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NATCHEZ TRACE PARKWAY
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 23-24, 2023

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Biloxi, MS

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WEDNESDAY, February, 2023 Registration Opens from 3:00- 5:00 pm Lobby area of convention center

Thursday February 23, 2023

Agriculture and Plant Sciences Room D1	Animal, Fish, Wildlife, Veterinary Sciences Room D2	Cellular, Molecular, and Developmental Biology Room D3	Chemistry and Chemical Engineering Room D11	Ecology and Evolutionary Biology Room D6	Geology and Geography Room D5	Health Sciences Room D7
MORNING	MORNING	MORNING	MORNING	MORNING	MORNING	MORNING
Oral Sessions 8:00-12:00	Keynote- Dr. Pruett Center of Biomed Research Excellence Oral Session 9:10- 11:50	Oral Sessions 8:50-11:50	Oral Sessions	Workshop Oral Session	Oral Sessions	Oral Session 8:00-10:00 Symposium I Telehealth 10:00-12:00
12:00 - 1:00 Lunch on Your own	12:00 - 1:00 Lunch on Your own	12:00 - 1:00 Lunch on Your own	12:00 - 1:00 Lunch on Your own	12:00 - 1:00 Lunch on Your own	12:00 - 1:00 Lunch on Your own	12:00 - 1:00 Lunch on Your own
AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON
POSTER SESSION 1:00-3:00 Hall C	Oral Sessions TBA	Workshop Room D3	Keynote Oral Sessions Room D11	POSTER SESSION 1:00-3:00 Hall C	Oral Sessions Room D5	Interactive Workshop 1:30-3:00 Room D2
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 Hall B Poster Session/ Reception Hall C	MAS Awards Ceremony/ Dodgen Lecture Hall B Poster Session/ Reception Hall C	MAS Awards Ceremony/ Dodgen Lecture Hall B Poster Session/ Reception Hall C	MAS Awards Ceremony/ Dodgen Lecture Hall B Poster Session/ Reception Hall C	MAS Awards Ceremony/ Dodgen Lecture Hall B Poster Session/ Reception Hall C	MAS Awards Ceremony/ Dodgen Lecture Hall B Poster Session/ Reception Hall C	MAS Awards Ceremony/ Dodgen Lecture Hall B Poster Session/ Reception Hall C

Thursday February 23, 2023

History and Philosophy of Science Room D12	Marine and Atmospheric Sciences Room L7	Mathematics, Computer Sciences, Statistics Room D7	Neuroscience Room D8	Physics and Engineering Room L6	Psychology and Social Sciences	Science Education Room B5-6
MORNING	MORNING	MORNING	MORNING	MORNING	MORNING	MORNING
Oral Sessions	Oral Sessions	Oral Sessions	Oral Sessions	Oral sessions	Open	Oral Sessions
12:00 - 1:00 Lunch on Your own	12:00 - 1:00 Lunch on Your own	12:00 - 1:00 Lunch on Your own	12:00 - 1:00 Lunch on Your own	12:00 - 1:00 Lunch on Your own	12:00 - 1:00 Lunch on Your own	12:00 - 1:00 Lunch on Your own
AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON
Oral Sessions Room D6	Open	Oral Sessions Room D7	Poster Session Hall C	Keynote RoomL5	Oral Sessions Room L7	Symposium Room B5-6
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 Hall B Poster Session/ Reception Hall C	MAS Awards Ceremony/ Dodgen Lecture Hall B Poster Session/ Reception Hall C	MAS Awards Ceremony/ Dodgen Lecture Hall B Poster Session/ Reception Hall C	MAS Awards Ceremony/ Dodgen Lecture Hall B Poster Session/ Reception Hall C	MAS Awards Ceremony/ Dodgen Lecture Hall B Poster Session/ Reception Hall C	MAS Awards Ceremony/ Dodgen Lecture Hall B Poster Session/ Reception Hall C	MAS Awards Ceremony/ Dodgen Lecture Hall B Poster Session/ Reception Hall C

Friday, February 24, 2023

Agriculture and Plant Sciences	Animal, Fish, Wildlife, Veterinary 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
Room D1	Room D2	Room D3	Room D11	Room D5	Rooms D6/D7/D8	Room L5	Room D4	Room L6	D12
MORNING	MORNING	MORNING	MORNING	MORNING	MORNING	MORNING	MORNING	MORNING	MORNING
Oral Sessions 8:00-12:00		Oral Sessions 8:00-12:00	Oral Sessions 8:00-12:00	Oral Sessions	Oral Session I (D2) Oral Session II (D12) 8:00-10:00 Oral Session III Symposium II 10:05-12:00 High School Poster Session	Oral Sessions	Oral Sessions 8:20-11:30	Oral Sessions 8:20-12:00	Oral Session 9:00-11:00 11:00-12:00 Symposia
12:00 - 1:00 Lunch on Your own	12:00 - 1:00 Lunch on Your own	12:00 - 1:00 Lunch on Your own	12:00 - 1:00 Lunch on Your own	12:00 - 1:00 Lunch on Your own	12:00 - 1:00 Lunch on Your own	12:00 - 1:00 Lunch on Your own	12:00 - 1:00 Lunch on Your own	12:00 - 1:00 Lunch on Your own	12:00 - 1:00 Lunch on Your own
AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON
Scholars Symposium Awards Hall B	Scholars Symposium Awards Hall B	Scholars Symposium Awards Hall B	Scholars Symposium Awards Hall B	Oral Sessions 1:00-3:00	Scholars Symposium Awards Hall B	Scholars Symposium Awards Hall B	Scholars Symposium Awards Hall B	Scholars Symposium Awards Hall B	Scholars Symposium Awards Hall B
ADJOURN	ADJOURN	ADJOURN	Oral Session	ADJOURN	ADJOURN	ADJOURN	Oral Session	ADJOURN	ADJOURN

Mississippi Gulf Coast Convention Center
Biloxi, MS 39531

DRIVING DIRECTIONS

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

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

Turn left onto US-90E/E Beach BLvd (3.2 miles)

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

If Coming from Starkville, MS Take US-45, I-59, and US49

Take US 45 (70 miles)
Then take the Exit onto I-20-W/I-59 South Toward Meridian
Continue on I-59 South (Look for signs Laurel/ New Orelans

Take exit 59 for US 98 E towards Lucedale/Mobile

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

Merge onto I-49 South

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

Turn left onto US-90E/E Beach BLvd (3.2 miles)

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If Coming from the Lorman MS on Highway 61 S:

Take US 61 S to US 98

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

Take exit 29 A Onto I-12 East toward Slidell

Take Exit 38 toward MS 605

Turn left onto US-90E/E Beach BLvd (3.2 miles)

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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, Gulfport

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

Turn left onto US-90E/E Beach BLvd (3.2 miles)

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If Coming from the Univeristy of Mississippi on MS 6 E/US-278E:

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

In Jackson, Continue on US 49 South towards Hattiesbug, then continue toward Gulfport

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

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The Executive Director's Column

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

Since this is the January edition of the journal, allow me to wish you a healthy and happy new year. After two pandemic years of uncertainity, we are now back on our normal annual meeting schedule. During those days of not knowing what is going to happen next, I kept reminding myself of an old African proverb—"Smooth Seas Do Not Make Good Sailors". Even though the waters were rough, the academy and divisional leadership during those uncertain times played significant roles in making sure to navigate, guide, and keep our academy strong. I am honored to be a part of a diverse group of educators and researchers that care about working effortlessly and because of their perseverance we are able to provide a forum for research and fellowship.

This year marks our 87th Annual Meeting for the Mississippi Academy of Sciences (MAS). The academy has so much to offer science nerds like myself. Our academy has 14 strong divisions that all have diverse topics, and in fact, many members present their research in more than one division. Regardless of which division you submit an abstract, present, or just attend the lectures, I hope that you always feel that you are a valued member of the Academy. The leadership takes into account that every academy inititative is designed to for all members. Throughout the years we have been very good at recognizing the people who have contributed to the academy for many years as well as our student members. However, we realized that the younger vibrant and productive faculty members are unrepresented, and now we have initiated new awards to recognize our upcoming scientist.

This past week, as I was watching various college and professional football players compete as a team to win recognition in their sport, I ask myself how as scientist are we any different from these elite atheletes. We face challenge after challenge in research, we absorb the failed research attempts, we celebrate the successful attempts, and then do it all over again. Our bowl game is the annual meeting where we get a chance to shine and let others see what our reseach teams have done and how our work may oneday impact humanity. Just like the bowl games, without sponsorship our annual meeting would not be possible. We are indebted to our sponsors for their immeausreable 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 llok forward to this continued partnership and we ask that you send an email to the Deans and Vice Presidents of Research at your instutition to thank them for their support and express how the it has benefited you in your moment to shine at the MAS.

I am thankful for your membership and want to encourage you to invite your colleagues to join us, 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. I envision that if we all work together, we can help each other to become better educators, listeners, scientist, and colleagues.

I am fortunate to be a part of a proud organization that works tirelessly to serve it members.

MISSISSIPPI ACADEMY OF SCIENCES AWARD WINNERS 2023

Contribution to Science

Timothy J. Ward is a Professor of Chemistry and Berry Family Endowed Chair in Science at Millsaps College. He also serves as Associate Dean of Research and Faculty Support, Director of the W.M. Keck Center for Instrumental and Biochemical Comparative Archaeology and as Faculty Athletic Representative to the NCAA. He previously served as Chair of the Department of Chemistry and Biochemistry, and Associate Dean of Sciences. He received his B.S. degree from the University of Florida and his Ph.D. from Texas Tech University. After receiving his Ph.D., he joined Syntex Pharmaceuticals and served as a lab manager in their process control division before joining the faculty at Millsaps College in 1990. In addition to his research interest in archaeology, he is a specialist in chiral separations and the development of analytical LC, GC, and CE separation methods. In 2007 he served as Chair for the 19th International Symposium on Chirality (ISCD19), the largest international symposium in his field. He has contributed significantly to his field with 60 peer-reviewed publications and over 200 scholarly presentations and abstracts. Dr. Ward has been recognized for his work, receiving the Outstanding Contributions to Science Award from the Mississippi Academy of Sciences and Chemist of the Year Award from the Mississippi Section of the American Chemical Society as well as the Distinguished Professor Award from Millsaps College.

Dudley Peeler Award

Contribution to the Mississippi Academy of Sciences

Joseph A. Cameron, Ph.D., is a life member of the academy and has been an active member for over forty years. He is a current Board Member of the Rocky Mountain Bioengineering Symposium (RMBS). He is a retired Professor in the Department of Biology at Jackson State University. During his tenure at JSU, he has directed or co-directed numerous funded biomedical research and training grants from the NIH (NIGMS, NHLBI, NIMHD), NSF, and the U.S. Army, resulting in the mentoring and training of hundreds of students, particularly minority, at the precollege, bachelor, masters and doctoral levels. Dr. Cameron has also served as Chair and/or member of many NIH grantsmanship review panels, an active member of research societies, e.g., endocrine society, society of experimental biology and medicine, etc. He has received many awards and recognition for his achievements, including the Sigma Xi award for "Meritorious Research," Outstanding Contributions to the MAS, and inclusion in "Personalities of the South" and "Who's Who Among Black Americans." In addition, he has published extensively and presented research findings nationally and internationally.

Dr. Cameron has served the academy at various levels over the past 40 years. He served as division chair, MAS Director, Past President and is currently serving as the MAS delegate for the NAAS and AJAS. His commitment to our academy has been steadfast and his momentum to continue presenting and promoting our academy are beyond outstanding.

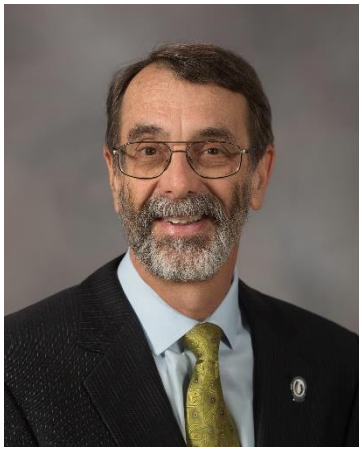
MAS Early Career Award

Contribution to the Mississippi Academy of Sciences

Dr. Lauren B. Priddy is an Associate Professor of Biomedical Engineering in the Department of Agricultural and Biological Engineering at Mississippi State University. Her research involves the design of surface-functionalized, load-bearing polymeric and metallic biomaterials for improved bone healing, and hydrogel-based composite materials for enhanced delivery of antimicrobial therapeutics. Since joining the faculty at MSU in 2016, she has supervised 121 trainees: 65 (54%) women and 99 (82%) undergraduate students, including 3 MS INBRE scholars and 5 MSU College of Veterinary Medicine Research Scholars (VMRS). For her mentorship of VMRS, she received the Boehringer Ingelheim Mentoring Award. Dr. Priddy received the *Journal of Orthopaedic Research* Early Career Award and was recognized as one of Georgia Tech Alumni Association's 40 Under 40 and Mississippi State Alumni Association's Reveille 25. Bringing her passion for research in tissue engineering and biomaterials into the classroom, Dr. Priddy received MSU's Donald Zacharias Early Career Undergraduate Teaching Excellence Award and was inducted into MSU's Bagley College of Engineering Academy of Distinguished Teachers. In 2022, she was selected as an Access, Diversity, and Inclusion Fellow at MSU, during which she spearheaded a research-based poster session where MSU faculty and students connected with prospective graduate students from underrepresented backgrounds in STEM. Dr. Priddy also served as delegate for the International Consensus Meeting on *Pre-Clinical Models of Orthopaedic Infection* and as session chair for the Orthopaedic Research Society the Southern Biomedical Engineering Conference.

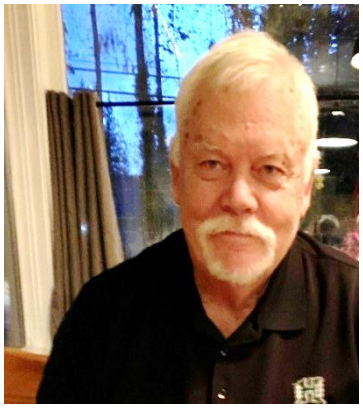
Mississippi Academy of Sciences Fellows -2023

Fellows of Mississippi Academy of Sciences



Rob Rockhold, Ph.D., FAPE is an Emeritus Professor of Pharmacology & Toxicology at the University of Mississippi Medical Center (UMMC) in Jackson, Mississippi. He retired in 2022 as Deputy Chief Academic Officer at UMMC. With over 40 years of teaching professional students in schools of Graduate Studies, Medicine, Dentistry, Pharmacy, Nursing, and Health Related Professions, he has been a major professor to 6 Ph.D. recipients and 2 MS recipients. He created and directed the *Base Pair* biomedical research mentorship program for high school students and teachers for over 30 years. Dr. Rockhold has published over 115 peer-reviewed articles in pharmacology and science education journals and received over $15.7 million on 61 awards since 1975. He received the Dudley F. Peeler Award for Outstanding Contributions to the Mississippi Academy of Sciences (Lifetime Achievement Award) in 2007, was cited as Southern Living Magazine's "*Southerner of the Year*", in 2017, with Tim Medley for *Base Pair*, and was honored to have been chosen as the SEC Faculty Achievement Award recipient for University of Mississippi in 2022. He is a Past President and Life Member of the Mississippi Academy of Sciences.

Juan Silva is a Professor, Researcher and Extension Specialist in Food Processing and Safety in the Department of Food Science, Nutrition and Health Promotion at Mississippi State University. He holds BS and MS in Chemical Engineering and PhD in Food Science and Technology. Acted as Interim Department Head and Graduate Coordinator. Served/chaired many committees including the MSU Graduate Council and the CALS/MAFES/MSUES P&T committee. He has authored/co-authored more than 250 peer-reviewed manuscripts, 400+ peer-reviewed abstracts and presentations at professional meetings. Has graduated over 80 PhD and MS students that have gone to be academic professors and administrators, industry leaders and some in government. He has received over $2.5 million in grants and contracts. He is co-author of a couple of patents. He was President-Elect (2005-2006), President (2006-2007), Past President and Nominations Chair (2007-2008) of Mississippi Academy of Sciences (MAS), Board Director, MAS (2004-2008), Annual meeting program co-chair (2006-2007), Host and organizer of the first MAS annual meeting at MSU (Starkville), a very successful meeting, positive in terms of funding, presentations and attendance. He was also Program Chair (1992 and 2002), Chair (1993 and 2003) of Agriculture and Plant Sciences Division, Co-chair technical sessions, and solicited/recruited abstracts/presentations from students and scientists for many annual meetings. He is a Food Systems Leadership Institute Fellow, former member, Board of Directors, Institute of Food Technologists, Member, Steering Committee and now Executive Advisory Board, International Food Safety Preventive Controls Alliance, FSPCA and Chair, International Work Group FSPCA. He also has served in many USDA review panels, in department review teams, and in other areas. He is a well-known international food safety and processing trainer, having visited more than 45 countries in four continents and delivered more than 300 trainings in addition to being guest speaker at many international workshops.



David A. Swanson is Emeritus Professor of Sociology, at the University of California Riverside. He served as a member of the U. S. Census Bureau's Scientific Advisory Committee for six years (2004-10) and chaired the committee for two. He has been in a number of professional association roles, including serving as a member of the mortality expert panel of the Society of Actuaries Research Institute, the Secretary-Treasurer (1995-7 and 2003-7) of the Southern Demographic Association, and the editor of *Population Research and Policy Review* (2004-7). Swanson has produced 115 refereed sole- and co-authored journal articles and nine books. He also has edited or co-edited four additional books, with another on the COVID-19 pandemic forthcoming. Google Scholar shows more than 6,000 citations to his work. Among other professional recognitions, he served as a "summer at census" scholar in June 2019 at U.S. Census Bureau and received the Terrie award in 1999 and again in 2016 and 2022 for presenting the best paper in state and local demography at the annual conference of the Southern Demographic Association. In addition to UC Riverside, other positions he has held include a visiting professorship at Aoyama Gakuin University in Tokyo, Dean at the Helsinki School of Economics and Business Administration (now part of Aalto University), and Professor & Chair of the Sociology/Anthropology Department at the University of Mississippi. His B.Sc. is from Western Washington University, and his Ph.D. and M.A. are from the University of Hawai'i. He is a lifetime member of the Mississippi Academy of Sciences.

Timothy J. Ward is a Professor of Chemistry and Berry Family Endowed Chair in Science at Millsaps College. He also serves as Associate Dean of Research and Faculty Support, Director of the W.M. Keck Center for Instrumental and Biochemical Comparative Archaeology and as Faculty Athletic Representative to the NCAA. He previously served as Chair of the Department of Chemistry and Biochemistry, and Associate Dean of Sciences. He received his B.S. degree from the University of Florida and his Ph.D. from Texas Tech University. After receiving his Ph.D., he joined Syntex Pharmaceuticals and served as a lab manager in their process control division before joining the faculty at Millsaps College in 1990. In addition to his research interest in archaeology, he is a specialist in chiral separations and the development of analytical LC, GC, and CE separation methods. In 2007 he served as Chair for the 19th International Symposium on Chirality (ISCD19), the largest international symposium in his field. He has contributed significantly to his field with 60 peer-reviewed publications and over 200 scholarly presentations and abstracts. Dr. Ward has been recognized for his work, receiving the Outstanding Contributions to Science Award from the Mississippi Academy of Sciences and Chemist of the Year Award from the Mississippi Section of the American Chemical Society as well as the Distinguished Professor Award from Millsaps College.

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-2024

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 2024 FMAS
November 15, 2023 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

2023 Dodgen Lecture

Thursday, February, 23, 2023

(Immediately following the 3:30 awards ceremony)

POLYMER SCIENCE AT THE INTERFACE OF BIOLOGY: DESIGNING POLYMERIC BIOMATERIALS

Given By

Sarah E. Morgan, PhD

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

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

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

Morgan returned to Southern Miss as a faculty member in 2003, where she has continued research in both bio-inspired and high-performance materials. The research involves multidisciplinary collaborations with academic, national lab, and industrial research partners, which support student training, internships, and employment. Key efforts include determination of peptide assembly mechanisms at interfaces, synthesis of polymeric mimics of naturally occurring antimicrobial peptides, and synthesis of bio-inspired glycopolymers designed to mimic the behavior of natural polysaccharides. Glycopolymer biomaterial application targets include RNA delivery, sensors, drug delivery, water purification membranes, and cell scaffolds. Morgan's research is funded by NSF, NIH, DoD, and industrial partners. She is Science Director of the state-wide *NSF Center for Emergent Molecular Optoelectronics* and PI of the multi-investigator *Multifunctional Materials to Address Military Engineering* U.S. Army Corps of Engineers research collaboration. She is PI of NSF Research Experiences for Undergraduates and Teachers and has led graduate student training programs. Seventeen Ph.D. and 10 M.S. students have graduated under her supervision, and she has mentored research of more than 50 undergraduate students. Morgan holds 9 patents and has over 80 publications.

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

Thursday, February 23rd, MAS Symposia

Louis Stokes Mississippi Alliance For Minority Participation (LSMAMP) Symposium at the Mississippi Academy of Sciences
Biloxi 2023

Symposium Chair(s): Dr. Victor Ogungbe and Dr. Martha Tchounwou, Jackson State University

10:00am-11:00pm

LSMAMP External Advisory Board Meeting
(Presidents/Provosts of Alliance Institutions and Program Administrators)

Chair: Drs William McHenry and Victor Ogungbe (Jackson State University)

12:00pm-4:00pm.

Lunch

LSMAMP Site Coordinators Proposal Writing Working Session

(Drs. Ogungbe, Tchounwou and Delaney)

Friday, February 24th, MAS Symposia

MAS Scholar Symposium

Sponsored by Millsaps College and Mississippi INBRE

Friday, February 24, 2023
12:00 P.M. (Room B)

86th Annual Mississippi Academy of Sciences Meeting
February 23-24, 2023

Mississippi Coast Coliseum and Convention Center
Biloxi, MS

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

1. Millsaps Undergraduate Scholars Symposium

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

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

Criteria for Selection of recipients:

1. Each division chair(s) and vice chair(s) of the 14 divisions will score the **top 10% of undergraduate student abstracts** to represent their division and present in the Millsaps sponsored lunch award symposium, "Honoring Excellence in

Science in Mississippi," on Friday, February 24th from 12:00 am – 2:00 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 23rd around 4-7 PM (see program for more detatils). Failure to physically present their poster and be present on Thursday 2/23/2023 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 3/20/2023 at 5 PM to be included in the competition and sent to Judges for initial screening.
5. On Friday 2/24/2023 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)

2. Mississippi INBRE Graduate/Post Graduate Scholars Symposium

Honoring Excellence in Science in Mississippi
Symposium Chairman: Dr. Alex Flynt | Program Coordinator, Mississippi INBRE
Event Coordinator: Mr. Danny Holland | Mississippi INBRE
The University of Southern Mississippi, Hattiesburg, MS

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 February24 th from 12:00 am – 2:00 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 **abstract** in a **rapid fire 3 minute oral presentation** of Friday, February 24th at noon. 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 2/15/2023 at 5 PM to be included in the competition and sent to Judges for initial screening.
4. On Friday 2/24/2023 the top ten candidates will receive awards as follows: 1st Place: Certificate plus $250; 2nd Place: Certificate plus $200; 3rd Place: Certificate plus $150; 4th Place: Certificate plus $100; and honorable mention for 5th – 10th winners. Each selected candidate will receive a complementary one-year membership to MAS in addition of certificate of achievement. (Must be present at the awards ceremony to qualify for awards or certificates)

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.**

The MAS, in its commitment to recognize and promote novel student research, would like to announce the following prestigious award:

Tougaloo MJAS Scholars Symposium

Honoring Excellence in Science in Mississippi Symposium

Chairman: Dr. Pradip Biswas, Tougaloo College

Coordinator: Mariam Ageli| MAS Executive Assistant

This symposium sponsored by Tougaloo College 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 Tougaloo 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 detatils) or in 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. Power point poster must be uploaded in MAS website no later than 6 days prior to annual meeting to be included in the competition and sent to Judges for initial screening.
5. On Friday, 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 $200; 2nd Place: Certificate plus $150; 3rd Place: Certificate plus $100; 4th Place: Certificate plus $100; and honorable mention for 5th – 10th winners. Each selected candidate will receive a complementary one-year membership to MAS in addition of certificate of achievement. (Must be present awards ceremony to qualify for awards.

Louis Stokes Mississippi Alliance For Minority Participation (LSMAMP) Symposium
Mississippi Academy of Sciences
Biloxi, MS 2023

Symposium Chair(s): Dr. Victor Ogungbe and Dr. Martha Tchounwou, Jackson State University

Room B2-B-3

Friday, February 24, 2023

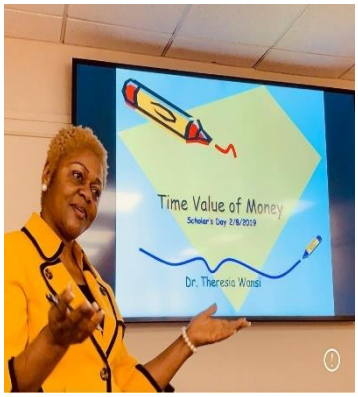
11:00-11:30: Moderator: Mrs. Jacqueline Vinson (University of Mississippi)

Motivational Speaker: Tina Grimes (Studying with the end in Mind)

Tina E. Grimes, CEO of TINA Enterprises (Turning Intent iNto Action), is an International Speaker, Executive Coach and Trainer. For nearly 30 years, she has coached and trained thousands of individuals and corporations, including youth and adults. She has been the Keynote Speaker or Executive Trainer for large companies such as Boeing, Cintas, and The John Maxwell Company, as well as universities, ministries, and non-profit agencies.

Tina is an accomplished writer and published author. She was inducted into the Inaugural Cardinal Ritter College Prep Hall of Fame in 2019 for her international leadership success. She has served as Adjunct Professor at Harris Stowe State University and serves on two Boards of Directors. Tina has received numerous awards and recognition, including the Inaugural Woman of Distinction Award for Inspiration from the Girl Scout Council of Eastern Missouri. She has coached and trained in Paraguay most recently and earned the highest honor of being selected as a Main Stage Speaker at the most prestigious International Maxwell Certification Conference. In August 2020, she won the John Maxwell Team JMTDNA Culture Award for Exceeding Expectations **(out of 60,000 coaches in 160 countries).** She recently trained for the largest businesswomen's organization in Ethiopia. Tina is a servant leader who is invested in the community and strives to model servitude for her 2 amazing children, Mya and Mason. Cardinal Ritter College Prep High School, Salutatorian; Jackson State University, Bachelor of Business Administration in Finance (Summa Cum Laude-1992); and Lindenwood University, Master of Arts- Human Service Agency Management (Summa Cum Laude).

11:30am-12:05 pm LSMAMP Financial Wellness Secession:



Moderator: Drs. Jonathan Townes and Carrie Kirkland
(Hinds Community College)

Dr. Theresia Atanga-Wansi,

Financial Wellness: Planning and Managing your Finance and Credit

Dr. Theresia Atanga Wansi is a professor of Finance at Marymount University, in Arlington Virginia. She holds Ph.D. in Financial Economics, MBA, and MA in Economics from the University of New Orleans. She also has an MBA-PLUS in Management Information Technology from the University of Carolina at Charlotte. She has taught Finance for 22+ years at the graduate and undergraduate levels. Her publications include "Changing Risk, Return and Leverage: The 1997 Asian Financial Crisis" : Co-Authored with N. Maroney and A. Naka, Journal of Financial and Quantitative Analysis (JFQA- 2004); "Integration across the MIS and Finance Curriculum - A Case Study of Team Teaching" Co-Authored with Liu Michelle, Competition Forum; Does Purchasing Power Parity hold between the US and Canada? Evidence from 1957 to 2010, co-authored with Dean Grumlose, The South Western Journal of Economics. Vol X1, No. 111.

Dr. Wansi is also the coordinating Chairperson of Financial Literacy at Mayor Marion Barry Summer Youth Program in DC/Maryland (http://www.jahkente.org/#/), a non-profit organization meant to advance under-represented youths, and a Micro-Finance Consultant. She has worked with students on several micro-finance projects in various countries including: Venezuela, China, India, Cameroon, Kenya and The Democratic Republic of Congo. Her research interests include: The relationship between micro-finance and economic growth in emerging nations.

12:05 BREAK

12:10pm - 12:40 **Luncheon Speaker**

Planning *for Graduate School, and the Future*

Dr. Howard Adams

Moderators: Drs. Jean Mohammadi and Delaney Foster
Mississippi State University

Dr. Howard Adams is the founder and president of H.G. Adams & Associates, Inc., based in Norfolk, VA. Dr. Adams is a leading expert on mentorship and internship programs. He has written many self-help guides and handbooks such as *Mastering the Ph.D. Process: Tips for Surviving and Excelling in a Doctoral Program (2002); The Internship Guide: A Blueprint for Successfully Managing the Internship Experience (2003)*; *Career Management 101: A Primer for Career and Life Goal Planning (2008).* Dr. Adams has served on the U.S. Congressional Task Force

on Women, Minorities and the Handicapped in Science & Technology (1989), and he received the Presidential Award for Excellence in Science, Mathematics, Engineering and Mentoring in 1996. Dr. Adams served as Executive Director of the National

Consortium for Graduate Degrees for Minorities in Engineering and Science, Inc. (GEM) from 1978 to 1994. Before joining GEM, Adams served as Vice President for Student Affairs at Norfolk State University.

12:45pm-1:15pm

Moderators: Dr. Hattie Spencer (Mississippi Valley State University) and Ms. Sonia Eley (Alcorn State University)

Dr. Sherry Painter

Finding and Preparing for Summer Internships

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

1:20-1:50 pm
Moderator: Dr. Banerjee: Tougaloo College and Dr. Sarah Lee (University of Southern Mississippi)

Awards

1:50-2:00 pm

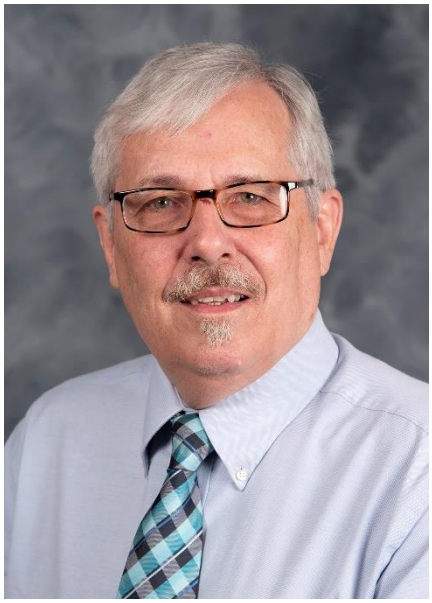
Group Photographs

Adjourn

LSMAMP Conference Room Managers: Mrs. Jacqueline Vinson and Ms. Amber Lampkin

DIVISIONAL SYMPOSIA AND WORKSHOPS
Thursday, February 23, 2023

ANIMAL SCIENCES, WILDLIFE, FISHEIES, VETERINARY SCIENCES
CENTER OF BIOMEDICAL RESEARCH EXCELLENCE
Dr. Stephen B. Pruett
8:30-9:00
Room D2



Dr. Stephen B. Pruett received his Ph.D. in Immunology from LSU School of Medicine in Shreveport in 1980 and did postdoctoral training in the laboratory of Dr. J. Claude Bennett, M.D. at the University of Alabama in Birmingham (1980-1982). His first academic research position was at Mississippi State University, where he rose from Assistant Professor (1984) to Professor (1996). He moved back to LSU School of Medicine in Shreveport as a Professor from 1997-2007, and in 2007 he accepted a position as Department Head of the Department of Basic Sciences in the College of Veterinary Medicine at Mississippi State University. Beginning in 2018, he served for 2 years as Interim Associate Dean for Research and Graduate Studies before stepping down in 2020 to focus more on research. Dr. Pruett has served on more than 30 NIH grant review panels and was a regular member of the Innate Immunity and Inflammation Study Section from 2010-2014. He has served on the editorial boards of several journals and currently serves on the boards of *Toxicology and Applied Pharmacology* and *Alcohol*. Dr. Pruett has published more than 125 peer-reviewed publications and has obtained 9 NIH R01 grants and an NIH COBRE grant, which was renewed in 2018. He is joint PI for an NIH T35 grant, and has been PI for grants from EPA, USDA, and NSF. His primary research interests include: mathematical and statistical modeling of the immune system, chemical mediated neuroendocrine stress responses and their effects on the immune system, the effects of ethanol on the immune system, and the role of redox status in immune function.

ECOLOGY AND EVOLUTIONARY BIOLOGY
SYMPOSIA
8:00-10:10
Room D6

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

Joseph Lane, Delta State University, MS.

Title: *"Guided Educational Tourism as Informal Physical Geography Education on St. Helena Island, Michigan"*

Guided educational tours are a major activity within informal education. This presentation examines the potential for tour guides of a largely historical tour of St. Helena Island, Michigan, to include physical geography within their existing guided educational tour. Using field data and interview methods, the researchers identified the physical features of the island that could be included based on evidence provided by the tour guides.

Mac H. Alford, Ph.D., Professor and Curator of the Herbarium, School of Biological, Environmental, and Earth Sciences, University of Southern Mississippi, MS.

Title: *"Similarities and Differences between the Longleaf Pine Savanna of the Southeastern United States and the Miombo Woodland Savanna of Central Africa."*

Most comparative studies of the forests of the eastern United States focus on the close relationship of this flora with that of eastern Asia and western Europe, in particular the geographical connectivity, refuges, and migrations associated with climate change as outlined in the boreotropical hypothesis. The mixed mesophytic forest (temperate deciduous forest) is not the only forest of eastern North America, though. The modern eastern flora, particularly of the longleaf pine savanna, also has connections with tropical America and Africa, and these will be discussed.

Mac H. Alford is professor of botany and curator of the herbarium at the University of Southern Mississippi. A graduate of Mississippi College, Duke University, and Cornell University, his research focuses on plant biodiversity, particularly relatives of willows and cottonwoods in the tropics. In 2021-2022 he taught and did research in Zambia as part of a Fulbright Scholar Award.

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

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

Oligocene floras of the Gulf Coast region of the southeastern United States remain poorly known. As part of a larger study of floras of the late Paleogene and Neogene of Mississippi, palynological samples were collected from the early Oligocene Forest Hills and Bucatunna Formations and the late Oligocene Jones Branch member of the Catahoula Formation. These three geologic units possess well-preserved and diverse assortment of 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. These palynofloras also are 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.

Seung-Joon Ahn, Ph.D., Assistant professor in Biochemistry, Molecular Biology, Entomology and Plant Pathology, Mississippi State University, MS.

Title: *"Chemical arms race between insect and plant"*

Insects and plants have been co-evolved for a long time, shaping a complex network in their interactions. Plant chemical defense has acted as an important selection pressure where insect herbivores have adapted by evolutionary key innovations. Understanding chemical interactions is, therefore, crucial to figuring out the close relationship between insects and plants. My research focus is the insect-plant interactions using biochemical and molecular tools not only to understand host plant adaptation strategies of arthropod herbivores, but also to develop novel strategies for integrated pest management.

Seung-Joon Ahn earned his Ph.D. from the International Max Planck Research School/Friedrich Schiller University Jena in Germany, where he studied chemically-mediated interactions between insects and plants, focusing on enzymatic detoxification mechanisms by herbivorous caterpillars against plant defensive compounds. After his postdoctoral research in Max Planck Institute for Chemical Ecology in Germany and in Oregon State University/USDA-ARS in Oregon, he has settled in Mississippi State University, where he teaches courses in entomology, toxicology, and molecular genetics.

HEALTH SCIENCES
Symposium I
POPULATION HEALTH DISPARITY AND DISEASE
10:10 AM-12:00 PM
Room D7

Moderators: Drs. D. Olga McDaniel and David Gordy

PATHOPHYSIOLOGY OF PREECLAMPSIA AND POSTPARTUM HYPERTENSION

Dr. Joey Granger

Associate Vice Chancellor for Research
Dean of the School of Graduate Studies in the Health Science

Dr. Granger will discuss clinical features of preeclampsia, pathophysiology of preeclampsia, and long-term cardiovascular consequences of preeclampsia and potential targets for preeclampsia treatment.

Dr. Granger is the Billy S. Guyton Distinguished Professor in Physiology and Medicine, Director of the Cardiovascular-Renal Research Center. His research focuses on the pathophysiology of preeclamspsia and his lab has been continuously funded by NIH since 1985.

Joey Granger, is a native of Louisiana. He received his BS degree from University of Louisiana, Lafayette, Louisiana and his PHD from University of Mississippi Medical Center, Jackson, Mississippi.

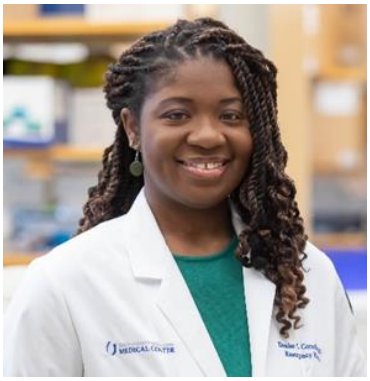
Dr. Granger currently serves as the principal investigator of a NHLBI Institutional Training Grant entitled "Hypertension and Cardiorenal Diseases Research Training Program and NIGMS "Mississippi Center for Clinical and Translational Research".

Dr. Granger's academic services are numerous. He served as a Chair of the American Heart Association Council on Hypertension. He was President of the American Physiology Society in 2012. He served on scientific study sections for the AHA, NIH, NASA, and the Veterans Administration. He served as chair of the Hypertension and Microcirculation NIH study section. In addition, Dr. Granger served as an Associate Editor for Hypertension and as Co-Editor of the eBook series entitled Integrative Systems Physiology; as the Editor of the Council for High Blood Pressure Newsletter and an Associate Editor for News in Physiological Sciences and American Journal of Physiology: Regulatory and Integrative Physiology.

Dr. Granger has a long list of scientific awards. This includes in part: AHA Excellence Award for Hypertension Research, the AHA Distinguished Scientist Award, APS E.H. Starling Distinguished Lecture Award, APS Bodil M. Schmidt-Nielsen Distinguished Mentor and Scientist Award, Dahl Memorial Lecture of the AHA, American Society of Hypertension Young

Scholar Award, the International Society of Hypertension Demuth Research Award etc. He has authored or co-authored over 300 peer-reviewed publications with over 24,000 citations.

10:45 **IMMUNE MECHANISMS OF PREECLAMPSIA**



Dr. Denise C. Cornelius

Associate Professor, Director of Immuno Assay Core, Pharmacology/Toxicology
Director of Pre-Clinical Research in the Department of Emergency Medicine,
University of Mississippi Medical Center, Jackson, MS

Dr. Cornelius will discuss immunological findings in preeclampsia and activation of the innate and adaptive immune system leading to inflammation and endothelial cell dysfunction during pregnancy.

Dr. Cornelius is a Jackson native. While an undergraduate Biology major, she pursued research experiences in various fields. She performed studies investigating the role of tumor-associated macrophages in breast cancer metastasis during her academic semesters at Howard University, and also performed summer research on eye infections in the Department of Microbiology and Immunology at UMMC. These experiences helped shift her career goal from practicing medicine to research in biomedical science.

Dr. Cornelius earned her PhD in Microbiology and Immunology from University of Mississippi Medical Center in 2012. She studied the development of novel methods to genotype *Trichomonas* parasites in order to identify the different strains that were more infectious or more likely to cause pelvic inflammatory disease. Upon graduation, she joined the Department of Pharmacology and Toxicology, as a Postdoctoral fellow to study immune dysfunction in preeclampsia.

Dr. Cornelius became Faculty at UMMC in 2015. All of her past and present research is tied to diseases with health disparities that disproportionately affect women, Black Americans, or Mississippians. Dr. Cornelius realized her passion for this work early in her training, and it is part of the reason she's a scientist.

Using multiple experimental models, her lab investigates changes that happen in placenta, kidneys and blood vessels during preeclampsia and how they are influenced by the immune system. In particular, she's looking at T helper cells, Natural Killer (NK) cells and inflammasomes, a group of proteins that trigger the inflammation as part of an immune response.

Dr. Cornelius is currently a member of the editorial board of BMC Pregnancy and Childbirth. She also serves as a reviewer for a number of journals including Hypertension, American Journal of Physiology: Regulatory and Integrative Physiology, Circulation, and Frontiers in Physiology. She has published over 60 peer reviewed manuscripts, book chapters, and editorials in leading journals for the field of hypertension research and cardiovascular physiology. A message to graduate students and young scientists: She said one of the keys to being successful in research is to find an area that excites you and encourages you to explore the unknowns and "mysteries in science."

