habits and anxiety in college students. To establish whether a relationship exists, this study will be conducted using quantitative quasi-experimental methodology. It was hypothesized that poor sleeping habits will cause more anxiety in college students. The independent variable is sleeping habits, and the dependent variable is anxiety. The target population of this study were students who attended college in Mississippi. The participants were with ages ranging from 18-26 years. Students were recruited using convenience sampling via email and social media invitation. Each email as well as social media post contained a link to the Microsoft Forms online survey. Data were collected from eighty (80) participants by administering the Sleep Quality Scale (SQS) (Shahid et al., 2011) and the Anxiety Symptom Questionnaire (ASQ) (2020). To test the research hypothesis a correlation coefficient was conducted. The Research is in progress

O13.07

10:30 HAS THE WATER CRISIS IMPACTED ECONOMIC DEVELOPMENT IN JACKSON, MS: A CROSS INDUSTRY ANALYSIS ON EDUCATION, HOSPITALITY, HEALTHCARE, AND REAL ESTATE?

Sydney Thompson, Ni-Yah Jones

Tougaloo College, Jackson, MS

The state of Mississippi has an overall ranking of 49 (out of 50) based on economic outlook, which is an assessment of eight categories inclusive of infrastructure, education, healthcare, opportunity, and crime to name a few. With a population of nearly three million, Mississippi's median income is just under $25,000 with 32.8% college educated. The state's capital, Jackson, recently experienced three city-wide water outages and multiple boil water notices over the past year that resulted in a state of emergency for months and federal assistance. The economic impact has been burdensome for the local community, which has disproportionately impacted the lower income bracket and rural areas in the city.

The objective of this research is to identify whether the water crisis has impeded on economic development for the city of Jackson. The assessment will be based on an analysis of four industries: education, hospitality, healthcare, and real estate. The research will be meaningful to see how a man-made natural disaster on water shortage in the 21st century can be overcome, but not without aid and assistance. In addition, the research hopes to provide support for policy implications that can mitigate future water outbreaks and increase the resiliency of

communities in the affected areas.

O13.08

10:50 PSYCHOLOGICAL IMPACT OF COASTAL DISASTERS

Nathon Gordon, Henrycia Simmons, Shaila Khan

Tougaloo College, Tougaloo, MS

Experience of a disaster event or expectation of such an event impacts psychological well-being in vulnerable communities. Disaster events in coastal communities, as in others, includes a list of natural and human made events among which hurricanes, flood events and oil spills have largely been highlighted in major discussions around the world. However, psychological impact of expectation (or recent experience) of disaster events that are predominantly attributed to climate change may not have been studied in much detail. In addition to the influence on the highlighted common natural events, climate change is expected to increase the sea level in coastal areas including such areas in Mississippi. This study will focus on the awareness and readiness of coastal communities in dealing with its impact on psychological well-being.

This qualitative study will focus on two objectives. First, the study will evaluate the current knowledge on assessment of vulnerability of coastal communities. Participating students will perform a thorough literature review and prepare a concise summary report on the projected vulnerability of disasters as expected by the climate scientists. They will also summarize the observed disaster events that are recognized as the effect of climate change, and their impacts. Second, the students will explore the relevant psychological impacts on members of coastal communities as observed by mental health professionals in available numerous studies. They will summarize such possible impacts in coastal communities of Mississippi. These findings will be helpful from the perspective of planning and management of disasters. Planning and execution of management practices during all phases of a disaster event (including preparedness, response, recovery and mitigation efforts) are fundamentally determined by the assessment of vulnerability of a community. Attention will be made in considering other contributing social factors influencing this assessment. Previous researchers and disadvantaged community members believe that access to planning and mitigation efforts of the disaster management agencies are not uniformly available across all communities because of social inequalities.

O13.09

11:10 BARRIERS TO SERVICE FOR HOMELESS VETERANS IN MISSISSIPPI: A QUALITATIVE STUDY

John Wolf

Mississippi State University Department of Sociology

To examine the prevalence and use of Veterans Affairs (VA) services by homeless veterans in the state of Mississippi as well as to identify perceived and verifiable barriers to care and service in the region, Methods will include qualitative interviews through partnership with VA institutions throughout the state. This research intends to explore difficulties and hindrances in care/service acquisition specific to veterans in Mississippi. The research could provide a foundation for further specified study with policy implications for both veteran homelessness and broader social welfare policies in the state of Mississippi.

11:30 Panel Discussion—Mental Health Awareness

12:00 General Session

Thursday, February 29, 2024

AFTERNOON

Room TC 228

O13.10

1:00 INVESTIGATING THE ROLE OF EMOTION REGULATION FOLLOWING RACIAL MICROAGGRESSION ON EMOTIONAL EATING IN MINORITY WOMEN

Khadiza Akter, Dr. Tammy Greer

The University of Southern Mississippi, Hattiesburg, MS

How to cope with racial microaggressions and their impact on the eating behavior of women from diverse backgrounds has been a demanding question to answer in recent times. The present studies will explore the role of emotion regulation on emotional eating when facing racial microaggressions. A total of 180 minority female participants from diverse racial backgrounds will participate in this study. A vignette video of racial microaggressions will be used to induce negative emotions. The consumption of different types of food after watching the video will be assessed. The participants will be randomly assigned to four different conditions to test the hypotheses. The study will investigate the consumption of foods in different conditions and differences in emotion regulation strategies between and among diverse groups. The data analysis will be performed by using a series of one-way ANOVA to test group differences, mixed model ANOVA to test the negative and positive effects differences over time and correlation will be used to test the relationship. The results will reveal that emotion regulation strategies during facing racial microaggression will contribute to the change in eating behavior. The findings will help develop interventions for eating disorders in minority women to reduce health disparities.

O13.11

1:20 COVID-19 VACCINATION PERCEPTIONS IN MISSISSIPPI YOUTH

Caroline Doherty, Garrett Jordan, Breanna Wade, Caroline Compretta

University of Mississippi Medical Center, Jackson, MS

Purpose: With high rates of chronic diseases and preventable mortality, Mississippi ranks as one of the least healthy states. Poor health begins early - MS youth engage in risker health behaviors, including higher tobacco use, risky sexual behaviors, and lack of healthy eating and exercising[2]. These poor health behaviors have been highlighted by the COVID-19 pandemic, especially regarding vaccination, as MS COVID-19 vaccination rates are below the national average. Stark differences exist especially among youth and adolescent populations. In Mississippi, 17.8% of children aged 5-11 and 47.7% aged 12-17 have received at least one dose of the COVID-19 vaccine, with 14.3% aged 5-11 and 39.9% aged 12-17 having completed the primary series[1]. Only 0.6% aged 5-11 and 1.5% aged 12-17 have received an updated bivalent booster dose[1]. Nationally, 40.0% of children aged 5-11 and 72.2% aged 12-17 have received at least one dose of the COVID-19 vaccine, with 32.9% of children aged 5-11 and 61.8% aged 12-17 having completed the primary vaccination series[1]. 4.8% aged 5-11 and 7.8% aged 12-17 have received an updated bivalent booster dose[1]. Research is needed to identify facilitators and barriers to COVID-19 vaccination from youth themselves to better understand how to address COVID-19 mistrust and misinformation. **Methods:** In this study, 50 students aged 11-17 who come from diverse, medically underserved communities were surveyed about their perceptions and knowledge regarding COVID-19 health behaviors and vaccinations. To contextualize survey responses, 15 students were interviewed. **Results:** Results show that some students are hesitant to receive COVID-19 vaccines due to concerns about vaccine safety and side effects, and many students endorsed difficulty with transportation to vaccination sites. The most commonly cited reasons students did get a vaccine was to keep their families, their communities, and themselves safe. Adolescents identified doctors, faith leaders, people they go to class with, and the NIH as trusted sources of information about COVID-19. Among social media sites, students trusted Tik Tok and Instagram the most for COVID-19 information. Students also endorsed drastic impacts on their personal lives, including social isolation, dissatisfaction with virtual learning, and death of family members. **Conclusion:** Analyzing youth perceptions of COVID-19 health highlights how social determinants of health and vaccine hesitancy contribute to low COVID-19 vaccination rates in Mississippi, particularly among youth. Identifying specific reasons that Mississippi youth do not obtain the COVID-19 vaccine and practice protective behaviors provides valuable information that can be used to inform future vaccination and public health efforts.