11:15 LAPAROSCOPIC AND ROBOTIC SURGERY VS. TRADITIONAL, APPLICATION IN ABDOMINAL DISEASE

Dr. Wade O'Connell Christopher

Assistant Professor, Surgery/Division of Surgical Oncology/SOM,
University of Mississippi Medical Center

Dr. Christopher, will discuss how these two surgery techniques are similar and different and when they're appropriate.

Wade, received his Batcheler Degree, from Auburn University. As an undergraduate, he played four years of football at Auburn University where he made the Southeastern Conference Academic Honor Roll and was a member of the 2010 BCS National Championship-winning team.

Dr. Wade Christopher obtained his Medical Degree from the University of South Alabama in Mobil Alabama, 2015. Then he completed his surgical internship and residency at the University of Mississippi Medical Center. Dr. Christopher served as administrative chief resident for the general surgery residency program.

Dr. Christopher entered the Fellowship program in complex surgical oncology at the John Wayne Cancer Institute in Santa Monica, California. Just recently he joined the University Medical Center faculty as an Assistant Professor of surgery within

the Division of Surgical Oncology in the School of Medicine.

At UMMC, Dr. Christopher received numerous honors, including AOA Resident of the Year, the Humanism and Excellence in Teaching Award presented by the Arnold Gold Foundation, and the Carl Evers M.D. Society Resident Teaching Excellence Award. As a resident, he also served on several research and quality improvement committees.

Dr. Christopher is a member of the American College of Surgeons and the Society of Surgical Oncology, he has participated in a number of professional research presentations across the country and is the lead author on a variety of peer-reviewed publications.

Dr. Christopher's first-author citations include publications in *The American Surgeon* discussing ectopic pancreatic IPMNs, the management of Wolffian duct carcinoma and HIPEC, the management of metastatic colorectal cancer to the liver and peritoneum, the management of metastatic renal cell carcinoma to the pancreas, and the management of GIST with neoadjuvant therapy. He is certified in the fundamentals of endoscopic surgery, fundamentals of laparoscopic surgery, Da Vinci robotic surgery, advanced trauma life support, advanced cardiac life support, and more.

CELLULAR AND MOLECULAR
Mississippi INBRE Microbiome Symposium
1:00 PM -3:00 PM
Room: D1

Single Cell RNA Sequencing Symposium

Organizers: Dr. Shahid Karim,
Shahid.Karim@usm.edu
Center for Molecular and Cellular Biosciences, School of Biological, Environmental, and Earth Sciences, The University of Southern Mississippi, Hattiesburg, MS-39406

Session description: Single-cell genomics has emerged as a revolutionary technology transforming nearly every field of biomedical research. Through its many applications (single-cell genome sequencing, single-cell transcriptomics, various single-cell epigenetic profiling approaches, and spatially resolved methods), researchers can characterize the genetic and functional properties of individual cells in their native conditions, leading to numerous experimental and clinical opportunities. Next-generation sequencing, microfluidic techniques, and super-resolution microscopy have spurred the development, and important new knowledge derived from these single-cell genomic techniques has been continuing to emerge. The rapidly increasing use of single-cell genomics to explain biological problems is a highly multidisciplinary effort. This session seeks to bring together molecular and cellular biology experts with innovators in genomic technologies and computational biologists. Our goal is to create a forum where knowledge is shared, hoping to define together the agenda of this new community. We encourage faculty, students, and postdocs to participate in this open forum.

1:00-1:20 PM

Integrating Single Cell and Visium Spatial Gene Expression Data

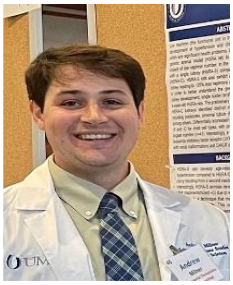
Nicky Hales, Ph.D.
10X Genomics (https://www.10xgenomics.com/)

1:20-1:45 PM:

Insights into Lung and Liver Immunity using Single cell RNAseq

Jay Kolls, M.D.
Center for Translational Research in Infection and Inflammation,
Tulane School of Medicine, New Orleans, LA

1:45-2:05 PM:

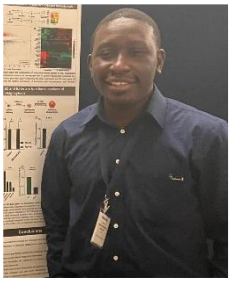


The Kidney, Disease, and Single Nuclei RNA Sequencing
Andrew Milner and Michael R. Garrett
Department of Pharmacology and Toxicology
University of Mississippi Medical Center, Jackson, MS

2:05-2:25 PM:

Gamma delta T cell subset regulation of anti-viral responses in the cornea
Rachel Rodenberg and Robert Barrington
Department of Microbiology and Immunology
University of South Alabama, Mobile, AL

2:25-2:45 PM:



Tick hemocytes at single-cell resolution
Abdulsalam Adegoke and Shahid Karim
School of Biological, Environmental, and Earth Sciences,
The University of Southern Mississippi, Hattiesburg, MS-39406

2:45-3:00 PM:
Open discussion and concluding remarks

CELLULAR AND MOLECULAR
Divisional Round Table: Women in STEM
2:00 PM -3:00 PM
Room: D3

Guest Speakers: **Dr. Lauren Priddy, Mississippi State University**
Dr. Courtney Roper, University of Mississippi
Dr. Davida Crossley, Mississippi University for Women

Dr. Lauren Priddy is an Associate Professor in the Department of Agricultural and Biological Engineering at Mississippi State University. Her research involves creating biomaterials to enhance bone healing and to treat bone infections. In 2021, she was recognized as one of Georgia Tech Alumni Association's 40 Under 40, was awarded MSU's Donald Zacharias Early Career Undergraduate Teaching Excellence Award, and she was inducted into MSU's Bagley College of Engineering Academy of Distinguished Teachers. Dr. Priddy is also engaged in outreach and mentorship, particularly to marginalized students interested in careers in orthopaedics and engineering. This year she served as an Access, Diversity, and Inclusion Fellow at MSU and received the Boehringer Ingelheim Mentoring Award.

Dr. Courtney Roper is an Assistant Professor of Environmental Toxicology and Assistant Research Professor in the Research Institute of Pharmaceutical Sciences in the University of Mississippi's School of Pharmacy. Her research group is focused on understanding air quality, particularly in the rural South. The goal of this research is to provide data necessary for exposure assessment and risk mitigation strategies to protect human health. She earned her PhD from the University of Pittsburgh where she was involved in molecular and environmental toxicology research. She then became a NIEHS-funded postdoctoral researcher at Oregon State University in developmental toxicology and environmental chemistry before moving to the University of Mississippi for her current position. She teaches courses on toxicology, environmental health, and science communication.

Dr. Davida Crossley has received her PhD in molecular biology at the University of Southern Mississippi. She has previously taught at Alcorn State University, Louisiana State University at Alexandria, and is currently an Assistant Professor of Microbiology at Mississippi University for Women (MUW). At MUW, she teaches Microbiology and Genetics, and obtains a research lab mentoring undergraduate students in studying gene regulation in the dimorphic pathogenic fungus *Histoplasma capsulatum*. Dr. Crossley is also an Emma Saddler Moss Chair Recipient at MUW, and was recently featured in an article in the Diversity in Action: Advancing STEAM Students and Professionals Magazine.

HEALTH SCIENCES
1:00 PM -3:00 PM
Interactive Workshop
Room: D7

Gene Editing

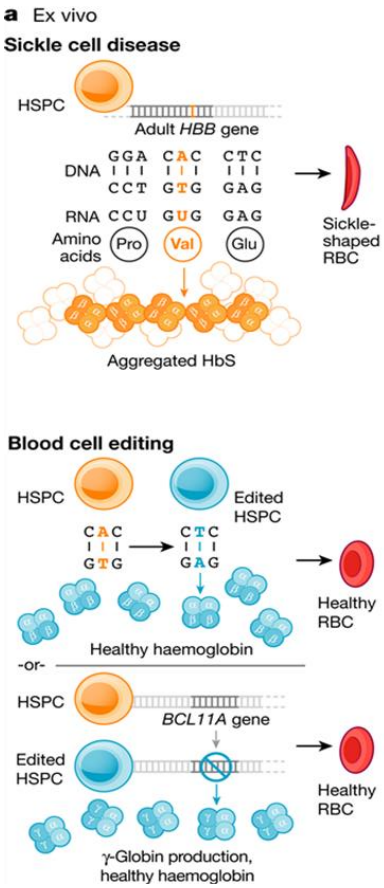
Dr. Lance Kellar

School of Medicine, Department of Cell & Molecular Biology, Center for Immunology and Microbial Research, UMMC

Univeristy of Mississippi Medical Center, Jackson. MS

Sickle cell disease-story of a young Mississippi woman (video)

Dr. Keller will discuss some aspects of genome editing approaches in somatic cells, as well as in diseases where application is available. Then he will demo a Sickle cell disease-story of a young Mississippi woman (video).



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

Dr. Keller joined the faculty at UMMC in 2020. He has exceled in the area of research discoveries very quick. He demonstrated that Pneumococcal Surface Protein K (PspK) is a canonical surface adhesin of non-encapsulated *Streptococcus pneumoniae* (NESp). He demonstrated that PspK allows NESp to colonize the nasopharynx as effectively and

encapsulated pneumococci. The prior beliefs indicated that pneumococci had to have a capsule to colonize the nasopharynx. This resulted in an Outstanding Young Researcher Award from UMMC. As well as an American Society for Microbiology (ASM) award to present his research. Dr. Keller's Award are numerous. He received a Defense and Advanced Research Project Agency (DARPA) Cooperative Agreement Award, 2017-2018 for the development of a novel sequencing technology based on FRET microscopy. He also took an active part in a Major International Joint Research Project (2019-2020), from the National Natural Science Foundation of China.

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

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

SCIENCE EDUCATION
WORKSHOP
1:00 PM -3:00 PM
Room: B5-6

Teaching Excellence Workshop: Optimizing STEM Instruction in Higher Education

Renee M. Clary, Lydia Lytal, Athena Owen Nagel, Christa Haney, Sarah Lalk

Are you interested in a professorship or teaching career in higher education? Successful, effective instruction requires pedagogical tools in addition to in-depth STEM content knowledge. Join us as we showcase active-learning strategies to engage students in both traditional and online classrooms. Science Literacy and Community Engaged Learning will be included. **Certificates of Teaching Excellence Completion will be provided to attendees**. *Early bird registration, before February 1st $50. ($75 after February 15th, $100 on-site registration fee).*

Our workshop teaching expert facilitators include:

Dr. Renee Clary
Dr. Christa Haney
Dr. Sarah Lalk
Lydia Lytal
Dr. Athena Owen Nagel

Dr. Renee Clary: Dr. Clary, MAS Fellow, is a Professor of Geology at Mississippi State University. Her research focuses on the optimization of science education in traditional, informal, and online settings. Clary has been recognized with the NAGT Transformation Award, the SEC Faculty Achievement Award, the MAS Science Teacher of the Year, and the MSTA Outstanding College Science Teacher awards.

Dr. Christa Haney: Dr. Haney is an Assistant Clinical Faculty in the Dept of Geosciences at Mississippi State University. Her research interests include the impact of humans on the environment as well as best practices and learning strategies in online education. Dr. Haney is the UPCEA Professional, Continuing and Online Educator Award winner for the South region (2022) as well as MSU's Center for Distance Education online teaching award winner (2022).

Dr. Sarah Lalk: Dr. Lalk is an Assistant Teaching Professor of Geography and Geology at Mississippi State University, and a former K12 science teacher. She has certified three courses with the MSU Center for Community-Engaged Learning along with local community-engaged weather projects. Her research focus includes community engagement, informal learning experiences, physical models of earth systems, and media portrayal of Geosciences related topics.

Lydia Lytal: Lydia is the incoming MAS Science Education Division Chair. She teaches biology and science education courses at Blue Mountain Christian University. She is currently working on a dissertation and will graduate soon from The University of Mississippi with a Ph.D. in Secondary Science Education.

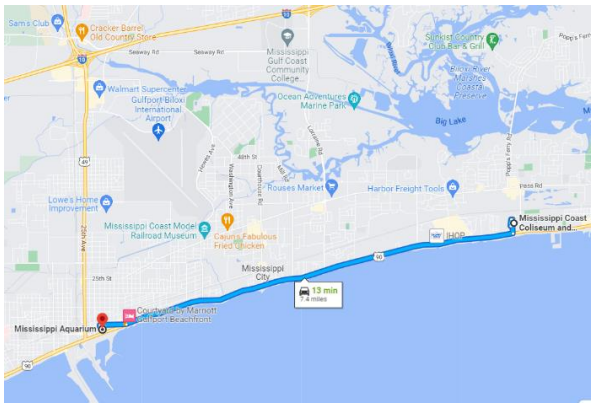
Dr. Athena Owen Nagel: Dr. Nagel is an Associate Clinical Professor in the Department of Geosciences at Mississippi State University. Her research focuses on Carbonate Island Karst and geoscience education in online classrooms. She is the winner of the 2021 UPCEA Excellence in Teaching Award, and has received the South Regional UPCEA Professional and Continuing and Online Educator Award and the Mississippi State Excellence in Online Teaching Award

DIVISIONAL SYMPOSIA AND WORKSHOPS
Friday, February 24, 2023

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

FIELD TRIP TO THE MISSISSIPPI AQUARIUM

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



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

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

Regular Adult Admission to the Aquarium: $24.95

Discount rate for MAS participants: $21.95

(Please mention MAS at the ticketing window.)

HEALTH SCIENCES
SYMPOSIUM II
10:10 AM-12:00 PM
Room: D8

PRECISION MEDICINE

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

GENOMIC TECHNOLOGY: SARS-COV-2 SEQUENCING BIOSURVEILLANCE IN MISSISSIPPI

Dr. Michael R. Garrett
Professor of Pharmacology and Toxicology;
Medicine (Nephology) and Pediatrics (Medical Genetics)
Director, Institutional Molecular and Genomics Core Facility (MGCF)

Dr. Garrett will discuss some aspects of genome technology, particularly, sequencing and the application of RNA sequencing in genome variant determination.

Michael received his BS and MS degrees in Biochemistry, from University of California-Riverside, Riverside, CA. He subsequently earned MBA degree in Finance, from Bowling Green State University, Bowling Green, OH. He received his Ph.D. from University of Toledo-College of Medicine, Toledo, OH. Dr. Garrett has extensive experience in molecular biology, animal models of disease, and genetic and genomics techniques. Dr. Garrett, aside from his role as a Director of the MGCF, has an active research program involving studying the genetics of complex disease including hypertension, kidney disease, diabetes and congenital birth defects.

Most recently, his laboratory activities also shifted in the direction of studying the whole viral genome and sequencing of SARS-CoV-2 patient samples collected through the Medical Center and across Mississippi (MS). In collaboration with Dr. Ashley Robinson, Microbiologist and Vice Chair of CMB Department, (and others in the Department of Pathology and Mississippi State Department of Health), they developed a SARS-CoV-2 Biosurveillance Program which identifies variants and lineages circulating in MS; as well as sequencing archived SARS-CoV-2 samples collected from the beginning of the pandemic.

Dr. Garrett has a long list of scientific awards and distinctions. This includes in part: UMMC Silver Medal for Excellence in Research (2012); Fellow of American Heart Association (FAHA)-Council for High Blood Pressure Research (HBPR) 2013; UMMC Gold Medal for Excellence in Research (2015); Meritorious Service Award- Core Services (2016); UMMC Platinum Medial for Excellence in Research (2020, >5million in extramural funds), and Deputy Editor of Physiological Genomics, etc.

Dr. Garrett's efforts in the development of the UMMC Molecular and Genomics Core Facility (MGCF) is supported through several extramural funding mechanisms, including 2 large Center grants, NIH-R01 awards, and through the Department of Pharmacology.

Dr. Garrett's has numerous publications, shown in the link.
https://www.ncbi.nlm.nih.gov/myncbi/michael.garrett.1/bibliography/public

SCIENCE EDUCATION
Friday, February 24, 2023
11:00 AM
Room: D12

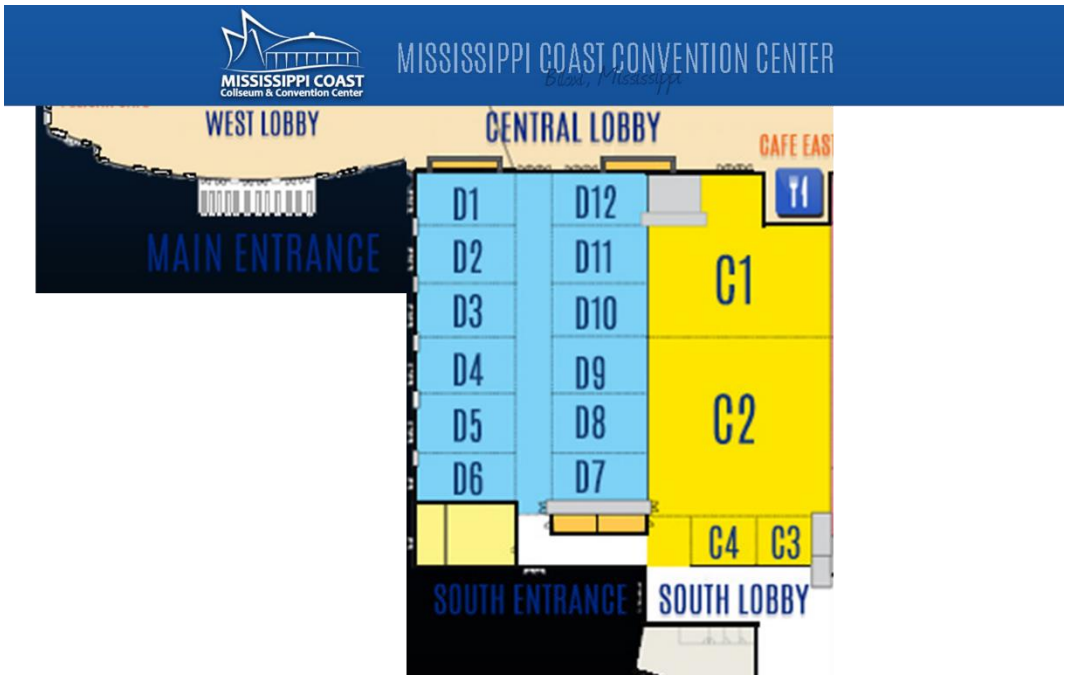
Roundtable

The Mississippi Base Pair Consortium (MBPC): Current Status and Future Plans

Dr. Robin Rockhold, Univeristy of Mississippi Medical Center

The MBPC has been established to promote inclusivity in research mentorship programs for pre-baccalaureate students, using a successful model – the Base Pair program between the University of Mississippi Medical Center (UMMC) and the Jackson Public School District – and expanding access to universities across Mississippi. Supported by the Phil Hardin Foundation of Mississippi, six research-intensive Mississippi universities (Delta State University, Jackson State University, Mississippi State University, the University of Mississippi, UMMC, and the University of Southern Mississippi) have begun sharing concepts of and infrastructures for campus-specific mentorship activities, along with outcomes for student recruitment and career advancement. The present session will provide an opportunity for key campus representatives to present the status of MBPC efforts on each campus, including collaborative arrangements with local high schools, the recruitment of students for upcoming mentorship activities, faculty who will participate as mentors, and plans for summer and after-school student engagement activities. As MBPC member campuses have initiated activities, a diversity of approaches, based on campus-specific research infrastructures, local school collaborations, and institutional resources, has become evident. This session will seek to document these differences and implement adaptation of what was a single model to the variety of unique institutional needs and capabilities. The presentation will share presentation space with the poster session for university-mentored high school student research outcomes. Funded by a generous donation from the Phil Hardin Foundation (https://www.philhardin.org).

Mississippi Coast Coliseum and Convention Center Floor Plan



NOTES

Key to Abbreviations

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

1 Agriculture and Plant Science
2 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: Raju Bheemanahalli

Mississippi State University

Co-Chair: Jagmandeep Dhillon

Mississippi State University

Thursday, February 23, 2023

MORNING

Room D1

8:15 Welcome and Opening Remarks

Oral Session 1: Moderator:

Purushothaman Ramamoorthy

Mississippi State University

O1.01

8:30 PROSPECT OF ORPHAN GENE QQS AND ITS NETWORK IN THE DEVELOPMENT OF HIGH-PROTEIN AND PEST-RESISTANT CROPS

Rezwan Tanvir[1], Wenli Ping[1], Ling Li[1]

[1]Mississippi State University, Mississippi State, MS 39762

Demand for high-protein crops is rising worldwide due to higher affordability, sustainability, and lower cardiovascular mortality associated with plant protein. *Arabidopsis thaliana*-specific orphan gene *Qua-Quine Starch* (*QQS*) and its interactor Nuclear Factor Y subunit C4 (NF-YC4) can increase total protein, decrease starch content in the leaves and seeds and enhance pathogen and pest resistance in different plant species. Here we introduced *AtQQS* and overexpressed *NF-YC4* homologs in potato (*Solanum tuberosum*, *StNF-YC4*) and tobacco (*Nicotiana tabacum*, *NtNF-YC4*) to study their effect on total protein, especially in potato tuber (modified stem) and resistance against common pests like whiteflies (*Bemisia tabaci*) and aphids (*Myzus persicae*) in tobacco. Our results showed that both *QQS* and *NF-YC4* positively impacted total protein accumulation in the leaves and seeds of tobacco and in the tuber of potato without any significant changes in the plant morphology and yield. *AtQQS* and *NtNF-YC4* also boosted pest resistance against whiteflies and aphids in tobacco plants, and upon pest infestation, *NF-YC4* expression was found to be increased in the pest-resistant tobacco varieties. In addition, *QQS* expression and *NtNF-YC4* overexpression altered the expression of several genes involved in carbon and nitrogen allocation in tobacco. Our data indicated that the activity of species-specific orphan genes may not be limited to the original species, its close relatives, or a particular organ, and this may have considerable application in crop development and biotechnology.

O1.02

8:45 IMPACT OF RECENT CLIMATE CHANGE ON CORN, RICE, AND WHEAT YIELDS IN SOUTHEASTERN USA

Ramandeep Kumar Sharma[1], Sunny Kumar[2], Kamal Vatta[2], Raju Bheemanahalli[1], Jagmandeep Dhillon[1], Krishna N. Reddy[3]

[1]Mississippi State University, [2]Punjab Agricultural University, [3]USDA-ARS, Stoneville, MS, USA

Climate change and its impact on agriculture productivity vary among crops and regions. The southeastern United States (SE-US) is agro-ecologically diversified, economically dependent on agriculture, and mostly overlooked by agroclimatic researchers. The objective of this study was to compute the effect of climatic variables; daily maximum temperature (Tmax), daily minimum temperature (Tmin), and rainfall on the yield of major cereal crops i.e., corn (Zea mays L.), rice (Oryza sativa L.), and wheat (Triticum aestivum L.) in SE-US. A fixed-effect model (panel data approach) was used by applying the production function on panel data from 1980 to 2020 from 11 SE-US states. An asymmetrical warming pattern was observed, where nocturnal warming was 105.90%, 106.30%, and 32.14%, higher than the diurnal warming during corn, rice, and wheat growing seasons, respectively. Additionally, a shift in rainfall was noticed ranging from 19.2 to 37.2 mm over different growing seasons. Rainfall significantly reduced wheat yield, while, it had no effect on corn and rice yields. The Tmax and Tmin had no significant effect on wheat yield. A 1 °C rise in Tmax significantly decreased corn (− 34%) and rice (− 8.30%) yield which was offset by a 1 °C increase in Tmin increasing corn (47%) and rice (22.40%) yield. Conclusively, overall temperature change of 1 °C in the SE-US significantly improved corn yield by 13%, rice yield by 14.10%, and had no effect on wheat yield.

O1.03

9:00 ASSESSMENT OF DROUGHT STRESS IMPACTS ON FLOWERING AND GRAIN-FILLING STAGES OF CORN

Ranadheer Reddy Vennam, Raja Reddy K, Raju Bheemnahalli

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

Drought is one of the major abiotic stresses that negatively affect corn-growing regions. The yield potential of corn is at risk due to drought stress during flowering and grain filling. The rate of yield reduction depends on the growth stage and magnitude of the drought. Therefore, this study aimed at systematically quantifying drought stress impacts on the physiology, yield, and quality of corn during flowering and grain filling stages. Four levels of suboptimal irrigation as drought treatments along with control (optimum irrigation) were provided during flowering (14 d, VT-R1) and grain filling (30 d, R2-R5) stages. Drought stress significantly affected stomatal conductance ($p<0.001$), transpiration ($p<0.001$), and chlorophyll content ($p<0.001$) during flowering and grain filling. Fourteen days of drought during flowering affected silk developmental processes and induced a significant reduction in kernel number (53%) and kernel weight (54%) compared to the optimum irrigation treatment. Sub-optimum irrigation during grain filling had less impact on kernel number (7%) than kernel weight (19%) compared to the control. Failure in kernel setting and kernel filling during flowering and grain filling had a pronounced impact on the final yield, respectively. Our findings suggested that drought adaptation strategies vary depending on growth stages. Future studies screening diverse corn genotypes/hybrids may help identify reproductive stage drought-tolerant hybrids for

rainfed conditions. In addition, our findings might guide better irrigation management practices during peak flowering and grain-filling stages to sustain higher yields.

O1.04

9:15 EVALUATING THE EFFECT OF FOLIARLY APPLIED AUXIN ON ROOTING OF SWEETBAY MAGNOLIA

Jenny Ryals[1], Patricia Knight[1], Anthony Bowden[1], Scott Langlois[1], Christine Coker[1], Patricia Drackett[1]

[1]Mississippi State University

Propagation of sweetbay magnolia (*Magnolia virginiana*) from cuttings has been noted to be difficult among cultivars. Two studies were conducted to provide growers with relevant cutting propagation recommendations. The first study investigated if basal wounding and/or hormone source would improve rooting of sweetbay cuttings. Treatments included two basal wounding treatments (wounded or non-wounded) and five levels of auxin (0, 2500, 5000, 7500, or 10000 ppm IBA). The auxin formulation applied was Hortus IBA (Hortus IBA Water Soluble Salts™). Data was collected after 16 weeks and included rooting percentage, growth index, cutting quality (0-5, with 0 = dead and 5 = transplant-ready cutting), total root number, average root length (of three longest roots), and root quality (0-5, with 0=no roots and 5=healthy, vigorous root system). Data were analyzed in SAS version 9.4. The interaction between basal wounding and level of auxin had no significant effect on any data parameter collected. Basal wounding alone had no significant effect on any data parameter collected. Auxin level did not have a significant effect on growth index or cutting quality. Root percentage, root number, root quality, and average root length (of three longest roots) were all significantly affected by auxin level. Overall results suggest that dipping sweetbay cuttings in Hortus IBA at 5000 ppm, 7500 ppm, 10000 ppm, regardless of basal wounding, will result in a higher quality liner. The second study investigated if auxin application method and/or propagation substrate could further improve rooting of sweetbay cuttings. Treatments included two substrates (100% pine bark or 100% perlite) and six methods of auxin application (no auxin, quick dip, single over-the-top spray, single over-the-top spray with surfactant, multiple over-the-top sprays, and multiple over-the-top sprays with surfactant). Data was collected and analyzed as previously stated in the first study. The interaction between substrate and auxin application method had no significant effect on any data parameter collected. Substrate alone had a significant effect on root number and root percentage, but no significant effect on average root length or root quality. Auxin application method did not have a significant effect on average root length or root number. Root percentage and root quality were both significantly affected by auxin level. Overall results suggest that sweetbay cuttings propagated into 100% pine bark with Hortus IBA 10000 ppm applied via a quick dip, single over-the-top spray, single over-the-top spray with surfactant or multiple over-the-top sprays, will result in a higher quality liner.

O1.05

9:30 ELUCIDATING THE IMPACTS OF DROUGHT STRESS DURING POD DEVELOPMENT IN SOYBEANS

Sadikshya Poudel, K. Raja Reddy, Raju Bheemanahalli

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

Drought stress due to low rainfall during the peak blooming and pod filling has been the main constraint of soybean production in the Southern US. The ever changing-climate conditions are predicted to increase drought spells which hamper every growth cycle of a plant, with flowering and seed filling being the most sensitive. To elucidate the impact of drought stress, twelve soybean cultivars were exposed to low soil moisture content during pod development, and a range of gas exchange and yield components were measured to identify drought-resilient high-yielding cultivars for the Southern US climate. The photosynthetic rate decreased by 38% under drought stress compared to the control. The plants grown under drought stress for 30 days showed reduced plant height (27%) with few node numbers (17%) compared to the control condition. Decrease in stomatal conductance (62%) and transpiration (37%) were observed for drought-stressed plants, which increased canopy temperature by +2 °C compared to the control. A significant variation was observed between treatment ($p < 0.001$) and cultivars ($p < 0.001$) for the yield parameters. Averaged across the cultivars, the seed number decreased from 372 to 195 plant^{-1} under control and drought stress, respectively. Consequently, seed yield decreased by 36% under drought stress in comparison to control. Our study identified some soybean cultivars that performed better under control and poorly under drought stress, emphasizing the complexities associated with drought stress tolerance. We also explored the functional limitation caused by drought stress during pod formation in soybeans. These findings also emphasize the need for an improved understanding of genetic regulation at different development stages to develop drought-resilient high-yielding soybean cultivars.

O1.06

9:45 OPTIMIZATION OF B-CAROTENE PRODUCTION IN RHODOTORULA GLUTINIS EMPLOYING RESPONSE SURFACE METHODOLOGY (RSM) USING SORGHUM SYRUP AS CARBON SOURCE

Kevaughn Prout, Keerthi Mandyam, Ananda Nanjundaswamy

Alcorn State University, Lorman, MS

β-carotene is one of the carotenoids found in nature among over 600 carotenoids. Plants, algae and microbes such as fungi and bacteria produce carotenoids. Animals cannot produce carotenoids but can assimilate the carotenoids for improved health and wellbeing. Carotenoids are known for their antioxidant properties and can reduce cancer incidence, slowing down Alzheimer's and Parkinson's disease progression. Carotenoids prevent these serious conditions by capturing reactive oxygen species [O2-] in the cells. β - carotene is used as food and feed colorant and global market for carotenoids is estimated at $2 billion in 2022. Because of

the commercial importance and increased focus on natural carotenoid use, the overall objective of the study was to utilize inexpensive agricultural resources such as sorghum syrup to produce natural, high value β-carotene using red yeast Rhodotorula glutinis fermentation. Response surface methodology (RSM) was used for bioprocess optimization for β-carotene production. Optimization in shake flasks provided key optimal points for media ingredients for β-carotene production. From RSM the predicted concentrations of media ingredients were Sorghum Syrup – 9.18%; Yeast Extract – 0.96%; KH2PO4 – 0.07%; (NH4)2SO4 – 0.13% and MgSO4 – 0.42% with a predicted β-carotene production of 1003 µg/g of yeast cells on day 10 of fermentation. The validation experiment produced 1153µg/g of yeast cells on day 10. From the optimized media scale-up in 7-liter benchtop bioreactor in triplicates, the red yeast transcriptional data from RNASeq, and total nutritional profile will be discussed.

10:00 BREAK

O1.07

10:15 RESPONSE OF LETTUCE (LACTUCA SATIVA L.) TO SALT STRESS

Bikash Adhikari[1], T. Casey Barickman[2], Raju Bheemanahalli[1]

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

Lettuce is a cool-season vegetable and widely consumed leafy salad in the United States. Salt stress is a widespread problem caused by drastic climate change and affects lettuce productivity. Limited availability of salt-free is a rising concern for lettuce production under hydroponics. Despite growing evidence supporting salt stress-induced changes in yield and quality losses, studies on romaine lettuce salt stress tolerance are limited. Thus, this study aimed to investigate the response of morph-physiological and biochemical attributes of the "Green Forest" romaine lettuce cultivar under salt stress (SS). The experiment was arranged in a randomized complete block design in a greenhouse under hydroponics. Exposure of lettuce to 150, 100, and 50 mM NaCl treatments decreased fresh weight by 76%, 54%, and 29% compared to the control (0 mM), respectively. Several gas exchange parameters, such as transpiration rate, stomatal conductance, mesophyll conductance, and intercellular carbon dioxide, were severely decreased with increased SS during both GS. Besides no changes in the carbon assimilation rate, water use efficiency increased linearly with increased SS. The phenolic compounds and sugar analysis supported the morphological and physiological changes. In response to SS, lettuce leaves accumulated higher amounts of phenolics and sugar compounds to counter oxidative stress damage. Imbalance in the mineral nutrient (higher sodium and lower potassium) under SS also supported morpho-physiological and biochemical changes across growth stages. Our study identified salt-sensitive growth stages, phenotypic traits associated with salt stress tolerance, and contrasting salt-tolerant cultivar genotypes.

O1.08

10:30 IMPROVED HERBICIDE SELECTIVITY IN TOMATO BY SAFENING ACTION OF BENOXACOR, 2,4,6- TRICHLOROPHENOXYACETIC ACID, MELATONIN, AND FENCLORIM.

Tabata de Oliveira, Antonio Tavarez, Varsha Singh, Josiane Argenta, Te Ming Tseng

Mississippi State University, Starkville MS

Safeners are substances used to protect crops. The mechanism involves the ability to metabolize different compounds, including herbicides. The primary action of safeners includes raising the crop´s endurance to herbicide damage by inducing the protein(s) involved in herbicide metabolism and catalyzing their detoxification in the crop´s system. This study aimed to understand the biochemical effect of benoxacor safener for use in tomato culture, including the activation of the detoxifying enzyme glutathione S-transferase (GST). The experiment was conducted in a randomized factorial design 4x2, with four replications separated into two factors, (a) herbicide rates (0, 0.01, and 0.05x), and (b) safeners (benoxacor, fenclorim, melatonin, and control). Treatments were applied to the aerial part of the tomato seedlings. Visual injury at 3, 7, 14, and 21 days after application (DAA) and biomass at 21 DAA were evaluated. Leaf tissues were collected 24 and 48 hours after herbicide application to determine GST activity. A close perusal of data indicates that seeds pre-treatment with safeners decreased injury, raised biomass, and showed high potential in increasing GST enzymatic activity, assisting the detoxification of plants caused by the herbicide. Knowledge of plant defense mechanism(s) will help improve our understanding of how safeners can offer protection against herbicides, thus leading to improved weed management strategies.

O1.09

10:45 USING MERISTEM-TIP TISSUE CULTURE TECHNIQUE TO REMOVE VIRUSES FROM SWEET POTATO

Alpha Jones, Chunquan Zhang, Yan Meng

Department of Agriculture, Alcorn State University, Lorman, MS, 39056

As a member of *Convolvulaceae* family, sweetpotato (*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 sweetpotato production is the cumulative effect of virus infection leading to cultivar decline and yield losses. To produce virus-tested sweetpotato 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 sweetpotato have been collected and processed for virus removal. The plants were first examined with the infection of five of the most prevalent viruses by using nucleic acid-based polymerase chain reaction (PCR) and reverse-transcription PCR (RT-PCR) techniques, which showed high sensitivity and confirmation at the genomic level of viral species and strains. Primers targeting to conserved regions of the know sweetpotato 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 sweetpotato lines in Mississippi. Virus-free planting material will be propagated in Agriculture Research Station of Alcorn State University at Preston, Mississippi for performance evaluation.

O1.10

11:00 PRE- AND POST-ANTHESIS DROUGHT STRESS IMPACT ON CORN YIELD

Xinyan Jian[1], Raja Reddy K[2], Jagman Dhillon[2], Raju Bheemnahalli[2],

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

Corn consumes a significant amount of water during the reproductive stage. Inadequate soil moisture around this stage could inhibit tassel emergence and cause abnormal ear formation. Such abnormalities during the reproductive stage can decrease the number of harvestable kernels per ear. On the other hand, rainfed corn-growing regions in the USA are often exposed to inadequate soil moisture during tasseling. Despite the sensitivity of these stages to inadequate soil moisture, the interaction between the time of irrigation and yield at different phenological stages has been overlooked. In this study, we quantified the impact of drought stress on different phenological stages targeting physiology, yield, and kernel quality using the Dekalb hybrid. Drought stress was imposed by withholding irrigation for seven days targeting: (i) tassel initiation, (ii) peak flowering, and (iii) after pollination or blistering. Physiology and pigment data were collected at the end of drought stress at each growth stage. After 7-day of drought stress, pots were rewatered or maintained under non-stress conditions until physiology maturity. At maturity, plants were hand-harvested and examined for drought stress effects on yield potential (kernel number, weight, 100-kernel weight) and quality (starch and protein). Drought stress imposed at different growth stages significantly reduced stomatal conductance, transpiration, and other photosynthesis-related pigments. Data obtained from the three treatments showed that drought stress considerably affected kernel number, kernel weight, and single kernel weight ($p<0.001$) across three growth stages. However, seven days of drought stress before anthesis resulted in greater yield loss, followed by the other two growth stages, indicating greater sensitivity of this stage to drought stress. Our finding suggests that the most beneficial water use can be achieved by supplying optimal irrigation to corn fields around tasseling.

O1.11

11:15 OPTIMIZATION OF PLANT REGENERATION PROTOCOL FOR SELECTIVE ELITE LINES IN SWEETPOTATO (*IPOMOEA BATATAS* (L.) LAM).

Jacob Piazza[1], Chunquan Zhang[1], Yan Meng[1]

[1]Department of Agriculture, Alcorn State University, Lorman, MS, 39096.

Sweetpotato regeneration is a big hurdle in plant genetics research and breeding. The lack of efficient system for regeneration has been a bottleneck for the genetic modification in sweetpotato. Thus, sweetpotato is considered a recalcitrant species for regeneration, and every cultivar varies widely in its response to plant regeneration. The purpose of this investigation was to develop an efficient plant regeneration protocol for the sweetpotato (*Ipomoea batatas* (L.) Lam) selective elite lines in Mississippi. The effect of different elite lines, different basal medium, different hormone combinations and type of explants on shoot regeneration was thoroughly evaluated. Selective lines used in this study were Red Jewel (PI566648), Yellow Jewel, White Triump, Kabuka and Vadham, which were collected from Agriculture Station of Alcorn State University at Preston, MS. The explants used were in the form of petiole sections and leaves disc. They were first cultured on callus inducing media MSM1 or LSM1 accordingly for 7 days. The explants were then transferred onto MSM2 and LSM2 media. After 3 weeks, samples were then subcultured on MSM2 or LSM2 accordingly. After about two months of culture, the regeneration rate was evaluated by calculating the percentage of the number regenerated shoots for every explant. For cultivars Red Jewel and Yellow Jewel, the highest percentage of shoot regeneration was obtained when petioles explants were cultivated on MS basal medium supplemented with 0.5 mg/L 2,4,5-T for callus initiation, then were transferred to MS basal medium supplemented with 0.5mg/L Zeatin. All the shoots formed roots on root induction medium (MS + 0.5 mg/L IAA). The regenerated plants showed 100% survival rate when transferred to soil. The regeneration rates for other three lines, White Triump, Kabuka and Vadham were much lower compared to Red Jewel and Yellow Jewel. As such, for lines Red Jewel and Yellow Jewel, the regeneration protocol described in this study could be used in sweetpotato transformation or gene editing research to produce genetic modified sweetpotato plants in the future.

12:00 General Session

Thursday, February 23, 2023

AFTERNOON

DIVISION POSTER SESSION

1:00-3:00 PM

Hall C

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

P1.01

STATISTICAL ANALYSIS BETWEEN VEGETATION INDICES DERIVED FROM UAV-BASED RGB IMAGES AND MAIZE YIELD

Max Feng[1], Yanbo Huang[2], Ardeshir Adeli[2]

[1]Mississippi School for Mathematics and Science, Columbus, MS, [2]USDA-ARS Genetics and Sustainable Agriculture Research Unit, Mississippi State, MS

Unmanned aerial vehicles (UAV) are becoming more prevalent in agriculture as they can autonomously and quickly gather data about plant stresses in agroecosystems. This data

can then be analyzed and interpreted to help farmers understand exactly where to implement field operations which ultimately maximizes yield and profit while minimizing the environmental footprint. However, current well-researched and widely used remote sensing techniques require expensive accessories, such as high-grade infrared sensors or LiDAR (laser-based Light Detection and Ranging scanner), which hinders the adoption of UAVs in the farming community. In this study, we explored an inexpensive and entry-level remote sensing method by comparing 17 different red, blue, and green (RGB) derived vegetation indices such as the normalized difference photosynthetic vigor ratio, green-red ratio index, and green-red vegetation index on the growth of maize. Finding the vegetation index with the highest correlation at a certain time of the growing season will provide a clearer understanding of which vegetation index is the most applicable at certain growth stages for maize. This will result in more accurate measurements for monitoring maize growth and estimates for grain yield. To achieve this, a consumer-grade UAV equipped with a portable digital camera was flown over a maize experiment field located at the Mississippi Agricultural and Forestry Experiment Station in Pontotoc, Mississippi. The experiment field comprises of 7 fertilizer treatments, including 1) no fertilizer (control); 2) broiler litter; 3) broiler litter + flue gas desulfurization; 4) 1-ton flue gas desulfurization + lignite; 5) 2-ton flue gas desulfurization + lignite; 6) 3-ton flue gas desulfurization + lignite; 7) urea ammonium nitrate, all of which were with and without cover crops. The fertilizer treatments were replicated three times with complete random arrangements on 6 blocks creating 42 plots in total. Six total flight missions were carried out over all plots in the entire field during the crop-growing season in May, June, and July 2022. The UAV flight missions were planned and controlled by using Pix4Dcaputre (Pix4D S.A., Prilly, Switzerland). After each flight, the acquired images were processed on Pix4Dcloud (Pix4D S.A., Prilly, Switzerland) to create the orthomosaic image that fully covers the experiment field. Then by using the raster calculator and zonal statistics tools in QGIS (https://qgis.org/en/site/), an open-source GIS (Geographic Information System) software, the RGB band data were extracted from the orthomosaic images for each treated plot to calculate different vegetation indices. As results, statistical regression models were established based on each vegetation index at different growth stages and crop yield. The results indicated that a consumer-grade UAV can detect differences in maize growth and yield as affected by cover crops and fertilizers using RGB-derived vegetation indices. This study provides the farming community with an inexpensive method to quickly scout their large fields for identifying plant stress and health allowing for a smart precision application of fertilizers at the right location.