References:

Centers for Disease Control and Prevention (2023, Nov 12). *Trends in Demographic Characteristics of People Receiving COVID-19 Vaccinations in the United States*. https://covid.cdc.gov/covid-data-tracker/#vaccination-demographics-trends

Vargas R, Zhang L. *2015 Mississippi Youth Risk Behavior Survey Report*. Office of Health Data and Research. Mississippi State Department of Health; 2017. Accessed August 15, 2019. https://msdh.ms.gov/msdhsite/_static/resources/7429.pdf

O13.12

1:40 THREADS OF FEAR: MAPPING COVID-19 ANXIETY AND DEPRESSION IN GRADUATE STUDENTS

Shiza Shahid, Amina Shahid[2]

[1]University Of Southern Mississippi, Hattiesburg, MS, [2]University of the Punjab

This study aimed to assess the levels of depression, stress, and anxiety experienced by graduate students during the pandemic lockdown attributable to the looming threat of COVID-19. A survey encompassing 120 graduates, comprising 44% females and 56% males aged between 20 and 38, was conducted. Among the participants, 68% were recruited from public universities, while 32% were from private institutions. The study revealed that the average levels of depression, stress, and anxiety surpassed the benchmarks considered normal. Notably, a statistically significant positive relationship was observed between the fear of COVID-19 and the experiences of depression, stress, and anxiety. Anxiety and stress appeared to act as mediating factors in the intertwined relationship between the dread of COVID-19 and depression. Furthermore, there were no significant differences between male and female participants concerning their levels of fear regarding COVID-19 and subsequent experiences of depression.

These findings underscore the pivotal role played by fear, stress, and anxiety in triggering depressive symptoms, emphasizing their importance in the design of programs aimed at preventing and treating this disorder. The study suggests general strategies to mitigate stress and the fear associated with COVID-19 while also advocating for tailored programs specifically addressing graduate-level anxiety regulation and mitigation.

O13.13

2:10 LIKES, SHARES, AND SNACKS: DECODING SOCIAL MEDIA'S IMPACT ON CHILD NUTRITION

Martha Ravola, Babu George

Alcorn State University, Lorman, MS

The interplay between social media and children's nutritional choices is an emerging field of study with profound implications for public health, dietary education, and marketing. Recent evidence suggests that social media platforms significantly sway children's food preferences, often towards unhealthy eating patterns. This is particularly evident with the proliferation of food-related content from social media influencers, where exposure to high-sugar beverage and snack promotions is rampant. The duality of social media is noteworthy; platforms such as

YouTube, Instagram, and Facebook can serve as vehicles for both the propagation of fast-food advertising and the promotion of healthy dietary behaviors.

This study seeks to delineate the complex relationship between social media content and children's eating habits. It is critical to address that children under the age of 12 are especially susceptible to advertising due to their developing cognitive abilities to discern marketing intentions. This vulnerability is nuanced by gender, race, income, family status, etc.

Our inquiry will pivot around the following research questions:

1. What is the nature of social media influencers' impact on children's propensity to consume unhealthy foods?
2. How do social media platforms differentially influence the promotion of healthy versus unhealthy eating habits?
3. How do social media food advertisements differentially impact different demographic segments of children, and what factors contribute to this disparity?
4. What are the potential remedial measures that contribute to healthy nutritional habits while not penalizing legitimate business interests?

The first stage of this study involves an extensive literature review to better define the research problems and develop testable hypotheses. This presentation is focused on the same. In the next phase, we will test the hypotheses with the primary data that will be gathered from elementary school aged children in the State of Mississippi.

In investigating these dimensions, the objective is to garner insights that can inform the development of targeted educational strategies. These strategies aim to leverage social media's influential capacity to foster healthier eating habits among children. This involves the creation of interventions designed to enhance children's critical engagement with digital food marketing, equipping them with the skills to make informed nutritional choices.

The anticipated outcome is a set of actionable recommendations that can be integrated into educational curricula, public health initiatives, and responsible marketing, thereby leveraging social media's ubiquitous presence as a positive force in shaping the dietary landscape of the younger generation. Certain additional dimensions that are essential to this study include the role of parental mediation in children's social media interactions, the impact of socio-economic factors on the vulnerability to digital food marketing, and the potential of collaborative efforts between policymakers, educators, technology developers, and advertisers to establish a healthier food marketing ecosystem on social media.

O13.14

2:30 CASE STUDIES IN INDIAN CONSTRUCTION SECTOR: ROADMAP TO SAFETY PRACTICES IMPLEMENTATION

Priyadarshini Dasgupta, Derrion Wilson, Debarshi Roy

Southeastern Louisiana University, Alcorn State University. Lorman, MS

Construction work is dynamic and production oriented. The work is usually fast paced, supervised and safety usually runs on every aspect of the job. An assistive device in construction is meant to make the job easier in construction. However, the tools, even if it is a laboratory tested one that did show positive results need to be accepted by the workers. The fact that a tool has shown positive results in the laboratory is called a tool that has high efficacy. The fact that workers will accept and adopt an assistive device for their everyday job is called effectiveness of that tool in construction sites. The author's recent visits to India have given her a chance to visit several construction sites in India. Overall, the workers were observed as not wearing any hard hats or steel toe boots or any other personal protective equipment, in majority of the sites. This is due to the fact that although safe practices are recommended by the respective authorities but are not implemented as a compliance. For example, they use scaffolds made up of bamboo shoots that do not look very stable. They step on the scaffold levels with bare foot which is similar to riding a tree. Accidents are common in such sites due to lack of regulations and implications; fatalities are often not recorded due to lack of compliance and safety inspections by the authorities. Only handful of organizations visited have shown good and safe working practices for regular construction practices. Through this research the authors are trying to find out whether participatory meetings would be a good example of educating the worker about good and safe practices in the construction. In these meetings, the workers would be shown good examples of both efficacious and effective tools and personal protective equipment already used in construction.

O13.15

2:50 GLOBAL POLICY ISSUE: NATURAL, MANMADE DISASTER, AND VULNERABILITY OF CHILDREN

Meherun Laiju

Tougaloo College, Tougaloo, MS

Children are most vulnerable when a country is engaged in conflict/war, during natural disasters, and in post disaster situations. Natural disasters and war usually create an immediate disruption of state and civil society. The chaotic environment attracts criminals to prey on vulnerable victims, especially children. The vulnerability increases when children are separated from their families by being unaccompanied, orphaned, or displaced. This study is an attempt to document the vulnerability of children during

and after any type of disaster. From that discussion, it will be clear why child protection should be an integral part of contingency planning and why it should start in the emergency phase of disaster response. This meta-analysis. used a subset of published research on natural disasters and human trafficking. Special emphasis was placed on children. Articles were collected using key terms "Natural Disaster" "Child Displacement" and "Child Trafficking" through the SOCINDEX (Social Science Citation index) and academic search premiere (EBSCO Host) databases with publication dates ranging from 2017 to 2022. A fixed-effect framework was used to analyze the collected articles.