P1.02

MITOCHONDRIAL DYSFUNCTION DRAMATICALLY INCREASES THE RATE OF ALCOHOLIC FERMENTATION IN *Saccharomyces cerevisiae*

Ismael Maya, Jon Moreno, Debarshi Roy, Marta Piva

Department of Biological Sciences, Alcorn State University, Lorman, MS 39096

The baker's yeast, *Saccharomyces cerevisiae*, is widely used to produce ethanol from fermentable substrates. Due to the mitochondrion's role in reducing the yeast tolerance to ethanol, which at a specific concentration triggers apoptosis, we sought to determine whether the mitochondrial function is also related to fermentation efficiency. Three strains were selected for this study, a wild type and two mutants (delta *ccm1* and delta *dss1*) that lack mitochondrial functionality. The *CCM1* gene participates in the processing of one mitochondrial transcript, while *DSS1* affects most of them. The fermentation reaction produces carbon dioxide (CO_2) and ethanol in equimolar amounts. Therefore, we used a CO_2 probe in a sealed chamber to determine the gas production from glucose over 10 minutes by three different amounts of each yeast strain. Mitochondrial dysfunction in the two mutants was assessed by their lack of growth on a medium with glycerol, a non-fermentable substrate; the loss of part of the *COX1* gene, a component of the electron transport chain essential for aerobic respiration, was determined by polymerase chain reaction. The results show that the weaker the mitochondrial function is, the more efficient the fermentation process, as assessed by the CO_2 levels produced over time and per amount of yeast. However, the higher efficiency cannot be attributed to higher mutant yeast tolerance to ethanol: the mitochondrion-initiated apoptosis takes several minutes, and the difference is detected as early as 30 seconds after the start. In addition, the wild-type curve never reached a plateau. In conclusion, pleiotropic mutations such as the *DSS1* gene deletion that affect several mitochondrial transcripts produce organisms with a significantly higher capacity to produce ethanol.

P1.03

WHAT'S THE BIG DILL WITH ORGANIC VEGETABLES? TRACE ELEMENTS IN COMMERCIAL AND ORGANIC CUCUMBERS

Takaye Farmer, Trent Selb[1], Scoty Hearst

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

Organic farming claims to cycle resources, enhance ecological balance, and works towards conserving biodiversity. Organically grown vegetables restrict the use of certain fertilizers, pesticides, and additives. Over fertilizing, overproduction, and the use of pesticides in conventional farming is thought to harm ecosystems, reduce soil health and biodiversity, and pollute groundwater and drinking water. Demand for organic vegetables is driven by consumer concerns for the environments and healthier food choices. But are organic vegetables really a healthier choice compared to commercially grown products? To answer this question, we examined three different varies of commercial and organic cucumbers for levels of trace nutrients and toxic elements using ICP-OES. We then compare these levels with the maximum permissible levels established by World Health Organization, USDA, and Food and Agriculture Organization of the United Nations. Here, we present our results to determine if organic vegetables are really more beneficial or harmful to human health as compare to commercially grown vegetables.

P1.04

PRE- AND POST-ANTHESIS DROUGHT STRESS IMPACT ON CORN YIELD

Xinyan Jian[1], Raja Reddy K[2], Jagman Dhillon[2], and Raju Bheemnahalli[2]

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

Corn consumes a significant amount of water during the reproductive stage. Inadequate soil moisture around this stage could inhibit tassel emergence and cause abnormal ear formation. Such abnormalities during the reproductive stage can decrease the number of harvestable kernels per ear. On the other hand, rainfed corn-growing regions in the USA are often exposed to inadequate soil moisture during tasseling. Despite the sensitivity of these stages to inadequate soil moisture, the interaction between the time of irrigation and yield at different phenological stages has been overlooked. In this study, we quantified the impact of drought stress on different phenological stages targeting physiology, yield, and kernel quality using the Dekalb hybrid. Drought stress was imposed by withholding irrigation for seven days targeting: (i) tassel initiation, (ii) peak flowering, and (iii) after pollination or blistering. Physiology and pigment data were collected at the end of drought stress at each growth stage. After 7-day of drought stress, pots were rewatered or maintained under non-stress conditions until physiology maturity. At maturity, plants were hand-harvested and examined for drought stress effects on yield potential (kernel number, weight, 100-kernel weight) and quality (starch and protein). Drought stress imposed at different growth stages significantly reduced stomatal conductance, transpiration, and other photosynthesis-related pigments. Data obtained from the three treatments showed that drought stress considerably affected kernel number, kernel weight, and single kernel weight ($p<0.001$) across three growth stages. However, seven days of drought stress before anthesis resulted in greater yield loss, followed by the other two growth stages, indicating greater sensitivity of this stage to drought stress. Our finding suggests that the most beneficial water use can be achieved by supplying optimal irrigation to corn fields around tasseling.

P1.05

AN INVESTIGATION OF THE GROWTH OF BACTERIA IN THE PRESENCE OF *Mexicana argemone*

Kiara Love, Jordan Johnson

Mississippi Valley State University, Itta Bena, MS

The antibiotic-resistant bacteria such as Escherichia coli can cause infections. Plant organs can be used as an alternative to inhibit the growth of some bacteria. The study was on the effects of Mexicana argemone on the Bacillus subtilis and Escherichia coli. The seeds of M. argemone used in this study were purchased from the seed company. The hypothesis was that the seeds of M. argemone extracted with different solvents would inhibit the growth of E. coli and B. subtilis. The seeds were extracted using ethanol, ethyl acetate, hexane, methanol, and water for 72 hours. The extracts were screened for antibacterial activities using a modified disk method. Penicillin, streptomycin, and tetracycline were used as control. The results revealed that extracts using ethanol, ethyl acetate, hexane, methanol, and water were not effective in inhibiting the growth of E. coli and B. subtilis. The growth of B. subtilis was inhibited by penicillin, streptomycin, and tetracycline. The growth of E. coli was inhibited by streptomycin and tetracycline. Penicillin did not inhibit the growth of E. coli in the present study. In conclusion, M. argemone does not inhibit the growth of E. coli and B. subtilis and might not be an alternative to antibiotics in inhibiting the growth of E. coli and B. subtilis.

P1.06

RADIOACTIVITY TRANSFER FACTORS IN SWEET POTATOES

Zehlin Cornett, Dearius White, Jermiah Billa, Steve Adzanu, Sam Nwaneri

Alcorn State University, Lorman, MS

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

P1.07

ANALYZING THE ANTIMICROBIAL PROPERTIES OF SALVIA ROSMARINUS AT VARIOUS CONCENTRATIONS ON *Staphylococcus aureus*, *Escherichia coli*, AND *Salmonella* IN COMPARISON TO PHARMACEUTICAL DRUGS AMPICILLIN AND ERYTHROMYCIN

Alliah Johnson[1], Karen Bautista[2]

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The traditional scope of medicine accounts for increases in population, inadequate drug supplies, and prohibitive treatment costs. However, the side effects from several synthetic drugs, and acquired resistance to currently used drugs for infectious diseases, have led to a heightened

emphasis on plant materials as a source of medicine for a wide variety of ailments and diseases. The aim of this research study is to investigate Rosemary (Salvia Rosmarinus), which is an essential herb found in Belize, Central America for its potential to reduce the growth of bacteria. The bacteria utilized in the study consist of Escherichia coli, Salmonella, and Staphylococcus Aureus. To assess the antimicrobial activity of Rosemary, 10 grams was measured and an extract was prepared using the Rotary-evaporator. Rosemary was then diluted at 4 various concentrations (25%, 50%, 75%, 100%, or pure) using distilled water and tested in vitro conditions against the growth of bacteria on 10mm spread agar plates of Escherichia Coli, Salmonella, and Staphylococcus Aureus cultured in the laboratory. Following overnight incubation at 32.0°C, the results were compared to a control of antibiotics Ampicillin and Erythromycin at 100 mg/5µl administered to 4 disks per plate. The results obtained demonstrated Rosemary was most effective at 25% concentration (1:4 ratio) against Escherichia Coli, and Salmonella and at 50% concentration (2:4 ratio) against Staphylococcus Aureus. In comparison to the pharmaceutical drugs Ampicillin and Erythromycin, the Rosemary extracts with a concentration of 25% and 50% displayed higher antibacterial activity when in contact with the three specific types of bacteria. Therefore, locals can indeed use Rosemary extract as a cost-effective substitute to fight off common bacterial infections but should still look to the help of a physician or medical consultant if any infections become out of control.

P1.08

115 - BIBLIOMETRIC ANALYSIS OF MANAGEMENT PRACTICES IN US CORN PRODUCTION

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The rate at which corn yield was increasing has started diminishing within the US. Some states in US corn belt and US Mid-South such as Mississippi (MS) have shown stagnant corn yield in the past decade. Moreover, a yield gap of 5 Mg ha^{-1} exists between the actual farmer yield and potential yield in MS, which is concerning as demand for crop production to feed ever growing population is increasing. The yield gap can be reduced by implementing proper management practices, which necessitates further exploration of management practices in US corn production. Therefore, a bibliometric analysis of 20 years (1992-2022) of research studies was performed using the Scopus database to identify research trends within US corn production. The search query was performed within the article title, abstract, and keywords indicative of management practices in corn. Keywords such as "corn," "maize," "Zea mays," "planting density," "row configuration," "planting depth," "crop rotation," "soil fertility," "nutrient," "hybrid," "irrigation," "harvest practices," "tillage," "weed control," and "disease control" were used to retrieve peer-reviewed articles. Exclusion criterion based on subject area and journals generated 3970 publications. These documents were downloaded in .csv format and further refined by deleting duplicate and undefined entries, which reduced results to 3909 publications. The VOS viewer software was used to create 25 network and density maps based on co-authorship, co-occurrence, citations, bibliographic coupling, and co-citations. The data analysis revealed contributions from 9620 authors, 8693 organizations, 132 countries and 298 journals. The top five organizations leading the investigation were in states with the highest corn production, which included Iowa State University, University of Nebraska, University of Illinois, University of Wisconsin, and Kansas State University. The most prominent authors were Dr. Rattan Lal (Ohio State), Dr. Jeffrey A. Coulter (University of Minnesota), Dr. Tony J. Vyn (Purdue University), Dr. L. Ma (USDA-ARS-NPA, Fort Collins, CO), and Dr. Douglas L. Karlen (USDA-ARS, Ames, IA). The journals that produced the largest number of publications included Agronomy Journal, Crop Science, Soil Science Society of America Journal, Weed Technology, and Soil and Tillage Research. The five most cited documents were authored by Dr. Tristam O. West (2002), Dr. Shelby Rajkovich (2012), Dr. Graeme L. Hammer (2009), Dr. Maysoon M. Mikha (2004), and Dr. M. K. Shukla (2006). The most prominent author keywords included maize, corn,nitrogen, tillage, irrigation, weed management, crop rotation, no-till, soybean, and cover crops. However, author keywords such as planting density, planting depth, carbon sequestration, best management practices, precision agriculture, nitrogen use efficiency, and sustainability were not very prominent. Overall, the analysis provides insight into the status, evolution, and future trajectory of US corn management, which will be necessary to bridge the yield gap present within US corn production.

P1.09

DEVELOPING SWEETPOTATO GERMPLASMS WITH INCREASED PROTEIN LEVELS AND IMPROVED VIRAL DISEASE RESISTANCE

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Food security and nutrition security exist as the major concerns in many countries of the world. Sweetpotato (*Ipomoea batatas* (L.) Lam.), a plant widely grown in all tropical and subtropical areas, is among the 10 most important food crops worldwide. However, sweetpotato contains lower protein content compared to other staple foods, e.g., maize, rice, wheat and soybean. Moreover, as a crop produced by vegetative propagation, cultivar decline due to viral infections significantly reduces sweetpotato yield and storage root quality. In this study, we applied novel biotechnological methods to develop sweetpotato plants with improved nutrition and viral resistance, thus, sweetpotato lines with higher nutritional value and increased yield production will be available for Mississippi sweetpotato seed industry and farmers. Specifically, we are using optimized protocols to generate transgenic sweetpotato with Arabidopsis specific Qua-quine Starch (QQS) gene and its major interactor, a nuclear factor Y subunit C4 NF-YC4 to increase protein levels and disease resistance in sweetpotato roots via *Agrobacterium*-mediated transformation method; The Arabidopsis QQS gene and NF-YC4 gene regulate carbon and nitrogen partitioning to starch and protein not only in

Arabidopsis, but also in soybean and other crops. Arabidopsis QQS expressing and sweetpotato NF-YC4 overexpressing vectors have been constructed in our lab. *QQS* was cloned from *Arabidopsis thaliana* ecotype Columbia 0 (Col-0); sweetpotato NF-YC4 was cloned from *Ipomoea batatas* varieties PI 318846, Jewel PI 566638 and PI 566648. These vectors have been transformed into *Agrobacterium tumefaciens* strain EHA105 in our lab for sweetpotato transformation. A high-efficient sweetpotato regeneration system and *Agrobacterium*-mediated gene transformation system for sweetpotato 'Red Jewel" cultivar have been well developed in our lab. The preliminary results showed that expression of foreign genes in kanamycin resistant callus has been achieved using *Agrobacterium tumefaciens* strain EHA105 harboring the expression cassette. Successful execution of this project will significantly boost quality of life and environment in the underserved communities and enhance research and education capacities of Alcorn State University.

P1.10

SOIL HEALTH AS INFLUENCED BY THE INTEGRATION OF COVER CROPS IN DIFFERENT CROPPING SYSTEMS IN NORTH-CENTRAL MISSISSIPPI

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One of the common management practices to restore soil health in a sustainable way is the integration of different cover crops into the existing cropping systems. An ongoing field study started in 2020 at the R.R Foil Plant Science Research Center with cropping systems being a rotation of Cotton and Corn integrated with 7 cover crop treatments including different cover crops elbon rye, daikon radish, Austrian winter field peas, and a mixture of these cover crops. To understand the influence of different cover crops on soil health, 7 cover crop patterns have been followed in the experiment. Core soil samples and loose soil samples were taken at depths of 0-5 cm and 5-10 cm in May, 2022. Data on soil physical health indicators including water stable aggregates, bulk density, available water content, and saturated hydraulic conductivity, and soil chemical health indicators including total carbon, total nitrogen, pH, K, P, Mn, and organic matter were measured to obtain the soil health score. The Principal Component Analysis (PCA) was used to cluster and model soil health indicator data to further determine the soil health score and explain the interrelationship between the soil health indicators and the soil health score. PCA was conducted only with the soil health indicators that showed direct correlation among them. The eigenvalues, the proportion of variance explained (% variance) and the cumulative variance of each component constructed is shown in PCA analysis. The results indicated that the integration of cover crops showed little effect on the soil properties as compared to no cover crop treatment. However, there was a significant difference between the two cropping systems (cotton and corn) and the depth of the soil indicating that the cotton crop responded well to the cover crop treatments and the topsoil (0-5 cm) is found to be healthier. Long-term studies are necessary to understand the influence of different cover crops on soil health.

P1.11

CORN SILK DYNAMICS TO SOIL MOISTURE DEFICIT AND ITS IMPACT ON YIELD

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Soil moisture deficit during flowering can negatively affect kernel setting in corn. The synchronous development of male and female inflorescence is important for successful pollination and kernel set in corn. However, corn silk is highly sensitive to soil moisture deficit conditions. Silk (female) responses to soil moisture deficit are less explored due to its complex development process. Therefore, this study is focused on quantifying the impact of soil moisture during silk development, kernel set, and yield in corn hybrid A6659VT2RIB. Five levels of irrigation were provided with 1000 mL as optimum and 800 mL, 600 mL, 400 mL, and 200 mL (suboptimal) for 14 days during pollination. Length, number, and dry weight of silk were recorded for four consecutive days across treatments. Soil moisture deficit negatively affected the silk parameters. On average, silk number and silk dry weight were reduced by 45% and 34%. Water deficit during silking delayed silk emergence, which resulted in a substantial yield loss ($p<0.001$). A linear decline in kernel yield was observed with an increase in soil moisture deficit ($R^2 = 0.92$). Average kernel number and kernel weight was reduced by 53% and 54%, with the harvest index ranging from 0.51 and 0.02. Plants under 200 mL irrigation had delayed silk growth and maximum yield loss. These results indicate that short-term drought can cause asynchronous male and female development and result in significant yield loss. Apart from the yield, a significant soil moisture deficit effect was observed in kernel starch ($p<0.001$) and protein ($p<0.001$) content. Our results suggest that improving the resilience of silk to drought might increase corn yields. The functional relationships between soil moisture and reproductive traits can be integrated into corn models for optimizing irrigation scheduling based on the available soil moisture content.

P1.12

CHARACTERIZING THE IMPACT OF COVER CROP ON SOIL MICROBIOME FUNCTION AFFECTING C AND N INPUTS IN MISSISSIPPI CORN PRODUCTION SYSTEMS

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Soil microbial communities are the primary drivers of soil nutrient cycling processes beneficial for crop production. Integrating cover cropping in agricultural systems enhances soil health and alters microbial communities. However, the

practical implications of cover crops and their impacts on ecosystem services deserve further investigation. To address this knowledge gap, we examined soil microbial abundance, activity, and diversity under N management with cover cropping in the corn production system. The study was a strip-plot design with three replications in two locations (Starkville and Newton, MS). In this study, two factors were considered: A) fertilizer application (0 lbs. nitrogen and 100 lbs. nitrogen) and B) cover crop treatments (Control, Ryegrass, Balansa, Radish, Red clover, Oats + Radish, and Ryegrass + Radish + Red clover). DNA was isolated using DNeasy PowerSoil kit and further amplicon sequencing for bacteria (16s rRNA gene) and fungal (ITS2 rRNA gene) will be performed, and the DNA sequence data will be processed by QIIME2 and MOTHUR pipeline. We used Biolog EcoPlates to perform Community-Level Physiological Profiling based on carbon compound consumption to assess microbial functional diversity. Average Well Color Development (AWCD) and Shannon Diversity Index (SDI) were calculated. There was no significant difference among the incubation times (24hr, 48hr, 72hr, 96hr, and 120hr) for all treatment combinations. AWCD for the Ryegrass + Radish + Red clover treatment was higher (1.66), followed by red clover (1.58) which infers catabolic diversity of the soil bacterial community may have increased due to higher levels of carbon and organic matter input from the cover crop mix. ANOVA results revealed significant differences between cover crop treatments for both AWCD and SDI values ($p<0.0008$ and $p<0.0001$, respectively) at Starkville. Overall, our findings indicate that integration of cover crops has a limited impact on microbial activity based on our first-year results. Results from subsequent years would help to infer the impact of cover crop and N management on soil health attributes under corn production systems.

P1.13

CHARACTERIZATION OF SOUTHERN UNITED STATES SOYBEAN CULTIVARS FOR HEAT AND DROUGHT STRESS TOLERANCE

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Drought and heat stress episodes are the major abiotic stress factors causing significant losses in yield and quality. The impacts of individual stress (heat or drought) on soybean physiological and morphological traits have been examined, while information related to interactive stress is limited. In this study, twelve soybean cultivars were subjected to four different treatments (32°C daytime with soil moisture content, 100% irrigation, characterized as an optimum growing condition), heat (38°C daytime+100% irrigation, drought (50% irrigation+32°C daytime) and heat and drought (38°C+50% irrigation) during reproductive and pod filling stage. Two-factor stress had a significant impact on the gas exchange and growth parameters. Maximum reduction in the photosynthetic rate was observed under interactive stress (56%) followed by drought (38%) and heat (37%) compared with control. Combined heat and drought stress significantly impeded the photosynthetic rate by decreasing CO_2 availability due to a maximum reduction in the stomatal conductance (74%) as compared to the control. The plants under drought stress displayed the highest decrease in transpiration (62%), resulting in maximum water use efficiency followed by combined stress and heat stress as compared to control. Furthermore, combined heat and drought stress resulted in a substantial decrease in the efficiency of photosystem II (28%) compared to the control. The two-factor stress during flowering-early seed filling reduced the pod number by 46%, pod weight by 54%, seed number by 52%, and seed weight by 57%. It was evident from our study that the ability to tolerate combined stress varies among soybean cultivars studied. Our study quantified the impact of individual and combined heat and drought stress which helps in identifying traits and cultivars with a highly desirable phenotypic expression that could offer valuable resources for breeding multi stress-tolerant soybeans.

P1.14

EFFECT OF X-RAY IRRADIATION ON POPULATIONS OF *Pseudomonas amygdali* pv. loropetali pv. nov.

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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 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 on chemical pesticides and their residues, irradiation is becoming a viable alternative and an effective nonchemical treatment for the control of several pathogens. Studies have shown successful results when gamma irradiation was applied to *Pseudomonas* spp., therefore we hypothesize that radiation could eliminate *P. amygdali* pv *loropetali* pv. nov. on loropetalum stock plants. 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.

P1.15

IMPACT OF RECENT CLIMATE CHANGE ON CORN, RICE, AND WHEAT YIELDS IN SOUTHEASTERN USA

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Climate change and its impact on agriculture productivity vary among crops and regions. The southeastern United States (SE-US) is agro-ecologically diversified, economically dependent on agriculture, and mostly overlooked by agroclimatic researchers. The objective of this study was to compute the effect of climatic variables; daily maximum temperature (Tmax), daily minimum temperature (Tmin), and rainfall on the yield of major cereal crops i.e., corn (Zea mays L.), rice (Oryza sativa L.), and wheat (Triticum aestivum L.) in SE-US. A fixed-effect model (panel data approach) was used by applying the production function on panel data from 1980 to 2020 from 11 SE-US states. An asymmetrical warming pattern was observed, where nocturnal warming was 105.90%, 106.30%, and 32.14%, higher than the diurnal warming during corn, rice, and wheat growing seasons, respectively. Additionally, a shift in rainfall was noticed ranging from 19.2 to 37.2 mm over different growing seasons. Rainfall significantly reduced wheat yield, while, it had no effect on corn and rice yields. The Tmax and Tmin had no significant effect on wheat yield. A 1 °C rise in Tmax significantly decreased corn (− 34%) and rice (− 8.30%) yield which was offset by a 1 °C increase in Tmin increasing corn (47%) and rice (22.40%) yield. Conclusively, overall temperature change of 1 °C in the SE-US significantly improved corn yield by 13%, rice yield by 14.10%, and had no effect on wheat yield.

P1.16

EVALUATING THE IMPACT OF BIOSTIMULANTS AT VARIABLE NITROGEN RATES IN MISSISSIPPI CORN PRODUCTION SYSTEMS

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Major challenges faced by corn producers are low nutrient use efficiency, volatile fertilizer cost, and dwindling production. Even though heavy incorporation of nitrogen (N) ameliorates yield but has no affirmative effect on nitrogen use efficiency (NUE). To strengthen the prospect of N uptake and alleviate the yield in corn, new biological advancements are vital. Biologically associated microorganisms, seaweed extracts, and humic substances termed as biostimulants have been touted as having an optimistic relationship in enhancing yield, nutrient uptake, and conserving the environmental ecosystem. However, literature associated with biostimulants interaction in cereal crops, especially corn is scanty. Therefore, to assess the impact of biostimulants and their interaction at variable rates of N on NUE and yield were studied under rainfed and irrigated conditions in Mississippi (MS). Field trials were conducted at two experimental stations at Starkville and Stoneville, MS. A total of 36 plots including 12 controls were replicated four times within a split-plot design where N rate was the main plot factor. Six commercially extracted microbial biostimulants (Source®, Envita, iNvigorate®, Blue N, Micro AZ™, and Bio level phosN) at their recommended rates were foliar dispensed at V4-V5 stages as subplot factors including control plots. Four different N rates 0, 87, 175, and, 218 kg N ha^{-1} were included at Starkville, whereas an additional rate of 218 kg N ha^{-1} was incorporated at Stoneville. At Starkville, grain yield ranged from 9.3 to 10.3 Mgha^{-1} and none of the biologicals tested resulted in any significant yield differences. At Stoneville, grain yield ranged from 6 to 11.8 Mg ha^{-1} with both N rate and biological treatments significantly affecting grain yield, however, no interaction was noted between the two factors. Specifically, yield increased with the application of 87 kg N ha^{-1} over the check plot, and no significant differences were noted between 87 kg N ha^{-1} and higher N rates. Significant differences were noted within biologicals, where Bio level, Source N, and Blue N all had significantly higher yields than Envita and iNvigorate. However, this was not statistically different from the check plot where no biological was applied. Overall, data from 2022 has shown limited potential with the use of biologicals on corn grain yield, however, we still need to evaluate its effect on NUE, and would like to continue this work for an additional year to make any firm and final recommendations to producers in MS.

P1.17

PHYTOCHEMICAL CONSTITUENTS OF GAZANIA RIGENS AND THEIR ANTIMICROBIAL ACTIVITY

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Phytochemical study of *Gazania rigens* whole plant led to isolation and structural characterization of six known compounds including lupeol (**1**), lup-20(29)-ene (**2**), β-sitosterol 3-*O*-β-glucopyranoside (**3**), dunalianoside D (**4**), 3,5-di-*O*-caffeoylquinic acid (**5**), and tachioside (**6**). Among them, five compounds (1-4, and 6) were isolated for the first time form *G. rigens*. The structures of the isolated compounds were elucidated using different spectroscopic analyses such as ^{1}H, ^{13}C, and DEPT NMR analyses, as well as HR-ESI-MS analysis. The isolated compounds and fractions were screened for *in vitro* antimicrobial activity against various bacterial and fungal strains. Only compound **1** exhibited a moderate antibacterial activity against *K. pneumoniae* with IC_{50} value of 19.05 µg/mL.

P1.18

COMPOSITION OF *Scabiosa ochroleuca* L. EXTRACTS PREPARED BY ULTRASONIC AND MICROWAVE METHODS AND THEIR ANTIRADICAL ACTIVITY ASSESSMENT

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Scabiosa ochroleuca is one of the promising Kazakh domestic medicinal plants. It has been used in traditional medicine for stomach and women's diseases, osteoalgia, fever, tuberculosis, syphilis, eye infections, and as a wound healing agent. Despite its therapeutical applications, there is a lack of its secondary metabolites. The aim of the manuscript is to study the chemical difference between the two extracts prepared by ultrasonic and microwave methods by GCMS analysis and their antioxidant properties. The GC/MS analysis of the silylized extracts revealed the presence of several major components: catechol, 2-methoxy-4-vinylphenol, 4H-pyran-4-one,2,3-dihydro-3,5-dihydroxy-6-methyl-, and quinic acid. The antiradical activity showed that the ultrasonic extract had a stronger activity (83.9%). The activity of the ultrasonic and microwave extracts at concentration of 0.75 mg / ml and 1 mg / ml, respectively, was almost the same as the standard butylhydroxyanisole (1 mg / ml).

P1.19

GC/MS ANALYSIS OF *Leontice ewersmanni* Bunge.

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Leontice ewersmannii Bunge is distributed in the South Kazakhstan. In modern folk medicine of the countries of Central Asia, is used in treatment of inflammation of the stomach, peptic ulcer, pulmonary tuberculosis, blood diseases and syphilis. This plant is rich in biologically active substances *viz*. quinolizidine alkaloids, melanoids, phenols, and flavonoids. *Leontice ewersmannii* had antioxidant, anticholinesterase, anti-diabetic, and anti-inflammatory effecs. GC/MS chemical profiling of 96% ethanol extract of *Leontice ewersmanni* bunge led to identification of 26 compounds, in which three alkaloids are identified including sophoridine was the major constituent with 15.58%, followed by α-isolupanine (13,01%), then 9,12-octadecadienoic acid, ethyl ester (4.82%), phytol (4.56%) and ethyl 9,12,15-octadecatrienoate (3.20%).

P1.20

8PHYTOCHEMICAL INVESTIGATION WITH ANTIMALARIAL AND ANTIMICROBIAL ACTIVITIES OF *Paeonia officinalis*

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Paeonia officinalis (European peony, peony) is native to south-eastern Europe and has been widely introduced as a garden plant. *Paeonia officinalis* roots has been included for years in the systems of medicine in Unani, Ayurvedic and Homeopathic together with Indian and Chinese system of medicines. In which, *Paeonia officinalis* roots are included as a component of several antioxidant preparations in Unani medicine, while in the Ayurvedic medicine, it represents a main part of many medicinal formulations to treat several diseases as jaundice, hepatitis, hepatomegaly, liver dysfunction, cirrhosis. Bioassay-guided fractionation and purification of roots of *Paeonia officinalis* led to isolation and structure elucidation of seven known compounds, including four monoterpene glycosides: lactiflorin (**1**), paeoniflorin (**4**), galloyl paeoniflorin (**5**), and (*Z*)-(1*S*,5*R*)-β-pinen-10-yl β-vicianoside (**7**), two phenolics; benzoic acid (**2**) and methyl gallate (**3**), and one sterol glycoside; β-sitosterol 3-*O*-β-D-glucopyranoside (**6**). The different fractions and the isolated compounds were evaluated for their antimicrobial and antimalarial activities. Fraction III and IV showed antifungal activity against *Candida neoformans* with IC_{50} values of 28.11 and 74.37 µg/mL, respectively, comparing with the standard fluconazole (IC_{50} = 4.68 µg/mL), and antibacterial potential against *Pseudomonas aeruginosa* (IC_{50} = 20.27 and 24.82 µg/mL, respectively), *Klebsiella pneumoniae* (IC_{50} = 43.21 and 94.4 µg/mL, respectively), comparing with the standard meropenem (IC_{50} = 28.67 and 43.94 µg/mL, respectively). Fractions III, IV and compounds **3, 5** showed antimalarial activity against *Plasmodium falciparum* D6 with IC_{50} values of 19.48, 24.57, 1.57 and 4.72 µg/mL and *P. falciparum* W2 with IC_{50} values of 8.06, 15.51, 0.61 and 2.91 µg/mL, respectively, comparing with the standard chloroquine (IC_{50} = 0.026 and 0.14 µg/mL, respectively).

P1.21

UNDERSTANDING AND ASSESSMENT OF SOIL MICROBIAL COMMUNITY STRUCTURE FOR DISEASE SUPPRESSION TO STUDY THE SOYBEAN TAPROOT DECLINE (TRD) DISEASE DISTRIBUTION AND SEVERITY IN MISSISSIPPI DELTA FARMS.

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Soybean taproot decline (TRD) is an emerging soilborne root disease, caused by *Xylaria necrophora*. TRD was first reported in Mississippi over 12 years ago and its progression in Mississippi has led to significant yield losses in fields with severe infestations. Diseased plants snap at the soil line, providing a key diagnostic feature in the field. To understand the disease severity and distribution, a questionnaire-based field survey of 20 soybean producer farms across the Mississippi Delta region was conducted and assessed for the intensity of TRD (*Xylaria necrophora)* in the year 2020. The distribution of TRD in infected fields exhibited significant complexity with no clear patterns and 97% of TRD-infected soybean plants had buried residue present in upper root zone. Based on the infection period and percent rating of TRD, seven farms were selected to study the microbial ecology of soil samples with different management practices - soybean residue remaining on the soil surface, buried residue, heavy residue (cover crops) and TRD asymptomatic farms. Bulk (latent period), detritusphere and rhizosphere soil (infectious period) samples were collected to study the influence of management factors on disease growth and suppression. DNA-based fungal (ITS2) community sequencing was adopted to know the association of the pathogen with other soil microbial communities which might influence the disease suppression. Fungal alpha diversity indices were significantly ($p > 0.05$) different for bulk and rhizosphere soil samples. Beta diversity showed significant ($p<0.001$) differences for the fungal community compositions, which accounts for 22% of total variation with distinct clusters for the soil types. A positive correlation was observed for the phyla *Mortierellomycota* and *Basidomycota* for the rhizosphere samples. The TRD symptomatic soil samples resulted in a higher abundance of order *Xylariales* and a lower abundance was detected in the asymptomatic bulk and detritusphere soil samples. Univariate analysis of abundance of order *Xylariales* showed significant differences across the TRD symptomatic and asymptomatic farms in the rhizosphere soils.

P1.22

Leonotis leonurus ACCUMULATES CADMIUM

Jennifer Laifa

Mississippi Valley State University, Itta Bena, MS

Cadmium (Cd) is mobile and considered very toxic. It tends to cause oxidative stress to plants, but some plants have antioxidative defense mechanisms. *Leonotis leonurus* is one of the plants that can tolerate cadmium. *L. leonurus* is a plant that is used by people for medicinal purposes, bitter taste for food, and nectar which is sucked by both children and birds. Glutathione reductase and phytochelatins can be used by plants to avoid oxidative stress. The hypothesis of the study was that the glutathione reductase and phytochelatins would increase in *L. leonurus* exposed to cadmium. The glutathione reductase, total soluble acid thiols, and oxidized glutathione were measured from the shoots and the roots of *Leonotis leonurus* that were exposed to 100 ppm of cadmium with a spectrophotometer. The results revealed that the cadmium did not have a negative effect on the development and growth of roots and the shoots of the plants. The cadmium was translocated from the roots to the shoots. There was a significant increase in the glutathione reductase in plants that were exposed to cadmium. There was no difference in the total soluble acid thiols found on shoots. The oxidized glutathione of the plants that were exposed to cadmium with increased phytochelatins on the roots was not different from the control plants. The results from the study are an indication that *L. leonurus* can tolerate and accumulate cadmium.

P1.23

REMOTE SENSING TECHNIQUES TO DETECT VARIATION IN MORPHO-PHYSIOLOGICAL TRAITS AMONG DIVERSE SOYBEAN ACCESSIONS

Purushothaman Ramamoorthy[1], Ranadheer Reddy Vennam[2], Sadikshya Poudel[2], Amrit Shrestha[3], K Raja Reddy[2], Raju Bheemanahalli [2]

[1]Geosystems Research Institute, MississippiState University, Mississippi State, MS, , [2]Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS, , [3]Department of Agricultural & Biological Engineering, Mississippi State University, Mississippi State, MS,

Plant biomass production is greatly influenced by the photosynthetic pigments that participate in the absorption, processing, and transport of light energy. Natural variation in phenotypic traits related to plant health or biomass production and their relationship remains a largely unexplored genetic resource in soybean. Therefore, the objectives of this study were to assess the naturally existing phenotypic variation in pigments and morphological traits in soybean and identify possible correlations with biomass. A diverse set of 457 soybean accessions differing in maturity groups (MG) were phenotyped for traits associated with photosynthetic pigments and biomass to achieve this. The diverse soybean accession in the field shows significant leaf pigments (chlorophyll content and anthocyanin), morphology (plant height and node number), above-ground biomass, and yield. The chlorophyll content varied substantially among MGs, ranging from (4.4 $\mu g\ cm^{-2}$) to (48 $\mu g\ cm^{-2}$). The specific leaf area (SLA) ranged between 53.2 and 306.7 $cm^2\ g^{-1}$ with an average of 181.5 $cm^2\ g^{-1}$. The maximum mainstem node numbers of all accessions (17.7 $plant^{-1}$) were thrice the node number of the lowest accession (5.7 $plant^{-1}$). Above-ground biomass varied considerably among MGs, ranging from 1.29 g $plant^{-1}$ (MG-000) to 25.1 g $plant^{-1}$ (MG-4). The chlorophyll content was negatively correlated ($r = -0.73$) with SLA. Shoot biomass was positively correlated with SLA ($r = 0.41$), plant height ($r = 0.66$), and node numbers ($r = 0.77$). Our results showed a

wide range of diversity in phenotypes associated with plant vigor, SLA, and yield among soybean lines. Trait-based breeding depends on identifying contrasting accessions for specific traits associated with yield potential. The identified accessions rich in traits associated with planting vigor and productivity could be used to develop elite soybean varieties for a niche environment.

P1.24

BENOXACOR, FENCLORIM, AND MELATONIN AS POTENTIAL SAFENERS IN PROTECTING TOMATO AGAINST 2,4-D DRIFT

Tabata Oliveira, Edicarlos Castro, Josiane Argenta, Shaun Broderick[1], Te-Ming Tseng

Mississippi State University, Mississippi State, MS

Safeners are substances used to protect crops. The mechanism involves the ability to metabolize different compounds, including herbicides. The primary action of safeners includes raising the crop´s endurance to herbicide damage by inducing the protein(s) involved in herbicide metabolism, catalyzing their detoxification in the crop´s system. This study aimed to understand the biochemical effect of benoxacor safener for use in tomato culture, including the activation of the detoxifying enzyme glutathione S-transferase (GST). The experiment was conducted in a randomized factorial design 4 x 2, with four replications separated into two factors, (a) herbicide rates (0, 0.01, and 0.05x), and (b) safeners (benoxacor, fenclorim, melatonin, and control). Treatments were applied to the aerial part of the tomato seedlings. Visual injury at 3, 7, 14, and 21 days after application (DAA) and biomass at 21 DAA were evaluated. Leaf tissues were collected 24 and 48 hours after herbicide application to determine GST activity. A close perusal of data indicates that seeds pre-treatment with benoxacor raised the GST activity of tomato plants. The use of benoxacor safener showed high potential in increasing GST enzymatic activity, assisting the detoxification of plants caused by the herbicide. Knowledge of the defense mechanism(s) in plants will help improve our understanding of how safeners can offer protection against herbicides, thus leading to improved weed management strategies

Thursday, February 23, 2023

EVENING

3:30 DODGEN LECTURE and AWARDS CEREMONY

Hall B

5:00 GENERAL POSTER SESSION

Hall C (immediately following Dodgen Event)

Friday, February 24, 2023

MORNING

Room D1

Oral Session 2:

Moderator: Purushothaman Ramamoorthy

Mississippi State University

8:05 Welcome and Opening Remarks

O1.12

8:15 SEED YIELD, QUALITY, AND COMPOSITION AS INFLUENCED BY THE HARVEST-AID PARAQUAT IN SOYBEAN GROWN IN MISSISSIPPI

Nacer Bellaloui[1], James Smith[1], Jeffery Ray[1], Anne Gillen[1], Alemu Mengistu[2], Daniel Fisher[1], Gurbir Singh[3]

[1]USDA-ARS, Stoneville, MS, [2]USDA-ARS, Jackson, TN, [3]University of Missouri, Columbia, MO.

Paraquat is used as a harvest-aid to desiccate green tissues for increasing harvest efficiency and maintaining seed quality. However, its application can cause significant crop damage and yield loss if applied too early. Information on how to determine the optimum time for applying paraquat is not well known. Therefore, the objectives of this research were to investigate the effects of the timing (critical stages of seed-fill) of paraquat application on soybean seed yield, seed quality (germination, viability, hard-seed, and seed damage), and seed composition. Field experiments were conducted in 2019 and 2020 at Stoneville, MS. Paraquat was applied at a rate of 0.56 kg a.i./ha at growth stages R6 (full seed-fill), R6.5 (pod cavities completely filled with seeds), or R7 (yellow color/beginning maturity). Cultivars P46A57BX and P48A60X were used. The results showed that the application of paraquat at R6 or R6.5 resulted in significant yield loss for both cultivars in both years, whereas application at R7 resulted in significant yield loss for P46A57BX in both years, but in only 1 year for P48A60X. Seed germination and viability were significantly increased over the control in 2020 for both cultivars at all three application stages, but with mixed effects in 2019. No significant seed damage was observed in any treatment, as seed damage for all treatments was below 2%. Application of paraquat at R6 resulted in significantly higher seed protein, oleic acid, raffinose, and stachyose, but lower oil and sucrose. This research demonstrated that the harvest-aid paraquat significantly reduced seed yield, and increased seed protein, oleic acid, raffinose, and stachyose when applied before growth stage R7. Our estimation indicated that a 1,000-ha farm would have lost over $390,000 in 2019 and this loss would have reached over $430,000 in 2020 with either cultivar if a farmer had sprayed paraquat at R6.5. Therefore, producers should use caution when applying paraquat for harvest efficiency before R7, as they will also likely reduce seed yield the earlier paraquat is applied.

O1.13

8:30 IMPACTS OF DIESEL COSTS ON OWNER-OPERATOR LOG TRUCK DRIVERS IN THE WESTERN GULF

Curtis VanderSchaaf

Mississippi State University, Mississippi State, MS

Forest harvesting, or logging, is extremely important to the fiber supply chain, allowing landowners to conduct management on their property and to receive financial compensation for their capital investment. After the felling, skidding, delimbing and often topping, and merchandizing of trees, the logs must be loaded onto a truck for the hauling or transport of that raw woody resource to a mill. Mills commonly pay for hauling with a haul rate that is calculated per ton per loaded mile ($/ton/loaded mile). This analysis is focused on owner-operator truck drivers, or independent contract drivers, and hence drivers that are self-employed. These drivers pay for the truck and trailer (and other necessary accessories such as straps or chains, etc.), insurance for the truck and trailer, licensing, maintenance, fuel, mandatory professional training, salary, fringe benefits such as health insurance, retirement, etc. This analysis looks at the impacts of different costs of diesel per gallon ($3, $4, $5, and $6 per gallon) along with basic assumptions about hauling conditions and maintenance costs, and varying rates of salary received per load ($/ton/loaded mile of $0.13 to $0.23 by two cents), on the annual salary of an average log truck driver. Foresters, forest landowners, and society as a whole, should be extremely concerned about adequate salaries to log truck drivers; especially given inflation, high insurance costs, and rising diesel prices. Without these drivers, forest management options become minimal.

O1.14

8:45 CLIMATE CHANGE AND SEVERE WEATHER: BOOKS, MOVIES, GAMES, AND OTHER RESOURCES FOR SCHOOL AND PUBLIC LIBRARIES

Oliver Kuttner[1], Joyce Shaw[1]

[1]Gunter Library, Gulf Coast Research Laboratory, Ocean Springs, MS

Gunter Library at the Gulf Coast Research Laboratory (GCRL) created a reading list of children's and young adult books about climate change and other severe weather topics to support a program at the GCRL Marine Education Center about impacts of climate change on communities. The list was broadened to include movies, games, and other resources to support STEM programs in schools and public libraries. This list provides factual and current information about climate change and global weather topics. Entries for each resource include a brief description of the resource, age appropriateness, and awards and honors with weblinks if applicable. Fictional stories and science fiction are included when the science presented is fact based.

O1.15

9:00 FROM MULTIPLE-CELL TO SINGLE-CELL GENETIC MODELS: THE ARABIDOPSIS ORPHAN GENE QQS MODULATES CARBON AND NITROGEN ALLOCATION ACROSS SPECIES

Lei Wang, Ling Li

Mississippi State University, Mississippi State, MS

The Arabidopsis orphan gene, *Qua-Quine Starch* (*QQS*) was previously identified as a regulator of carbon (C) and nitrogen (N) partitioning across multiple plant species, such as Arabidopsis, rice, corn, soybean, potato. As to QQS functional mechanism, our prior findings from multiple-cell genetic models showed that *QQS* modulates this important biotechnological trait by replacing NF-YB (Nuclear Factor Y, subunit B) in its interaction with NF-YC. Recently, we expanded these prior findings by developing single-cell genetic models, *Chlamydomonas reinhardtii* and *Saccharomyces cerevisiae*, to refactor the functional interactions between QQS and NF-Y subunits to affect modulations in C and N allocation and we updated QQS functional model. Such synthetic biology strategies provided experimental evidence to support the "mimicry-model" for orphan gene function, and a mechanistic understanding of QQS function, which impacts C and N allocation across species.

O1.16

9:15 MULTI-GROWTH STAGE CORN YIELD PREDICTION USING HIGH-RESOLUTION UAV MULTISPECTRAL DATA AND MACHINE LEARNING MODELS

Chandan Kumar[1], Partson Mubvumba[2], Yanbo Haung[3], Jagmandeep Dhillon[1]

[1]Department of Plant and Soil Sciences, Mississippi State University, 75 B. S. Hood Rd, Mississippi State, MS, [2]Crop Production Systems Research Unit, USDA-ARS, 141 Experiment Station Road, Stoneville, MS., [3]Genetics and Sustainable Agriculture Research Unit, USDA-ARS, 150 Twelve Lane, Mississippi State, MS

An accurate and rapid crop yield prediction is vital for policy and decision-making in food security and management. This study presents a conjugate utilization of high-resolution unmanned aerial vehicle (UAV) multispectral data and state-of-the-art machine learning models (MLMs) in predicting corn yield during the early, mature, and harvesting stages. The experiment was performed over a field in the USDA research farm at Stoneville, MS. Numerous vegetation indices (VIs) derived using multispectral images acquired by an unmanned aerial vehicle (UAV) mounted by a portable multispectral camera coupled with soil test data were selected using feature selection and variable inflation factor. Among thirty-two VIs the simplified canopy chlorophyll content index, normalized green red difference index, chlorophyll absorption ratio index, the ratio of near-infrared and red edge, normalized difference red edge index, and modified triangular vegetation index were satisfactory in predicting the corn yield across different growth stages. Similarly, the potassium (K), phosphorus (P), pH, and sodium (Na) explained yield prediction accurately in

comparison to other soil nutrients. The performance of different MLMs such as support vector machine (SVM), random forest (RF), k-nearest neighbors (KNN), multi-layer perceptron (MLP), and generalized linear regression model (GLM) was evaluated based on three different input features (a) suitable soil nutrients, (b) suitable VIs, and (c) combination of both across different growth stages. Overall, the KNN (R^2=0.56) and RF (R^2=0.54) outperformed other models in predicting yield using suitable soil nutrient data. At early stages, the MLP (R^2=0.60) and the RF he MLP (R^2=0.58) outperformed other models using suitable soil nutrients and the combination of soil nutrients and VIs data, respectively. During the mature stage, the SVM (R^2=0.60) and the MLP (R^2=0.56) outperformed other models using suitable VIs and the combination of soil nutrients and VIs data, respectively. At the harvesting stage, the RF outperformed other models with R^2=0.58 and R^2=0.63 using suitable soil nutrients and the combination of soil nutrients and VIs. As demonstrated in this study, the reliably predicted yield across different growth stages of corn could be efficiently used in crop management.

O1.17

9:30 MOTILE AEROMONAS SEPTICEMIA IN MISSISSIPPI AQUACULTURE

Brian Burnes

Mississippi University for Women, Columbus, MS

Catfish farming is the leading aquaculture industry in Mississippi and the United States, but significant losses are caused by infection by the bacterium *Aeromonas hydrophila*. Here we review the catfish farming industry, including production methods and state, national, and global production levels, and describe the infectious disease, motile aeromonas septicemia (MAS), including symptoms, molecular biology, genetics, and epidemiology. The author's research contributions to the epidemiology of MAS are highlighted and explained. Recommendations and projections are made concerning the future of the catfish farming industry.

O1.18

9:45 TECHNOLOGICAL IMPROVEMENTS AND PROSPECTS OF A MODERN-DAY PLANT DISEASE DIAGNOSIS

Emran Ali

Alcorn State University, Lorman, MS

Agriculture is a multibillion-dollar industry in the United States and worldwide. Diseases are one of the main threats to crop production. The accurate and rapid identification of plant pathogens is the first step in controlling diseases and producing quality crops. It is a very difficult and lengthy process to diagnose diseases using traditional methods like microscopy, culture plate-based observation techniques, etc. The recent development of several advanced molecular techniques is 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. Loop-mediated isothermal amplification, or LAMP, Recombinase Polymerase Amplification, or RPA, and Oxford Nanopore Technology (ONT) are the three 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 technologies are very popular among growers, field specialists, and crop advisers for on-site monitoring of diseases in humans, animals, and plants. The demand for rapid onsite technologies in agriculture has been growing over the last decade. The impact of this new detection approach is expected to accelerate plant health research and contribute for transformative teaching and research excellence in Plant Health.

10:15 BREAK

10:30 Divisional Business Meeting and Divisional Award Ceremony

Friday, February 24, 2023

AFTERNOON

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

Animal, Fish, Wildlife, Veterinary Science

Chair: Hossam Abdelhamed

Mississippi State University

Co-Chair: Raymond Iglay

Mississippi State University

Thursday, February 23, 2023

MORNING

Room D2

8:00 Welcome and Opening Remarks

8:30 Center of Biomedical Research Excellence
Stephen Pruett
Mississippi State University

O2.01

9:10 ESTIMATION OF MORTALITY RATES FOR THE GULF MENHADEN STOCK

Catherine Wilhelm[1], Amy Schueller[2], Emily Liljestrand[3], Kim de Mutsert[1], Robert Leaf[1]

[1]University of Southern Mississippi, GCRL, [2]Southeast Fisheries Science Center, Beaufort, NC, [3]Michigan State University, East Lansing, MI

Gulf Menhaden, *Brevoortia patronus*, is the target species of the second largest fishery in the United States. Gulf Menhaden fishery and stock is described using an age-structured stock assessment that has been ongoing since the 1960s. The model is parametrized, in part, using age-specific mortality rates. New advancements in technology have made it possible for modernizing the calculations of many of these parameters in the assessment. In an effort to improve estimates of Gulf Menhaden mortality rates we conducted a study to develop mark-recovery models in AD Model Builder to evaluate recently digitized records of a large-scale tag and recapture

study. Recovery data were comprised of adult (n = 90,210) and juvenile (n = 142,013) individuals that were captured, tagged with unique ferro-magnetic tags, and then recovered from the fishery from 1970 to 1988. The models account for the difference in juvenile and adult tagging mortality as well as tag recovery probability. Juvenile dynamics were modeled such that 'transition' into the adult tagged population took place after tagging, with the assumption that all recovered fish were adults. Fishing effort was derived from fishery landings per month throughout the tagging study. Estimating mortality rates based on mark recovery data using contemporary methods will provide validation of current parameters, indicate the annual variation in mortality, and allow an understanding of the range of observed mortality.

O2.02

9:30 PUERTO RICAN SLICK-HAIRED HOLSTEIN CATTLE EXHIBIT ENHANCED MAMMARY GLAND HEMODYNAMICS COMPARED TO THEIR WILD-TYPE HAIRED COUNTERPARTS

Zully Contreras Correa[1], Hector Sanchez Rodriguez[2], Gladycia Muniz Colon[2], Caleb Lemley[1]

[1]Mississippi State University, Mississippi State, MS, [2]University of Puerto Rico-Mayaguez, Puerto Rico

A mutation of the prolactin receptor gene (PRLR) results in cattle with short and sleek hair coat and superior thermoregulatory capacity when exposed to heat stress conditions. This mutation, which is present in Puerto Rican Holstein cattle (SLICK) results in decreased vaginal temperatures and increased milk yield (MY) compared to wild-type haired Holstein cattle (WT) under tropical conditions. The superior performance of SLICK Holstein cows has been considered multifactorial in nature and physiological differences between genotypes still need to be elucidated. Thereby, the objective was to compare the mammary gland hemodynamics and udder skin temperature between SLICK (n=7) and WT (n=7) Holstein cows during the summer as possible contributors to such physiological differences. Animals were selected for differences in MY (23.77±1.24 vs. 19.74±1.24 kg, SLICK vs. WT, respectively; P=0.041) and stratified by body weight (BW), lactation number, and days in milk (DIM). At 160±3 DIM, left and right pudendoepigastric arteries were assessed transrectally via Doppler ultrasonography and the udder skin temperature was determined using a thermal camera. Data were analyzed by one-way ANOVA using the MIXED procedure of SAS with resistance index (RI), pulsatility index (PI), diameter, total mammary blood flow (MBF), MBF relative to BW, and udder skin temperature as dependent variables and hair coat as the independent variable. The CORR procedure of SAS was used to determine the correlation between MY and MBF. Statistical significance was declared at $P\leq0.05$ and tendencies were established at $0.05\leq P\leq0.10$. The RI was lower (P=0.045) in SLICK Holsteins (0.56±0.02) compared with WT (0.64±0.02). The PI tended (P=0.0589) to be lower in SLICK Holsteins (0.94±0.07) compared with WT (1.15±0.07). The average diameter of the left and right pudendoepigastric arteries was greater in the SLICK animals compared with WT (1.31±0.07 vs. 1.08±0.07 cm, respectively; P = 0.038). Total MBF was increased in SLICK cattle compared with WT (9.03±1.11 vs. 5.14±1.11 L/min; P=0.0291). There was a tendency (P=0.0577) for the MBF relative to BW to be greater in the SLICK Holsteins compared to the WT (16.75±2.14 vs. 10.38±2.14 mL/min*kg). No differences were observed in udder skin temperature between SLICK and WT Holsteins ($P\geq0.05$). Lastly, a tendency for a positive correlation between MY and MBF was observed (r= 0.51, P=0.066). In the current study, SLICK Holsteins had enhanced blood supply to the mammary gland which is indicative of greater amount of oxygen and nutrients available for milk synthesis. Therefore, the gene introgression of the PRLR mutation to a dairy herd may result in animals with superior physiological performance during heat stress conditions preventing economical losses in the dairy industry.

O2.03

9:50 VIRULENCE TYPING OF AVIAN PATHOGENIC *Escherichia coli* ISOLATES FROM BROILER BREEDERS WITH COLIBACILLOSIS IN MISSISSIPPI

Jiddu Joseph, Christopher Magee, Linan Jia, Li Zhang, Pratima Adhikari, Reshma Ramachandran

Department of Poultry Science, Mississippi State University, Mississippi State, MS 39762, [2]USDA-ARS, Poultry Research Unit, Mississippi State, MS

Avian pathogenic *Escherichia coli* (APEC) causes extraintestinal infections called colibacillosis in various poultry species and are responsible for huge economic losses worldwide. The disease in broiler breeders needs to be controlled because APEC can be vertically transmitted from the breeders to the offspring through contaminated eggs. Moreover, the bacterial populations are continuously evolving from time to time creating high genetic diversity. Therefore, in this study, we evaluated the phenotypic virulence characteristics of 28 APEC isolates from broiler breeders with colibacillosis in Mississippi using Embryo Lethality Assay (ELA) and Chick Virulence Assay (CVA). Additionally, the relationship between genotypic and phenotypic virulence patterns were determined. For ELA, 558 eggs from Ross 708 × YPM breeder flock were divided into 31 groups (n=18 eggs/group, 28 isolates and PBS injected, non-injected, and dry punch as controls), and eggs were incubated under standard conditions. On day 12 of incubation, 0.1mL of an overnight culture of bacteria in LB broth at a final concentration of 100-500 CFU/mL was injected into the allantoic sac of embryonated eggs. The eggs were candled daily for 7d post-inoculation and embryo mortality was recorded. For CVA, 256-one-day-old female Ross708 × YPM chicks were divided into 32 groups (n=8 chicks/group, 28 isolates, and 2 PBS-injected and 2 non-injected controls). An overnight culture of bacteria in LB broth was reconstituted in PBS to get a final concentration of 10^8 CFU/mL and 0.1mL was subcutaneously injected into the neck region of each chick. Then, the chicks were monitored for 7d post challenge and mortality along with lesions following necropsy were recorded. A pathogenicity score (PS) was assigned to each isolate based on the day of chick death and lesions during necropsy and then, isolates were classified based on pathogenicity. Pearson correlation analysis using SAS 9.4 was performed to determine the relationship between ELA, CVA,

and various virulence-associated genes. The mortality following ELA ranged between 6% to 78%, and for CVA, it was from 0% to 100%. However, there existed a strong positive correlation between embryo mortality and PS (R= 0.73, P<0.01). Hence, to assess the virulence of the APEC isolates, based on PS, among the 28 isolates, 11 (39%) were classified as highly pathogenic, 6 (21%) as intermediate, and 11 (39%) as low pathogenic. Additionally, 74% of the isolates which were found highly virulent during ELA were classified under High/ Intermediate pathogenic group during CVA. Moreover, positive correlations were observed for embryo mortality and PS with the presence of virulence genes that predict APEC, *iroN*, *iss*, *ompT*, *hlyF*, and *iutA* (R=0.53, P<0.01 and R=0.42, P=0.02 respectively). In conclusion, this study helped us to evaluate the virulence characteristics of APEC isolates obtained from diseased broiler breeders in Mississippi based on their phenotypic virulence and its relationship with genotypic virulence. Future research to determine their vertical transmission potential need to be done. All these findings would direct us towards more conclusive results to help develop an *E. coli* challenge model and an effective vaccine for broiler breeders.

10:10 BREAK

O2.04

10:30 BUTYRATE KINASE OF *Listeria monocytogenes* IS REQUIRED FOR BRANCHED-CHAIN FATTY BIOSYNTHESIS AND PATHOGENESIS

Q M Monzur Kader Chowdhury[1], Seto Ogunleye[1], Shangshang Wang[2], Thu Dinh[2], Hossam Abdelhamed[1]

[1]Department of Comparative Biomedical Sciences, College of Veterinary Medicine, Mississippi State University, Mississippi State, MS, [2]Department of Animal and Dairy Sciences, Mississippi State University, Mississippi State, MS

Listeria monocytogenes is a psychrotolerant food-borne bacterial pathogen that can survive and multiply in refrigerated food. The ability of *L. monocytogenes* to survive at low temperatures leads to frequent recalls of contaminated food products. A critical mechanism that enables *L. monocytogenes* to grow at low temperatures is altering its membrane composition to increase membrane fluidity, mainly by decreasing the length of fatty acid chains and increasing the anteiso to iso branched-chain fatty acids (BCFA) ratio. Branched-chain -keto dehydrogenase (BKD) complex has been identified as a key enzyme in the determinant of membrane BCFA composition. Exogenous fatty acid precursors are proposed to be incorporated into *L. monocytogenes* membrane by an alternative pathway that includes phosphotransbutyrylase (Ptb) and butyrate kinase (Buk) enzymes, products of *ptb* and *buk* genes located just upstream of the *bkd* gene cluster. To further study the role of the Ptb and Buk, two knockout mutants were constructed, and *in vivo* and *in vitro* fitness of these mutant strains were evaluated to verify the role of Buk and Ptb pathway in BCFA synthesis. Our result showed that Buk is required for *L. monocytogenes* growth at low temperatures by maintaining BCFA composition. Furthermore, Buk promotes virulence in mice, intracellular replication, plaque formation in L2 fibroblast cells, and phospholipase activity. However, loss of *ptb* has no significant impact in BCFA biosynthesis and virulence of *L. monocytogenes*. This is the first study to demonstrate that Buk has impact in *L. monocytogenes* pathogenesis and BCFA composition in the membrane, which may provide insight into the development and application of antimicrobial agents.

O2.05

10:50 HOW THE EXTRACELLULAR AUTOLYSIN PROTEIN FROM *S. epidermidis* CONTRIBUTES TO SURFACE ATTACHMENT IN BIOFILM FORMATION

Nicholas C. Fitzkee[1], Rahul Yadav[2], Y. Randika Perera[3], Yang Shen[4], Radha P. Somarathne[1]

[1]Department of Chemistry, Mississippi State University, Mississippi State, MS, [2]Department of Chemistry, University of Arkansas at Fort Smith, Ft. Smith, AK, [3]Center for Structural Biology, Vanderbilt University, Nashville, TN 32740, [4]Laboratory for Chemical Physics, NIDDK, National Institutes of Health, Bethesda, MD

Bacterial biofilms on medical devices and implants pose a serious health challenge, and the interaction between bacterial surface proteins and abiotic surfaces is an important initial step towards bacterial colonization and biofilm development. The autolysin (AtlE) surface protein of *S. epidermidis* functions in cell wall homeostasis by catalyzing the hydrolysis of peptidoglycan (PGN) subunits. AtlE is also known to play a direct role in biofilm formation. Both the amidase domain (Ami) the R2ab domain of AtlE have been implicated in bacterial attachment to surfaces. Here, we explore the function and surface adsorption of AtlE. We have characterized the structure, function, and interaction of the Ami domain with a serum-coated abiotic surface using solution NMR spectroscopy. We have also investigated the interaction between R2ab and polystyrene surfaces. The NMR-derived solution structures of Ami and R2ab are similar to the previously-determined crystal structures. Zn^{2+} binding to the Ami domain is characterized by high affinity (KD ~ 30 nM) and induces a local conformational change around the active site. In contrast, the substrate (muramyl tripeptide) for Ami showed a much weaker affinity (KD ~ 60 μM). We find that Ami binds to serum-coated surfaces, and upon binding, it significantly reduces staphylococcal biofilms on those surfaces. Surface binding was further investigated using serum-coated nanoparticles, which allowed a structural characterization using NMR relaxation measurements. The R2ab domain, on the other hand, interacts strongly with polystyrene surfaces, including polystyrene nanoparticles. Using a combination of NMR spectroscopy, calorimetry, and chemical labeling, we develop a model whereby R2ab binds loosely to polystyrene surfaces, adsorbs, and then unfolds. Taken together, these results reveal the structural and functional properties of AtlE required for normal cell growth, and they also demonstrate this protein's role in biofilm formation.

O2.06

11:10 MECHANISTIC ROLES OF LYSR-TYPE TRANSCRIPTIONAL REGULATORS IN VIRULENCE AND ADAPTATION OF *Listeria* monocytogenes

Seto Ogunleye, Q M Monzur Kader Chowdhury, Hossam Abdelhamed

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

Background: *Listeria monocytogenes* is an important foodborne pathogen known to survive in wide environmental niches owning to many transcriptional regulators encoded by its genome. Among these regulators are genes that encode uncharacterized LysR-type transcriptional regulators (LTTRs). This study aimed to explore the contribution of *Lmof2365_0315(315)* and *Lmof2365_0518 (518)* encoding LTTRs in *L. monocytogenes* virulence and environmental adaptation.

Methods: F2365Δ*315* and F2365Δ*518* mutants were constructed by inframe deletion of *315* and *518* in *L. monocytogenes* strain F2365. To determine the role in *vivo* and *in vitro*, mice model challenges, plaque assay in murine L2 fibroblast, and intracellular replication in J744A.1 macrophage were conducted. Furthermore, biofilm formation, nitrogen utilization, and oxidative stress responses of the deletion strains were performed.

Results: After 3 days post-infection, bacterial burdens in the spleen and liver were found to be lower in the mice infected with F2365Δ*315* and F2365Δ*518* compared to the wild-type F2365 strain, without significant differences. The expression of listeriolysin O protein and phospholipase activities were lower in the F2365Δ*315* and F2365Δ*518* mutants than in the wildtype. Furthermore, the loss of the *315 and 518* genes negatively impacted the phospholipase activities and plague formation significantly compared to the wildtype, but the intracellular replication shows no significant reduction compared to the wildtype. The loss of *315* and *518* has no significant impact on the glucose and nitrogen utilization compared to the wildtype.

Conclusion: This study is the first to demonstrate that *315* and *518 have* no major contribution towards the virulence activities of *L. monocytogenes*. Further study will investigate other mechanistic roles of these genes on the physiology and adaptation of *L. monocytogenes*.

O2.07

11:30 BUCK NETWORKING: A RISKY BUSINESS WITH CWD AT THE DOOR

Scoty Hearst[1], Miranda Huang[2]

[1]The Department of Chemistry and Biochemistry, Mississippi College, Clinton, MS, [2]Department of Wildlife, Fisheries, and Aquaculture, Mississippi State University, Starkville, MS

Chronic wasting disease (CWD), a fatal, highly contagious, brain disease occurring in species of the deer family has been slowly spreading among Mississippi White-tailed deer (WTD). It is not well known how WTD are acquiring and transmitting CWD; however, male WTD have higher rates of infection than females. We speculated that a major transmission route for CWD in male WTD is through social contact. Identifying high-risk social groups and high-risk locations are vital for CWD prevention and management strategies. Buck social networks can be visualized by monitoring scrapes using camera traps. In this study, we generated the large buck social network, comprised of multiple communities, to determine high-risk individuals, high-risk social groups, and high-risk locations in a Mississippi county neighboring a CWD positive area. We called these high-risk individuals "potential super-spreaders" of disease and these high-risk locations potential disease transmission hotspots. Potential super-spreaders are individuals that are high-risk for acquiring and transmitting infection due to their increased social activity. Analysis of potential super-spreader demographics, revealed that most potential super-spreaders were males under 2.5 years of age. These young bucks had numerous social contacts that spanned WTD communities, making them high-risk for acquiring and subsequently spreading infection. The young bucks also bridged multiple WTD communities giving them the potential to infect more individuals as compared to other bucks. To model potential CWD management approaches, we randomly removed different age groups to determine which management strategies had the most impact on potential disease transmission. We also monitored hunting activity, and WTD harvest to better understand how hunting influences social networks and potential disease transmission. We found that hunter-harvest fragmented WTD social networks, reducing the potential spread of disease. Combining social network analysis and heatmapping software, we located potential disease transmission hotspots, where the risk for possible disease transmission is higher as compared to other locations. Overall, this study demonstrates a model for predicting high-risk super-spreaders of diseases, describes new methods to locate high-risk transmission hotspots, and provides new insights for CWD prevention and management.

12:00 General Session

Thursday, February 23, 2023
AFTERNOON
Room D

1:20 TBA
1:40 TBA

Thursday, February 23, 2023
EVENING

3:30 DODGEN LECTURE and AWARDS CEREMONY
Hall B

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

P2.01

RADIOACTIVITY STUDIES ON LOCAL CATFISH

DeMarcus Jackson, Alyssa Greer, Jermiah Billa, Steve Adzanu, John Adjaye

Alcorn State University, Lorman, MS

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

P2.02

BIG SHRIMPIN': ANALYSIS OF TRACE ELEMENTS IN FARM RAISED AND WILD-CAUGHT SHRIMP

Mohammad Ibrahim, Jana Thoma, Scoty Hearst

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, 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. The levels of these contaminants in commercially farmed and wild-caught shrimp is unknown. To explore this idea, we analyzed various commercially farmed and wild-caught shrimp for toxic metals and trace elements using an ICP-OES. Here, we compare trace elements and toxic metals in the various shrimp samples from commercially farmed and wild-caught shrimping industries and compare these levels with the maximum permissible levels established by World Health Organization, USDA, and Food and Agriculture Organization of the United Nations.

P2.03

COASTAL CONTAMINATION: MONITORING MARINE SPECIES FOR TRACES ELEMENTS FROM THE GULF

Carlee Cockrell, Joseph Kazery, Jana Thoma, Scoty Hearst

Mississippi College, Clinton, MS

Pollution in marine environments are a major concern for marine wildlife especially in the Gulf of Mexico. Discharge from the Mississippi River brings high levels of nutrients and environmental contaminants into the Gulf. Oils spills, coastal industry, and municipal sites from five US states as well as Mexico discharge toxic chemicals and pollution from human activities and agricultural into the Gulf watershed. The levels of these contaminants in marine wildlife is unknown. To explore this idea, we analyzed various marine organisms for toxic metals and trace elements using an ICP-OES. Marine samples were collected from the waters of the Gulf of Mexico via fishing vessels or collected in coastal environments using nets near Biloxi, MS. We collected various crustacean and fish species for analysis. Here, we compare trace elements and toxic metals in the various species from the Gulf Coast and compare these levels with the maximum permissible levels established by World Health Organization, USDA, and Food and Agriculture Organization of the United Nations.

P2.04

CRAYFISH AS SENTINEL SPECIES TO MONITOR TRACE ELEMENTS IN FRESHWATER ECOSYSTEMS

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

Mississippi College, Clinton, MS

Crayfish are common in freshwater ecosystems being the largest invertebrate making up the largest amount of invertebrate biomass & are of great ecological importance that can even impact public health. Crayfish can be used as a sentinel species to monitor the health of environments. This provides information of substances that are in or have been passing through freshwater ecosystems and has accumulated in crayfish.

Crayfish were sampled from 13 locations within Clinton, MS & each location was categorized into regions: industrial, rural, suburban, & urban. Abdominal muscles & exoskeletons were digested using HNO_3, HCl, & H_2O_2 as described in EPA Method 200.7, then analyzed by ICP-OES to determine the concentration of selected trace elements. The uptake of Al, Cu, Hg, Mn, Sr, & Zn was observed in crayfish and varied significantly in concentrations and by location. Our results indicated that most trace elements (Al, Cu, Mn, Sr) were concentrated in the exoskeleton, whereas Zn was concentrated in the abdominal muscle. Based on regions, results indicated there were significantly higher concentrations of Al, Cu, Mn, & Sr in the suburban & rural regions than industrial or urban. There was significantly more Zn in the industrial region, & significantly more Hg in the urban region.

Crayfish are an integral part of freshwater habitats; therefore, potential ecological or public implications may occur due to toxic levels of trace elements. This may cause a decline in

population or affect the public being a food source or being passed through the food chain to desirable fish.

P2.05

ANALYSIS OF LOCAL CRAYFISH IN LOTIC ECOSYSTEMS

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

Mississippi College, Clinton, MS

Crayfish are common organisms in freshwater ecosystems & are of great ecological importance that can even impact public health. Crayfish are responsible for promoting nutrient cycling through decomposition, providing habitats to other organisms, & are prey to many organisms. Knowing the importance of crayfish to the environment as well as the public charges us with & understanding of what type of crayfish are found locally and baseline data for their health. This study provides baseline information of the local genera as well as the biometrics of crayfish found in flowing waters within Clinton, MS as well as to determine if there is variation in crayfish by local regions.

Samples of crayfish were collected between May and October 2022 from lotic systems: streams, creeks, & springs. Specimens were keyed to genus, sexed, and biometric data (total length & mass) was collected and analyzed.

The main genus of crayfish was *Procambarus* making up 93% of the samples & 7% *Lacunicambarus*. In total, the crayfish demonstrated a healthy distribution with a total mean length 6.5 cm. The mean length of crayfish varied significantly only between the industrial (7.2 cm) and suburban regions (6.0 cm). the mass of the crayfish, the suburban region (4.930 g) was demonstrated to be significantly lower than the other industrial (7.989 g), urban (8.714 g), & rural (6.615 g) regions.

This data provides a baseline data for future studies or management. This study can be furthered by monitoring existing populations or comparing other specimens from the surrounding areas.

P2.06

ROLE OF FABH IN *Listeria monocytogenes* PATHOGENESIS

Munshi Mustafiz Riman, Q M Monzur Kader Chowdhury, Seto Ogunleye, Mark Lawrence, Hossam Abdelhamed

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

Listeria monocytogenes (LM) is a gram-positive, facultative intracellular foodborne pathogenic bacteria that causes listeriosis. LM can survive and multiply at low temperatures by maintaining membrane fluidity using their high percentage of branched-chain fatty acids composition in membrane. β-ketoacyl-acyl carrier protein synthase III (FabH) catalyzes the first elongation stage of fatty acid production in type II fatty acid synthesis (FASII) pathway. FabH functions to enhance preference for 2-methylbutyryl-CoA at low temperatures and contribute to increasing anteiso fatty acids. Anteiso- fatty acids promote cold adaptation and virulence in LM. In LM, the importance of FabH in both *in vitro* and *in vivo* conditions is entirely unexplored. Here, we constructed a *fabH* deficient LM strain by in-frame deletion. To determine the role of *fabH* in *in vivo* and *in vitro*, mice model challenges, plaque assay in murine L2 fibroblast, and intracellular replication in J744A.1 macrophage were conducted. At 72 hours post-infection, no significant difference in bacterial loads in liver and spleen were observed between the F2365Δ*fabH* and parent F2365 strain. There was no significant different shown in *in vitro* model using murine L2 fibroblast and intracellular replication in J744A.1 macrophage. It may be happened due to using serum in infection, which bypassed the fatty acid requirement. Our result indicated that LM could bypass FabH requirement for virulence and intracellular replication. Further study is needed to analyze without serum to confirm the FASII pathway bypassing capability of LM.

P2.07

SERPENT SENTINELS: USING SNAKE SKIN TO MONITOR TOXIC METALS IN TERRESTRIAL ENVIRONMENTS

Andrew Doubert, Frank Hensley, Scoty Hearst

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

Pollution is a major problem for terrestrial and aquatic environments. Sampling soil over vast regions to acquire adequate assessment of terrestrial containment levels is a daunting task. Snakes thrive in a variety of habitats, where accumulation of toxic metals may occur. We hypothesis that, snake skin, would bioaccumulate toxic metals acting as environmental sentinels useful for monitoring contaminant levels in terrestrial environments. To explore this idea, we collected snake skins from various location and assessed these tissues for toxic metals. In this study, we compare the bioaccumulation of toxic metals in these samples to toxic metals in the surrounding soils. Overall, this data will conclude if snake skins is a promising source useful for monitoring toxic metals in the environment.

P2.08

AN OPTIMIZED FLOW CYTOMETRY PANEL FOR CLASSIFYING MACROPHAGE POLARIZATION

Liyuan Liu, John Stokes, Wei Tan, Stephen Pruett

Mississippi State University, Starkville, MS

The mechanism of action of many toxicants involves inflammatory responses, which can exacerbate tissue damage. It is clear that deaths from some infectious diseases, including COVID-19, result from excessively aggressive inflammatory responses. Thus, toxicants that also exacerbate or inhibit inflammation would be expected to alter the course of such infections.

Macrophages are scavenger cells and a fundamental part of the innate and adaptive immune responses that participate in the body's physiological and pathological processes, which can be generally divided into two groups: M1 (inflammatory) and M2 (wound healing) based on the expression of surface and intracellular markers.

With this in mind, we have established and optimized an eleven-color flow cytometric assay for macrophage subtype

identification that can be used to assess the effects of toxicants on immune responses. First, we polarized 3×10^5 of the mouse macrophage cell line RAW 264.7 with 10 ng/mL IFN-γ ± 100 ng/mL LPS for 24 hours to get M1-type macrophages. During the same time, the M2a and M2c were polarized by 20 ng/mL IL-4 and 20 ng/mL IL-10 for 24 hours, respectively. The TNF-α level of cell supernatants were tested by ELISA to verify polarization. Then polarized cells were labeled with the following antibodies and assessed by flow cytometry to identify each marker's expression: F4/80, Arginase 1, TLR4, CD86, VEGF, CD14, CD206, MHC Class II, and TNF-α (surface and internal).

We have clearly identified macrophages subtypes using these markers. We propose this as a useful approach to identify the effects of infectious pathogens and toxicants on inflammatory responses. In addition, we are working to develop a mathematical expression of the M1-M2 continuum that can be used to quantify the degree to which all the markers are consistent with an M1 phenotype or one of the M2 phenotypes. This lab is supported in part by NIH P20103646-09.

P2.09

GENERATION OF SINGLE CHAIN FRAGMENT VARIABLE ANTIBODY AGAINST PNEUMOLYSIN USING PHAGE ANTIBODY DISPLAY LIBRARY

Chaeyoung Kim, Joo Youn Park, Nogi Park, Justin Thornton, Youngkyung Park, Clare Seo, Carol Baker, Keun Seok Seo

Mississippi State University, Starkville, MS

Streptococcus pneumoniae (Spn) causes 1.5 million cases of severe pneumonia, meningitis, and other diseases annually in the United States. Spn infection in the lung can spread to bloodstream and lead to high morbidity and mortality. Pneumolysin (PLY) is a cholesterol-dependent pore-forming toxin (PFT) which has been implicated in the dysfunction of lung and endothelial barrier that enable Spn to transit from the lung to the blood and the blood brain barrier to cause life-threatening septicemia and meningitis. Therefore, PLY is an important vaccine candidate to prevent Spn infection. The goal of the proposed study is to develop single chain fragment variable (scfv) neutralizing antibody against PLY for passive immunization. The PLY consists of four domains (D1-D4) in which D4 L1 loop (aa454-471) contains tryptophan-rich, and a threonine-leucine amino acid pair involved in recognition and binding to membrane associated cholesterol for pore formation. In this study, we generated a recombinant PLY L1 loop protein which was mixed with TiterMax adjuvant to immunize C57BL/6 mice twice in a two-week interval. Western blot analysis showed a robust antibody response up to 1:100,000 serum dilution. Animals were humanely euthanized. RNA was extracted from spleen and peripheral blood leukocytes and used for cDNA synthesis. The heavy chain and light chain variable regions were amplified and assembled to scfvs by Splicing Overlap Extension PCR (SOE-PCR). Assembled scfvs were cloned into phage antibody display vector, pADL100 to generate phage antibody display library. The diversity was checked with colony PCR. The specificity and sensitivity of phage antibody display library will be further determined by panning and screening.

P2.10

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

Jose Alfonso Xavier[1], Trent Selby[1], Lee Lee Yelverton[1], Marguerite Yelverton[2], Megan Megan Malone[2], Scoty Hearst[1]

[1]The Department of Chemistry and Biochemistry, Mississippi College, Clinton, MS, [2]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. Researchers have identified many environmental factors and deficiencies linked to osteoporosis making causation location specific. Deer antlers are a very 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. Completion of this study could reveal essential elements required for bone growth or reveal environmental concerns due to toxic metal accumulation. We also speculate that antlers can be used to monitor for toxic elements in the environment. We suggest that this research can further the understanding of environmental factors and deficiencies that lead to weak and brittle bones progressing osteoporosis research.

P2.11

RIVER MONSTERS: PREDATORY FISH AS SENTINEL SPECIES FOR TOXIC METALS IN AQUATIC ENVIRONMENTS

James Lock, Joseph Kazery, Trent Selby, Scoty Hearst

The Department of Chemistry and Biochemistry, Mississippi College, Clinton, MS, [2]The Department of Biology, 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 fish, especially top predators, would bioaccumulate toxic metals acting as environmental sentinel species useful for monitoring contaminant levels in aquatic environments. To explore this idea, we collected River Monsters, the top predator species in

the Mississippi River, and assessed their tissues for toxic metals. We collected Alligator Gar (*Atractosteus spatula*), channel catfish (*Ictalurus punctatus*), flathead catfish (*Pylodictis olivaris*), and blue catfish (*Ictalurus furcatus*) from the Mississippi River near Davis Island, MS and at Wolf Lake near Yazoo City, MS. In this study, we compare the bioaccumulation of toxic metals in these top predatory fish to other species. We also compared these levels to water and sediments. Overall, this data will conclude if top predator species are superior sentinel species for toxic metals as compared to other species inhabiting the same environment.

P2.12

DETECTION OF CONTAMINANTS IN BOTTLENOSE DOLPHINS (*Tursiops truncatus*) STRANDED ALONG THE MISSISSIPPI SOUND FROM 2010 – 2021

Nelmarie Landrau Giovannetti[1], Jordan Rogers[1], Stephen Reichley[1], Debra Moore[1], Ashli Brown[2], Ashley Meredith[2], Christina Childers[2], Darrell Sparks[2], Mark Lawrence[1], Barbara L.F. Kaplan[1]

[1]College of Veterinary Medicine, Mississippi State University, Mississippi State, MS, [2]Mississippi State Chemical Laboratory, Mississippi State University, Mississippi State, MS

Marine mammals, such as cetaceans, are exposed to a wide range of environmental pollutants, including metals, polychlorinated biphenyls (PCBs), and polyaromatic hydrocarbons (PAHs) as a result of direct or indirect anthropogenic disturbances within their environment. Since the 1960s, accumulation of chemicals like PCBs has been detected in the tissues of marine mammal species, and this has persisted throughout the decades. Cetaceans are regarded as a sentinel species, as changes in their health and population can serve as indicators of current or potential negative effects on the marine ecosystem. Our research primarily focused on detection of PAHs, PCBs, and metals in tissues of 146 bottlenose dolphins (*Tursiops truncatus*) that stranded in the Mississippi Sound between 2010 and 2021. Each individual bottlenose dolphin that stranded had four tissue types (i.e., blubber, kidney, liver, and muscle) collected either from frozen archival or fresh tissues from necropsies at the Institute for Marine Mammals Studies, MS. Analysis and quantification of 23 PAHs, 8 PCBs, and 22 metals was performed at the Mississippi State Chemical Laboratory in Starkville. The samples were divided into four times periods: 1) 2010-2018, 2) 2019, 3) 2020, and 4) 2021 and normalized to 1g of tissue. This allowed for the possibility to observe any potential variations in environmental exposures brought on by the Bonnet Carré Spillway's more frequent opening in 2019, which helped to avert flooding in New Orleans. It has been suggested that more frequent spillway openings could impact marine ecosystems by changing the pH or salinity of the water. Only 8/23 PAHs were detected, with naphthalene being detected most often with highest levels in blubber and liver. Most of the 8 PCBs were detected regardless of the time period and the trend of PCB-positive dolphins decreased in 2020 before increasing again in 2021. Three metals were detected in all four tissues in each individual: potassium, sodium, and zinc. In contrast, beryllium was not detected in all four tissues in each individual. Our results show that bottlenose dolphins are susceptible to the accumulation of PAHs, PCBs, and heavy metals. Despite mitigation and regulation measures to reduce pollution, the majority of these animals still exhibit detectable levels of environmental contaminants. Understanding the impact of environmental pollution on cetaceans is important because a decline in their health and population may disrupt critical marine ecosystem functions. Long-term surveillance of bottlenose dolphins is of importance and reaffirms their role as sentinels for marine ecosystems and public health.