3:10 Business Meeting

Thursday, February 29, 2024

EVENING

3:30 DODGEN LECTURE /AWARDS CEREMONY

THEATER

5:00 GENERAL POSTER SESSION

(immediately following Dodgen Event)

P13.01

A QUANTITATIVE ANALYSIS OF THE PREDICTORS OF DEPRESSION STIGMA AND HELP-SEEKING ATTITUDES

Davin Francis, Pamela Banks

Jackson State University, Jackson, MS

The experience of a depressive episode in the adult population is the highest among individuals aged 18 to 25 in the United States. Moreover, it has been documented that there is a growing mental health crisis on college campuses. One significant contributor to this issue is the stigma that prevents students from seeking help for their depressive symptoms. Hence, one aim of the current study was to ascertain whether there was a relationship between depression stigma and help-seeking attitudes among a sample of students at a college in the southern United States. A second aim was to predict depression stigma and help-seeking attitudes using sociodemographic variables such as gender, age, and familiarity with depression. The study comprised 162 undergraduate students aged 18 to 25 years. Preliminary findings showed that males produced significantly higher overall and personal stigma scores. The results demonstrated a weak negative correlation between depression stigma and help-seeking attitudes. Additionally, one multiple regression model found that being male and 22-25 years old were statistically significant predictors of personal depression stigma. Another multiple regression model found that for this sample, being 22-25 years old and not having a family member with depression were significant predictors of perceived depression stigma. Regarding help-seeking attitudes, the results demonstrated that being female was a significant predictor. Additionally, personal and perceived stigma were significant predictors of help-seeking attitudes. The finding on the relationship between depression stigma and help-seeking attitudes suggests the need for more research and evidence-based interventions to be implemented among this population.

P13.02

THERAPY DOGS AND THEIR EFFECTS ON ANXIETY AND DEPRESSION

Rebecca Pyburn

Mississippi College, Clinton MS

Dogs are known as man's best friend for many reasons and have proven themselves to be some of the most loyal beings over the course of time. Many speak of their dogs helping with anxiety and "healing the soul" but how do we know that the bond between humans and animals leads to healing in a therapy setting? Within the college setting, therapy dogs have been used in the form of "study breaks" and other anti-stress events to improve overall campus well-being. However, little empirical research has been published on the effects of therapy dogs within these quick interactions on college campuses. In this study, we examined whether interacting with therapy dogs in the form of five to ten-minute sessions has a positive effect on those with anxiety and depression. In a sample of 125 undergraduate students, we examined their levels of anxiety and depression before petting the dogs and then surveyed whether or not interacting with a therapy dog changed their emotional state afterward. Findings showed that of those who scored normal amounts of anxiety 93.94% reported feeling better. Of those who scored borderline case levels of anxiety, 89.74% reported feeling better. Finally, of those who scored abnormal or case levels of anxiety, 83.02% reported feeling better. Within the depression findings, of the participants who scored normal levels of depression, 82.69% reported feeling better. Within the borderline case participants, 86.67% reported feeling better. Lastly, of those who scored abnormal or case levels of depression, 66.67% reported feeling better. These findings show that interacting with a therapy dog for a brief period has an overall positive response. With anxiety, every level had an overwhelmingly positive response to the therapy dogs. Therapy dogs appeared to have less of an overwhelming effect on depression but continued to show mostly positive responses. This study suggests that therapy dogs have a positive impact on college students by reducing anxiety and depression levels and should be viewed as an effective campus mental health tool.

P13.03

HOW ARE OVERCOMMITMENT AND SATISFACTION WITH LIFE CORRELATED WITH STRESS, ANXIETY, AND DEPRESSION IN COLLEGE STUDENTS?

Elise Lewis

Mississippi College, Clinton, MS

Life as a college student carries with it many challenges and unique experiences that can drastically affect many areas of life for individuals. There is a unique amount of pressure that comes from academic, professional, and social expectations that can be directly or indirectly communicated to those who are living and studying at a university. There have been countless studies conducted on stress, anxiety, and depression symptoms in this age bracket, and considerable evidence points to the fact that students are far more susceptible to mental health issues. It is hypothesized that a large contributing factor to these issues is the tendency for college students to over-commit. Evidence has led to the possibility that lower satisfaction with life could be a risk factor for over-commitment. To contribute to this research, a study was conducted of 100 or more undergraduate participants at Mississippi College through a Google Survey format. This survey was administered to test the hypothesis that students with lower satisfaction with life will show results for greater overcommitment, anxiety, and depression symptoms in addition to the hypothesis that individuals with high satisfaction with life will show results for lower overcommitment and lower stress, anxiety, and depression. Research suggested that there is a correlation between stress, anxiety, depression, and overcommitment in college students, with the most significant relationship being stress. However, this is not related to overall satisfaction with life nor the level of campus involvement, suggesting that over-commitment may be relative to the specific student.

P13.04

THE IMPACT OF SOCIETAL AND INTERPERSONAL MATTERING ON JOB SATISFACTION IN RESIDENT ASSISTANTS

Abigail Shook

Belhaven University, Jackson, MS

The purpose of this study is to investigate the impact societal and interpersonal mattering impact job satisfaction on resident assistants, as well as to see if one form of mattering has a more significant impact on job satisfaction. Researchers will gather results from multiple universities across the Southeast. A survey comprised of the Work Mattering Scale, Societal Mattering Scale, and University Mattering Scale will be sent out to the RAs via email. A multiple regression analysis will be used to analyze the data obtained from the research. The research will be completed prior to the conference.

P13.05

THE IMPACT OF NON-MEDIA MULTITASKING ON WORKING MEMORY

Andrew Sinclair

Belhaven University, Jackson, MS

The purpose of this study is to examine the impact of non-media multitasking on working memory in college students. We hypothesize that non-media multitasking will have a negative impact on working memory. Our project aims to administer the Operation Span Task (OSPAN) to participants. The study will utilize both an experimental and a control group. Data collection is still being conducted; however, the research will be complete by the time of the conference. An updated abstract will be submitted.

P13.06

THE IMPACT OF DEPENDENT DISABILITY ON PARENTAL BURNOUT

Aspen Powell, Amy Cox

Belhaven University, Jackson, MS

The purpose of this study is to investigate the impact of caring for a dependent with a disability has parental burnout. Participants will complete a demographics page, the Barthel Index, and the Parental Burnout Assessment. The researchers hypothesize that increased severity of disability will be correlated with parental burnout. The researchers also hypothesize that increased severity in disability will result in higher levels of parental burnout. Data is still being collected at this time; however, the research will be completed by the time of the conference. A new abstract of printing can be provided.

P13.07

COVID-19 VACCINATION PERCEPTIONS IN MISSISSIPPI YOUTH

Caroline Doherty, Garrett Jordan, Breanna Wade, Caroline Compretta

University of Mississippi Medical Center, Jackson, MS

Purpose: With high rates of chronic diseases and preventable mortality, Mississippi ranks as one of the least healthy states. Poor health begins early - MS youth engage in risker health behaviors, including higher tobacco use, risky sexual behaviors, and lack of healthy eating and exercising[2]. These poor health behaviors have been highlighted by the COVID-19 pandemic, especially regarding vaccination, as MS COVID-19 vaccination rates are below the national average. Stark differences exist especially among youth and adolescent populations. In Mississippi, 17.8% of children aged 5-11 and 47.7% aged 12-17 have received at least one dose of the COVID-19 vaccine, with 14.3% aged 5-11 and 39.9% aged 12-17 having completed the primary series[1]. Only 0.6% aged 5-11 and 1.5% aged 12-17 have received an updated bivalent booster dose[1]. Nationally, 40.0% of children aged 5-11 and 72.2% aged 12-17 have received at least one dose of the COVID-19 vaccine, with 32.9% of children aged 5-11 and 61.8% aged 12-17 having completed the primary vaccination series[1]. 4.8% aged 5-11 and 7.8% aged 12-17 have received an updated bivalent booster dose[1]. Research is needed to identify facilitators and barriers to COVID-19 vaccination from youth themselves to better understand how to address COVID-19 mistrust and misinformation. **Methods:** In this study, 50 students aged 11-17 who come from diverse, medically underserved communities were