P2.13

MODELING AQUATIC BATTERY POLLUTION AND BIOREMEDIATION USING POND MUSSELS

Emily Rodrigue, Clinton Bailey, Scoty Hearst

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Illegal dumping of batteries leaches corrosive materials and heavy metals that contaminate the environment. The United States disposes of over 200,000 tons of batteries each year. How much of this battery waste is recycle remains unknown? In our environmental chemistry studies throughout Mississippi, we have found evidence of battery contaminates in local ponds and in large river systems. Lithium-ion and Nickel-cadmium batteries are the most commonly batteries used today. As Americans move to more battery powered devices, like electric cars, there are major environmental concerns about pollution created by these energy sources. To model possible environmental contaminants from battery waste, we placed damaged Lithium-ion and Nickel-cadmium batteries in an aquatic environment and monitored changes in toxic and trace metals using ICP-OES. We found that these batteries released high levels of lithium, lead, nickel, and other contaminants hazardous to the environment. Mussels are aquatic filter feeders that have been use for bioremediation of human waste products. We hypothesized that these bivalves might also help to reduce aquatic contaminants created from battery waste. We exposed pond mussels to Lithium-ion and Nickel-cadmium battery waste and found significant changes in water levels of contaminates after 48hrs. Our data suggest improper disposal of batteries can cause major environmental contamination and pond mussels may be an excellent bioremediation tool to combat future battery contaminants in aquatic ecosystems.

P2.14

A NEW SURVEILLANCE STRATEGY USING KIDNEY TISSUE REVEALS SARS-COV-2 POSITIVITY TRENDS IN MISSISSIPPI WHITE-TAILED DEER

William Yarbrough[1], John Bates[2], Doug Watts[3], Scoty Hearst[1]

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Early detection and monitoring of SARS-CoV-2 infections in animal populations living within close proximity to humans is crucial to preventing reverse zoonosis of new viral strains. *Odocoileus virginianus* (White-tailed deer, WTD) are one few animal species susceptible to zoonotic SARS-CoV-2 spill-over. SARS-CoV-2 infections into WTD populations have been reported in states such as Michigan, Pennsylvania, Illinois, Iowa, New York, Ohio, and Texas. The major challenges for SARS-CoV-2 surveillance are sample collecting expertise and manpower. In this study, we developed a new SARS-CoV-2 surveillance strategy using WTD kidney tissue collected from hunter harvested deer to lessen these challenges. Using this method, we report the first exposure of SARS-CoV-2 in WTD from the southeastern region of the United States in the great state of Mississippi. During the 2021-2022 Mississippi deer hunting season, we tested for SARS-CoV-2 positivity in nasal swabs, blood serum, and kidney tissues collected from hunter harvested deer throughout the state. PCR analysis revealed a 25% positivity rate (n=12). Serologic analysis indicated 67% positivity (n=15) and tissue analysis revealed a 26% positivity rate in WTD (n=62). However, assessing WTD positivity rates over time revealed increasing positivity trends mirroring SARS-CoV-2 rates in Mississippians. Comparison of WTD and human positivity trends in Mississippi showed a strong correlation of 83.9%. Overall, this study demonstrates the efficacy of this new SARS-CoV-2 tissue surveillance strategy, which can help to limit the burdens of future surveillance studies and monitoring programs.

P2.15

EFFECT OF TREATED TIME OF HYDROTHERMAL ETCHING PROCESS ON OXIDE LAYER FORMATION AND ITS ANTIBACTERIAL PROPERTIES

Jooyoun Park, KeunSeok Seo, Raheleh Miralami, Nayeon Lee

Mississippi State University, Mississippi State, MS

Inspired by natural materials, we developed an antibacterial surface on titanium (Ti) using hydrothermal etching techniques and examined the effect of treated time on oxide layer formation, its antibacterial properties, and surface defects. Hydrothermal etching was conducted on Grade 2 commercially pure Ti immersed in 5M NaOH at 250 °C during a range of time of 0–12 h. Nanopillars generated on the surface had ~100 nm thickness, which resulted in decreased attachment and rupturing of the attached bacteria. The results also showed that 6 h and 8 h of etching time provided a desirable uniform nanopillar structure with the most effective prevention of bacterial adherence on the surface. Multiscale SEM observations revealed that the longer the etching was conducted, the more cracks propagated, which led to an increase in dissociated fragments of the oxide layer. In the 12 h of etching, a higher density of bacterial adherence was observed than that of the untreated and the shorter time treated samples, indicating that etching took longer than 10 h worsened the antibacterial properties of the nano-patterned surface of Ti. This study demonstrated that the optimal time duration is 6–8 h for the oxide layer formation to maximize antibacterial activity and minimize cracking formation on the surface. For future studies, we suggest exploring many possible conditions to generate a more uniform nanopattern without structural defects to secure the integration between a newly deposited oxide layer and the substrate.

P2.16

QUANTIFICATION OF VIRULENT *Aeromonas hydrophila* ML09-119 IN CHANNEL CATFISH ORGANS FOLLOWING IP INJECTION

Basant Gomaa, Hossam Abdelhamed, Michelle Banes, Saida Zinnurine, Mark Lawrence

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

Aeromonas hydrophila as a primary pathogen began impacting U.S. catfish aquaculture in 2009. From 2009 to 2014, *A. hydrophila* caused losses of more than 12 million pounds of market-size catfish in Alabama and Mississippi. Mortality rates in ponds ranged up to 50-60%, and predominantly marketable size fish were impacted. The aim of this study is to understand the pathogenesis of motile aeromonas septicemia caused by an emergent, highly virulent *Aeromonas hydrophila* (vAh) in channel catfish. Specific pathogen free catfish fingerlings were transferred into 20 L tanks supplied with flow-through dechlorinated municipal water. Tanks were infected intra-peritoneally with a sub-lethal infection dose of *vAh strain* ML09-119. A total of 10 fish per timepoint were randomly sampled at 2, 4, 8, 12, 24, 48, 72 h, and 5 days post-infection for vAh quantification. Liver, spleen, and trunk kidney were aseptically collected in PBS. The resulting suspensions were serially diluted, and 50 µl aliquots were spread on BHI plates for quantification. Colony counts were determined 24 hr post incubation. The number of CFU/g of tissue were calculated for each fish and transformed by taking the base 10 logarithm to improve normality. Three fresh dead fish following challenge were sampled to confirm vAh as the cause of mortality. Results of this study indicate that the vAh rapidly spread into fish tissues and caused high mortality following IP infection. At 2 h post challenge, vAh was detected in anterior kidney, liver, and spleen. Spleen had the most vAh at 4 h post challenge. The highest concentration of vAh was detected at 12 h post challenge in spleen, anterior kidney, and liver. Liver had the highest concentration of vAh at 24 h post challenge, while spleen had the highest concentration at 48h. At 72 hr post infection, the vAh concentration was markedly decreased in anterior kidney, followed by a decrease in spleen at 5 days post infection. These results suggest that vAh was able to rapidly proliferate and spread in host tissues following IP infection, and it caused mortality within 8-48 hr.

P2.17

CHARACTERIZATION OF GENETIC MECHANISMS OF ANTIMICROBIAL RESISTANCE IN CATFISH PATHOGENS

Hossam Abdelhamed, Munshi Mustafiz Riman, Mark L. Lawrence

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

The emergence of multi-drug resistant (MDR) bacterial strains is a concern within the aquaculture industry. Here we report multi-drug resistant (MDR) strain of *Edwardsiella ictaluri* and *Edwardsiella piscicida* isolated from moribund catfish in east Mississippi at the aquatic diagnostic laboratory at Mississippi State University College of Veterinary Medicine (MSU-CVM). To elucidate the molecular mechanisms of resistance in this isolate, whole genome sequencing and assembly of *E. ictaluri* strain MS-17-156 and *E. piscicida* strain MS-18-199 were conducted. Data from genome analysis revealed that *E. ictaluri* MS17-156 carries a 135,268 bp plasmid (pEIMS-171561). Based on RepA similarity, the pEIMS-171561 plasmid belongs to IncA/C1 group. Genome annotation identified 170 open reading frames (ORFs), of which 4 were identified as pseudogene and 166 were identified as protein encoding regions. pEIMS-171561 plasmid contains chloramphenicol/florfenicol efflux MFS (*floR*), sulfonamides (*sul2*), and tetracycline efflux MFS (*tetD*) genes flanked by insertion sequences (IS6 family), suggesting that they were gained through IS-mediated transposition. The plasmid contains two conjugative transfer-associated regions and encodes six transposases and insertion sequences (belonging to IS91 family, IS6 family IS15DIV, and IS256 family ISEic2). The genome of *Edwardsiella piscicida* strain MS-18-199 revealed a 117,448 bp novel plasmid named pEPMS-18199. This plasmid contains several antimicrobial resistance (AMR) elements/genes, including *floR, tetA, tetR, sul2*, aminoglycoside O-phosphotransferase *aph(6)*-Id (*strB*), and aminoglycoside O-phosphotransferase *aph(3)*-Ib (*strA*). Conjugation mating experiments demonstrated that the IncA/C plasmid can transfer from *E. ictaluri* to *Escherichia coli* J53. Both plasmids are stable in *the original host even without selection pressure.*

P2.18

PATHOLOGY AND EARLY DETECTION OF PARASITIC *Bolbophorus* TREMATODES IN COMMERCIAL CATFISH PONDS

Haleigh Hassinger, Scoty Hearst

Dept of Chemistry and Biochemistry, Mississippi College, Clinton, MS, 39056

Digenetic trematodes are a major problem for the commercial catfish industry. Trematodes from the genus *Bolbophorus* cause significant economic loss to the Mississippi commercial catfish industry each year. These parasites use the gut of the American white pelican (*Pelecanus erythrorhynchos*) and the gut of the ram's horn snail (*Planorbella trivolvis*) as intermediate hosts, where these hosts can be infected with *B. damnificus* and *Bolbophorus* type II trematodes simultaneously. Bolbophorus infections causes visible skin lesions and mortality in commercial catfish, where infected catfish refuse to eat and eventual waste away. Since, Bolbophorus infect the gut of their hosts, we hypothesized that *Bolbophorus* may also infect the gut of commercial catfish resulting in mortality. In this study, we collected Mississippi commercial catfish and snails from Control ponds, where there were no visible signs of *Bolbophorus* infections and from ponds where there were visible signs of infection. We tested catfish skin and gut samples as well as snail gut samples for *B. damnificus* and *Bolbophorus* type II trematodes using the widely used 18S PCR diagnostic assay. We found *B. damnificus* and *Bolbophorus* type II positivity in catfish skin and gut samples from both the Control ponds and Infected ponds. We also found *B. damnificus* and *Bolbophorus* type II positivity in snail samples from Control ponds and Infected ponds. Our data suggests that the Control ponds were in the early stage of infection, though there were no visible lesions, infections were detected in catfish and snail samples. Furthermore, the fact that *Bolbophorus* infections were detected in the gut of catfish with no sign of infection and with visible infections suggest that *Bolbophorus* infections of the gut could be a major cause of the digestive issues linked to mortality in this disease pathology.

Friday, February 24, 2023

MORNING

Room

8:00 Welcome and Opening Remarks

O2.08

8:20 EFFECTS OF PERIPARTURIENT VAGINAL BETADINE LAVAGES ON DAM AND NEONATAL IMMUNE RESPONSES

Caleb Lemley, Riley Messman, Rebecca Swanson

Mississippi State University, Mississippi State, MS

The vaginal microbiota (VM) is one of the initial contacts of the neonate with microorganisms and can attribute to neonatal health outcomes. The impacts of an altered VM on post-partum dam and neonatal immune responses has not been evaluated. Betadine lavages (BL) have been used to mitigate bacterial infections within the reproductive tract by ablating the VM. Thus, this study aimed to determine if an altered VM impacts passive transfer and immune responses in post-partum dams & calves. Commercial beef cows (n = 22) were randomly assigned to either the control group (CON) or BL treatment group (BTL) two weeks prior to calving. Treatment BL bags were infused into the anterior vagina and cows received 1-3 treatments depending on calving date. Blood samples were gathered from the dam and calf at 0d, 15d, 30d, and 60d post-partum. Processed blood serum & dam colostrum samples were stored at -80°C. Calf serum (0d) and dam colostrum were analyzed for immunoglobulin (IgG) concentration via a commercial ELISA. A D2Dx™ testing kit was used to determine immune status in both dam and calves at 1, 15, 30, and 60d by using gold nanoparticles as a pathogen substitute to identify immune system factors within serum samples. The test produces a numerical score that can be correlated to immune response strength. All IgG data were analyzed using R software. All D2Dx data were analyzed using repeated measures of ANOVA (SAS software version 9.4). There was no difference in passive transfer status between CON and BTL calves, represented by no significant differences in calf serum ($P = 0.62$) or dam colostrum ($P = 0.32$) concentrations of IgG. In dams, there was a main effect of day with immune responses decreasing at 60d postpartum compared with 0d ($P < 0.001$), 15d ($P < 0.001$), and 30d ($P < 0.001$). In calves, there was a main effect of day where

immune responses were increased on 15d compared with 30d ($P = 0.046$) but decreased on 15d compared with 60d ($P = 0.005$). Moreover, there was a decreased immune response in calves at 0d ($P < 0.001$) and 30d ($P < 0.001$) compared with 60d. In calves, there was a tendency ($P = 0.08$) for BTL calves to have a decreased immune response compared with CON. Interestingly, immune status fluctuated in both dams and calves from calving to 60d post-partum. While full elucidation of causes behind these fluctuations is limited, more research evaluating their implications is warranted.

O2.09

8:40 SEMEN QUALITY EVALUATION USING NEAR INFRARED SPECTROSCOPY

Tina Nguyen[1], Notsile H Dlamini[2], Qingyu Sheng[3], Li-Dunn Chen[3], Poudel Ashmita[3], Carrie K Vance[3], Scott T Willard[1], Peter L Ryan[2, 4], Jean M Feugang[2]

[1]Department of Biological Sciences, Mississippi State University, Starkville, MS, [2]Animal and Dairy Sciences, Mississippi State University, Starkville, MS, [3]Biochemistry, Molecular Biology, and EPP, Mississippi State University, Starkville, MS, [4]Pathology and Population Medicine, Mississippi State University, Starkville, MS

Artificial insemination (AI) is the primary breeding tool used in the swine industry to introduce and maintain superior genes. Various extrinsic and intrinsic factors affect sperm characteristics (e.g., motility and morphology), negatively affecting productivity – however, the lack of reliable predictors of sperm quality limits improvements in AI programs. Seminal plasma is a sperm-protective biofluid rich in various bioactive molecules that provides an extensive reservoir for detecting noninvasive predictors (e.g., proteins, hormones, and other bioactive factors) of sperm quality and fertility. Despite the current state of research progress, new tools still need to rapidly and noninvasively assess seminal plasma abnormalities, which are commonly associated with semen quality. Therefore, near-infrared spectroscopy (NIRS) is a nondestructive tool capable of analyzing biochemical changes in reproductive biofluids and has the potential to predict sperm quality effortlessly and quickly. Our study uses NIRS to characterize seminal plasma (SP) of phenotypically different boar semen quality. Raw semen was collected from sexually mature Duroc boars in a commercial stud (Prestage Farms, MS, USA). Semen samples (n=84) were classified as Good (≥70%) or Poor (<70%) quality based on their motility and normal morphology. Semen samples were centrifuged to isolate seminal plasma (SP) and stored at -80o C until analyses. NIRS absorbance (750-2500 nm) was measured using ASD FieldSpec®3 portable spectrometer - 1 mm quartz cuvettes. Multivariate analysis of NIRS spectra was conducted using Unscrambler®X v.10.5 (CAMO Analytics-Oslo Norway). Both Principal Component Analysis (PCA) and Linear Discriminant Analysis (PCA-LDA) were used in the transformed spectra containing the water information (1300–1600 nm). Significant differences between groups (Poor and Good) were set for P<0.05. NIRS aquaphotomics revealed different spectrum profiles between Poor and Good SP groups, and both groups showed different profiles with distilled water used as the baseline. Changes were observed in bulk water molecules region at Coordinate 5 (C5) with S0 Vibration (free water), corresponding to 1398 nm and 1404 nm absorbances in Poor and Good SP, respectively. Additional changes were observed in the kosmotropic region at Coordinate 10 (C10) with S3 Vibration (water with 3 Hydrogen-bounds), favoring strength through water interactions and macromolecule stabilization. The PCA-LDA analysis revealed high accuracy (85.3%), sensitivity (88.4%), and specificity (82.1%). The LDA discriminated three sub-groups classified as "Good-specific," "Poor-specific," and "Common" SP samples. In conclusion, the results indicate biochemical differences in seminal plasma composition collected from boars with different phenotypic traits (motility and morphology). Studies are ongoing to characterize the three subgroups of samples to identify potential biomarkers of Good or Poor semen for better breeding management in commercial stud farms.

O2.10

9:00 EXPLORING SEMINAL PLASMA EXTRACELLULAR VESICLE miRNA IN RELATION TO SPERM QUALITY

Notsile Dlamini, Tina Nguyen, Santanu Kundu, Scott Willard, Peter Ryan, Jean Feugang

Mississippi State University, Starkville, MS

The hog industry relies on boars with the best semen and highest fertility potential to increase profitability. Most pig production systems use artificial insemination (AI) as the primary breeding tool to introduce superior genes. However, AI still faces challenges due to the lack of reliable predictors of sperm quality. Seminal plasma (SP) surrounding spermatozoa is an excellent source for detecting reliable non-invasive biomarkers of sperm quality. It contains a wide range of bioactive molecules whose dynamic compositions, in response to extrinsic and intrinsic factors, influence sperm motility and morphology. SP contains extracellular vesicles (EVs), whose roles in semen quality remain unfolded. EVs contain various biomolecules, such as microRNAs (miRNAs), which can affect semen quality. Previous studies have reported the regulatory roles of miRNA in spermatogenesis, sperm maturation, and sperm function. Therefore, the present study evaluates the microRNA content of EVs derived from poor and good quality boar semen.

Raw semen of seventy-five sexually reproductive Duroc boars was harvested at a commercial stud (Prestage Farms, MS) for eight weeks, using a standard protocol. All harvested semen was analyzed for sperm quality (motility and morphology) and classified as poor (n=38) or good (n=37) quality based on standard cut-offs (<70% and ≥70%, respectively) for both motility and morphology. Raw semen samples were subjected to serial centrifugations to collect spermatozoa and SP. Seminal plasma-extracted EVs (SP-EV) were isolated by differential ultracentrifugation. Extracted SP-EV were characterized by high-resolution transmission electron microscopy (HR-TEM), dynamic light scattering (DLS) for size distribution, and western immunoblotting analyses. Spermatozoa, SP, and EVs were collected and appropriately stored at -80^{o}C for analyses. Five pools of three individual EV samples, corresponding to extremely poor or good quality semen, were constituted for total exosome RNA isolation, small RNA sequencing, and miRNA detection. Differentially

expressed miRNAs between groups were subjected to bioinformatic analysis. Significant differences were set at $P<0.05$.

The boar SP-EVs appeared as round spherical structures under microscopy, with a size distribution of 30 to 400nm in diameter. Specific molecular markers of SP-EV (CD9, CD63, and CD81) were detected. Totals of 281 and 271 miRNAs were detected above 5 CPM counts in poor and good SP-EV samples. A total of 259 miRNAs were shared between both groups, of which 12 were differentially expressed (DE). Target search revealed only three DE miRNAs (ssc-miR-205, ssc-miR-493-5p, and ssc-miR-378b-3p), resulting in 109 mRNAs. In conclusion, this study indicates that the miRNA content of SP may be associated with semen quality. Studies are ongoing to identify relevant mRNA as potential biomarkers of semen quality affecting male fertility.

O2.11

9:20 SEMINAL PLASMA UTERINE PRIMING REDUCES OFFSPRING GROWTH AND ALTERS UTERINE ARTERY INDICES OF VASCULAR RESISTANCE IN EMBRYO-RECIPIENT BEEF COWS

Rebecca Swanson, Riley Messman, Caleb Lemley

Mississippi State University, Mississippi State, MS

Uterine priming with seminal plasma has been shown to alter endometrial gene expression as well as uterine cytokines and chemokines. However, the effects of seminal plasma uterine priming on uterine blood flow, fetal and postnatal offspring growth performance have yet to be elucidated. Therefore, we investigated the effects of pooled seminal plasma uterine priming at estrus on embryo crown-rump length, uterine blood flow, and birth weights. Commercial cows (n = 65) were synchronized, evaluated for standing estrus (day 0), and randomly assigned to treatment groups: seminal plasma or control. Seminal plasma treated cows (n = 27) received 0.5mL of pooled seminal plasma from commercial bulls mismatched from embryo sire placed in their uterine body via artificial insemination rod 12 hours after estrus detection (day 0). Control cows (n = 27) were passed through the chute without receiving treatment. On day 7, cows underwent non-surgical embryo transfer and were confirmed pregnant on day 35 via ultrasonography. Final treatment numbers were n = 9 seminal plasma and n = 7 control. On days 35, 40, and 45 embryo crown-rump length was measured via transrectal ultrasonography. On days 140, 180, 200, 220 uterine artery hemodynamics were measured via Doppler ultrasonography. Birth weights were collected within 24 hours of birth. Data collected over time were analyzed using repeated measures of ANOVA with fixed effects of treatment, day, and their respective interaction. Birth weights and gestation length were analyzed using ANOVA. Embryo sire and dam, side of pregnancy, and fetal sex were included as covariates if $P < 0.10$. Covariance structure was selected based on lowest AIC and BIC. Embryo crown-rump length was decreased ($P = 0.0483$) among seminal plasma treated cows compared with controls. Embryo crown-rump length increased ($P < 0.0001$) by day. Total uterine blood flow increased ($P < 0.0001$) as gestation proceeded. Ipsilateral resistance index was increased ($P = 0.0431$) among seminal plasma treated cows compared with controls. Ipsilateral resistance index was increased ($P = 0.0107$) on day 180 of gestation compared with days 200 and 220 of gestation. Ipsilateral pulsatility index was decreased ($P < 0.0001$) on day 220 of gestation compared with days 140 and 180 of gestation. Contralateral blood flow was decreased ($P = 0.0037$) on day 140 of gestation compared with days 180, 200, and 220 of gestation. There were no differences in contralateral uterine artery blood flow, resistance index, or pulsatility index, or gestation length between treatment groups. Birth weights were decreased ($P = 0.0102$) among calves from seminal plasma treated cows compared with calves from control cows. In summary, seminal plasma uterine priming reduced offspring growth while increasing uterine artery resistance index, which indicates uterine vascular bed anomalies that persisted into the third trimester of pregnancy.

10:00 BREAK

O2.12

10:30 EFFECTS OF DIETARY TRANS-CINNAMALDEHYDE ON HEALTH STATUS OF CHANNEL CATFISH CHALLENGED WITH *Edwardsiella ictaluri*

Sahar Rostami, Munshi Mustafiz Riman, Hossam Abdelhamed

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

Edwardsiella ictaluri is the cause of significant economic losses in channel catfish (Ictalurus punctatus), and it is mainly controlled by antimicrobial feed additives. Natural antimicrobial agents are considered a promising alternative to be added to fish diets to promote growth performance, manipulate the gut microbiota, improve the immune and oxidative status of fish, and control bacterial infections. One of the safe replacements could be applying such plant-based oils, namely, Trans-cinnamaldehyde (TC). This study will explore the protective effect of dietary TC on channel catfish following the challenge with the *E. ictaluri*. Channel catfish will be divided into several groups and fed diets supplemented with TC at different concentrations, followed by an immersion challenge with *E. ictaluri* 93-146. Fish in the control group will receive a regular feed without any supplements. Innate immune response and disease resistance of channel catfish against *E. ictaluri* will be evaluated

O2.13

10:50 INTENSIFIED UTILIZATION OF BSF LARVAE FOR CONVERSION OF MYCOTOXIN-CONTAMINATED MAIZE INTO VALUABLE PROTEIN SOURCES

Carolyne Kipkoech

The German Federal Institute for Risk Assessment (Bundesinstitut für Risikobewertung (BfR)),Germany

Mycotoxin contamination of maize in Africa is a severe problem, exhibiting strong adverse health effects, especially regarding aflatoxins. Therefore, high percentages of the

harvest cannot be regarded as safe. Contaminated maize kernels that are not suitable for animal or human consumption can be reintroduced into the feed and food chain with a higher value of protein. This can be achieved if the contaminated maize can be used to rear black soldier fly (BSF) larvae, without the contaminants being accumulated by the insects. This could improve the worldwide expensive animal protein and ecological challenges related to its production. However, whether this approach will optimize nutritional value, efficiency, and sustainability of food production and processing is still under investigation. In this project, young larvae (1 and 5day old) were fed on naturally contaminated maize from Kenya. Clean maize and market waste were used as negative control while 25, 50, 75, and 100% contaminated maize were used as interventions. The suspected maize contained aflatoxins, fumonisins, deoxynivalenol, and zearalenone. Preliminary results indicated high survival of larvae with higher weight gain in mixed market waste than in the 100% clean maize group. Data collection and analysis are ongoing with great hope that this research will contribute to better quality animal feed and bridge the existing animal protein deficit. This project is supported by the German Federal Ministry of Food and Agriculture, grant No. 2819DOKA01

O2.14

11:10 TBA

O2.15

11:30 TBA

12:00 General Session

Friday, February 24, 2023

AFTERNOON

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

1:30 Student Awards and Divisional Business Meeting

Cellular, Molecular, Developmental Biology

Co-Chair: James a. Stewart, Jr.
University of Mississippi
Co-Chair: Davida Crossley
Mississippi University for Women
Vice-Chair: Yvette Langdon
Millsaps College
Vice-Chair: Felicite Noubissi-Kamdem
Jackson State University
Vice-Chair: Nikki Reinemann
University of Mississippi

Thursday, February 23, 2023

MORNING

Room D3

Moderators: Drs. James A. Stewart, Jr., Davida Crossley, Yvette Langdon, Felicite Noubissi-Kamdem, Nikki Reinemann

8:50 Welcome

O3.01

9:00 TARGETING THE BAI 1-DRIVEN SIGNALING PATHWAY IN BREAST CANCER TREATMENT

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

[1]Department of Biology, RCMI, Jackson State University, Jackson Mississippi, USA, [2]Department of Biology, Jackson State University, Jackson MS, USA; [3]Department of Biomedical Engineering, University of Minnesota Twin-Cities, Minneapolis, MN

Breast cancer is the most common cancer in women and the second leading cause of cancer-related death among women worldwide. Breast cancer is also a model of health disparity, because it continues to show survival disparity between black and white women, with black women dying at a higher rate than white women. Although the reasons for this disparity are multifactorial, differences in molecular mechanisms and signaling pathways driving the progression of the disease, might account at least in part for the survival disparity. In this study, we explore cancer cell fusion-driven tumor heterogeneity and metastasis, as a basis for the disproportion in breast cancer survival between white and black women. We hypothesize that the mechanism of breast cancer fusion involves Bai1 activation-driven induction of the Elmo1/Dock 180/Rac 1 signaling pathway. Elmo1 and Dock 180 are overexpressed in breast cancer cell lines and Elmo1/Dock 180 activation is associated with breast cancer metastasis. Targeting this pathway could prevent cancer cell fusion-driven metastasis and death. To test our hypothesis, we used non-metastatic and metastatic breast cancer cells isolated from black (HCC 1806, MDA-MB-157) and white (T47D, MDA-MB-231) women, as well as mesenchymal stem cells (MSCs) (hMSC4099, hMSC39334) as fusion partners. We used

Elmo1 and Dock 180 shRNAs and a Rac1 inhibitor to analyze the role of Elmo1/Dock 180/Rac1 signaling in breast cancer cell fusion. Fusion products were scored using the *Cre/loxP* system. We observed that breast cancer cells isolated from black women are more prone to fuse with MSCs than cells isolated from white women ($P<0.05$). Knocking down Bai1 significantly reduced the frequency of fusion across all cell lines ($P<0.05$), and more significantly in the non-metastatic breast cancer cell line isolated from black women ($P<0.001$). A notable reduction in the frequency of fusion between breast cancer cells and MSCs was observed when Elmo1, Dock180, or Rac1 was inhibited ($P<0.05$). These results suggest that the Bai1/Elmo1/Dock180/Rac1 signaling plays an important role in cancer cell fusion. Targeting this mechanism could lead to new drug development tactics for cancer treatment.

O3.02

9:30 TARGETING INSULIN-LIKE GROWTH FACTOR 2 MRNA-BINDING PROTEIN 1(IGF2BP1) MODULATES GLI1 EXPRESSION AND ITS TARGETS IN TUMORS DEVELOPED BY THE PTCH+/- MOUSE MODEL

Joshua Herron, Felicite K. Noubissi

Jackson State University, Jackson, MS, USA

Basal Cell Carcinoma (BCC) is the most common form of cancer affecting more than 3 million people in the U.S. yearly worldwide. BCCs develop mostly on areas of skin that are regularly exposed to sunlight, a natural source of ultraviolet radiation. Therefore, anyone who has been exposed to excessive sunlight has a higher likelihood of developing BCC. Individuals who are at highest risk of developing BCC are fair skinned populations and immunocompromised patients. Although, there have been drugs approved to treat metastatic BCC, such as Vismodegib, which has shown positive results in many cases, unfortunately, about 20% of patients develop resistance within the first year of treatment. This drug resistance is caused by a mutation in the targeted protein Smoothened (SMO), which plays a key role in the Hedgehog signaling pathway, a key driver of BCC. We are currently investigating the cross-talk between the Hedgehog (Hh) and the Wnt/ β-Catenin signaling pathways in the pathology of BCC, and how inhibition of IGF2BP1 that serves as a link between these two pathways could contribute to the treatment of BCC. IGF2BP, which is a direct target of the Wnt /β-Catenin signaling pathway, binds to and upregulates Gli1 levels and activities. Gli1 is the transcriptional factor through which the Hh signaling is mediated. We hypothesize that inhibition of IGF2BP1 will downregulate Gli1 and its targets and prevent BCC development. To test our hypothesis, we generated a skin specific IGF2BP1 knockout mouse model in the Ptch +/- background called IGF2BP1-loxP +/- ; K5-cre-ERT2 +/- ; Ptch +/- . The Ptch +/- mouse is a model for BCC. This mouse model develops BCC-like tumors when repeatedly exposed to UVB. Utilizing the immunofluorescence procedure, we accessed the expression levels of IGF2BP1, GLi1, and PTCH in tumors isolated from the skin of these mice. We observed a lower expression of IGF2BP1 and Gli1 in the tumors isolated from skin specific IGF2BP1 knockout mice compared to their expression in control tumors. Although Ptch1 is constitutively activated in the Ptch +/- mice, we noticed high expression levels of Ptch 1 in the budding tumors infiltrating the dermis of control mice. Contrarily, the skin specific IGF2BP1 knockout mice showed both a significant reduction of tumors in the epidermis and no infiltration of tumors in the dermis. These findings suggest that inhibition of IGF2BP1 downregulates the Hh signaling pathway and could prevent BCC development.

10:00-10:15 BREAK

Oral Presentations Session II

Moderators: Drs. James A. Stewart, Jr., Davida Crossley, Yvette Langdon, Felicite Noubissi-Kamdem, Nikki Reinemann

O3.03

10:10 EFFICACY OF ANTIFUNGAL COMPOUND OCCIDIOFUNGIN AGAINST MATURE BIOFILM BY CANDIDA SPECIES

Rabina Kumpakha, Donna M. Gordon

Mississippi State University, Mississippi State University, Starkville, MS

Candida biofilms associated with medical devices pose a serious health concern as these cells can enter the blood stream and cause systemic infections. Although *Candida albicans* is most common in biofilm-associated infections, other non-*albicans Candida* species are increasingly reported from hospital settings. The structural complexity of a mature biofilm, including the heterogenous population of cells and surrounding extracellular matrix material, makes it resistant to antifungal treatment and complete elimination difficult. Prior data has demonstrated that occidiofungin effectively prevents attachment of cells and reduces biofilm formation in *C. albicans* and *C. tropicalis*. Here, we have extended our studies to investigate the impact of occidiofungin on mature biofilm using an *in vitro* biofilm model. The minimum biofilm inhibitory concentration of occidiofungin required to eliminate cells from a mature biofilm, was determined by measuring metabolic activity and viable cell number by XTT and colony forming unit assays, respectively. Structural changes in mature biofilm post antifungal exposure were identified by confocal microscopy. Our results indicate that occidiofungin can effectively eradicate cells within a mature biofilm of both *C. albicans* and *C. tropicalis* with a 2-fold lower dose of occidiofungin required for *C. tropicalis* biofilm compared to *C. albicans*. Short-term exposure of cells to a sublethal dose of occidiofungin was found to promote morphological changes including the accumulation of abnormal hyphae and reduction in hyphal cells. Together these results demonstrate that occidiofungin targets cells within a mature biofilm suggesting it may be an effective antifungal agent for the prevention and treatment of *Candida* biofilm-associated infections.

O3.04

10:40 ENGINEERING DESIGN FOUND IN MUSCLE

Robert Waltzer

Belhaven University, Jackson, MS

The purpose of this talk is to build muscle from the ground up (as if an engineer were designing it) in order to provide insights into its structure and function and generate questions for future research. Motor proteins are the key force generators in muscle. Myosin is a good candidate partly because its tracks are made of actin, which is the smallest of the motor protein tracks. Since a high density of protein is required, saving space will be critical. The myosin molecules are arranged within a repeated cylindrical unit called the sarcomere. It measures about 2.3 um long and 1 um in diameter. Thin filaments made of actin serve as the tracks to which myosin attaches. The thin filaments are attached to disks on each end of the sarcomere. Bundling the myosin molecules provides a way to generate greater force. At the center of the sarcomere interdigitated between the free ends of the thin filaments are bundles of myosin (thick filaments) arranged in a centrally located lattice. The heads of the myosin are at the ends of the thick filaments in a mirror-image arrangement while their shafts are in the middle. In addition, the heads stick out at all angles around the thick filament, attaching to one of the 6 thin filaments that surround it. Instead of the myosin within the thick filament walking along the track, the myosin is stationary and pulls the tracks (thin filaments) toward the center of the sarcomere, making the sarcomere shorter. The arrangements of the myosin molecules within the thick filament and the surrounding thin filaments ensure that the ends of the sarcomeres are pulled evenly toward its center. Now there must be a high number of sarcomeres in the cell and they would have to arranged so their forces and movements are additive. The modified cell found in muscle is referred to as a fiber and is unusually long, possibly extending the length of the muscle. The sarcomeres, being short cylinders, can be arranged in series (attached end-to-end) to stretch the entire length of the fiber. This is called a myofibril. Since the fiber is 100um in diameter and the myofibril is 1 um in diameter, multiple myofibrils can be contained in a muscle fiber and multiple fibers are arranged in parallel. The result is that the force of contraction is oriented toward the long axis of the muscle. Other engineering parameters will be considered in the numbers and arrangement of sarcomeres. Questions for future research include the following: How are the lengths of the thick and thin filaments so consistent within and between sarcomeres of a muscle? Do the sizes and numbers of filaments within a sarcomere vary between and within species? How are the thick and thin filaments spaced so evenly and how is that distance between them optimal for their function? Answers to such questions can lead to new knowledge about muscles and their function.

12:00 General Session

Thursday, February 23, 2022

AFTERNOON

Room D3

Oral Presentations Session III

Moderators: Drs. James A. Stewart, Jr., Davida Crossley, Yvette Langdon, Felicite Noubissi-Kamdem, Nikki Reinemann

2:00-Divisional Round Table: Women in STEM

Guest Speakers:

Dr. Lauren Priddy,
Mississippi State University
Dr. Courtney Roper,
University of Mississippi
Dr. Davida Crossley,
Mississippi University for Women

Thursday, February 23, 2023

EVENING

3:30 DODGEN LECTURE and AWARDS CEREMONY

Hall B

5:00 GENERAL POSTER SESSION

Hall C (immediately following Dodgen Event)

P3.01

WRESTLING WITH NEURODEGENERATION: SUMOYLATION IN BRAINS OF A DROSOPHILA MODEL OF SPINOCEREBELLAR ATAXIA TYPE 1 (SCA1)

Morgan Peters, Caleb Snoddy, Natraj Krishnan, Peyton York

Mississippi State University, Starkville, MS, USA

Spinocerebellar ataxia type 1 (SCA1) is a dominantly inherited progressive neurodegenerative disease that results in atrophy of cerebellar Purkinje cells. SCA1 is caused by the expansion of a CAG trinucleotide repeat tract in the ataxin-1 gene, resulting in an abnormally long polyglutamine tract within the protein. Accumulation of mutant ataxin-1 [82Q] into nuclear inclusions is a hallmark of the disease. Protein modification by small polypeptides is an important mechanism for regulating protein events such as trafficking, aggregation, and degradation. Ubiquitin is one such attachment. SUMO (small ubiquitin-like modifier) is a member of the ubiquitin family of proteins. SUMO targets include proteins involved in numerous roles including trafficking, transcriptional regulation, degradation etc. A role for SUMOylation in the pathogenesis of neurodegenerative diseases and associated sumoylated proteins include Huntington's disease (huntingtin), Parkinson's disease (tau, α-synuclein, DJ-1, Alzheimer's disease (tau, APP), spinocerebellar ataxia 1 (ataxin-1)) among others. An unresolved question is: What is the precise role of SUMOylation in the disease process? Alternatively, does an increase or decrease of SUMOylation impact disease

pathology? To answer this question, the initial steps in the SUMOylation pathway were investigated in a *Drosophila* model of SCA1 expression the abnormal human ataxin-1 [82Q]. The expression of genes encoding two subunits of the Sumo activating enzyme (E1) heterodimer complex - *Aos-1* (activator of Sumo) and *Uba2* (ubiquitin activator) as well as *Sumo* (*dSmt3*) were studied. Results demonstrated that, in general, SCA1 flies have heightened neurodegeneration in comparison to age-matched 30-day old control flies. Additionally, *sumo* gene expression is markedly reduced, indicative of reduced Sumo protein levels and hence of SUMOylation. Interestingly, *Aos1* and *Uba2* gene expression were both significantly elevated in 30-day old SCA1 flies in comparison to control flies. This could be indicative of a feed-back regulatory mechanism where augmented E1 activating enzyme levels could be a compensatory response to decline in SUMO protein. These results point to a role for reduced SUMOylation in the disease progression.

P3.02

GENETIC CONTROL OF STREPTOCOCCUS PNEUMONIAE MORPHOLOGY AND IMPACT ON IMMUNE EVASION

Faith Anderson[1, 2], *Lance Keller*[3], *Courtney Thompson*[3], *Rohinton Dossabhoy*[4, 5], *Larry McDaniel*[3]

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The bacterium *Streptococcus pneumoniae* is a Gram-positive commensal organism, capable of causing life-threatening infections such as pneumonia, meningitis, and sepsis. The mechanisms that cause *S. pneumoniae* to become pathogenic or avoid the host immune response are not well understood. Research indicates that shorter chain length increases survivability in the blood due to reduced surface area. We hypothesize that variations in pneumococcal morphology influence the ability to cause disease. Morphology of a diverse set of 96 pneumococcal strains was examined through brightfield microscopy. Image analysis was performed with ImageJ plugin MicrobeJ, and values for area, length, width, and chain length were obtained. Interaction with immune proteins was tested through flow cytometry after incubation with human serum and probing with fluorescently labeled antibodies. Whole genome sequencing of the 96 strains was performed using paired-end illumina sequencing for genome-wide association study (GWAS). We determined that there is significant variation in the different pneumococcal morphologies that can be grouped into large and small categories. Likewise, there were high and low binders for all serum proteins tested, CLEC3b, ceruloplasmin, HFE2, vitronectin, haptoglobin, and serum amyloid P. Whole genome sequences will be used for future GWAS analysis. This study identifies genomic variations that influence the morphological differences observed in different pneumococcal strains. The changes in morphology also correlate to interaction with host immune factors and can alter virulence. Future work will validate genotype correlation to phenotype and be used as a potential screening method to predict the invasive potential of colonizing strains of S. pneumoniae.

P3.03

CARBOXYLESTERASE 1 MODIFIES THE PROINFLAMMATORY PHENOTYPE OF HUMAN THP-1 MACROPHAGES

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Unregulated inflammation can be fatal to the body because it serves as basis for the progression of diseases like atherosclerosis, diabetes mellitus, and cancer. Studies have shown that classically activated M1 macrophages have greater triacylglycerol (TAG) content than unstimulated M0 macrophages, and the buildup of these lipids is important for skewing macrophages towards the proinflammatory phenotype. We hypothesized that carboxylesterase (CES1), a member of the serine hydrolase superfamily that can hydrolyze TAGs and release fatty acids, might play an important role in lipid metabolism and macrophage activation. We used a macrophage-like human cell line that expresses high levels of CES1 (control THP1) and one where CES1 expression was ablated (CES1 knockdown THP1) to examine their inflammatory phenotype following exposure to lipopolysaccharide (LPS, 1 µg/mL). On the basis of lipidomic analysis, the levels of TAGs were increased in CES1KD cells compared to control cells. Furthermore, inflammatory molecules – i.e., prostaglandin E_2 and D_2 (PGE2 and PGD2) and interleukin-1 beta (IL-1β) – were all higher in the CES1KD cells than control cells over a 24-hour period following LPS stimulation. These findings suggest that CES1 may connect TAG metabolism with inflammation, and CES1 might play a role in the phenotypic alteration of macrophages following immune stimulus.

P3.04

A GENETIC COMPLEMENTATION APPROACH EXAMINING OCCIDIOFUNGIN TARGETING OF FUNGAL ACTIN ORTHOLOGS USING THE S. CEREVISIAE SHUFFLE STRATEGY

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Department of Biological Sciences, Mississippi State University, Starkville, MS, USA

Occidiofungin is a cyclic glycolipopeptide produced by the soil bacterium *Burkolderia contaminans* MS14, with demonstrated fungicidal activity against fungi of clinical and agricultural importance. Recent studies have identified the cytoskeletal protein actin, as its biological target. *ACT1* is an essential gene in *S. cerevisiae* as it codes for the sole form of actin with roles in endocytosis, nuclear positioning, and polarized cell growth. Despite the high degree of amino acid conservation between fungal actin proteins (>90%), sensitivity to occidiofungin has been shown to vary. For example, the minimum inhibitory concentration (MIC) for *C. albicans* is 2-4-fold higher than that of *S. cerevisiae*, while *F. oxysporium* and *P. digitatum* require >10-fold higher levels of the antifungal compound. This study seeks to determine whether the amino acid differences between the fungal actin

proteins are directly responsible for the differences in susceptibility to occidiofungin. The functionality of actin gene products from *C. albicans*, *F. oxysporium*, and *P. digitatum* were assessed in a haploid *S. cerevisiae ACT1* shuffle strain by measuring growth kinetics, cellular bud morphology, nuclear positioning, and actin protein expression levels. Data for susceptibility testing to occidiofungin by MIC assay indicates a similar sensitivity profile as cells expressing *ACT1* from *S. cerevisiae*. These findings suggest that the amino acid differences in the actin protein for these fungal organisms are not directly linked to the reduced susceptibility to occidiofungin, and that other cellular factors are likely responsible for such differences.

P3.05

FRIEND OR FOE? INVESTIGATING THE EXPRESSION OF MATRIX METALLO-PROTEINASES IN A DROSOPHILA MODEL OF SPINOCEREBELLAR ATAXIA TYPE 1 (SCA1)

Emma Palmer, Caleb Snoddy, Peyton York, Natraj Krishnan

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. The ECM is a complex and dynamic facet of tissue architecture which is known to play fundamental roles in development, wound healing, tissue homeostasis and a host of pathological processes. Dysregulation of MMPs has been implicated to be the proximal factor in many diseases and disorders including neurodegenerative disease. Dysregulation of MMPs can be detrimental to neuronal function and can enhance neurodegeneration. MMPs can be a double-edged sword, due to their essential function in neurorepair and their destructive function in neurodegeneration. Around 23 different MMPs are found in the human genome with overlapping function, making the analysis of the role of human MMPs a daunting task. Investigating the biology of MMP in model organisms with simple MMP families will allow for elucidating the function of specific proteases. The fruit fly *Drosophila melanogaster* with only two MMP genes, dMMP1 and dMMP2 offers an excellent model system to investigate MMP function in the nervous system. In the fly, MMP activity in the developing nervous system is essential for both axon pathfinding and dendritic plasticity in the brain. The full-length amino acid sequence alignments of dMMP1 and dMMP2 with the full-length amino acid sequences of 23 human MMPs ranging from MMP1 to MMP28 was conducted using Clustal Omega. A phylogenetic tree was constructed with MEGA 7.0 using the neighbor-joining method. Additionally, the gene expression of dMMP1 and dMMP2 was investigated in a *Drosophila* model of Spinocerebellar ataxia type 1 (SCA1) expressing the human abnormal Ataxin-1 with 82 CAG repeats. Nuclear localization signal sequences were predicted for Ataxin protein and dMMP1 and dMMP2 using NLS Mapper. This study will lay the foundation for further research on unraveling the discrete molecular mechanisms underlying the intracellular role of MMPs in neurodegenerative disease pathology.

P3.06

INVESTIGATING YAP1 INVOLVEMENT IN RESPONSE TO OXIDATIVE STRESS IN HISTOPLASMA CAPSULATUM

Terraline Green, Davida Crossley

Mississippi University for Women, Columbus, MS

Histoplasma capsulatum (Hc) is a dimorphic fungus that can exists as a mold or a yeast. It is the yeast which causes the respiratory infection histoplasmosis. YAP1, a protein in *S. cereivisiae* and *C. albican*,has been shown to be involved in survival in oxidative stress. There is a YAP1 homolog in *Hc*. We will investigate YAP1 involvement in oxidative stress in *Hc*, by conducting a Reactive Oxygen Assay (ROS) of wild type vs YAP1 RNAi strain, as well as conduct a spot assay of the wild type and YAP1 RNAi strain, with various concentrations of hydrogen peroxide and paraquat. If YAP1 is involved in survival of *Hc* in oxidative stress conditions, then it could be used as a target to combat histoplasmosis.

P3.07

PHAGE PEPTIDE TECHNOLOGY TO CHARACTERIZE EXTRACELLULAR VESICLES IN THE BRAIN TUMORS

Jadelynn Rudolf[1], Michael Graner[2], Xiaoli Yu[2]

[1] Mississippi University for Women, Columbus, MS, [2] University of Colorado Health Sciences Center, Aurora, CO

Extracellular vesicles (EV) are lipid-bound containers derived from the endosomal membrane network or from the extracellular membrane of cells. They can carry proteins, lipids, miRNAs, and other molecules, and may be involved in intercellular communication via membrane-associated proteins. Glioblastomas (GBM) are aggressive cancers of the brain and spinal cord derived from astrocytes. Extracellular vesicles derived from glioblastomas can make their way through the blood brain barrier and find their way to different bodily fluids, and so could serve as biomarkers for this cancer. We have isolated phage-display peptides from a commercial library of random phage-displayed peptides that will bind glioblastoma extracellular vesicles (GBM-EVs). We compared dose-response ELISA quantification of phage-display peptides bound to extracellular vesicles from glioblastomas to phage-mediated real-time immuno-PCR. Real-time immuno-PCR is a powerful technique that combines ELISA with the specificity and sensitivity of PCR. Both techniques had a hard time distinguishing GBM-EV-binding phage from control phage, but preliminary results indicated that real-time immuno-PCR had a higher sensitivity at low concentrations.

P3.08

POST-TRANSLATIONAL MODIFICATION OF THE GLUCOCORTICOID RECEPTOR INDUCTION IN CASTRATION-RESISTANT PROSTATE CANCER

Leslie McClinton, III[1], Surendra Gulla[2,3,4,5,6], Remi Adelaiye-Ogala[2,3,4,5,6]

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NY, [5] Department of Medicine, [6] Division of Hematology and Oncology, Buffalo, NY

Prostate cancer (PC) is the second leading cause of cancer related deaths in men in the United States. This disease is driven by androgen receptor (AR) activity, and the mainstay therapeutic option is AR targeted therapy. However, despite success in previous clinical studies, patients develop resistance, and progression occurs to castration-resistant prostate cancer (CRPC). An emerging mechanism of resistance to AR targeted therapy is induction of compensatory hormone nuclear receptor, the glucocorticoid receptor (GR). Recently published data from the research lab, shows that posttranslational modification (PTM) mechanisms by phosphorylation via PI3K/AKT signaling pathway, led to blockade of the induction of GR expression. Recent pre-clinical and clinical data, implicated induction of GR expression and activity to be upregulated in treatment resistant CRPC. Recently published data from the research lab, shows that inhibition of PI3K/AKT signaling, led to blockade of the induction of GR expression, suggesting that pro-oncogenic GR expression and activity may be modulated via posttranslational modification (PTM) mechanisms, such as phosphorylation even in the absence of ligand. However, this specific role of PTM in the induction of GR in CRPC is unknown. What is the specific role of PTMs mechanism by PI3K/AKT signaling pathways in the induction of GR in CRPC? Our hypothesis suggested that the induction of GR following AR blockade, is modulated by phosphorylation via PI3K/AKT signaling pathway. We analyzed and selected PC cell lines (sensitive and resistant) that were treated with enzalutamide to determine GR expression and determinants by performing various downstream analyses (E.g., cell viability assay, qPCR, and protein and gene expression). Overexpressed GR cell lines were treated with enzalutamide and inhibitors to determine GR expression by PTM. In conclusion, our results demonstrated that our downstream analyses and functional study in our cell lines and PDX (Patient-Derived Xenograft) models, showed that there is an induction of GR expression and modulation by phosphorylation via PI3K/AKT signaling pathway activity following AR blockade. This is a potential therapeutic target for advanced PC when AR targeted therapy becomes resistant. Ongoing studies (data brewing in the lab) will determine GR phosphorylation status in the following AR blockade in addition PDX models.

P3.09

CHARACTERIZING THE INHIBITOR OF DNA BINDING 3 (ID3) MEDIATION OF DOXORUBICIN IN TRIPLE NEGATIVE BREAST CANCER CELLS

Karina Alarcon, ,Benjamin Onyeagucha

Mississippi University for Women, Columbus, MS

Triple-negative breast cancer (TNBC) is a subtype of breast cancer that lacks the expression of the hormone receptors (estrogen and progesterone receptors) and human epidermal growth factor receptor 2 (HER2). TNBC is commonly diagnosed in young women below 50 years of age. It is the most aggressive breast cancer subtype with the highest metastasizing tendency. Although it represents about 15-20% of breast cancer cases, TNBC accounts for approximately 25% of the death due to breast cancer. The overall survival of TNBC diagnosed at stage 1 is about 85% compared to 94%-99% of HER2-positive breast cancers, another breast cancer subtype. However, the median overall survival of metastatic TNBC is one year compared to five years of the other subtypes. Due to the lack of molecular targets, chemotherapy remains the primary treatment option for TNBC. During the initial treatment, TNBC responds very well to chemotherapy but becomes resistant and aggressive to subsequent exposure, thus resulting in early relapse and shorter patient survival. Besides, chemotherapy faces obstacles due to toxicity and severe side effects that significantly limit its use in patients. Hence, there is an urgent need to develop a novel strategy to improve treatment outcomes and reduce toxicity in cancer patients. Recently, we have discovered the Inhibitor of DNA binding 3 (ID3) as a mediator of Doxorubicin (DOX) in TNBC. ID3 is a member of the helix-loop-helix (HLH) transcription factor that inhibits the DNA-binding function of members of the basic helix-loop-helix (BHLH) family of transcription factors. Our data demonstrated that the knockdown of ID3 significantly decreased the number colony of TNBC cells. Also, ID3 expression is significantly elevated in cells treated with DOX in a dose-dependent fashion compared to the untreated control. Interestingly, the knockdown of ID3 decreased the number of viable TNBC cells in the presence of DOX treatment compared to the control TNBC cells. These data warrant further investigation into how ID3 mediates DOX response in TNBC cells.

P3.10

INVESTIGATING YAP1 INVOLVEMENT IN DIMORPHISM IN HISTOPLASMA CAPSULATUM

Emma Hughes, Davida Crossley

Mississippi University for Women, Columbus, MS

Histoplasma capsulatum is the etiologic agent for the respiratory infection histoplasmosis. It is a dimorphic fungi that exist at 25^{o}C as a multicellular mold in contaminated soils of birds and bat excrements, and at 37^{o}C, converts to a unicellular yeast in mammalian host. It is the yeast that is responsible for histoplasmosis. Temperature and sulfur metabolism are two aspects that independently are thought to play a role in dimorphism. Our investigation focuses on investigating a YAP1 homolog that is found in *S. cerevisiae* and *C. albican* (a dimorphic fungi). YAP1 is thought to be involved in glutathione metabolism that plays a role in sulfur metabolism. We will investigate a YAP1 RNAi strain and compare it to wild-type to see if it is able to convert to mold to yeast and yeast to mold, by recording observation of the cells grown in liquid media via bright field microscopy and SEM, and solid media via a Dino-lite microscope. We will also determine YAP1 involvement in sulfur metabolism directly, by conducting a glutathione assay. If YAP1 is shown to play a role in sulfur metabolism and dimorphism, then it could be used as a target to combat histoplasmosis

P3.11

MASS SPECTROMETRIC ANALYSIS OF HIV-1 INTEGRASE AND VIRAL RNA INTERACTION

Tolga Catmakas, Jian Sun, Thania Gonzales, Jacques Kessl

The University of Southern Mississippi, Hattiesburg, MS

HIV-1 integrase (IN) is an essential viral protein that enables viral DNA insertion into the host cell genome. Binding of IN to the viral RNA as well as the interaction between them is essential for the viral life cycle. Structural analysis on IN has proven to be difficult due to its poor solubility and propensity to aggregate. Consequently, we utilized a mass spectrometry-based approach to analyze the interaction between the HIV-1 integrase and the viral RNA. These results will further improve our understanding of HIV-1 IN function and its complex role in the life cycle of HIV-1.

P3.12

AN EFFECTIVE LIVE-ATTENUATED ZIKA VACCINE CANDIDATE WITH A MODIFIED 5′ UNTRANSLATED REGION

Farzana Nazneen, Elizabeth Thompson, Claire Blackwell, Faqing Huang, Fengwei Bai

The University of Southern Mississippi, Hattiesburg, MS

Zika virus (ZIKV) is a mosquito-transmitted flavivirus that has caused devastating congenital Zika syndromes (CZS), including microcephaly, congenital malformation, and fetal demise in human newborns in recent epidemics. ZIKV infection can also cause Guillain-Barré syndrome (GBS) and meningoencephalitis in adults. Despite intensive research in recent years, there is no approved vaccine or antiviral therapeutics against CZS and adult Zika diseases. In this report, we developed a novel live-attenuated ZIKV strain (named Z7) by inserting 50 RNA nucleotides (nt) into the 5′ untranslated region of a pre-epidemic ZIKV Cambodian strain, FSS13025, which is attenuated in neurovirulence, immune antagonism, and mosquito infectivity compared with the American epidemic isolates. Our data demonstrate that Z7 replicates efficiently and produces high titers without causing apparent cytopathic effects (CPE) in Vero cells or losing the insert sequence, even after ten passages. Significantly, Z7 induces robust humoral and cellular immune responses that completely prevent viremia after a challenge with a high dose of an American epidemic strain (PRVABC59) in type I IFN receptor A deficient (*Ifnar1*$^{-/-}$) mice. Moreover, adoptive transfer of plasma collected from Z7 immunized mice protects *Ifnar1*$^{-/-}$ mice from ZIKV infection. These results suggest that modifying the ZIKV 5′ UTR is a novel strategy to develop live-attenuated vaccine candidates for ZIKV and potentially for other flaviviruses.

P3.13

EXPRESSION AND PURIFICATION OF A PROMISCUOUS HEXOKINASE

Benjamin Hemming, 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 active site but unlikely to affect protein folding were selected for mutation, Y36A, H94S, and D140G, to determine if promiscuity can be expanded to other mono and disaccharides. The Y36A, H94S, and D140G mutations were cloned, transformed into overexpression strains, and overexpressed. Purification was performed His-tag, anion exchange, and gel filtration using FPLC. The purified protein was then used for crystallographic and kinetics experiments.

P3.14

TRIAZOL COMPOUNDS – POTENTIALS IN THE TREATMENT OF CYSTIC FIBROSIS

Maggie Taylor[1], Zithlaly Amezquita[2], Pinaki Talukdar[3], Ghanshyam D. Heda[1]

[1]Mississippi University for Women, Columbus, MS, USA, [2]LSU Health Science Center, Shreveport, LA, USA, [3]Indian Institute of Science Education Research, Pune, India

BACKGROUND AND OBJECTIVES: Cystic fibrosis (CF) is a genetic disease that is most common among Caucasians. CF is caused by mutations in a membrane protein CFTR impairing its chloride ion channel function. DF508 is the most common CFTR mutation affecting over 70% of CF cases. Our laboratory has shown that DF508-CFTR mutation can be partially reversed by physical-chemical means [Heda & Marino, BBRC, 271:659-664, 2000]. Synthetic anion carriers have shown to augment the chloride ion channel function in many cell lines. Triazol compounds synthesized in Talukdar lab, known for their ability to bind and facilitate chloride influx in cultured cell lines are used in this study to determine their effects on DF508-CFTR upregulation. METHODS: Epithelial cell lines from human lung (CFBE) stably transfected with DF508-CFTR were treated with various concentrations of triazol compounds (ABS-089, PJ08) at 27ºC for 60 hrs to determine their effects on the plasma membrane CFTR expression. Cell lysates were prepared and immunoblotted with anti-CFTR antibody and CFTR-specific signal was detected by chemiluminescence using c300 image analyzer (Azure Biosystems). RESULTS: Both triazol compounds increased the CFTR band-B when compared with vehicle alone. These triazol compounds are now being analyzed for their effects on CFTR mRNA expression and chloride ion efflux ability using patch-clamp techniques. CONCLUSIONS: Our data suggests that triazol compounds has potentials to become therapeutic agents in the treatment of CF.

Acknowledgement: This work was funded by NSA seed grant (#80NSSC20M0101) and an Institutional Development Award (IDeA) from the NIGMS (#P20GM103476).

Friday, February 24, 2023

MORNING

Room D3

8:50 Welcome

9:00 Cellular, Molecular, Developmental Biology Division Awards

9:15 Cellular, Molecular, Developmental Biology Division Meeting

Oral Presentations Session IV

Moderators: Drs. James A. Stewart, Jr., Davida Crossley, Yvette Langdon, Felicite Noubissi-Kamdem, Nikki Reinemann

O3.05

9:30 CROSSTALK BETWEEN WNT AND HEDGEHOG (HH) SIGNALING PATHWAYS IN THE PATHOLOGY OF BASAL CELL CARCINOMA (BCC)

Cayla Harris[1], Mohammed Hajahmed[1], Joshua Herron[1], Clement Yedjou[2], Oluwatoyin Odubanjo[1], JeanChristophe Chamcheu[3], Tithi Roy[3], Samuel Boateng[3], Roxane-cherille chamcheu[3], Vladimir Spiegelman[4], Felicite K Noubissi[1]

[1]Jackson State University, Jackson, MS, [2]Florida A&M University, Tallahassee, FL, [3]University of Louisiana Monroe, Monroe, LA, [4]Pennsylvania State University, Hershey Medical Center, Hershey, PA

More than three million cases of Basal Cell Carcinoma (BCC) are diagnosed each year worldwide, making BCC the most common form of all cancers. Although it metastasizes rarely, BCC is locally aggressive, and if not treated can destroy tissues and nearby organs and cause disfigurement. The cost of care for BCC represents a growing public health care problem, it is the fifth highest for all cancers in the Medicare population. BCC is caused mostly by long term sun exposure. However, patients with basal cell nevus syndrome (Gorlin Syndrome) and immuno-compromised patients are more susceptible to developing BCC. Constitutive activation of the Hedgehog (Hh) signaling pathway is a key factor driving the development of BCC. Activation of GLI1 which is the transcription factor through which the Hh signaling is mediated, has been shown to be a key step in the initiation of the tumorigenic program leading to BCC. Our previous studies showed that GLI1 was also regulated at the post transcriptional level by the Wnt signaling. We showed that IGF2BP1 which is a direct target of the Wnt/β-catenin signaling could bind to and activate GLI1, and this regulation of GLI1 by IGF2BP1 was independent of the Hh upstream signal. We hypothesized that inhibition of IGF2BP1 will reduce GLI1 expression and activity, and therefore prevent BCC development. To test our hypothesis, we determined the effects of IGF2BP1 inhibition on the growth of UW-BCC1 cells in xenograft mice. 2 million UW-BCC1 cells were injected subcutaneously in the back of 30 (male and female) immunocompromised mice (*Foxn1^{nu}*), and they were fed doxycycline supplemented chow to inhibit IGF2BP1 in the BCC cells. Tumor growth was monitored weekly for a total of eight weeks. Knockdown of IGF2BP1 in UW-BCC1 cells significantly reduced tumor growth in xenograft mice compared to controls ($P<0.05$). We also generated a skin specific IGF2BP1 knockout mouse model in a BCC background (Ptch1tm1Mps/J) using the *Cre/LoxP* system. Experimental mice (*IGF2BP1-loxP$^{+/-}$; K5-cre-ERT2$^{+/-}$; Ptch1$^{+/-}$ or IGF2BP1-loxP$^{-/-}$; K5-cre-ERT2$^{+/-}$; Ptch1$^{+/-}$*) received 75mg of tamoxifen/kg for five days to inhibit IGF2BP1. They were subsequently exposed to 240 mJ/cm^2 UVB irradiation, three times a week for 44 weeks. Inhibition of IGF2BP1 significantly reduced tumor development compared to the control mice that did not receive tamoxifen. IGF2BP1 appears to contribute to BCC development and might represents a novel target in the treatment of basal cell carcinoma.

O3.06

10:00 PROCESSING OF MITOCHONDRIAL PRIMARY TRANSCRIPTS IN SACCHAROMYCES CEREVISIAE

Marta Piva, Jon Moreno

Department of Biological Sciences, Alcorn State University, Lorman, MS

The mechanism by which mitochondrial primary transcripts lacking transfer RNA (tRNA) are recognized and cleaved by endonucleases to produce the active mature RNAs, is currently unknown. The pentatricopeptide repeat (PPR) protein Ccm1p is essential to separate the 3' end of the ribosomal RNA (rRNA) of the small subunit from a 1308-nucleotide spacer. However, there is no tRNA cloverleaf structure at the rRNA-spacer junction for processing. Ccm1p has a stretch of 35 amino acids known as PPR2, which is indispensable for its activity. We prepared a mutant Ccm1p ($Delta_2$) that lacks that sequence, it but is still imported into the mitochondrion. $Delta_2$ is inactive, suggesting that its interaction with the rRNA is defective. To elucidate the processing mechanism, we conducted binding studies with two versions of the wild-type protein (with and without a ZZ tag at the C-terminal end) and D_2-ZZ. Proteins with the ZZ tag bind to immunoglobulin G (IgG). Thus, it was possible to separate them from a complex mixture of compounds using IgG, bound to a solid matrix like Sepharose. The target rRNA was identified and quantified by reverse transcription quantitative PCR. Our results show that both ZZ proteins bind to the rRNA, but not to any other mitochondrial transcript tested. Binding specificity was confirmed by the inability to recover the rRNA when the wild-type protein without the ZZ tag was used as bait. Therefore, we hypothesize that the Ccm1p PPR2 modifies the conformation of the rRNA, allowing it to adopt a cloverleaf-like structure that is recognized and cleaved by an endonuclease.

10:30 BREAK

Oral Presentations Session V
Moderators: Drs. James A. Stewart, Jr., Davida Crossley, Yvette Langdon, Felicite Noubissi-Kamdem, Nikki Reinemann

O3.07

DEFINING SCUBE3 ROLES IN TRIPLE NEGATIVE BREAST CANCER

Benjamin Onyeagucha

Mississippi University for Women, Columbus, MS

Triple-negative breast cancer (TNBC) is the most aggressive subtype of breast cancer. Characterized by the lack of hormone receptors, TNBC is commonly diagnosed in women below 50. TNBC patients have worse treatment outcomes than the other subtypes due to the lack of clear molecular targets associated with the disease. Chemotherapy remains the primary treatment option for TNBC but faces significant obstacles due to toxicity, adverse side effects, resistance, and death. We identified Signal peptide-CUB-EGF-like domain-containing-protein-3 (SCUBE3) through a genome-wide loss of function study as a molecular target to improve TNBC treatment in combination with doxorubicin (DOX). SCUBE3 level is elevated in TNBC tissue compared to normal tissue. Treatment of SCUBE3 knockdown cells with DOX decreased the number of viable cells compared to the control. Knockdown of SCUBE3 in TNBC cells inhibited colony formation, migration, and invasion. Equally, SCUBE3 overexpression promoted TNBC growth in the orthotopic mouse model compared to the control. Similarly, the knockdown of SCUBE3 significantly improved DOX treatment by inhibiting xenograft tumor cell growth compared to controls. DOX treatment induces SCUBE3 nuclear localization. The result demonstrated that nuclear localization of SCUBE3 promotes resistance to DOX treatment. Using an immunoprecipitation assay, we discovered the binding between SCUBE3 and EGFR. Knockdown or overexpression of SCUBE3 altered levels of phosphorylated EGFR and ERK1/2. Interestingly, full-length SCUBE3 could be cleaved into two: N- and C-terminal domain fragments. The result demonstrated that the N-terminal domain is responsible for regulating EGFR signaling. EGFR signaling activation is known to promote cell proliferation and survival. The result also showed that SCUBE3 N-terminal Lastly, changing in SCUBE3 level significantly altered the expressions of BRCA1, RAD51, and FOXM1 genes, thus implicating it in DNA damage repair. Altogether, these results demonstrated that targeting SCUBE3 could significantly improve DOX treatment effects in TNBC patients.

O3.08

11:10 NEW CATHEPSIN L (CATL) INHIBITORS AS A POSSIBLE TREATMENT FOR HEPATOCELLULAR CARCINOMA

Olamide Crown, Felicite Noubissi-Kamde[1], Ifedayo Victor Ogungbe

Jackson State University, Jackson, MS

Cathepsin L (CatL), a lysosomal cysteine protease, plays an important role in the occurrence, development, and metastasis of malignant tumors. CatL has been studied as a diagnostic marker as well as a pharmacological target for cancer therapies. Despite tremendous efforts in developing novel agents for HCC treatment over the past two decades, the treatment options for advanced malignant hepatocellular carcinoma (HCC) is sparse. New CatL inhibitors were investigated in this study. The long-term goal of the work is to develop CatL inhibitors as anti-hepatocellular carcinoma drugs. In dose-dependent cell viability and migration tests, the inhibitors' antiproliferative properties were investigated using multiple HCC cell lines. CatL inhibition and drug target selectivity studies were studied with recombinant and endogenous CatL and CatB. In addition, the inhibitors' ability to generate reactive oxygen species (ROS) in HCC cells lines and ability to suppress tumor growth and associated toxicity in mice was assessed. The inhibitors have antiproliferative effects with low micromolar IC_{50} values, and the lead compound has a time-dependent selective inactivation of recombinant and endogenous CatL. The compound did not produce significant ROS, had a dose-dependent tumor reduction comparable to sorafenib, and was less toxic to the liver than Sorafenib and Doxorubicin. Pharmacokinetics and medicinal chemistry optimization studies in mice are currently being conducted. Overall, the CatL inhibitors under investigation appear to be promising candidates for future development as potential HCC treatments.

Friday, February 24, 2023

AFTERNOON

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

Chemistry and Chemical Engineering

Chair: Samuel Dasary

Holmes Community College

Co-Chair: Rajaskekhar Kanchanapally

Mississippi Valley State University

Vice-Chair: Joseph Emerson

Mississippi State University

Vice-Chair: Bhanu Priya Virka Nellore

Mississippi Valley State University

Thursday, February 23, 2023

MORNING

Room D11

8:00 Welcome and Opening Remarks

Session 1: Moderator:

O4.01

8:10 COPPER-CATALYZED C-N BOND CONSTRUCTION OF ARYLAMINES AND ARYL SULFONAMIDES VIA CHAN-EVANS-LAM CROSS-COUPLING

Selvam Raju, Sean. L Stokes, Joseph. P Emerson

Mississippi State University, Starkville, MS

Copper(II) pyridyl-based *NNN*-ligand complexes with triflate counterions were utilized in Chan-Evans-Lam cross-coupling through *N*-arylation of multifarious *N*-nucleophiles and aryl boronic acids. The methodology employed catalytic Cu^{2+} complex, inorganic or organic base in deionized water or acetone solvent at ambient temperature using atmospheric oxygen as an oxidant. Solvent and base-controlled chemoselective cross-coupling reactions were observed, which led to the chemodivergent synthesis of a C–N coupled sulfanilamide. The complexes and pyridine-based hemilabile ligands were characterized and their structures were investigated through ^{1}H and ^{13}C-NMR, HRMS, FTIR, single-crystal X-ray diffraction, UV-Vis, and cyclic voltammetry. Beyond the catalysis reported here, the reactivity of the Cu^{2+} complexes were assessed through the well-documented arylation of *N*-nucleophiles and sulfanilamide by aryl boronic acid activation. *N*-arylated products were screened against *S. pneumoniae* as potential new starting structures for antimicrobial design.

O4.02

8:25 THE LANDSCAPE OF RELAXIVITIES FOR IRON OXIDE NANOPARTICLES LOADED WITH DRUG

Pohlee Cheah

Jackson State University, Jackson, MS

Magnetic Resonance Imaging (MRI) is an essential tool for diagnostic and prognosis of diseases. Contrast agents (CAs) are typically used to further improve the sensitivity and detection capability of MRI. Traditional MRI is used for disease diagnosis by observing the accumulation/ distribution of CAs in the lesions and surrounding tissues. Magnetic nanoparticles (MNPs) can directly affect the inhomogeneity of the magnetic field and shorten the T_2 relaxation time. Meanwhile, the effect of MNPs on T_1 relaxation mechanism is mainly due to the direct interaction of the hydrogen nucleus in water molecules and metal ions. Recent advances focusing on developing responsive MRI-CAs featured with T_1T_2 switching in response to microenvironment/ specific physical conditions (e.g. pH, temperature, specific stimulus etc.). In this paper, we study the changes of T_1T_2 of magnetic iron oxide upon loading with different drugs. Interaction of iron oxide with these drug molecules of different physico-chemical properties changes the relaxation time based on the water accessibility/ mobility at the magnetic core. Study of the relaxation mechanisms of drug-loaded nanoparticles provides understanding of mixing, interaction between them, enabling the feasibility to design engineered nanostructures for biomedical applications such as MRI-responsive CAs with therapeutics effects for non-invasive diagnosis and monitoring.

O4.03

8:40 VINYL SULFONE-BASED INHIBITORS OF TRYPANOSOMES WITH IMPROVED ANTITRYPANOSOMAL ACTIVITIES

Damilohun Metibemu, Oluwatomi Ajayi, Olamide Crown, Olawale Adeyinka, Ifedayo Victor Ogungbe

Jackson State University, Jackson, MS

The kinetoplastid protozoan parasites Trypanosoma brucei and Trypanosoma cruzi are responsible for human African trypanosomiasis (HAT) and Chagas disease, respectively. Available front-line drugs for both diseases are inadequate because of parasite stage-specific activities and drug resistance. In addition, the drug discovery and development pipeline for the diseases remains sparse. Our current work is focused on investigating new chemical identities that have dual-acting modes of action on the kinetoplastid protozoans with no or limited off- target toxicity. Hence, we designed and evaluated molecules that can covalently inhibit the major cathepsin L-like enzymes in the parasites and alter the parasite's antioxidant system. We found that the initial molecules have potent activities on the parasite but have suboptimal ADME properties. Analogs of these compounds have been synthesized and

evaluated. The analogs with soft electrophiles have nanomolar potency on T. brucei, with much improved ADME properties and in vivo efficacy. On-going studies are focused on in vivo evaluation of antitrypanosomal activities in murine models. The antitrypanosomal cathepsin L inhibitors from this work are good candidates for lead optimization studies.

O4.04

8:55 SYNTHESIS OF CESIUM ANTIMONY SULFIDE NANOCRYSTALS AND STUDIES OF POST-SYNTHETIC SULFIDE-TO-IODIDE EXCHANGE

Vaishali Kshirsagar, Sidney Creutz

Mississippi State University, Starkville Mississippi State, MS

Cesium antimony chalcohalide perovskites (e.g., $CsSbSX_2$, X = Br or I) have been proposed as a potential nontoxic lead-halide perovskite replacement for applications as an absorber layer in thin-film solar cells. However, synthetic methods to access these materials, especially solution-processable thin films, are currently lacking. We are developing a new method to make mixed halide-chalcogenide nanomaterials such as $CsSbSX_2$ using post-synthetic ion exchange on sulfide precursors. Specifically, $CsSbS_2$ nanocrystals synthesized using hot injection and heat-up methods will be used as starting materials for ion exchange. In order to achieve this goal, we are first developing synthetic methods to access $CsSbS_2$ or other cesium antimony sulfide phases, which were previously unknown as colloidal nanomaterials. In this talk, the optimization of the solution-phase synthesis of $CsSbS_2$ to achieve phase- and size-tunable colloidal nanocrystals will be discussed. Preliminary ion-exchange experiments will also be discussed.

O4.05

9:10 DISCRETE NI COMPLEXES ON METAL-ORGANIC FRAMEWORK (MOF) FOR CATALYTIC HYDROBORATION

Luz J. Barrios-Vargas, Niroshani Abeynayake, Carlee Secrist, Virginia Montiel-Palma

Department of Chemistry, Mississippi State University, Mississippi State, MS

In recent years, Metal-Organic Framework materials (MOFs) have been grafted with organometallic complexes that are homogeneous catalysts, to form **heterogeneous catalysts materials**. The choice of MOFs as solid supports is inspired by the properties of MOFs: porosity, high surface area, large pore aperture, crystalline structure, low density, and thermal stability. As a general rule, heterogeneous catalysts are easier to separate from a reaction mixture than their homogeneous counterparts and can be reused multiple times, this is the reason that they are more useful in industries. On the other hand, the hydroboration of aldehydes and ketones is an important transformation because the boron-containing products are used as intermediates in the synthesis of alcohols of high economic value.

Herein, we present our results on the employment of NU-1000, a zirconium-based MOF, as a host for "NiP_3SiH" and "NiP_3GeH" compounds. These two organometallic Ni complexes are active homogeneous catalysts for the hydroboration of carbonyl compounds. Their grafting upon NU-1000 generates catalysts, [Ni-1]@NU-1000 and [Ni-2]@NU-1000. Both materials allow the heterogeneous hydroboration of carbonyl compounds to take place in one step, while they can be easily removed and reused after the completion of the reaction. Standard methods were used for the characterization of the grafted MOF materials and NMR spectroscopy for the determination of their catalytic activity.

O4.06

9:25 SYNTHESIS AND CHARACTERIZATION OF LITHIUM {(t-Bu)M-tris(o-phenyl(dimethylamino)} COMPLEXES, WHERE M =AL, GA, IN FOR THE CATALYTIC HYDROBORATION OF BENZOPHENONE

Mohammad Raziul Hasan, Omar J. Garcia de Jesus, Mariana L, Miguel-Angel Munoz-Hernandez

Mississippi State University, Starkville, MS

Aldehydes and ketones have been catalytically reduced by hydroboration employing unsupported bimetallic Li-M complexes, where M is a group 13 metal. Herein, we disclose our studies on supported Li-M complexes [Li{(t-Bu)M(*o*-$C_6H_4(NMe_2)$}] where M = Al **(1)**, Ga **(2)**, In **(3)**, which catalyze the hydroboration reaction of benzophenone at room temperature using HBpin. A series of group 13 complexes [M(*o*-$C_6H_4(NMe_2)_3$] were used as precursors to produce **1**-**3** in excellent yields by reacting them with Li(t-Bu) in diethyl ether [**1** (89%), **2** (93%) and **3** (85%)]. Precursors and complexes were characterized by ATR-IR, ^{1}H-NMR, and ^{13}C-NMR spectroscopic methods and single crystal X-ray. A comparative study on the hydroboration reaction of benzophenone catalyzed by **1-3** under various catalytic conditions will be discussed.

O4.07

9:40 ASSESSMENT OF AMINOQUINLINE-BASED TRIDENTATE (NNN)-CU(II) CATALYSTS TOWARDS THE REDOX-NEUTRAL CROSS-COUPLING REACTION OF ANILINES WITH DIAZO CARBONYL COMPOUNDS

Mohsen Teimouri, Joseph P Emerson, Sean Stokes

Mississippi State University, Starkville, MS

Cu2+-based synthetic architectures have been well-studied to catalyze redox-neutral carbene transfer reactions between different diazo carbonyl compounds (carbene source) and heteroaryl coupling partners for N-H/O-H insertion reactions. Here, we report our current efforts to generate a water-tolerant catalyst for C—N bond-forming reactions in water and other low boiling solvents, representing an efficient protocol to obtain the desired

products in good yields toward asymmetric hybrid-catalyst development. Outlined is our methodology toward the synthesis and characterization of a novel isoquinolinamine tridentate ligand system and the resulting Cu2+ complexes. These tridentate copper(II) complexes provide good conversion and highly substituted C–N product formation. This protocol provides an oxidant-free method and proceeds through milder reaction conditions and releasing environmentally benign N2, and sets the foundation for related enantioselective processes.

O4.08

9:55 SYNTHESIS OF A CCC-NHC PINCER RE COMPLEX: AN AIR STABLE CATALYST FOR COUPLING KETONES WITH PRIMARY ALCOHOLS VIA BORROWING HYDROGEN

Hoang Pham, Bruno Donnadieu, T. Keith Hollis

Mississippi State University, Mississippi State, MS

To date, no CCC-NHC pincer complexes of Re have been reported in the literature. The first CCC-NHC pincer complex of Re is reported. It was fully characterized by 1H and 13C nuclear magnetic resonance (NMR) spectroscopy, mass spectroscopy, elemental analysis, and X-ray crystallographic methods to determine the molecular structure. It was synthesized via transmetallation from an isolated Zr precursor and was found to be air stable. The catalytic activity of the CCC-NHC Re(I) pincer complex was demonstrated for the borrowing hydrogen coupling reaction between benzylic ketones and primary alcohols to generate a new C–C bond in an environmentally friendly catalysis requiring no activating groups for the alcohol functionality. This borrowing hydrogen coupling reaction produced a stoichiometric amount of water as the only byproduct and did not require the conversion of the primary alcohol to a leaving group. A broad range of substrates was examined, and isolated yields from 53% to 92% were obtained. A catalytic cycle for the CCC-NHC Re(I) pincer complex catalyzed borrowing hydrogen coupling reaction is proposed.

10:10 BREAK

Session 2: Moderator:

O4.09

10:20 NATURE-INSPIRED MATERIAL DESIGN FOR COMBATING SARS-COV-2 AND SUPERBUGS

Paresh Ray, Avijit Pramanik, Kalein Gattes

Jackson State University, Jackson, MS

Current global pandemic caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is responsible for over 6.5 million deaths till now. In the last few decades there has been dramatic increment in antimicrobial resistance for pathogenic bacteria which constitutes to be a key threat for our society. All the above facts have triggered initiatives in this world for the development of novel antimicrobial compounds for targeted inhibition of virus and killing of superbugs. Nature has served mankind as a great source of inspiration by virtue of millions of well- coordinated engineered designs. Naturally produced host defense peptides by all living organisms are bioactive small proteins, which are important components for our innate immune system. Those peptides are the first-line defense against microbial attacks for our health. Here we will discuss our recent reports on the development of next generation antibacterial and antiviral nanocomposite material using nature inspired peptides, biochar, chitosan, etc. We will also discuss the combating mechanism via the interactions between the nanocomposite surface and cell wall, which will control the antimicrobial and antiviral processes.

O4.10

10:40 CURE-ON-DEMAND MATERIALS BY FRONTAL POLYMERIZATION

John Pojman

Louisiana State University Baton Rouge LA

The goal of cure-on-demand polymerization is to create one-pot systems that have a long shelf live but will react rapidly when curing is desired. We use an approach called frontal polymerization in which a localized reaction zone propagates from the coupling of thermal transport and the Arrhenius dependence of the reaction rate of an exothermic polymerization. We demonstrate that frontal polymerization can be used to create a cure-on-demand putty for filling holes in wood, marble, and sheet rock. The putty has a months-to-years shelf life, is a one-pot formulation, can be applied leisurely and then cured rapidly with a flat heat source. We will explore the commercialization of "QuickCure Clay" for the arts and crafts market and consider how frontal polymerization can be used for additive manufacturing.