surveyed about their perceptions and knowledge regarding COVID-19 health behaviors and vaccinations. To contextualize survey responses, 15 students were interviewed. **Results:** Results show that some students are hesitant to receive COVID-19 vaccines due to concerns about vaccine safety and side effects, and many students endorsed difficulty with transportation to vaccination sites. The most commonly cited reasons students did get a vaccine was to keep their families, their communities, and themselves safe. Adolescents identified doctors, faith leaders, people they go to class with, and the NIH as trusted sources of information about COVID-19. Among social media sites, students trusted Tik Tok and Instagram the most for COVID-19 information. Students also endorsed drastic impacts on their personal lives, including social isolation, dissatisfaction with virtual learning, and death of family members. **Conclusion:** Analyzing youth perceptions of COVID-19 health highlights how social determinants of health and vaccine hesitancy contribute to low COVID-19 vaccination rates in Mississippi, particularly among youth. Identifying specific reasons that Mississippi youth do not obtain the COVID-19 vaccine and practice protective behaviors provides valuable information that can be used to inform future vaccination and public health efforts.

P13.08

ADOLESCENTS WITH SELF-HARM HISTORIES REPORT DIFFERENT PATTERNS OF SUBSTANCE USE CONSEQUENCES

S.R. Barbin, C. C. O'Dell, N.E. Charles, C.T. Barry

The University of Southern Mississippi, Hattiesburg, MS

During adolescence, young people undergo a host of physical, emotional, and social changes that may make them more vulnerable to negative outcomes and cause consequences in their current environment (Gupta et al., 2019). Substance misuse and self-harm are increasingly common in adolescence as young people begin to engage in more risky behaviors (Bailey et al., 2017; Kahn et al., 2019). Self-harm is defined as a deliberate intent to hurt oneself without suicidal intent. Substance misuse includes the harmful excessive use of substances such as alcohol, illicit drugs, prescription drugs, and marijuana (Atzendorf et al., 2019). Understanding links between substance use consequences and self-harm may inform prevention and intervention measures among young people (Slee et al., 2008). Previous studies have established a connection between substance misuse and self-harm (Wu et al., 2004; Swahn et al., 2012), with some research arguing that substance misuse may also be classified as a form of self-harm behavior (Laukkanen, et al., 2009). This study aims to examine differences in alcohol, marijuana, and other drug-related consequences among adolescents who do and do not report non-suicidal self-injury thoughts and behaviors. This study draws from a sample of 239 adolescents (mean age = 16.7, 82.2% male, 63.5% White) who participated in a residential-style boot camp in the Southeastern United States. Self-harm was assessed through questions asking if the respondent had ever had thoughts of or actually engaged in purposely hurting themselves without the intent to die. Substance use consequences were assessed through questions asking whether use of substances had impacted various domains of functioning, and a binary composite score was used to denote individuals who had and had not experienced substance use consequences. 23.8% (n=57) of the sample reported thoughts of self-harm and 20% (n=47) reported engaging in self-harm behaviors at some point in their lives. Among those reporting consequences, 30.6% (n=83) reported having experienced alcohol-related consequences, 29.2% (n=79) reported marijuana-related consequences, and 23.2% (n=63) reported other drug-related consequences. Chi-square tests of independence were performed to evaluate relationships between self-harm thoughts and behaviors and alcohol, marijuana, and other drug-related consequences. Adolescents who reported having alcohol-related consequences were more likely to have had thoughts of self-harm ($X2[1, N= 235] = 6.490$, $p = .011$) and to have actually engaged in self-harm behaviors ($X2[1, N= 235] = 12.399$, $p < .001$). Alternatively, adolescents who reported having marijuana-related consequences and adolescents who reported other drug-related consequences were not more likely to have had self-harm thoughts or to have actually engaged in self-harm behaviors. Overall, these results suggest that problematic consequences of alcohol use may be particularly related to risk for other forms of self-injury. These results may have implications for treatment of substance and self-harm behaviors in adolescents. A more thorough discussion of these results, limitations, and future directions will be discussed.

P13.09

STRATEGIES FOR DISASTER RECOVERY FOR SMALL BUSINESS

Kristen Hobson, Adarius Hyde, Donnayla Brown

Tougaloo College, Tougaloo, MS

The city of Jackson, Mississippi which has over 150,000 residents has experienced 3 city wide water outages and boil water advisories in the last 2 years. The water issues have lasted for weeks each time causing widespread closures of schools, colleges, and businesses. The most recent water outage in 2022 lasted 7 weeks and led to the state distributing over 12 million bottles of water and the Governor issuing a state of emergency that last over three months. The water outages and boil water notices have disproportionately affected the city's small business owners which typically do not have the financial resources to remain closed for extended periods of time.

The purpose of this qualitative, multiple case study is to explore the financial strategies small business owners used for successful business recovery following a human-made disaster, such as the Jackson, Mississippi water crisis. The targeted population consists of small businesses that used

financial strategies which resulted in successful business recovery after the water crisis and whose businesses remain sustainable in the city of Jackson, Mississippi. Restoring and strengthening the resilience of small businesses could provide economic opportunities for individuals and families who wish to return and rebuild their neighborhoods and their communities after a disaster. Additionally, the vendors who supply small businesses with goods and services could also benefit from their survival.

P13.10

THOUGHT PROCESSES AND EMOTIONAL REGULATION

Garrett Posey

Mississippi College, Clinton, MS

This research is about the correlation between the mental health of college students and which emotional regulation (ER) strategies are used depending on where one falls on the MHI-38, which would either show a higher rate of psychology wellbeing or psychological distress. The falling on this scale would determine the amount of positive thought-process or negative thought-process he or she experiences. There are six ER strategies (Distraction, Cognitive Reappraisal, Rumination, Relaxation, Expressive Suppression, and Expressive Engagement) one can use subconsciously or consciously throughout his or her day. I'm attempting to see which strategies are used by those who experience more positive thought-processes versus those who experience more negative thought-processes. There is not a lot of research on three out of the six types of ER strategies, and I think that if we can discern who uses what, then more research on how to effectively use these strategies could be applied.

P13.11

EXPERIENCES OF DÉJÀ-RÊVÉ IN THE USA

J. McGee

Mississippi College, Clinton, MS

The perceived experience of dreaming about an event that seems to take place at a later time in life - a phenomenon known as déjà-rêvé - has been subject to few studies; there are only two major studies on the subject itself that have taken place recently, neither of which were done in the USA. Despite this, recent studies suggest that it is experienced by the majority of people. Currently, though, there is little research into what causes this phenomenon or if it is even a real experience. The purpose of this present study is to consider how many people within the United States and its territories believe they have experienced déjà-rêvé and if there are any factors that may influence its perceived happenings, such as sex, religious affiliation, age, and more. In order to do so, a convenience sample of 52 participants was collected and surveyed via a demographic questionnaire, questions about their sleep quality and attitude towards dreams, a basic personality inventory, and questions about their perception of déjà-rêvé experiences. Initial findings of this study suggest that the majority of Americans believe in déjà-rêvé and feel that they have had experiences with it, but further research is still needed to fully assess the questions presented.