O4.11

11:00 CHALLENGES AND RECENT PROGRESSES IN OPTICAL CHARACTERIZATION OF NANOSCALE AND LARGER MATERIALS

Dongmao Zhang

Mississippi State University, Mississippi State, MS

Macromolecular, supramolecular, and nanoscale (MSN) and larger materials have become increasingly popular in chemical, biological, and materials research. Optical spectroscopic methods that exploit light/matter interactions including absorption, scattering, and fluorescence emission have remained the most applied tools for studying the MSN structures and properties. However, existing measurement techniques are inadequate to resolve the complex interplay among the materials light absorption, scattering, and fluorescence emission that can concurrently occur in many MSN samples. Problematic data interpretation has been

widespread in current literature including those published in leading chemical, biological, and materials science journals. After demonstrating the common issues in the current literatures on the UV-vis, fluorescence, and scattering-based measurements, I will introduce the theories and methodologies of several new optical spectroscopic techniques we have developed in the recent five years. Examples applications of these spectroscopic methods will be shown with MSN materials that can be approximated as the pure light scatterers, pure absorbers, and simultaneous absorbers and scatterers, simultaneous absorbers and emitters, all the way to simultaneous absorbers, scatterers, and emitters. These techniques are broadly accessible as they can be implemented with conventional UV-vis and fluorescence instruments with commercially available accessories. The potential applications of the spectroscopic methods for agricultural, environmental, biological, and materials research will also be discussed.

O4.12

11:20 SYNTHETIC PHOTOCHEMISTRY OF PYROMELLITDIIMIDES IN AQUEOUS SOLUTION

Wolfgang Kramer[1], *Donya Razinoubakht*[1], *Axel Griesbeck*[2], *Gurjit Kaur*[1]

[1]*Millsaps College, Jackson, MS, USA* [2]*University of Cologne, Köln, Germany*

Pyromellitimide (1,2,4,5-Benzenetetracarboxylic acid diimide) is widely used in polymeric films (Kapton) due to its high thermal stability, good mechanical properties, low dielectric constant, low coefficient of thermal expansion and high radiation resistance. Additionally, the characteristic absorption of the radical anion at 720 nm makes pyromellitimide an attractive component of electron-transfer cascade systems.

Because of the reported high stability, photochemical reactivity of various pyromellitic diimides was examined, in particular the decarboxylative photocyclization. In this reaction, aromatic imides are converted to medium to large ring structures. The reduction potential of pyromellitimide identifies it as a potential chromophore for this photochemical transformation.

The photochemical starting materials were synthesized by simple condensation reactions yielding pyromellitimide w-carboxylic acids. Irradiation in basic aqueous solution led to the formation of a stable radical species, which was identified by ESR, UV/Vis and NMR as the radical anion of pyromellitimide. The radical anion concentration, characterized by the absorption at 720 nm and the reported extinction coefficient, was largest after about 100 minutes. It disappeared completely after 200 to 400 minutes, depending on the spacer length of the carboxylic acid substituent. Interestingly, the radical anion has a lifetime of several days in deoxygenated solution. The intermolecular reaction led to the formation of surprising products which differ from the intramolecular results.

This is the first time pyromellitimides have been shown to exhibit synthetic photochemical potential.

O4.13

11:40 EXOSOME AS A DELIVERY SYSTEM OF WATER-INSOLUBLE CANCER THERAPEUTICS TO ENHANCE THE THERAPEUTIC ACTIVITY

Rajashekhar Kanchanapally

Mississippi Valley State University, Itta Bena, MS

Delivering water-insoluble therapeutics at the tumor site still remains a major challenge. We explored the usage of exosomes for the delivery of water-insoluble drugs (Honokiol and Paclitaxel) for the treatment of pancreatic and breast cancer respectively. We used mesenchymal stem cell-derived exosomes for the delivery of Honokiol to pancreatic cancer cells. On the other hand, we have used breast cancer cell-derived exosomes for the delivery of Paclitaxel to breast cancer cells. We have used either passive or active loading techniques for the loading of therapeutics into exosomes. We have tested the efficacy of the exosomal formulations in arresting cell-cycle and inducing apoptosis in cancer cells and compared it to the activity of free and liposomal forms of the drug. Our results indicate that loading of therapeutics inside the exosomes is beneficial over free and liposomal forms of the drug. More studies are warranted to establish the efficacy of these formulations in 3D cell culture and animal models.

12:00 General Session

Thursday, February 23, 2023

AFTERNOON

Room D 11

1:00-1:50

Moderator: Dr. Joseph Emerson

Mississippi State University

"Open Forum on chemistry-focused research collaboration, and education in Mississippi"

An open and interactive session aimed to build connections between chemists across Mississippi to support research, community service, and teaching

Session 3: Moderator:

O4.14

2:00 INVESTIGATION OF NON-STRUCTURAL PROTEIN 2 (NSP2) INHIBITORS AS THERAPEUTICS FOR ENCEPHALITIS AND CHIKUNGUNYA VIRAL INFECTIONS.

Olawale Adeyinka, Damilohun Metibemu, Oluwatomi Ajayi, Olamide Crown, Ifedayo Victor Ogungbe

Jackson State University, Jackson, MS

Emerging infectious diseases like those caused by arboviruses such as Venezuelan equine encephalitis virus

(VEEV) and Chikungunya virus (CHIKV) pose a severe threat to public health. Therefore, the development of therapeutics and vaccines against emerging infectious diseases is of utmost importance. In this work, inhibitors of the cysteine protease domain of VEEV's non-structural protein 2 (nsP2) were investigated as promising starting scaffolds against VEEV and CHIKV. The initial compounds in the series were found to have potent inhibitory activity against nsP2 and block the replication of VEEV and CHIKV in infected cells in vitro. In addition, the compounds were found to have promising but suboptimal ADME properties. Analogs of the initial hits were synthesized and evaluated against both viruses and found to be significantly more potent against CHIKV, have similar activity against VEEV, and have optimal in vitro ADME properties. Our current results provide structural insights into a new class of potent non-peptidic covalent inhibitors of nsP2 cysteine protease with validated antiviral activities. These results may facilitate the evolution of the compounds into selective and broad-spectrum anti-alphaviral drug leads.

O4.15

2:15 ADVANCES OF NANOMATERIALS-BASED STRATEGIES FOR THE PREVENTION AND TREATMENT OF COVID-19

Avijit Pramanik, Sudarson Sekhar Sinha, Kaelin Gates, Lauren R. Corby, Paresh Ch. Ray

Jackson State University, Jackson, MS

Recent data reported by the World Health Organization depicts that the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has infected more that 610 million people and killed more than 6.5 million worldwide. Because of mutation in viruses, the traditional antiviral medicines and vaccines can partially control the infections, but so far, no specific drugs are available that can cure the infection completely. Nanotechnology has offered novel alternatives in managing this COVID-19 pandemic. Due to several advantages of nanomaterials such as low cost for diagnosis, efficient delivery of viral antigens, inhibited SARS-CoV-2 replication and inflammation reduction, researchers have utilized nanomaterial-based strategies for fighting to combat COVID-19. In this research, we will discuss a few novel nanomaterials that act as promising tools for prevention, diagnosis, and therapeutics as well as open new avenues in the treatment of COVID-19.

O4.16

2:30 N-HETEROCYCLIC METAL COMPLEXES AND THEIR DNA HYBRID CATALYSTS FOR APPLICATIONS IN C—C AND C—HETEROATOM BOND FORMING REACTIONS AND ASYMMETRIC CATALYSIS

Mitu Sharmsa, Amanda Perkins, Sean Stokes, Joseph Emerson

Mississippi State University, Starkville, MS

The isolation and characterization of a series of newly synthesized tridentate copper(II) N-heterocyclic carbene (NHC) complexes with different azole rings such as imidazoles, benzimidazoles, 5,6-dimethylbenzimidazoles are reported here. These complexes have been optimized for their application in various organic transformations including the generation of new C-heteroatom bond formation reactions as well as in the reduction of the carbonyls to alcohol in various solvent media. Arylboronic acids show immense importance as coupling agents in the construction of various therapeutics and value-added chemicals in modern organic chemistry by forming new C—C and C— heteroatom bonds. We have investigated the efficiency of these complexes in an aqueous solution and in a range of solvents to generate phenol and aryl ethers, respectively. The optimized reactivity showcases the ability to make C—O bonds but also identifies conditions where water and alcohol activation could be limited to C—C and C—heteroatom bond-forming reactions. The relationship between product formation and temperature and catalyst loading is described, along with the effects of buffer, pH, base, and co-solvent are explored for C—C and C—heteroatom bond forming reactions. In another approach towards checking the efficiency of these Cu-NHC complexes as catalysts, the DNA hybrid catalyst is generated by the noncovalent binding of these Cu-NHCs to DNA for asymmetric catalysis. These hybrid catalysts allow the effective transfer of chirality of the DNA double helix to the catalyzed hydrogenation reaction. These complexes and the hybrid catalysts have been optimized for their application in the ketone reduction reactions using a variety of different target ketones and phenylsilane as the reducing agent in various solvent media. The new copper(II) NCN-pincer complexes are comprehensively characterized by X-ray crystallography, elemental analysis, HR-MS, cyclic voltammetry, UV-Vis, and EPR spectral studies.

O4.17

2:45 ELECTRONIC STRUCTURE STUDIES AND CHARACTERIZATION OF PYRAZINE-(DIIMINE) NI AND CO COMPLEXES

Daniela Sanchez Arana, Jaylan R. Billups, Sidney E. Creutz

Mississippi State University

Redox non-innocent ligands are a versatile tool to enhance the reactivity of a metal complex. A very well studied class of redox non-innocent ligands are the pyridine(diimine) pincer ligands. Our motivation is to study the effect of incorporating an additional nitrogen in the aromatic ring of the pincer to lower the energy of the p* orbital. This nitrogen atom can provide an extra reactive site. Studies about the bonding of pyrazine(diimine) ligands with nickel and cobalt are presented as well as characterization and electronic structure analysis by DFT. The square pyramidal P^zDIMX_2 (M = Ni, Co) complexes undergo 1 e^- reduction with KC_8 resulting in square planar M(II) centers coupled

to ligand radicals. Based on DFT, the spin density of the dihalide complex is localized on the metal while in the reduced compound, it is delocalized along the ligand. The ligand reduction is expected to lengthen the C=N imine bonds, which agrees with the bond distance changes observed by single-crystal X-ray diffraction. A trend is observed across the 1st-row series; going to the right in the series, covalency between the ligand and the metal center is increased. Our hypothesis of further reactivity of the *p*-nitrogen of the pyrazine ring is supported by cyclic voltammetry.

O4.18

3:00 SOLUTION-PHASE SYNTHESIS OF BARIUM ZIRCONIUM SULFIDE PEROVSKITE NANOMATERIALS AND THEIR RELATED ALLOYS

Daniel Zilevu, Sidney Creutz, Omri Parks

Mississippi State University, Starkville, MS

Transition metal chalcogenide perovskites with the general formula ABX_3 (A = Ca, Ba, Sr; B = Zr, Hf; Ti; X = S, Se) and their related alloys have gained enormous attention in photovoltaic research due to their promising optoelectronic properties and high stability at elevated temperatures and in moist environments. Despite considerable experimental work, a solution-based synthesis of these materials, particularly nanoscale materials, still remains a challenge. We present the synthesis of $BaZrS_3$ and $BaTi_xZr_{1-x}S_3$ as colloidal nanomaterials using reactive metal amide precursors. A red shift in the absorption onset was observed from $BaZrS_3$ to titanium-alloyed $BaZrS_3$ in the visible region. Both types of nanoparticles ($BaZrS_3$ and $BaTi_xZr_{1-x}S_3$) show nanoplatelet morphology in transmission electron microscope images. We also aim to improve the colloidal stability of these nanocrystals by increasing the ligand coverage on the surface for thin film processing.

O4.19

3:15 ELECTRONIC STRUCTURE STUDIES AND CHARACTERIZATION OF PYRAZINE-(DIIMINE) NI AND CO COMPLEXES

Daniela Sanchez Arana, Jaylan R. Billups, Sidney E. Creutz

Mississippi State University, Mississippi State, MS

Redox non-innocent ligands are a versatile tool to enhance the reactivity of a metal complex. A very well studied class of redox non-innocent ligands are the pyridine(diimine) pincer ligands. Our motivation is to study the effect of incorporating an additional nitrogen in the aromatic ring of the pincer to lower the energy of the p* orbital. This nitrogen atom can provide an extra reactive site. Studies about the bonding of pyrazine(diimine) ligands with nickel and cobalt are presented as well as characterization and electronic structure analysis by DFT. The square pyramidal P^zDIMX_2 (M = Ni, Co) complexes undergo 1 e^- reduction with KC_8 resulting in square planar M(II) centers coupled to ligand radicals. Based on DFT, the spin density of the dihalide complex is localized on the metal while in the reduced compound, it is delocalized along the ligand. The ligand reduction is expected to lengthen the C=N imine bonds, which agrees with the bond distance changes observed by single-crystal X-ray diffraction. A trend is observed across the 1st-row series; going to the right in the series, covalency between the ligand and the metal center is increased. Our hypothesis of further reactivity of the *p*-nitrogen of the pyrazine ring is supported by cyclic voltammetry.

Thursday, February 23, 2023

EVENING

3:30 DODGEN LECTURE and AWARDS CEREMONY

Hall B

5:00 GENERAL POSTER SESSION

Hall C (immediately following Dodgen Event)

P4.01

DEVELOPING GOLD NANOPARTICLE-GRAPHENE OXIDE HETEROSTRUCTURES FOR THE INHIBITION OF OMICRON VARIANT OF SARS-CoV-2

Rithik Banerjee[1], Avijit Pramanik[2], Paresh Ray[2]

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

We live in a world inundated with millions of types of viruses, and this is rapidly becoming one of the biggest concerns for the future state of human health. Throughout recent history, there have been multiple accounts of viruses substantially impacting society, such as influenza, zika virus, hepatitis B, and HIV. More recently, since the outBREAK of the COVID-19 virus in December 2019, researchers have spent more and more resources toward the development of enhanced nanomaterials that can interact with these viruses and defunctionalize them significantly. Specifically, spherical gold nanoparticles (AuNPs) are attracting significant attention from researchers because of their high surface-to-volume ratio, non-toxicity, and ability to quench fluorescence. These properties create a phenomenon called fluorescence resonance energy transfer (FRET), which indicates that decay rates of fluorescent molecules, including viruses, can be significantly increased through interaction with AuNPs. However, one problem with AuNPs by themselves is that they have a high tendency to agglomerate, which notably reduces their antiviral activity. Therefore, they often need to be conjugated with another nanomaterial in order to stabilize and optimize antiviral activity. Another very promising nanomaterial for researchers is graphene oxide (GO). Synthesized from pure graphite, graphene oxide is one of the most important carbon-based nanomaterials because of its very interesting two-dimensional nanosheet structure,

solubility in water, and strong antiviral properties. The properties of AuNPs and graphene oxide seem impressive on their own, but when they are fused together to create a GO-AuNP nanocomposite heterostructure, that becomes an even more interesting phenomenon. These nanocomposites have a three-dimensional layered sheet structure with spherical AuNPs floating around on the surface of the sheets, which allows for strong surface interactions with viruses, especially through the adsorption of fluorescence proteins. Overall, the bioconjugation of graphene oxide and AuNPs is a very new and exciting field that researchers are delving into, and it could provide many useful applications for the development of antiviral medicines in the future.

P4.02

K-40 RADIOACTIVITY IN WATER-SOFTENERS

Joey Courville[1], Jermiah Billa[2], Steve Adzanu[2], John Adjaye[2]

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

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

P4.03

RADIOACTIVITY STUDIES ON SLUDGE SAMPLES COLLECTED FROM LOCAL WATER TREATMENT FACILITIES

Brianna Lynch[1], Felecia Shoulders[1], Jermiah Billa[1], Steve Adzanu[1], John Adjaye[1]

[1]Alcorn State University, Lorman, MS

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

P4.04

THE QUALITY OF WATER ASSESSMENT IN FRAMES OF GENERAL CHEMISTRY I LAB COURSE

Karina Kapusta, Manliang Feng

Tougaloo College, Tougaloo, MS

Over 90 percent of Americans get tap water from community water systems subject to safe drinking water standards. Nonetheless, the city of Jackson (MS) has struggled with safe water access for decades and has lacked the funding to implement change. Considering the importance of water safety for the population, water quality analysis has been performed in frames of a "General Chemistry I Lab" course. Five samples were collected, including a sample of pond water from the lake located on a territory of the Tougaloo College campus, tap and stormwater samples, bottled water of a specific brand, and distilled water for comparison. Various testing techniques have been carried out to assess samples' pH, conductivity, amount of dissolved oxygen, hardness, and anion content. The performance of a "Tetra 5-in-1 Easy Strip" indicator strip was evaluated by comparing its results with more accurate techniques such as titration. Additionally, samples of tap, storm, bottled, and distilled waters were tested as potential media for the growth of algae. The change in algae concentration over the course of three weeks was measured using a spectrophotometer. Results revealed that most water samples had qualities within a normal range according to U.S. EPA standards. However, bottled water had surprisingly low conductivity, thus, was not a significant source of total dissolved solids.

P4.05

INVESTIGATION OF ADAMANTYL-BASED PHENYL SULFONYL ACETAMIDE AND ANALOGS AS ANTILEISHMANIAL AGENTS

Bosede Olayemi Kolawole[1], *Damilohun Metibemu*[1], *Olamide Crown*[1], *Ifedayo Victor Ogungbe*[1]

[1]*Jackson State University, Jackson, MS*

Over 20 species of the kinetoplastid protozoan parasite Leishmania cause the leishmaniasis complex of diseases. The parasite is transmitted through the bite of infected female sandflies. Up to 1.2 million new cutaneous leishmaniasis (CL) cases occur annually. The infection leaves permanent scars, and even severe disability, with substantial social and public health impacts. Current frontline drugs have several limitations. These include inadequate safety profile and susceptibility to drug resistance, primarily when used as monotherapies. In this work, a phenotypic assay against *Leishmania amazonensis* in vitro and in vivo led to the identification of an adamantyl-based phenyl sulfonyl acetamide as a promising antileishmanial agent. The new agent inhibited the growth of intracellular forms of *L. amazonensis* (IC_{50} = 4 µM) and exhibited low toxicity to host cells, with a selectivity index (SI) of 125. However, the agent did not reduce lesions and parasite load in murine models of cutaneous leishmaniasis (CL) when administered as monotherapy or when given simultaneously with a suboptimal dose of miltefosine. It also lacks optimal ADME properties. Ongoing work is focused on synthesizing and evaluating analogs and enhancing the drug-like properties of the new class of antileishmanial agents.

P4.06

DEGRADABLE POLYSTYRENE FROM BIO-BASED PRECURSOR

Colleen Scott, Ana Valencia

Mississippi State University

Petroleum-based plastics have been widely used since the mid-1900 century because they are cheap, durable, and mechanically diverse. However, these plastics are non-degradable, and solid plastic waste accumulation adversely affects the environment.

Among the many petroleum-based polymers, polystyrene (PS) is the third most important polymer produced. It is known for its low cost, lightweight, insulation, chemical durability, and ease of manufacturing. It is primarily used for single-use applications such as food packaging and insulators. PS persists in the environment indefinitely after disposal, contributing to the waste accumulation problem. Thus, the need to design alternative polymers to address the environmental problem is the most viable solution. One approach is to design degradable PS from biomass. Biomass waste is a sustainable and inexpensive feedstock that is highly appropriate for designing alternative degradable thermoplastics. In this way, the introduction of acetal groups would improve the hydrolytic degradation of the polymer, and the products of this degradation will not cause damage to the environment.

In this poster presentation, we will report on the synthesis and characterization of an acetal containing PS and its ability to undergo degradation under ambient conditions. Degradable Polystyrene from bio-based precursor.

P4.07

VINYL SULFONE-BASED INHIBITORS OF TRYPANOSOMES WITH IMPROVED ANTI-TRYPANOSOMAL ACTIVITIES

Oluwatomi Ajayi, Damilohun Metibemu, Olamide Crown, Olawale Adeyinka, Ifedayo Victor Ogungbe

Jackson State University, Jackson, MS

The kinetoplastid protozoan parasites Trypanosoma brucei and Trypanosoma cruzi are responsible for human African trypanosomiasis (HAT) and Chagas disease, respectively. Available front-line drugs for both diseases are inadequate because of parasite stage-specific activities and drug resistance. In addition, the drug discovery and development pipeline for the diseases remains sparse. Our current work is focused on investigating new chemical identities that have dual-acting modes of action on the kinetoplastid protozoans with no or limited off- target toxicity. Hence, we designed and evaluated molecules that can covalently inhibit the major cathepsin L-like enzymes in the parasites and alter the parasites' antioxidant system. We found that the initial molecules have potent activities on the parasite but have suboptimal ADME properties. Analogs of these compounds have been synthesized and evaluated. The analogs have nanomolar potency on T. brucei and T. cruzi, with much improved ADME properties; On-going studies are focused on in vivo evaluation of antitrypanosomal activities in murine models. The antitrypanosomal cathepsin L inhibitors from this work are good candidates for lead optimization studies.

P4.08

BIOPROCESS OPTIMIZATION BY EMPLOYING RESPONSE SURFACE METHODOLOGY (RSM) IN RHODOTORULA GLUTINIS FOR B-CAROTENE PRODUCTION

Kevaughn Prout, Keerthi Mandyam, Ananda Nanjundaswamy

Alcorn State University, Lorman, MS

Response Surface Methodology statistical tool for process optimization. RSM is used to study the interaction of multiple nutrients, which influences the production of bioproducts. In the present study we employed RSM for optimize media composition for optimal production of beta-carotene in *R. glutinis*. β-carotene is one of the carotenoids found in nature among over 600 carotenoids. Plants, algae and microbes such as fungi and bacteria produce carotenoids. Animals cannot produce carotenoids but can assimilate the carotenoids for improved health and wellbeing. Carotenoids are known for their antioxidant properties and used for preventing oxidation of milk,

serves as provitamin-A and reduction stress in cells. Carotenoids acts by capturing reactive oxygen species [O_2^-] in the cells. β -carotene is used as food and feed colorant and global market for carotenoids is estimated at $2 billion in 2022. Because of the commercial importance and increased focus on natural carotenoid use, the overall objective of the study was to utilize inexpensive agricultural resources such as sorghum syrup to produce natural, high value β-carotene using red yeast *Rhodotorula glutinis* fermentation. Response surface methodology (RSM) was used for bioprocess optimization for β-carotene production. Optimization in shake flasks provided key optimal points for media ingredients for β-carotene production. From RSM the predicted concentrations of media ingredients were Sorghum Syrup – 9.18%; Yeast Extract – 0.96%; KH_2PO_4 – 0.07%; $(NH_4)_2SO_4$ – 0.13% and $MgSO_4$ – 0.42% with a predicted β-carotene production of 1003 µg/g of yeast cells on day 10 of fermentation. The validation experiment produced 1153µg/g of yeast cells on day 10. From the optimized media scale-up in 7-liter benchtop bioreactor in triplicates, the red yeast total nutritional profile will be discussed.

P4.09

BIOPROCESS OPTIMIZATION BY EMPLOYING RESPONSE SURFACE METHODOLOGY (RSM) IN RHODOTORULA GLUTINIS FOR B-CAROTENE PRODUCTION

Kevaughn Prout, Keerthi Mandyam, Ananda Nanjundaswamy

Alcorn State University, Lorman, MS

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P4.10

BIOPROCESS OPTIMIZATION BY EMPLOYING RESPONSE SURFACE METHODOLOGY (RSM) IN RHODOTORULA GLUTINIS FOR B-CAROTENE PRODUCTION

Kevaughn Prout, Keerthi Mandyam, Ananda Nanjundaswamy

Alcorn State University, Lorman MS

Response Surface Methodology statistical tool for process optimization. RSM is used to study the interaction of multiple nutrients, which influences the production of bioproducts. In the present study we employed RSM for optimize media composition for optimal production of beta-carotene in *R. glutinis*. β-carotene is one of the carotenoids found in nature among over 600 carotenoids. Plants, algae and microbes such as fungi and bacteria produce carotenoids. Animals cannot produce carotenoids but can assimilate the carotenoids for improved health and wellbeing. Carotenoids are known for their antioxidant properties and used for preventing oxidation of milk, serves as provitamin-A and reduction stress in cells. Carotenoids acts by capturing reactive oxygen species [O_2^-] in the cells. β -carotene is used as food and feed colorant and global market for carotenoids is estimated at $2 billion in 2022. Because of the commercial importance and increased focus on natural carotenoid use, the overall objective of the study was to utilize inexpensive agricultural resources such as sorghum syrup to produce natural, high value β-carotene using red yeast *Rhodotorula glutinis* fermentation. Response surface methodology (RSM) was used for bioprocess optimization for β-carotene production. Optimization in shake flasks provided key optimal points for media ingredients for β-carotene production. From RSM the predicted concentrations of media ingredients were Sorghum Syrup – 9.18%; Yeast Extract – 0.96%; KH_2PO_4 – 0.07%; $(NH_4)_2SO_4$ – 0.13% and $MgSO_4$ – 0.42% with a predicted β-carotene production of 1003 µg/g of yeast cells on day 10 of fermentation. The validation experiment produced 1153µg/g of yeast cells on day 10. From the optimized media scale-up in 7-liter benchtop bioreactor in triplicates, the red yeast total nutritional profile will be discussed.

P4.11

KINETICS OF CROSS-SEEDED INTERACTIONS BETWEEN TDP-43 AND A-SYNUCLEIN

Landon Lee, Shailendra Dhakal, Malay Mondal, Vijay Ranchachari

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TDP-43 and α-synuclein (αS) are proteins implicated in multiple neurodegenerative illnesses such as Parkinson's disease (PD), Alzheimer disease (AD), and amyotrophic lateral sclerosis (ALS). Each of these diseases are characterized by the misfolding of intrinsically disordered proteins such as TDP-43 and αS to form large neurotoxic fibrillar aggregates known as amyloids, concentrated deposits of which are hallmarks of AD and PD. It was previously observed that TDP-43 and αS synergistically cross-seed and interact to form highly neurotoxic hybrid fibrils. In this study, the kinetics of these interactions were observed. Using ThT fluorescence, the kinetics of aggregation reactions with varying stoichiometries of αS seeded and TDP-43 seeded heterotypic and homotypic interactions were recorded. The kinetics data suggest selectivity in seeding and distinct kinetic mechanisms.

P4.12

DIRECT SYNTHESIS OF WATER-DISPERSIBLE MFE2O4 (M=FE^{2+}, NI^{2+}, CO^{2+}, MN^{2+}) NANOPARTICLES WITH CONTINUE GROWTH

Mikiyah Jefferson, Jing Qu, Yongfeng Zhao, Daniel Adams, Charles Collen

Jackson State University, Jackson, MS

We report a new strategy to fabricate metal-doped iron oxide nanoparticles (MFe_2O_4, M=Fe^{2+}, Mn^{2+}, Ni^{2+}, Co^{2+}) in diethylene glycol (DEG). This synthesis route is based on the decomposition of $Fe(acac)_3$ and $M(acac)_2$ under a certain temperature. A continuous addition of precursors results in continued growth of magnetic nanoparticles. The as-synthesized particles have a spherical single crystal structure as characterized by TEM and XRD. However, the size and distribution of MFe_2O_4 nanoparticles were found to be affected by the type and percentage of dopant metal. Meanwhile, the magnetization for $MnFe_2O_4$ samples exhibited improvement while other samples decrease according to superconducting quantum interference device (SQUID) magnetometry measurement at the temperature of 10 K and 300 K. Changes in magnetic properties lead to differences in dispersibility of nanoparticles in aqueous media. For practical utility, the MRI imaging were compared before and after metal doping and it was found that manganese and cobalt metals improved T_2-weighted images. Hence, these MFe_2O_4 nanoparticles have great potential for magnetic nanodevice and biomedical applications.

P4.13

REMOVAL AQUEOUS AND GASEOUS METAL BY THE HEXAGONAL NANOSHEETS OF COAL-MOS4 LAYERED DOUBLE HYDROXIDE

Subrata Roy

Jackson State university, Jackson, MS

Water and air pollution due to heavy metal poses serious concerns due to its detrimental public health effects. In this work, we report the synthesis, characterization, and sorption properties of Cr^{6+}(aq) and Hg^0(g) by the novel $[MoS_4]^{2-}$ intercalated layered double hydroxide, CoAl-MoS_4-LDH (CoAl-MoS_4). Our results show that the CoAl-MoS_4 can effectively remove Cr(VI) ions from acidic, neutral, and basic media. At neutral medium, it exhibits a very strong affinity, $K_d \sim 1.91\times10^5$ mL/g, toward Cr(VI) ions. Under such condition, this material can remove over 99% of Cr(VI) from a $\sim10^4$ ppb of Cr(VI) contaminated solutions, leaving behind residual concentration below the World Health Organization (WHO) defined limit for drinking water. Moreover, our study shows that the CoAl-MoS_4 as a highly-competent Cr(VI) adsorbent exhibiting a removal capacity (q_m) as high as ~ 231 mg/g. The CoAl-MoS_4 follows pseudo-second order rate kinetics for the sorption of chromate, and the concentration dependent sorption data can be fitted well with the Langmuir sorption isotherm. Furthermore, the CoAl-MoS_4 is highly selective to Cr(VI) ions in the presence of various competitive ions in contaminated water systems. On the other hand, the mercury vapor capture experiment shows that mercury vapor adsorption capacity of this novel material is 2.3×10^6 µg/g. All these results suggest that the CoAl-MoS_4 is a very efficient sorbent for the decontamination of hexavalent chromate and mercury vapor from wastewater and polluted air, respectively.

P4.14

ENHANCING LC-MS QUANTIFICATION OF NUCLEOBASES BY CHLORO-ACETYLALDEHYDE PRECOLUMN DERIVATION

Amani Dickenson, Shuguang Wang, Yiming Liu

Jackson State University, Jackson, MS

The chemical Analysis of Nucleobases and Nucleosides is very important, they are highly sensitive. They both can serve as diagnostics and prognostic markers of various diseases. The use of mass spectrometry is common, it is a powerful analytical chemistry tool. To improve or enhance the mass spectrometry of nucleobases and nucleosides then the use of chloroacetylaldehyde (CAA) pre-column derived hydration would be needed. The purpose of this study is to develop a method for the measurement of cytidine in two different dilutions. After the chemical reaction between the compounds and dilutions, the samples are then analyzed for LC-MS analysis. We then found that the enhancement lies in different aspects. The first aspect is the improvement of the retention of analytes and reversed phased solids. The second aspect is improving the

mass spectrometry detection SRM mode.

P4.15

EFFECTS OF GROUP II METAL BINDING ON STABILITY OF DNA I-MOTIF STRUCTURES

Charlotte Powers, Randy Wadkins, Ali Younis

University of Mississippi, Oxford, MS

In addition to B-form helical DNA, DNA can adopt alternative secondary structures such a G-quadruplexes (G4s) and i-motifs (iMs). G-quadruplexes arise from guanine rich sequences of DNA and occur frequently near transcription start sites of several oncogenes and telomeric regions.[1] G4s have interesting properties like metal binding, dye binding, and porphyrin binding, enabling applications in biosensing such as thrombin sensors and intracellular pH sensors.[2,3,4] G4 structures have received great research focus due to their role in telomeric maintenance mechanisms and transcriptional regulation of oncogene expression. They are thought to be important targets for drug design, and there has been significant *in vivo* evidence for formation of G4s.[2,5]

Until recently, interest in secondary structures of cytosine rich sequences was low. In cytosine rich sequences, the N3 position of cytidine can be protonated creating an additional hydrogen bond resulting C•C^+ interactions and greater stability for the iM structure.[6] Protonation of the N3 position implies slightly acidic solution, thereby it was thought that the iM structure was irrelevant at physiological pH. However, it has been shown that molecularly crowded conditions shift the pH towards physiological pH.[7] Recently, direct evidence of *in vivo* formation of iMs was achieved using human antibody fragments.[8] Also, iMs have found use in biosensors such as a glucose sensor in urine/blood and intracellular pH sensors.[9,10]

The stability of iMs is affected by several factors such as DNA sequence, temperature, pH, ionic strength, and molecular crowding conditions. Temperature, pH, and molecular crowding conditions have well documented effects.[7,11,12] In contrast, the effects of ion presence in solution are less studied. Long et al., studied the binding preferences of a series of group two metals with dsDNA and found that Ca^+, Sr^+, and Ba^+ had a stronger preference for the phosphate backbone than Mg^{++}.[13] Day and colleagues investigated the effects of Ag^+ ions on iM formation and found a significant increase in thermal stability of iM structures in the presence of Ag^+ (1-5mM).[14] Bo Gao and Xi-Miao Hou studied the effects of potassium ions on thermal stability of iMs and found a stabilizing effect in PB (phosphate buffer), SCC (saline sodium citrate buffer), and SCB (sodium cacodylate buffer) and a destabilizing effect in MES and Bis-Tris buffers.[15] Additionally, they concluded that in some cases, an increase in T_m does not represent formation of iMs (rather some partially folded structure).[15] Interestingly, Kim et al., reported Na^+ and K^+ ions have a stabilizing effect, while Li^+ suppresses formation of iM structures.[16] further investigation of the human c-*jun* protooncogene sequence by Saxena and co-authors reveal stabilization of iM, as well as G4, structures in the presence of Mg^{++}.[17] Further studies are needed for divalent cation interactions with iM structures. Herein, we address the effects of group two metals ($MgCl^2$, $CaCl^2$, $SrCl^2$, $BaCl^2$, $BeCl^2$) on the thermal stability of i-motifs. This study examines the interactions between the C6T iM and a series of divalent cations (Mg^+, Ca^+, Sr^+, Ba^+, Be^+).

P4.16

USING 3D MOLECULAR MODELS OF CRYSTALLINE STATES TO TEACH CHEMISTRY

Aubrey Norris, Joe Bentley

Delta State University, Cleveland, MS

Visualization is very important to understanding many concepts in chemistry. Generous funding through MS-INBRE has allowed us to purchase a large number of inorganic crystalline lattice models from Klinger Educational Products. Some of the models that we have purchased include: Set of 9 Basic Crystal Structures, Set of 14 Bravais Type Lattices, Spinel, Inverse Spinel, Perovskite, Rutile, Anatase, and others. These models are being used in teaching chemistry classes at Delta State as well as making videos for Dr. Bentley's YouTube channel. Discussion of models are presented in the poster along with discussion of the videos.

P4.17

BUCKY BALL AND GRAPH THEORY

Benjamin Hemming, Joseph Bentley, Catherine Putnam

Delta State University, Cleveland, MS

Buckminsterfullerene is the most complex symmetric molecule found to date. They form the icosahedral group, which is the point group with the largest number of elements; hence, C_{60} can be called the most symmetric molecule. In 1985, an experiment was repeated by Harold Kroto, James R. Heath, Sean C. O'Brien, Robert Curl, and Richard Smalley at Rice University, who recognized the structure of C_{60} as a geodesic dome. The discoverers of the allotrope named the newfound molecule after Buckminster Fuller, who designed many geodesic dome structures that look similar to C_{60} and who died in 1983, two years before discovery. Molecular graph theory provides a structural representation of the chemical compound such that computable properties of the graph provide insight into the physical properties of the chemical compound. This project will explore how graph theory can be used to analyze Buckminsterfullerene. An example of molecular analysis using graph theory is the adjacency matrix of the molecular graph which is connected to the Huckel matrix in Huckel Molecular Orbital Theory. The energies and the molecular orbitals of the pi system can be determined from Huckel molecular orbital method.

P4.18

WHAT LURKS BENEATH THE SURFACE? MODELING ENVIRONMENTAL CONTAMINANTS RELEASED DURING FLOODING

Davis Bishop

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

Extreme flooding damages landscapes causing landslides and erosion. Heavy precipitation causing flash floods leads to forceful water accumulation into ponds, lakes, and streams. Heavy flood waters degrade water quality and damage aquatic habitats. Hidden beneath the water's surface, upheaval and changes in sedimentation can lead to the release on environmental contaminants such toxic metals causing further unseen damage to aquatic ecosystems. To better understand the impact of flooding on the release of contaminants, we collected sediment and water samples from a local lake, and performed a flood simulation. We measured the changes in toxic and trace elements in flood waters created from disruption of sediments using an ICP-OES. We compared the water quality before and after the flood simulation. We foundthat flooding increased the release of toxic and trace elements from sediment reducing the overall water quality. Here, we present our data, measuring the changes in toxic and trace elements induced by flooding. These changes in toxic and trace elements can be harmful for aquatic plants and wildlife, further demonstrating the hidden ecological damage of flooding far after the waters have receded.

P4.19

AMINO-ACID COATING CAPABILITIES FOR PLGA NANOPARTICLES

Deauntaye Jones

University of Mississippi, University, MS

In recent years, nanoparticles (NPs) have emerged as a promising form of targeted drug delivery that minimizes off-target effects seen with other forms of drug delivery; however, a major barrier to NPs success is an immune system response to the protein coronae, which forms on the NP surface post-intravenous injection. As an approach to bypass this barrier, ionic liquids can coat the surface of NPs to mediate the interactions between NPs and blood components. While ILs can act as a mediator, little is known about the capability of different ILs, specifically amino acid-base ILs, to coat NPs. This investigation gained insight into the influence on size and surface charge that different amino acid ILs had on NPs when coated. These findings suggest a variation in measurements among amino acid-coated NPs, and the possible differences in interaction during future blood testing of top candidates.

P4.20

CHEMICAL ANALYSIS OF A TOOTH GEM KIT

Charles Smithhart, Benjamin Hemming

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

A Tooth Gem is a fashion accessory in which the user glues a faceted "gem" to a cleaned tooth with a UV-cured adhesive. This dental decoration is designed to remain in place for up to several weeks. The components of a commercially-available Tooth Gem Kit were analyzed using FTIR (Fourier-Transform Infrared spectroscopy), SEM-EDS (Scanning Electron Microscopy with Energy-Dispersive X-ray Spectroscopy) and GC-MS (Gas Chromatography-Mass Spectrometry) to qualitatively determine the identities of the Tooth Gem kit materials. The general safety of the kit's materials will be discussed.

P4.21

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

Kaylee Hood, David Magers

Mississippi College, Clinton, MS

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 Thular and Zhao. Three correlation-consistent basis sets are employed: cc-pVDZ, cc-pVTZ, and cc-pVQZ. Natural Bond Order 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.

P4.22

CONVENTIONAL STRAIN ENERGY AND HYPERCONJUGATION IN CYCLO-PROPYLBORANE AND FLUORO AND CHLORO DERIVATIVES

Gabrielle Winters, David Magers

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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 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 Thular and Zhao, and the ωB97XD 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 Order analysis is employed to judge the degree of hyperconjugation in each system.

P4.23

STABILIZATION FACTORS IN FLUORO AND CHLORO DERIVATIVES OF 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 $C_3H_5CFH^+$, $C_3H_5CF_2^+$, $C_3H_5CClH^+$, 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 Thular and Zhao, and the ωB97XD 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 Order 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.

P4.29

GEOBIOCHEMISTRY OF ALKALINE PHOSPHATE-RICH LAKES

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Several lakes in British Columbia are among the most phosphate-rich lakes in the world. During Summer 2022, samples were retrieved from carbonate and phosphate rich lakes in British Columbia, Canada by researchers at the University of Washington. Here we present the first characterization of the biomolecule profile of such a high phosphate lake environment, which has applications to the early Earth, Mars, and other environments potentially favorable for developing life. Evidence for previous life on Mars may potentially be found in the form of biosignatures, which are the organic remains characteristic of current or previous biotic activity. Among potential biosignatures, lipids and fatty acids are notably important. By better understanding the relationship between the organic chemistry and geochemistry of these lakes, it may be possible to better constrain the necessary conditions for origins of life and whether planets within or outside our solar system fulfill such requirements. Following the development of an efficient and sensitive extraction protocol, we performed bulk and trace analysis on a suite of lake sediment samples by GC-MS, in complement to other analytical techniques.

P4.30

METHOD DEVELOPMENT FOR THE ANALYSIS OF PULQUE EXTRACTED FROM BLANCO LEVANTADO AMPHORAS

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College, Jackson, MS, [2]Millsaps College, Department of Sociology & Anthropology, Jackson, MS

Potsherds from the Mesoamerican region were collected for the analysis of pulque. This region was believed to hold the remnants of the amphoras that were used for the storage/distribution of many goods, and the amphoras themselves are built based on the role they served, whether it be storage, distribution, or both. Evidence from earlier research indicated that the potsherds analyzed 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. Due to the nature of pulque, with it consisting of lipids and fatty acids, it had to be derived 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 its products being thermally stable. The products of the derivatization serve as biomarkers that are indicative of pulque since the pulque in its original form is not be stable enough to have been preserved over the passage of times. A pulque reference was produced to obtain the biomarkers that were extracted from the pulque residue. The pulque was also grounded with potsherds similar to the ones analyzed to ensure that similar environments are sustainable for the pulque. In this presentation, we developed a method for the analysis of pulque residue in potsherds from the Mesoamerican region in Mexico.