P13.12

COMPARATIVE ANALYSIS OF THE HEALTHCARE FACILITIES OF THE MISSISSIPPI DELTA AND MISSISSIPPI GULF COAST REGIONS

Renia Hartfield, Meherun Laiju, Diva Melvin

Tougaloo College, Tougaloo, MS

The state of Mississippi is currently ranked forty-fifth of fifty states as it relates to healthcare access. Along with this healthcare access ranking, the state ranks last in the quality of healthcare. Although the ranking alone are causes for concern and public policy improvement, the state of environmental pressures and climate changes also impact the access and quality of the healthcare in Mississippi. Natural disasters such as lethal thunderstorms, tornadoes, and hurricanes can trigger a healthcare emergency. While natural disasters such as tornadoes and hurricanes can be region specific, the Mississippi Delta and the Mississippi Gulf Coast, respectively, the other regions are not immune to the climate activities. This analysis was conducted to collect three different measures of healthcare access and healthcare quality - one) the number of healthcare facilities within the Mississippi Delta and Mississippi Gulf Coast regions within a five-year period and reasons for the changes in number, two) the number of regional especially climatic activities within the regions within a five-year period and how these climatic activities put stress on the healthcare facilities located in the region, and three) how these regions compare to the surrounding regions facilities and the facilities management of healthcare after similar climatic activities. Using open sources research, data was collected. Our preliminary findings show that there is a steady and significant decrease in the number of healthcare facilities within the Mississippi Delta region. While there is a growing number of healthcare facilities in the Mississippi Gulf Coast, healthcare facilities are still some difficulties is continuing services in maintaining services during a climate crisis. In comparison to other states and regions, the Mississippi Delta and Coastal regions rank is comparable in access and quality of healthcare. Continued research must be completed to identify potential policy changes and social determinants of health that could be targeted to improve healthcare access and quality rankings.

P13.13

THE EFFECTS OF COVID-19 ON THE MENTAL HEALTH OF COMMUNITY MEMBERS.

Antoinette Thigpen

Tougaloo College, Tougaloo, Mississippi

Research has shown that COVID-19 had more long-term effects besides the physical aspect. Depression and anxiety are one of the lingering results, stimming from forced

isolation from family and friends, as well as forced unemployment.The All of Us research program provided data from surveys that participants completed. There was a total of 100,220 participants who were asked 191 COVID-19 related questions. The survey results were that between the months of May and December 2020 around 30-32% of the participants felt down, depressed, or hopeless for several days throughout the past 2 weeks. 4 percent of the participants experienced these effects nearly every day. These results show a correlation between increases in anxiety and depression throughout the first year of COVID-19. COVID-19 increased fears of family members and individuals worrying about getting sick, as a result, increasing stress levels. 11,300 of those who experienced several day symptoms were between the ages of 60-69, while 3,220 were between ages 18-19. This developed a correlation between middle-aged individuals having more anxiety than some of the younger participants. For many, COVID-19 increased fears of not being in control of their own lives anymore. The surveys conducted by the All of Us research program provided data that supports the statement that many people began to worry about life, and as a result it took a negative toll on their mental well-being, which also could have led to a decrease in physical health.

P13.14

HOW LACK OF SLEEP AFFECTS ACADEMIC PERFORMANCE AND ATTENTIVENESS

Julia Dunn

Mississippi College, Clinton, MS

Much research has been done throughout the years that show how sleep affects a person's overallhealth. Research has provided evidence to support that during sleep, the human mind processes events and stores memories, preparing itself for the next day. Based on the research that has been done, guidelines have been established for the number of hours of adequate sleep that are recommended for a person throughout the different ages of life. Research among college students has shown that the amount of time that students spend sleeping affect their academic performance and attentiveness in class. Research has involved both undergraduate and graduate students. In addition, research has involved students with and without sleep disorders and attention deficit hyperactivity disorder. This study investigated the relationship between sleep and academic performance and attentiveness among college undergraduate students. To evaluate the possibility of such a relationship, a sample of 52 undergraduate students from Mississippi College in Clinton, Mississippi, voluntarily completed a survey consisting of the Sleep Quality Scale assessment, the Pittsburgh Sleep Quality Index, and a demographic questionnaire. The data was quantified and evaluated using descriptive statistics and a series of t-tests. The data revealed a significant correlation between quality and quantity of sleep and academic performance and attentiveness in class.

P13.15

ANALYZING THE EFFECTS OF STUBBLE BURNING IN THE STATES OF PUNJAB AND HARYANA, INDIA, ON THE AIR QUALITY IN NORTHERN INDIA

She'Kyra Paige, Santanu Banerjee

Tougaloo College, Tougaloo, MS

Stubble burning is the deliberate burning of agricultural residue left in the fields following harvest season. Farmers frequently use this method to clear their fields fast and affordably and get them ready for the next planting season. Stubble burning is prevalent in areas with extensive crop cultivation, such as those growing sugarcane, wheat, and rice. In India, where rice and wheat are widely grown, stubble burning is a major problem, especially in the states of Punjab and Haryana. In this region, burning stubble is a quick and simple method of clearing land, but it has a number of detrimental effects which include increasing pollution over a wide region of northern India, causing respiratory and prenatal health diseases for a vast population, and disrupting the ecosystem. Farmers frequently turn to burning agricultural residue—including stubble—as a fast and low-cost way to prepare fields for the next planting season after harvest.

Particulate matter (PM) refers to tiny particles or droplets in the air that can be composed of various materials, including dust, dirt, soot, and liquid droplets. These particles come in different sizes, and they are categorized based on their aerodynamic diameter. The two main categories of particulate matter are PM10 and PM2.5. PM10 (Particulate Matter with a diameter of 10 micrometers or less): These are inhalable particles, and they include both fine and coarse particles. PM10 particles can penetrate into the respiratory system but are generally filtered out by the nose and throat. PM2.5 (Particulate Matter with a diameter of 2.5 micrometers or less): These are fine particles that are smaller and can penetrate deeper into the lungs. PM2.5 particles are of particular concern due to their ability to cause respiratory and cardiovascular problems. In India, high levels of particulate matter, especially PM2.5, have been a significant environmental and public health concern. In this study, we focus on using secondary publicly available data and satellite images to study the effect of stubble burning on air quality (Air Quality Index (AQI), PM 10, PM 2.5, other) in northern India, including the heavily populated Indian capital, New Delhi. We also look at respiratory diseases and pre-natal development impact of stubble burning, and also their ecological impact. We will also report available alternatives or solutions that can substantially reduce or eliminate the environmental scourge of stubble burning in northern India.

P13.16

THE EFFECT OF THE BLACK INK RED INK TESTING METHOD ON ANXIETY LEVELS, TEST PERFORMANCE, AND NOTE-TAKING BEHAVIOR AMONG COLLEGE STUDENTS

Peyton Murphy, Lin Agler, Shelley Bentz

The University of Southern Mississippi, Long Beach, MS

Throughout universities worldwide, formal testing is the primary assessment method for gauging students' learning outcomes. Unfortunately, over the years, test anxiety has become an increasingly urgent issue as it has contributed greatly to decreased academic performance and mental well-being of students (Chen, 2004; Davis, DiStefano, & Schutz, 2008). In addition, students tend to show even greater test anxiety in STEM-related courses (Magula, 2019; Vakili & Pourrazavy, 2017). Past research has examined different factors that may affect students' test anxiety, including methods of testing. A novel testing method called "Black Ink Red Ink" (BIRI), proposed by Rodgers and Rodgers (2011), utilizes both the traditional format of testing (i.e., closed book) while incorporating an open book portion, allowing students an opportunity to answer additional test questions. Specifically, this testing method allows students to have two chances to answer test questions. In the first round, they will complete all the questions they know the answers to with a black ink pen. After the first round, they will be allowed to use the handwritten notes they took during class sessions to complete the remaining test questions using a red ink pen. In other words, students get a second chance to provide answers to questions they failed to answer in Round 1 using their own notes to receive up to half credit. Some studies have shown that this method seems to reduce test anxiety and accelerate academic performance (Rodgers & Rodgers 2011), but the available evidence is still limited.

As the BIRI method has not been studied extensively, the purpose of the present study is to examine the effect of the hybrid BIRI method on student test performance in STEM-related courses. The goal of the proposed research project is threefolds: (1) to investigate the BIRI testing method to determine if this method helps decrease students' test anxiety; (2) to examine if the BIRI method increases students' test scores; and (3) if the BIRI method encourages students to take more notes during class sessions. Students in a Biology course (N = 25) will be used for this study. Students will receive a weekly in-class test for a total of 12 weeks and will be tested using 3 weeks of no BIRI method vs. 3 weeks of the BIRI method in rotation (i.e., an ABAB design). The significance of the present study can potentially benefit the academic future of many students if the BIRI testing method is shown to alleviate anxiety and enhance performance outcomes.

The researchers hypothesize that the BIRI testing method will result in higher test scores, lower self-reported test anxiety, and more note-taking behavior when the BIRI method is implemented. Data collection will begin in the first week of the Spring semester of 2024 and will continue until the end of the semester. Although data collection for the study will not be completed when the Mississippi Academy of Sciences annual conference takes place, preliminary data will be processed and discussed.

Science Education

Chair: Lydia Lytal

University of Mississippi

Co-Chair: Sarah Lalk

Mississippi State University

Vice-Chair: Christopher Jurgenson

Delta State University

Thursday, February 29, 2024

MORNING

Room Union D

8:15 Welcome and Opening

O14.01

8:30 STUDENT REACTIONS TO THE PHENOMENON OF CLIMATE CHANGE

Johnny Mattox[1]

[1]Blue Mountain Christian University, Blue Mountain, MS

The microbiology students at Blue Mountain Christian University were given a questionnaire asking their opinions about the phenomenon of climate change. 100 percent of those questioned believed that climate change was a real occurrence. Most of their thoughts on why it was occurring included the destruction of the tropical rain forests resulting in increased accumulation of greenhouse gases as well as industrial pollution. As evidence for the occurrence of climate change, they listed increased melting of ice in Antarctica and glaciers in other areas, and increase in the occurrence of natural disasters. When asked how humans might help decrease the occurrence of climate change, the students suggested ending the destruction of rain forests, limiting the use of fossil fuels, and decreasing the production of industrial wastes. Their thoughts on when climate change was originally initiated included the beginning of the industrial revolution, when rain forests began to be destroyed at an increased rate, the increased use of natural resources, and increased production of industrial pollutants.

O14.02

8:50 SCIENCE SATURDAY: SPARKING STEM INTEREST IN UNDERREPRESENTED GROUPS THROUGH WEEKEND FUN

Latoyia Downs[1], Shahid Karim[1]

[1]The University of Southern Mississippi, Hattiesburg, MS

Science Saturday" is an outreach program that focuses on introducing science experimentation to disadvantaged youth to spark interest in STEM subjects. Research and surveys show that black scientists are underrepresented at every education level. While there is high diversity amongst insects, there is very little diversity in the entomologists that study them. Our Science Saturday outreach program occurs once a month at a community center where children come and have an interactive science lesson. Our two main objectives are to provide educational lessons about STEM concepts using insects and hands-on experiments and to shine a light on STEM career paths. We use insects and arthropods in our outreach in hopes of encouraging interest in entomology careers amongst the diverse cohort of students. Our goals for this outreach program are to positively impact the youth by building relationships in the community, encouraging the students to think critically, and gaining the ability to deal with real-life challenges. We intentionally use scientific facts to debunk myths about insects and arthropods and show that "bugs" are interesting and cool creatures. Since the beginning of our program, attendance has increased by over 100%, and word has spread, increasing community involvement with the program. We hope to improve attitudes toward science and to have a long-term impact by encouraging scientific careers by using this hands-on scientific approach in a classRoom-like setting.

O14.03

9:10 SUPPORTING TEACHERS THROUGH CHANGE

Lydia Lytal[1]

[1]*The University of Mississippi, Oxford, MS*

In 2018, Mississippi introduced new science standards to K-12 public schools throughout the state. These College and Career Readiness Standards for science made a significant shift in how standards were written and the expectations of students in learning them. With the three-dimensional design, teachers were required to change their pedagogy in order to implement the standards with fidelity. Now, five years later, this study was conducted to provide insight in experiences of high school teachers in Mississippi as they transitioned to the new standards. It was concluded that to implement standards effectively, teachers needed training, support, resources, and time for reflection.

O14.04

9:30 ASSESSMENT OF SCIENCE IDENTITY AMONG JROTC CADETS WITHIN A ONE-WEEK STEM RESIDENTIAL SLUMMER CAMP

Renee Clary[1], *Caleb Carlton*[2], *Mark Powers*[1]

[1]*Department of Geosciences, Mississippi State University,* [2]*Great Lakes Stewardship Initiative, Michigan*

From 2016 through 2019, the leaderSTATE STEM program hosted up to 360 public school JROTC cadets annually in six, one-week summer camps on a university campus. The cadets, typically rising juniors from three southern states, participated in multiple activities, including a fitness regimen, leadership development, and a STEM overview that focused on geosciences. Both scientific content and science identities of the attending cadets were assessed in pre- and post-camp surveys. The Test of Science Related Attitudes (TOSRA), implemented by the previous STEM partner, was continued as an assessment of scientific attitude. However, chi square analysis ($p=0.05$) revealed only sporadic significance from pre- to post-camp, without any discernible trend. Beginning with 2018 summer camps, cadets also participated in pre- and post- Draw-a-Scientist (DAST). Cadet drawings were analyzed with the Draw-a-Scientist Checklist (DAST-C) as well as a new Draw-a-Scientist Growth (DAST-G) developed by the second author to measure cadets' development in scientific identities. DAST-C analysis revealed significant reduction of cadets' scientific stereotypes ($p<0.05$) in all camp cycles in 2018 ($n=6$) and 2019 ($n=6$), while DAST-G analysis revealed significant gains ($p<0.05$) in cadets' understanding of scientific inclusivity in 11 of the 12 cycles. Although leaderSTATE STEM was postponed during COVID-19, the program returned in summer 2023. The SEIVEA instrument (Science identities, Expectations of success in science, Values of science, and Environmental attitudes; Aghekyan 2019) has now replaced the TOSRA, through the DAST assessments remain.

O14.05

9:50 THE PERCEPTIONS OF FACULTY AND STUDENTS REGARDING ARTIFICIAL INTELLIGENCE USAGE IN EDUCATION AT AN ACADEMIC MEDICAL CENTER

Xiaoshan Gordy[1], *Angela Burrell*[1], *Britney Reulet*[1], *Jacob Daniels*[1], *Kristy Cole*[1], *Robin Thompson*[1], *Driscoll DeVaul*[1], *John Garner*[1]

[1]*University of Mississippi Medical Center, Jackson, MS*

Background: Artificial intelligence has taken center stage in the education sector, particularly following the emergence of OpenAI. It is essential for educators to recognize that AI tools are becoming an integral part of education, akin to the transformative inventions of the past century like computers and the Internet. Objective: The current study aimed to gain insights into how faculty and students at the University of Mississippi Medical Center perceive AI usage in education. Methods: This study utilized a sequential exploratory mixed-methods design. Quantitative data were collected first through a cross-sectional survey and analyzed with descriptive statistics using SPSS 28. Qualitative data were collected through semi-structured interviews and analyzed with constant comparative methods. Results: A total of 169 faculty (36%) and students (64%) responded to the survey. 74% of respondents reported that they were aware of AI tools and 45% reported that they had personally used AI for academic activities. In addition, 67% of the respondents

believed that AI tools could potentially have positive impact on learning. However, they were concerned about the reliability and accuracy of AI-generated content. The interviews indicated that faculty were open to utilizing AI tools but were uncertain about how to proceed. Students stated that they were actively using AI to assist with assignments but were concerned about potential penalties. Conclusion: The study revealed that AI tools have not been widely used by faculty and students. However, the inevitability of AI tools becoming integral to education should motivate educators to proactively leverage AI's potential and turn challenges into opportunities.

10:10 Break

O14.06

10:30 CARES ONLINE HIGH SCHOOL COURSE PROJECT

Brian Burnes

Mississippi University for Women, Columbus, MS

The CARES Online High School Course Project was funded to produce courses to assist high schools across Mississippi with challenges to in-class instruction such as a pandemic, natural disaster, or other disruptions. The courses are AP Computer Science, Biology I, CCR English I, CCR English II, CCR English III, CCR English IV, Chemistry, Exploring Computer Science, Foundations of Algebra, Foundations of Biology, US History, US Government, and World History. The courses were prepared in Canvas and include an instruction manual called a "Teacher Resource Guide" as well as a Course Map connecting each course component to the appropriate state education standard. The courses developed from the CARES Online High School Course Project are freely available to Mississippi high school teachers at helpdesk@rcu.msstate.edu.

O14.07

10:50 ARTIFICIAL INTELLIGENCE AND STUDENT LEARNING: A POLICY PERSPECTIVE

Abu Khan

Jackson State University, Jackson MS

Artificial Intelligence (AI) has demonstrated its far-reaching influence on all aspects of society and has the potential of altering our vision of the physical world. Evaluation of its impact on higher education and development of concrete policies in our academic institutions are essential. This presentation highlights the perceived advantages and practical disadvantages of its integration in the learning environment and its potential placement in any learning model. The advantages (adaptable pace of learning, real-time feedback and simulation) are helpful in higher-order advanced skills development (analysis, evaluation, creating) and the disadvantages (inefficiencies in introducing fundamental concepts, enhancement of critical-thinking) are of lower-order cognitive learning (developing basic knowledge, comprehension) category in Bloom's taxonomy. Even though researchers disagree on whether following a definitive sequence is required for effective learning, over-reliance on AI literally turns upside down these sequences that have been successfully used for a long period of time. Educators are faced with two choices: either to demonstrate that the drawbacks in the lower-level cognitive process do not impede effective learning, or to develop a new learning model and demonstrate that the adopted sequences reflect effective learning. Development of an effective policy requires that institutions should independently identify and recognize its effectiveness in research, teaching strategies, and student learning through exhaustive discussion with instructors and objectives of individual courses. Obtaining information on students' perspectives is a challenging task. For example, ChatGPT is widely used by students but they are reluctant to admit it. Some sample responses from instructors and students will be presented.

O14.08

11:10 EXPLORATION OF LOCAL GEOSCIENCE IN AN ONLINE WATER RESOURCES COURSE

Christa Haney

Mississippi State University

Incorporating local hydrology into course assignments is an ideal way to increase student understanding of complex geoscience issues related to water quality and quantity. This presentation will explore strategies that teachers can use in an online classRoom to encourage students to collect and analyze hydrologic data. This approach was found to deepen understanding of local and regional environmental geoscience and hydrologic processes. Positive student feedback and a reported increase in engagement and relevance of course material was found when students conducted local research and data collection in an online undergraduate water resources course.

O14.09

11:30 EXPERIENTIAL LEARNING: CITIZEN SCIENCE AND COMMUNITY ENGAGEMENT

Sarah Lalk, Kyle McDill, Caroline Sleeper, John Cartwright

Mississippi State University, Starkville, MS

The goal of an experiential learning project for an environmental geosciences course was utilizing citizen science to engage the community in weather observations. The course is certified as "community-engaged learning" by the university and provides documentation on student transcripts of completion of CEL courses. It is a split-level class of undergraduates (6) and graduate students (2) that worked with the community center and all public K-5 schools (4) to install "weather poles" across the local county. The weather poles included a NOAA rain gauge

and outdoor thermometer for monitoring changing weather conditions. The university students also developed a web-based resource that provides information to the community about monitoring the weather, collecting/reporting data on precipitation, severe weather safety, and other weather citizen science projects.

12:00 General Session

Thursday, February 29, 2024

AFTERNOON

Room TC 218 B

1:00-2:00

WORKSHOP

THE PARADIGM OF CONSTRUCTIVISM

Mais Abdelhaq ; Jazmin Martin ; Yufeng Lu, PhD ; Audra Schaefer, PhD ; Nathan Tullos, PhD ; Tim Dasinger, PhD

University of Mississippi Medical Center, Jackson, MS

The purpose of this workshop is to outline using a constructivist approach in science education. Constructivism is a learning theory described as building knowledge based on previous experiences through active engagement of students including collaboration among peers. This workshop will provide examples of how the workshop team has used tenets of constructivism in the medical gross anatomy course at UMMC. For example, the team will discuss the implementation of leaders and peer teaching in laboratory settings and their reflections from the semester. During the workshop, participants will have the opportunity to build their own framework of how to use constructivism in their science education course.

Thursday, February 29, 2024

EVENING

3:30 DODGEN LECTURE /AWARDS CEREMONY

THEATER

5:00 GENERAL POSTER SESSION

(immediately following Dodgen Event)

P14.01

MARINE BIOLOGISTS IN THE MOVIES: HOW POPULAR CULTURE PORTRAYS MARINE BIOLOGY AS A CAREER

Megan Le, Joyce Shaw

Gunter Library--Gulf Coast Research Laboratory

As part of an ongoing effort to engage with undergraduate and graduate students in The University of Southern Mississippi's School of Ocean Science and Engineering, Gunter Library at the Gulf Coast Research Laboratory compiled a list of popular movies featuring a marine biologist as a major or minor character. This fictional look into the profession allows for myth-busting conversations and discussion about career options and opportunities for students. These movies are a way to understand how popular culture views the work of marine biologists. Plans include purchasing copies of the movies for the library's film collection and using the movies to hold informal viewings during lunch times and encouraging faculty to show a movie or parts of the movies in the classRoom to stimulate discussion about careers in marine biology. The list includes a brief description of each film, its age-appropriate rating, and any awards or honors it received. Gunter Library maintains a small collection of career resources in the marine sciences.

P14.02

IMPACT OF AN INTERACTIVE ONLINE EXHIBIT ON MUSEUM VISITORS' GEOLOGICAL KNOWLEDGE AND INTEREST

Sydney Stanard, Renee Clary, Athena Nagel

Mississippi State University, Starkville, MS

Interactive online content is becoming more common in museum spaces. This research investigates the effectiveness of a virtual geology exhibit on students' knowledge retention of selective geologic concepts. The Omeka e-exhibit will act as a virtual counterpart to a physical exhibit located in the Dunn-Seiler Museum at Mississippi State University (MSU). The "John Guyton Table," donated by entomologist and educator John Guyton, consists of a large wooden table with 480 small compartments containing various geologic, archeological, and paleontological specimens. The interactive online content, available via QR code or the MSU Library Omeka website, will provide informational text and labels, short informational videos, and downloadable brochures. This research aims to determine students' knowledge gains from online content interaction, verses students' knowledge gains from online content interaction reinforced by in-person experiences. Pre and post surveys will ascertain students' incoming knowledge of select geological content, and differences following electronic interactions, and electronic interactions followed by in-person activities and/or museum visits. We also assess students' attitudes towards e-learning and hands-on activities.

P14.03

UNRAVELING CHALLENGES IN STEM EDUCATION PERSPECTIVE OF STUDENTS AND FACULTY

Faith Iseguede, Martha Tchounwou, Ebele Okoye

Jackson State University, Jackson, MS

STEM education is pivotal in global education for contemporary industries and human resource development, yet challenges hinder its effectiveness. This study evaluates Dr. McGuire's meta-cognitive study skills intervention on 543 STEM students with low midterm grades at an urban historical black college(HBCU), utilizing pre/post-intervention surveys, grades, and feedback. Results indicate positive academic improvements post-intervention, with challenges challenges identified, including poor study habits, the need for active learning, punctuality, technology distractions, book accessibility issues,

faculty support concerns, and teaching progression issues. Positive academic performance was observed in specific courses, but challenges persisted, notably in Chemistry, Civil Engineering, Computer Engineering, Computer Science, and Physics. Intervention strategies, such as tutoring and advisement, in-class presentations, and workshops, proved effective but faced limitations due to duration and scope. The discussion emphasizes the need for enhanced pedagogical approaches, faculty support, active learning environments, and synchronized teaching progression. The study underscores the importance of addressing these challenges to optimize STEM learning environments and improve student performance.

Friday, March 1, 2024
MORNING
Room TC 228

8:15 Opening Remarks
8:30 Workshop

The Wolbachia Rodeo: A STEM COMPETITION FOR STUDENTS

Denise Thibodeaux[1], Kathy McKone[1], Rob Rockhold[2]

[1]Copiah Lincoln Community College, Wesson, MS; [2]University of Mississippi Medical Center, Jackson, MS

The *Wolbachia* Rodeo was an idea inspired by the curriculum, Discover the Microbes Within: The *Wolbachia Project,* developed by Seth Bordenstein while at the Marine Biological Lab in Woods Hole, MA. Starting in 2011, a few Mississippi schools have participated in the nation's only high-tech DNA rodeo which assists high school students in developing molecular biology techniques such as micropipetting, DNA extraction/purification, polymerase chain reaction and electrophoresis. Students participating in the *Wolbachia* rodeo work in teams to extract DNA from local insect pests (ants, fleas, & mosquitoes) to determine infection rates with the bacteria *Wolbachia,* a special interest to the scientific community because of its abundance and ability to affect the host's DNA. *Wolbachia* is currently being researched as a biological agent for controlling mosquito populations. Insect vectors and fire ant pests cause problems to which all Mississippi students can relate and find an interest. The rodeo's resources provide opportunities for students from diverse backgrounds to view STEM career possibilities as they participate in a collaborative environment, exploring the first step in a possible biological control by determining the *Wolbachia* infection rate of local insect pests. This workshop trains teachers, of all levels, in extracting, purifying, and amplifying insect DNA, which will be analyzed after running on a E-gel, to determine *Wolbachia* infection rates of designated insects. This project is supported in part by a grant from the Phil Hardin Foundation of Mississippi

O14.10

leaderSTATE STEM: GEOSCIENCE RESEARCH DISSEMINATED WITHIN CREATIVE PRESENTATIONS

Renee Clary, Sydney Stanard,
JROTC of Callaway High School, Forest Hill High School, Jim Hill High School, Lanier High School, Murrah High School, Provine High School, and Wingfield High School

Mississippi State University, Starkville, MS

As part of the leaderSTATE STEM program, JROTC cadets in 7 Jackson, MS public schools participate in a research activity each Fall. Student groups are tasked with investigating a geoscience topic of their choice (e.g., tornados, Jackson water quality, extinct Mississippi volcanoes); their research must include an interview with a STEM professional in that discipline. Student groups then communicate the results of their research in creative presentations—which can include a song, rap, skit, or other artistic expression. The winning groups travel to Mississippi State University in December for the leaderSTATE STEM Day, where they again present their research to guest judges within the university. We showcase our leaderSTATE STEM Day winning student groups at the 2024 Mississippi Academy of Sciences. Cadets not only disseminate their research findings to a larger science education community, but also have the opportunity to expand their understanding of the scientific enterprise as they interact with an extended group of scientists and university science students.

Friday, March 1, 2024

Author Guidelines

Editorial Policy. The Editorial Board publishes articles on all aspects of science that are of general interest to the scientific community. General articles include short reviews of general interest, reports of recent advances in a particular area of science, current events of interest to researchers and science educators, etc. Research papers of sufficiently broad scope to be of interest to most Academy members are also considered. Articles of particular interest in Mississippi are especially encouraged.

Research papers are reports of original research. Submission of a manuscript implies that the paper has not been published and is currently at the time of submission being considered for publication elsewhere. At least one of the authors must be a member of the Academy, and all authors are encouraged to join.

Manuscripts. Submit the manuscript electronically to the Mississippi Academy of Sciences under your profile in the member location of the website. Please also provide a cover letter to the Editor of the Journal. The cover letter should authorize publication: give the full names, contact information, for all authors; and indicate to whom the proofs and correspondence should be sent. Please notify the Editor on any changes prior to publication.

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- One inch margins on 8.5 x 11 inch paper;
- Text should be left-justified using twelve point type;
- Double spaced throughout, including the title and abstract;
- Arabic numerals should be used in preference to words when the number designates anything that can be counted or measured (7 samples, 43 species) with 2 exceptions:
- To begin a sentence (Twenty-one species were found in…)
- When 2 numeric expressions are adjacent in a sentence. The number easiest to express in words should be spelled out and the other left in numeric form (The sections were divided into eight 4-acre plots.).
- Measurements and physical symbols or units shall follow the International System of Units (SI *Le Système international d'unités*) with metric units stated first, optionally followed by United States units in parentheses. *E.g.*: xx grams (xx ounces); and
- Avoid personal pronouns.

Format

Abstract. In 250 or fewer words summarize any new methods or procedures critical to the results of the study and state the results and conclusions.

Introduction. Describe the knowledge and literature that gave rise to the question examined by, or the hypothesis posed for the research.

Materials and methods. This section should describe the research design, the methods and materials used in the research (subjects, their selection, equipment, laboratory or field procedures), and how the findings were analyzed. **For all human and animal studies please indicate Institutional Approval** in this section**.**

Results. The text of the results should be a descriptive narrative of the main findings, of the reported study. This section should not list tabulated data in text form. Reference to tables and figures included in this section should be made parenthetically in the text.

Discussion. In this section compare and contrast the data collected in the study with that previously reported in the literature. Unless there are specific reasons to combine the two, as explained by the author in the letter of transmittal, Results and Discussion should be two separate sections.

Acknowledgments. Colleagues and/or sources of financial support to whom thanks are due for assistance rendered in completion of the research or preparation of the manuscript should be recognized in this section rather than in the body of the text.

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Literature cited. List references alphabetically. Cite references in the text by author and year of publication (e.g., Smith, 1975; Black and Benghuzzi, 2011; Smith et al., 2010; Smith, 2011a, 2011b). The following examples illustrate the style to be used in the literature list.

Black DA, Lindley S, Tucci M, Lawyer T, Benghuzzi H. A new model for the repair of the Achilles tendon in the rat. J Invest Surg. 2011; 24(5): 217-221.

Pearson HA, Sahukhal GS, **Elasri** MO, Urban MW. Phage-bacterium war on polymeric surfaces: can surface-anchored bacteriophages eliminate microbial infections? Biomacromolecules. 2013 May 13;14(5):1257-61.

Bold, H.C., C.J. Alexopoulos, and T. Delevoryas. 1980. Morpholgy of plants and fungi, 4th ed. Harper and Row, New York. 819 pp

Web-page

- name of author(s) -if known
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Ackermann, Ernest. "Writing Your Own Web Pages." *Creating Web Pages.* 23 Oct. 1996. http://people.umw.edu/~ernie/writeweb/writeweb.html 10 Feb. 1997.

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Plece Tables and Figures at the end of the manuscript submitted.

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Footnotes. Text footnotes **should not be used**

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