P4.31

FREE EARTH ENERGY: OPTIMIZING ELECTRODE MATERIALS AND SOIL COMPOSITION FOR EARTH BATTERIES

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With the rising cost of energy production, America is heading towards an energy crisis. There are high demands for cheaper alternative energy sources. We looked to Mother Earth for answers and found the Earth battery. An Earth battery is a pair of electrodes made of two dissimilar metals buried in the soil capable of generating an electric current. These electrodes can tap into telluric currents and could be possibly used as an alternative energy source. To explore this idea further, we used computational analysis to determine the electropotential between different metals to find the optimal electrode combination for our Earth Battery. Next, we measured the current production of different electrode material combinations in soil. After, optimizing the electrode materials, we produced Earth batteries from a wide range of soil types. We compared the current production of the different soil types and analyzed the soil composition using ICP-OES. We examined the various electrolytes in the soil to determine optimal soil components and soil types for Earth battery production. Overall, this study suggests that Earth batteries are a plausible alternative energy source warranting further research into Earth batteries.

P4.32

INVESTIGATING BIOFILM FORMATION ON POLYMER SURFACES VIA FLOW CELLS

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Biofilms are colonies of bacteria which form on surfaces and secrete a matrix composed of nucleic acids, proteins, lipids, and other molecules. Biofilms grant increased antibiotic resistance and greater adhesion to surfaces. Biofilms pose a serious medical problem as they play a role in a significant portion of antibiotic-resistant infections that stem from growth on the surfaces of polymer-based medical devices such as catheters, gastric mesh, and prosthetic implants. This project used bacteriophages, highly specific viruses that target bacterial cells and destroy them via lysis, to control and prevent biofilm formation on polymer surfaces by creating a surface layer of attached bacteriophages. Plasma was used to attach maleic anhydride (MA) to medical grade polypropylene to act as a binding agent between the protein head of the bacteriophages and the polymer surface. This process was optimized by varying time of exposure to plasma and number of times one surface had MA attached to it, in order to have the most MA present possible, and was evaluated using attenuated total reflectance Fourier transform infrared spectroscopy (ATR-FTIR). Afterwards, carbodiimide coupling chemistry was used to bond the bacteriophages to the MA. Static condition plates were then used to optimize biofilm formation on polymer surfaces and to determine the most important variable factor in this formation, found to be the time of incubation. Flow cells designed specifically for holding these polymer samples were used to observe the effects of time of incubation and flow speed on biofilm formation and the anti-biofilm effects of the bacteriophage-coated surfaces. Biofilm formation was evaluated using crystal violet staining and measurement of absorbance using a UV-Vis spectrophotometer, in addition to light microscopy and confocal microscopy techniques. Preliminary results indicate that longer incubation times lead to more robust biofilm formations in both static and dynamic fluid conditions, and it is expected that there will be a gradual decrease in bacteriophage efficacy over time of incubation in dynamic fluid conditions.

P4.33

CALCULATION OF CONVENTIONAL STRAIN ENERGIES OF SMALL HETEROCYCLES OF CARBON AND SILICON BY MODEL REACTIONS

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The conventional strain energies for three- and four-membered heterocycles of carbon and silicon 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. 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 Thular and Zhao, and the ωB97XD 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 Order 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.

P4.34

A POLYPEPTIDE-BASED MULTI-FUNCTIONAL DRUG CARRIERS FOR TARGETED AND IMAGE-GUIDED DRUG DELIVERY

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Controlled and localized drug delivery is key for effective therapy with minimal side effects. Early-stage diagnosis, the accurate assessment of drug delivery efficiency, and the timely assessment of therapeutic response are also critical for disease treatment. One of the therapies that particularly demands controlled and localized drug deliveries is the treatment of cancers as most synthetic anticancer drugs are toxic to normal cell and poorly soluble in water. In this research multi-functional drug carrier is designed on a polypeptide platform. A functional polypeptide was developed, which combined an elastin-like polypeptide (ELP) , a cell penetration and Gd^{3+} binding amino acid sequences as well as an amino acid tag that can be used for conjugation with synthetic drug molecules. The final drug carrier can achieve thermally target delivery through the ELP part and in-vivo MRI imaging via the polypeptide-Gd^{3+} complex, which function as a MRI enhancing agent by increasing the T1 relaxation time. Niclosamide, a synthetic drug that has found effective in killing cancer cells was used as a model drug to test the feasibility of the proposed approach. Niclosamide was first reduced to convert a one nitro group to amino group which was conjugated to the polypeptide drug carrier by succinimidyl-4-(N-maleimidomethyl) cyclohexane-1-carboxylate (SMCC). The modification and conjugation of niclosamide were confirmed with FTIR and NMR spectroscopy. The T1 of the contrast-enhancing polypeptides was measured on a Niumag 0.5 T relaxometer. The niclosamide loaded polypeptide drug carrier was test on treating MDA-MB-231 breast cancer cells.

P4.35

ANION RECOGNITION STUDIES WITH TWO TRIPODAL UREA/THIOUREA RECEPTORS.

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Anion recognition and binding study is an interesting area of supramolecular chemistry due to various reasons. Anions play many important roles whereas excessive amounts can impose toxicity and cause environmental pollution. Artificial anion receptors can sense particular anions in solution state and can form stable association complex, thus helping in the remediation process. In this study two tripodal urea and thiourea based anion receptors have been synthesized followed by the study of their sensing and binding capabilities for common halides and oxo anions. Colorimetric study qualitatively shows the receptors can effectively detect fluoride and bicarbonate anion in solution as they produce visible color change. The magnitude of anion binding strength of the receptors was demonstrated and examined thoroughly through UV/Vis and NMR spectroscopic titration methods. Acknowledgement: The project described was supported by the US Department of Defense(Grant Number W911NF-19-1-0006).

P4.36

CREATION OF EXT1-DEFICIENT HEK 293 CELLS: A TOOL FOR EXPLORING THE ROLES OF HEPARAN SULFATE PROTEOGLYCANS IN EXOSOME BIOGENESIS AND VIRAL DYNAMICS

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Exosome biogenesis has been reported to involve interactions between the exosomal tetraspanin CD63, the CD63-binding PDZ protein syntenin, the syntenin-binding protein Alix, and the syndecans, a family of 4 syntenin-binding proteins that are major cell surface and exosomal carriers of heparan sulfate (HS). HS is a linear, O-linked polysaccharide that is synthesized by a complex series of

reactions in which the EXT1 glycosyltransferase and the NDST1 N-deacetylase/N-sulfotransferase play critical roles. Here. we explore the use of CRISPR/Cas9 gene editing to generate mutations in the syntenin, Alix, EXT1, and NDST1 genes, and describe the effects of these mutations on the expression of their respective gene products, on HS expression, and on exosome biogenesis.

P4.37

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-hydroxy-quinoline, 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 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 Thular and Zhao, and the ωB97XD 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.

P4.38

HYDROBORATION OF CARBONYL COMPOUNDS USING A [NI(H)(PSIME)(PPH3)] AND [NI(H)(PSIIPR)(PPH3)] CATALYST AT MILD CONDITIONS

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Silylphosphines such as $PSiH^x$ (x= methyl or isopropyl) are a kind of bidentate ligands with strong sigma donor character, ideal to synthesize nickel(II) complexes via oxidative addition of the Si-H moiety by the metal center.[1] Moreover, nickel is a low-cost transition metal, abundant and easy to handle. Therefore, a nickel(II) silylphosphine family of complexes has been synthesized, characterized by ^{1}H-NMR and $^{31}P\{^{1}H\}$-NMR, and used as a catalyst in the hydroboration reactions. Hydroboration of aldehydes and ketones has been demonstrated as an excellent synthetic path to functionalize organic molecules to be used as starting materials in further reactions such as C-C coupling[2] or to access to primary or secondary alcohols after the hydrolysis of the boronated ester.[3] This nickel(II) catalyst system (Scheme 1. **Ni1** and **Ni2**), hydroborates aldehydes and ketones chemoselectivity with HBpin at room temperature using a low catalytic load in benzene.

P4.39

SYNTHESIS OF MACROCYCLIC DIAMINOPOLYPHENYLETHYNYLARENES AND DIAMINOPYRIDINYLETHYNYLARENES

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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 diamino-pyridinyl-ethynylarenes. 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.

P4.40

PREPARATION OF CONJUGATED POLYPHENYLETHYNYLARENE MACROCYCLES

Elizabeth McRae, Bailey Steen, Trent Selby

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The preparation of π-conjugated macrocyclic organic molecules is a focus of our group. The syntheses of several macrocycles, with varying degrees of conjugation will be presented and can all be prepared from the same key intermediate structure, (3-ethynylphenoxy)(tert-butyl)dimethylsilane. This key intermediate was prepared from the commercially available 3-hydroxybenzaldehyde. Protection of the hydroxyl with *tert*-butyldimethylsilyl chloride in the presence of a weak base (imidazole), under microwave conditions gave the protected compound in 94% yield. The aldehyde functional group was converted into the terminal alkyne via Corey-Fuchs olefination reaction conditions in 87% yield. Sonogashira coupling (palladium/copper(I) iodide catalyst) of the terminal alkyne

with aryl halides gave polyphenylethynylarenes in high yields. Cyclization of the polyphenylethynylarenes alcohols can be accomplished under dilute conditions via nucleophilic substitution or acylation addition/elimination reactions. Structures of this type are expected to show directed energy and electron transfer and thus should be effective in the preparation of photoreactive materials such as electronic sensors or light harvesting materials.

P4.41

PLATINUM (II) COMPLEXES: MONOFUNCTIONAL VERSUS BIFUNCTIONAL MECHANISMS

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Cisplatin (cis-diamminedichloroplatinum(II)) is a FDA approved anticancer agent for the treatment of certain types of cancer. Hydrolysis of cisplatin's two labile chloride substituents forms an electrophilic aqua complex that generally reacts with the N7 position of DNA purine bases. The resulting adducts are mostly intrastrand 1,2-d(GpG) cross-links that cause DNA distortion, which hinders transcription and cell division ultimately leading to cell death. Cisplatin is not effective against all cancer types and induces a number of toxic side-effects, so efforts are ongoing to find novel, more effective and less toxic platinum (II) complexes. Platinum (II) complexes with only one labile substituent are termed "monofunctional" to distinguish them from the "bifunctional" complexes with two substitution-labile sites. Some monofunctional complexes exhibit anticancer properties, and they are useful in modelling the reactions of platinum complexes as the reduction in reactive sites makes interpretation of results easier. In this project, we describe the synthesis of new platinum (II) complexes with commercially available or novel substituents.

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P4.42

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

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Cancer cells are the result of disruption of tightly regulated metabolic pathways. This leads to uncontrolled proliferation of cells as seen in invasive tumors. Inhibition of certain metabolic enzymes thus might provide a tool to minimize the harmful effects of excessive cell growth. Two key phosphorylating enzymes, glycogen synthase kinase-3 (GSK3) and cyclin-dependent kinases (CDKs) are the target of researchers to interfere with cancer metabolism. Valmerins are isoindolone piperidines that have been shown to inhibit GSK3/CDK enzymes during cell proliferation. In this project, we are using the photodecarboxylative cyclization as a key step in the synthesis of GSK3/CDK inhibitors. The syntheses are initiated from affordable building blocks and culminate in the stereo-controlled synthesis of the target molecules.

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P4.43

SYNTHESIS OF PYRIDINE-BASED HIV INTEGRASE INHIBITORS

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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. In this project, we are constructing the pyridine core 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. This requires the extension by one carbon, which we accomplish by a Bode homologation reaction. Further incorporation of substituents on the pyridine core will determine the efficiency of the inhibitors.

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P4.44

COMPUTATIONAL SCREENING OF PYRIDINE-BASED HIV INTEGRASE INHIBITORS

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Allosteric inhibitors for the enzyme HIV integrase are developed to augment the HIV therapy which usually consists of a cocktail of three antiviral drugs. 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 AIDS virus. HIV integrase inhibitors are based on a heteroaromatic core, which can consist of simply a pyridine or quinoline core. In our lab, we focus on pyridine as a basis for the synthesis of HIV integrase inhibitors. The pharmacophore is well established and consists of a two-carbon sidechain containing a methine carbon carrying a *tert*-butoxy group and a carboxylic acid. The binding strength is determined by the substituents on the heterocycle and to predict potential successful substituents on the pyridine we run docking studies with the protein using the AutoDock software suite. So far, the literature-known compounds are correlating well with the calculations.

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P4.45

PEROXYGENATION AND OXIDATIVE FUNCTIONALIZATION BY ARTIFICIAL CU PROTEINS (ARCUPS)

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Cu dependent metalloenzymes catalyze myriads of reactions in nature. Lytic Polysaccharide Monooxygenases (LPMO), a mono nuclear Cu containing enzyme that was discovered in the last decade can efficiently degrade lignin and biomass. Unraveling the structure function relationship and reactivity with substrates in presence of terminal oxidant(s) will advance the underpinning of the mechanism how these enzymes play crucial role in activating inert C-H bonds of complex organic substrates that are useful in biofuel generation and bioenergy research. I will describe our approaches to design Artificial Cu Proteins (ArCuPs) employing de novo protein design and computational protein engineering tools that serve as the functional model of native enzymes. ArCuPs react with H2O2 to form Cu-Oxygen intermediate that activates C-H bonds of model organic substrates. Furthermore, modulations in the outer sphere coordination improved the catalysis by creating more space for substrate access. Insights into kinetics of formation of Cu-oxygen intermediates, priming reduction and reoxidation with O_2 and H_2O_2 are obtained by optical and fluorescence spectroscopy. Electrochemical determination of reorganization energy and fine tuning of redox potentials led to the detailing of kinetics of electron transfer which substantiate an outer sphere mechanism. A detailed functional study along with structural and spectroscopic characterization will be demonstrated.

P4.46

ANALYSIS OF TRACE ELEMENTS OF METAL ARTIFACTS FROM AN AMERICAN CIVIL WAR CAMPSITE LOCATED IN BENTONIA, MISSISSIPPI

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The American Civil War, from 1861 to 1865, was a civil war in the United States between the United States "the North" and the Confederate States of America "the South". The Confederate States of America includes the states of: South Carolina, Mississippi, Florida, Alabama, Georgia, Louisiana, Texas, Virginia, Arkansas, Tennessee, North Carolina, Kentucky and Missouri. In this 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. The site is located 5 miles away from the Battle of Benton Road, where 700 to 800 Confederate soldiers lost their lives in defense of Yazoo City. 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. To further validate these as Civil War artifacts, we conducted elemental analysis of Civil War artifacts with certified providence as a comparison. We obtained Confederate canister shot from The Battle of Appomattox Court House, Appomattox, VA, and an axe head from the Confederate camp in Smyrna, GA as our certified reference samples. The certified Civil War reference material was a good match to the artifacts uncovered at the study site and suggest these artifacts are genuine and date back to the Civil War period. This data also validates the Bentonia campsite as a real Civil War camp.

P4.48

HOLY SHARDS: ELEMENTAL ANALYSIS OF CERAMIC SAMPLES REVEALS SOCIAL AND TRADE NETWORKS ACROSS THE HOLY LAND

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Pottery, made out of clay and other ceramic materials hardened by heat, is one of man's oldest inventions. The earliest pottery dates back before the Neolithic period in 29,000 BC. Ceramic pottery served as mainly cooking and storage vessels as well as functional art. Pottery is divided into three major types: earthenware, stoneware and porcelain. Each requires its own specific clay material and varying firing temperatures. The studying pottery provides archaeological insight into cultures of the past. Understanding the unique characteristics of pottery collected from a particular location reveals a great deal the area's culture such as: technology, sophistication, and trade. In this study, we use ICP-OES to determine the chemical composition of pottery collected from various time periods and 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. Here, we present our results and chemical findings. We speculate that identifying the chemical composition of these archaeological samples will allow us to determine locations with similar or distinct pottery characteristics and provide evidence of shared culture or cultural exchange such as trade. This can provide better insight into the daily life, religion, and social relationships between these vast location and cultures across the Holy Land. We found similar composition in pottery samples indicating that there were vast social and trade networks across the Holy Land. Using social network analysis, we also found locations next to rivers or seas were major social or trade centers signifying the importance of aquatic transportation routes in cultural exchange.

P4.49

DETERMINING BLUE LIGHT EMISSION IN PLATINUM CCC-N-HETEROCYCLIC CARBENE PINCER COMPLEXES

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New molecular architectures for NHC pincer complexes have been researched and developed to emit light at 465nm wavelengths. Using these architectures as transitional metal ligands, we can develop a new material for use as a blue light emitter in OLED screens, the industry standard for blue light being 465nm. In our research, we are designing molecules based on these new architectures to investigate what structural changes lead to alterations in the absorption and emission of the wavelength. Our work has proceeded by using the modeling program, Cerius[2] to build the initial molecular structures and Gaussian 16 to calculate the optimizations, emission spectra, and absorption spectra. Approximately 120 unique architectures have received the emission calculations for the optimized architectures. The Goal of this work is to provide experimentalists with the best synthetic target molecules that emits at 465nm.

P4.50

DETECTION OF BLOODY FINGER MARKS ON DIFFERENT SURFACES FROM COMPLEX BACKGROUND USING A TURN-ON NIR FLUORESCENCE DYE

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Forensic analysis has successfully improved public security through the identification of trace evidence. It is well known that bloodstain analysis provides important forensic information about the crime under investigation. This study reports a novel fluorescent dye (sulfonate indolizine squaraine, SO_3SQ) for bloody fingermarks detection on different surfaces under near-infrared (NIR) irradiation. While the dye itself is minimally fluorescent in aqueous solution, it exhibits a "turn-on" mechanism upon binding with human serum albumin (HSA). The fluorescence intensity increases over 160 times with strong absorption and emission at 693 nm and 758 nm, respectively. There is minimal interference from background because NIR light is applied. Imaging results from this preliminary investigation indicate that the use of dye SO_3SQ makes it possible to detect fingermarks on different surfaces, such as the surface of paper, metal, plastic, and glasses. Overall, this technique will have both high resolution and non-destructiveness. It also can offer obvious advantages over the current technologies for identifying blood stains on different surfaces.

P4.51

SQUARAMIDE ORGANOCATALYZED DIASTEREOSELECTIVE ADDITION OF A MASKED ACYL CYANIDE TO A BETA-NITROSTYRENE

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Squaramide organocatalysts can catalyze reactions via dual binding modes that activate both the substrate and a nucleophile of appropriate p*K*a. We have demonstrated that masked acyl cyanide (MAC) reagents are applicable nucleophiles under these conditions. MAC reagents serve as an oxidation state 3 equivalent and were added to beta-nitrostyrenes in high yields and enantioselectivities using a chiral squaramide catalyst. This presentation will describe

an extension of this reaction to achieve diastereoselectivity by choosing a substituted, cyclic beta-nitrostyrene. We have developed and screened achiral squaramide catalysts for this reaction, which provide a similar organized transition state and effective conversions but are much simpler to access in only two steps. The products can be converted to beta-amino acids and other small chiral building blocks of use in drug discovery.

P4.52

SYNTHESIS OF ACHIRAL SQUARAMIDE ORGANOCATALYSTS FOR THE SCREENING OF NEW REACTIONS

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Squaramide organocatalysts (SQs) can catalyze a wide variety of reactions by taking advantage of noncovalent interactions between substrates. While these interactions are minute in impact alone, collectively they dictate the fate of the reaction and observed stereoselection. However, chiral SQs have the drawback of being fairly cost prohibitive and requiring lengthy or complex syntheses of the enantiopure arm(s) of the catalyst. For training new students and investigating new reactions, we have found achiral SQs to be a very good substitute. They are still able to achieve the requisite noncovalent interactions to encourage bond forming yet are readily accessible in two steps from diethylsquarate. They also can provide the racemic samples required for chiral HPLC when determining the enantioselectivity of the reaction. This presentation will discuss the synthesis of achiral SQs with various acidifying and basic groups. The catalysts are readily assignable by ^{1}H NMR and can be isolated via a simple filtering procedure without the need for further purification.

P4.53

DEVELOPMENT OF AN ASYMMETRIC ORGANOCATALYZED NUCLEOPHILIC ADDITION TO 1,3-DIARYLPROPENES

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Noncovalent interactions (NCIs) are the collection of both favorable and unfavorable interactions between molecules and include hydrogen-bonding, ion-dipole, and π-π interactions. These interactions are at the core of asymmetric catalysis using chiral catalysts to convert an achiral or prochiral substrate to a chiral product. Squaramide organocatalysts (SQs) are a privileged type of catalyst that can catalyze a wide variety of reactions by taking advantage of NCIs via one of two main modes of activation – either dual activation or chiral anion catalysis. The latter type involves a chiral ion pair and has been of interest recently based on the discovery of a chiral, SN1-type alkylation of a highly stabilized cation. We are interested in extending this system to other allylic substrates and a variety of nucleophiles. This presentation will describe the results of the screening of various Lewis acids and achiral squaramide organocatalysts with 1,3-diarylpropenes containing different leaving groups to more cost effectively screen reactions and probe reactivity. The products generated are small, chiral building blocks that provide a valuable derivatization of petroleum feedstocks for synthesis.

P4.54

SCALABLE THREE-STEP SYNTHESIS OF THE MASKED ACYL CYANIDE TBS-MAC

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Masked acyl cyanide (MAC) reagents are useful moieties that demonstrate umpolung reactivity by serving as an oxidation state 3 nucleophilic equivalent. Their weakly acidic methine hydrogen can be activated by a mild base, such as a tertiary amine, which makes them compatible in organocatalyzed reactions. TBS-MAC is a silyl-protected MAC reagent that is synthesized in three steps: 1) acetylation of malononitrile to form the sodium enolate, 2) protonation of the enolate to form acetylmalononitrile, and 3) epoxidation of the enol, rearrangement to form an unstable alcohol, and finally TBS-protection to form the title compound. While the synthesis of TBS-MAC is published in the literature, we have found complications including difficult to remove by-products, water solubility during workup, and scalability issues. These factors contributed to inconsistent yields and reproducibility in our hands. We have reworked the first two steps completely to provide high yields at various scales by taking advantage of solubility differences and filtration, without requiring any purification. For the third step, we have scaled up and can reproducibly synthesize the unstable hydroxy-malononitrile intermediate, which is then protected and purified resulting in consistent yields of 55-70% for TBS-MAC.

P4.55

THE INFLUENCE OF THE POLYOL SOLVENTS ON THE SYNTHESIS OF IRON OXIDE NANOPARTICLES

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ABSTRACT: The magnetic iron oxide nanoparticles were obtained under a simple polyol synthetic route. The polyol solvents play a crucial role in the structure and properties of the formed particles, such as size, colloidal stability, and uniformity, as well as the magnetic properties. The crystal structure and morphology of iron oxide nanoparticles were studied using TEM, XRD, FTIR and TGA. The magnetic properties of samples were characterized by superconducting quantum interference device (SQUID) magnetometry at 10K and 300K. The results show that the

size difference of as-prepared iron oxide nanoparticles synthesized in different solvents appears even bigger under a higher reaction temperature. As the chain length of the polyol solvent increases, the size of the synthesized nanoparticles also increases. The nanoparticles which synthesized in DEG solvent can be easily dispersed in aqueous media, however, precipitation occurred using other polyol solvents (e.g., TREG, TEG) due to the tendency of nanoparticles to aggregate. The magnetic test results show that the magnetism is not directly related to the structure of the polyol solvent, but to the size of the particles. We also observed that there are no obvious differences on MR contrast behavior for Fe_3O_4 nanoparticles synthesized by different polyols.

P4.56

DESIGN OF ANTIBODY CONJUGATED MAGNETIC NANOPARTICLES FOR THE SEPARATION, IDENTIFICATION AND DESTRUCTION OF MRSA SUPERBUGS

Sanjay Singh, Gautam Ray, Yongfeng Zhao

Jackson State University, Jackson, MS

In the twenty first century, one of the greatest health challenges worldwide is an infectious disease caused by drug resistant pathogens or superbugs. To address this problem, there is an urgent need to discover a novel antimicrobial agent for killing as well as early-stage screening of superbugs. Herein, we present the design of bio-conjugated *polyacrylic acid* (*PAA*) coated iron oxide based magnetic nanoparticle (PAA-IONP), which has the capability for magnetic separation, calorimetric immunoassay-based detection and killing of methicillin-resistant *Staphylococcus aureus* (MRSA). For the capturing of MRSA, we have used immunomagnetic separation. After capturing, for the identification of superbugs, we have used magnetic nanoparticles-mediated TMB (3, 3', 5, 5'-tetramethylbenzidine)-H_2O_2 colorimetric system. For the selective identification from complex mixture, we have modified PAA-IONP with anti-MRSA antibody. After separation, we have used an artificial enzyme to produce green colour by catalysis of TMB into oxTMB in the presence of H_2O_2. Once the bacteria were captured and detected, killing process was begun with photo thermal therapy (PTT) effect of oxTMB by using a laser of 808 nm. Experimental results show 88% capture efficiency for antibody attached magnetic nanoparticles with colorimetric detection limit of 10^2 CFU/mL. Using 808 nm near infrared (NIR) light, we have observed 100% of MRSA killed.

Friday, February 24, 2023

MORNING

Room D11

7:55 Divisional Welcome and Introductions

Session 4: Moderator-

O4.19

8:00 SYNTHESIS OF NOVEL COPPER(II) NHC COMPLEXES OF PYRIDINE-FUNCTIONALIZED BENZIMIDAZOLYLIDE LIGANDS AND STUDY OF ELECTRONIC INFLUENCE IN PYRIDINE RING

Selvam Raju, Bhupendra Adhikari, Mitu Sharma

Mississippi State University, Department of Chemistry, Starkville, MS

N-Heterocyclic carbene (NHC) containing ligands have been shown to support novel reactivity with first row transition metal ions. Building on our recent work describing copper(II) catalyzed C—N bond forming reactions, we report a series of copper(II) *N*-heterocyclic carbene [CuX_2(NHC)] complexes were synthesized from newly prepared pyridine functionalized benzimidazolylide ligand precursors to study the role of pyridine—Cu bonding interactions in the Chan-Lam-Evans reaction. Additionally, the electronic effect of central, substituted pyridine system was studied and several ligands with substitution on the 4-position of pyridine ring were synthesized. The complexes and pyridine-based benzimidazolylide ligands were characterized and their structures were investigated through ^{1}H and ^{13}C-NMR, HRMS, FTIR, single crystal X-ray diffraction, UV-Vis, and voltammetry. The reactivity of these complexes was assessed through the well-documented arylation of imidazole and aniline by aryl boronic acid activation.

O4.20

8:15 UNDERSTANDING THE MECHANISM OF CORONA FORMATION ON GOLD NANOPARTICLES IN SERUM AND SIMPLER MIXTURES OF SERUM PROTEINS

Tanveer Shaikh, Nicholas Fitzkee

Mississippi State University, Mississippi State, MS

Nanoparticles have been extensively used as antimicrobial agents against bacterial biofilms. But when nanoparticles are injected into the body, they are rapidly coated by proteins, forming a protein corona. These nanoparticles are then eliminated from the circulatory system by macrophages and never reaches the biofilm. Developing predictive models of bio-nano interactions is, therefore, of high interest. Here we present an in-situ study to understand the mechanism of corona formation on gold nanoparticles (AuNPs) in serum by tracking the behavior of bovine serum albumin (BSA) in complex protein mixtures. The binding of BSA on AuNPs is confirmed by ^{1}H NMR, UV-vis, and dynamic light scattering (DLS).

Serum albumin was isotopically tagged at Lys residues using ^{13}C formaldehyde as a methylating agent. A ^{1}H-^{13}C HSQC NMR spectrum reveals that the adsorption of BSA increases linearly as we increase the AuNP concentration. This led us to investigate the binding capacity of BSA on AuNPs. The effects of other serum proteins such as Transferrin (Tr), Fibronectin (Fin), and Immunoglobulin G (IgG) were determined on the binding of BSA on AuNPs using NMR spectroscopy. The data reveals that Tr and Fin can compete with BSA to bind to AuNPs, whereas IgG does not displace BSA. DLS analysis on these samples suggests that IgG forms aggregates of AuNPs and BSA can be displaced by Tr and Fin. Similar results were found when different combinations of these proteins were mixed. In the presence of serum, it was determined that the binding of BSA decreases as the concentration of serum is increased. A mixture of BSA, Tr, Fin, and IgG provides similar displacement behavior as complete serum. These results indicate that serum proteins at high concentrations out-compete a tagged protein of interest in complex mixtures. Circular dichroism revealed that protein mixtures could alter the protein secondary structure in unpredictable ways in the presence of AuNPs. This work demonstrates that each serum component uniquely contributes to the corona. Moreover, it suggests that a simple mixture of four protein components may be sufficient to reproduce many aspects of adsorption in complete serum.

O4.21

9:00 ELECTRONIC STRUCTURE STUDIES AND CHARACTERIZATION OF PYRAZINE(DIIMINE) NI AND CO COMPLEXES

Daniela Sanchez Arana, Jaylan R. Billups, Sidney E. Creutz

Mississippi State University

Redox non-innocent ligands are a versatile tool to enhance the reactivity of a metal complex. A very well studied class of redox non-innocent ligands are the pyridine(diimine) pincer ligands. Our motivation is to study the effect of incorporating an additional nitrogen in the aromatic ring of the pincer to lower the energy of the p* orbital. This nitrogen atom can provide an extra reactive site. Studies about the bonding of pyrazine(diimine) ligands with nickel and cobalt are presented as well as characterization and electronic structure analysis by DFT. The square pyramidal P^zDIMX_2 (M = Ni, Co) complexes undergo 1 e^- reduction with KC_8 resulting in square planar M(II) centers coupled to ligand radicals. Based on DFT, the spin density of the dihalide complex is localized on the metal while in the reduced compound, it is delocalized along the ligand. The ligand reduction is expected to lengthen the C=N imine bonds, which agrees with the bond distance changes observed by single-crystal X-ray diffraction. A trend is observed across the 1st-row series; going to the right in the series, covalency between the ligand and the metal center is increased. Our hypothesis of further reactivity of the *p*-nitrogen of the pyrazine ring is supported by cyclic voltammetry.

O4.22

9:15 DIRECT ACCESS TO SYMMETRICAL AND UNSYMMETRICAL BIS-ABNORMAL CCC-NHC PINCER COMPLEX PRECURSORS: C-H ACTIVATION FOR BIS(AZOLIUM) SALT SYNTHESIS

Alan Cecil, Evans Fosu, T. Keith Hollis

Mississippi State University, Mississippi State, MS

The copper-mediated methodology for the direct C2 arylation of bis(azolium) salts with aryl halides provides an efficient pathway to access symmetrical and unsymmetrical abnormal N-heterocyclic carbene (aNHC) pincer precursors. The mono- and di-arylation of bis(azolium) salts is easily controlled by the manipulation of reaction stoichiometry. This method is favored over the direct Cu-catalyzed coupling of previously C2 arylated azoles with disubstituted aryl halides. The assembly of arylated bis(azolium) salts play a vital role in the synthesis of materials for use in catalysis, organic light-emitting diodes (OLEDs), electrochromic devices, photovoltaic cells, ionic liquids, and biological systems. We demonstrate the broad scope of this Cu-catalyzed direct C-H arylation methodology with a variety of substituted aryl halides and bis(azolium) salts with good to excellent yields. The latest results will be presented.

O4.23

9:30 SYNTHESIS OF HETEROBIMETALLIC RUTHENIUM AND RHODIUM COMPLEXES INCORPORATING AROMATIC N-HETEROCYCLES AND A GROUP 13 METALS

Gabriela Sanchez Lecuona, Niroshani Abeyanayake, Virginia Montiel-Palma

Mississippi State University, Mississippi State, MS

One of the most common greenhouse gases is the family of nitrogen oxide (NOx) pollutants. Most of these components come from factories, vehicles, and burning fossil fuels that contain aromatic nitrogen compounds [1]. The hydrodenitrogenation (HDN) process is used in petroleum refining to eliminate the aromatic nitrogen compounds. However, this industrial method utilizes dihydrogen gas at elevated pressures and temperatures [2]. The study of heterobimetallic complexes is expanding today due to their unusual chemical properties and excellent catalytic activity in certain transformations. For example, some of these complexes have been used on N_2 activation [3], and hydrogenation of olefines [4]. In this regard, some synthetic designs have included complexes incorporating both a transition metal (TM) and a Lewis acid metal (M 'in this case, E = Ga, Al, In) [3].

We describe our efforts to generate arene zwitterionic complexes containing carbazoles and indoles in which the nitrogen atom is directly linked to a main-group metal (Al, Ga, In) moiety and the arene group is biding to the transition metal by η^6 modes in piano-stool geometries.

Spectroscopic approaches, including NMR in solution and solid-state, have been used to describe these complexes extensively. We explored the reactivity of these species towards hydrogen and employed computations to suggest reaction mechanisms.

O4.24

9:45 PROTEIN CHARGE DISTRIBUTION GOVERNS THE PROTEIN NANOPARTICLE INTERACTIONS

Chathuri Kariyawasam[1], Radha Somarathne[1], Railey Mayatt[1], Rebecca Conner[2]

[1]Mississippi State University, Mississippi State, MS, [2]Harrisburg University of Science and Technology, Harrisburg, PA

Bacterial biofilms are assemblies of microbial cells enclosed in an extracellular polymeric substance matrix, with the ability to attach to surfaces. The proteins on the surface of microbial cells play an important role on attaching the biofilms to surfaces. Therefore, it is important to understand how proteins interact with different surfaces. In this study, we use polystyrene nanoparticles (PSNPs) as a model surface and GB3 as a model protein to understand the interaction of proteins with surfaces. Proteins get adsorbed onto nanoparticle surfaces forming a "protein corona". Depending on the binding affinities and the exchange rates of the proteins, the protein corona can be composed of multiple protein layers on the surface, as "hard" and "soft" corona. The tightly bound proteins with high binding affinities form the hard corona, and the loosely bound proteins with high exchange rates form the outer, soft corona. In this study, we examine how protein charge distribution influences nanoparticle-protein interactions. Specifically, we investigate how protein variants (KXA variants of GB3) interact with PSNPs and study the nature of the protein corona. The binding affinities of the different variants to PSNPs are determined using isothermal titration calorimetry (ITC). The K19A GB3 variant exhibited the highest binding affinity for both non-functionalized PSNPs and carboxylate-functionalized PSNPs. Further, ITC thermograms suggest that this variant forms a monolayer, while other variants appear to bind in multiple layers. We hypothesize that the K19A variant has a flatter interaction surface with neutral charge that enables more efficient PSNP binding than other variants. Fluorescence denaturation experiments show that PSNPs destabilize GB3 variants. The correlation of ITC and fluorescence data reveal that the variants with higher binding affinity are destabilized more on nanoparticles. This suggests that GB3-PSNP binding has multiple thermodynamic signatures, each with its own characteristic binding interactions. This work demonstrates that the thermodynamics of nanoparticle binding can be understood using a protein's structure, an important first step toward predicting the protein-nanoparticle interactions.

O4.25

10:00 NANOPARTICLES

Jing Qu, Daniel Adams, Charles Collen

Jackson State University, Jackson, MS [2]The University of Southern Mississippi, Hattiesburg, MS

The magnetic iron oxide nanoparticles were obtained under a simple polyol synthetic route. The polyol solvents play a crucial role in the structure and properties of the formed particles, such as size, colloidal stability, and uniformity, as well as the magnetic properties. The crystal structure and morphology of iron oxide nanoparticles were studied using TEM, XRD, FTIR and TGA. The magnetic properties of samples were characterized by superconducting quantum interference device (SQUID) magnetometry at 10K and 300K. The results show that the size difference of as-prepared iron oxide nanoparticles synthesized in different solvents appears even bigger under a higher reaction temperature. As the chain length of the polyol solvent increases, the size of the synthesized nanoparticles also increases. The nanoparticles which synthesized in DEG solvent can be easily dispersed in aqueous media, however, precipitation occurred using other polyol solvents (e.g., TREG, TEG) due to the tendency of nanoparticles to aggregate. The magnetic test results show that the magnetism is not directly related to the structure of the polyol solvent, but to the size of the particles. We also observed that there are no obvious differences on MR contrast behavior for Fe_3O_4 nanoparticles synthesized by different polyols.

10:15 BREAK

Session 5: Moderator-

O4.25

10:30 RELATIVE STABILITIES OF AMINO, NITRO, AND METHOXY DERIVATIVES 6-METHYLPENTACENE AND 6-METHYLENE-6,13-DIHYDROPENTACENE

Whitney Schuler, 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 due to a [1,5]-sigmatropic hydrogen shift (*Nature* 1949, *163*, 921). Thus, the aromaticity of the central ring and the planarity of the overall compound is destroyed by this shift. In the current study we investigate if certain derivatives of these pentacene systems stabilize the methyl derivative relative to the methylene. Specifically, nitro, amino, and methoxy derivatives of pentacene are examined. 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 Thular and Zhao, and the ωB97XD 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. We gratefully acknowledge support from the Mississippi College Catalysts, the alumni support group of the Department of Chemistry & Biochemistry.

O4.26

10:45 DETECTING VOLATILE ORGANIC COMPOUNDS RELEASED FROM PLANTS: LITERATURE REVIEW AND PRELIMINARY DATA COLLECTION

Christopher Bartle, Amelia Craze, Courtney Roper

University of Mississippi, University, MS

A paper published in 2011 by Lit Et al. showed that scent detection dogs are highly susceptible to handler bias. This could be a major contributing factor to the average 600,000 marijuana related arrests each year. A new methodology for drug detection must be developed in order to eliminate the inherent bias behind the current methods of detection. For years, Gas Chromatography-Mass Spectrometry (GC-MS) has been the standard for identifying illicit drugs such as cannabis in a laboratory setting by first separating substances within a sample by way of gas chromatography and then identifying the substances that make up the sample by way of mass spectrometry. GC-MS samples prepared with thermal desorption (TD) are the gold standard for identifying odorous compounds such as those detected by drug detecting dogs. Most detection methods deal with samples physically collected, but our proposed method will be used to detect the presence of cannabis growth in the air. In order to create this method, a combination of air sampling and GC-MS analysis of volatile organic compounds (VOCs) associated with cannabis growth is needed. Preliminary investigation of this research is underway via literature review and pilot data collection. For this experiment, six small growth chambers will be constructed using PVC pipe and a wooden baseboard and sealed using plastic sheeting. Four pots will be placed into each of the chambers: 2 chambers growing cress, 2 growing beans, and two with only soil to act as a negative test control. Air samplers will be placed in each chamber, and air will be collected continuously onto filters for 2 weeks. Following filter collection, samples will undergo solid phase microextraction, analytes will be extracted from the sample filter, and then analyzed using GC-MS to identify VOCs present, and determine if the plants can be differentiated by the VOCs emitted during growth. Further tests confirming a VOC fingerprint for cannabis will be required, as well as tests to test how proximity and total plant mass affect the detected levels of VOCs. Further refinement of this technique could allow for a quantitative method of determining the location of illicit cannabis groves, and could eliminate the handler bias inherent to the use of drug detection dogs. The methodology could also be extended to detect other substances, like other drugs or even explosives.

O4.27

11:00 RELATIVE STABILITIES OF AMINO, NITRO, AND TRIFLUOROMETHYL 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 due to a [1,5]-sigmatropic hydrogen shift (*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, amino, nitro, and trifluoromethyl 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 Thular and Zhao, and the ωB97XD 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. We gratefully acknowledge support from the Mississippi College Catalysts, the alumni support group of the Department of Chemistry & Biochemistry.

O4.28

11:15 EXPANDED POLYSTYRENE CONSUMPTION BY INSECT LARVAE NATIVE TO MISSISSIPPI

Sydney Watts, Lillian Sisson, Scoty Hearst, Trent Selby

Mississippi College, Clinton, MS

Plastic pollution has become a major environmental issue due to the increase production of disposable plastic products. 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. The focus of this study is on expanded polystyrene and insect larvae native to Mississippi. Wild caught insect larvae of several different species were fed a diet of expanded polystyrene. Most species did not eat the polystyrene. All specimen of

one species that ate the polystyrene died within two days. Some species ate up to three-percent of their body mass in polystyrene per day. Depending upon the larva stage, some polystyrene fed larvae were able to pupate and then later, hatch. 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.

O4.28

11:30 ANALYSIS OF PULQUE RESIDUE IN AMPHORA USING PRINCIPAL COMPONENT ANALYSIS

Christine Rose Ward, Powers Lamb, Timothy Ward

Millsaps College, Jackson, MS

An archaeological study conducted at the Tula site outside of modern-day Mexico City revealed a interesting correlations between the location of ancient ceramic vessels, called Amphora, and their abundances. In general, it was found that the abundance of ceramics and pottery is usually much greater in cities than rural areas, however, Amphora seem to defy this trend. Unlike other ceramics, Amphora are found in significantly greater abundance in rural areas than cities or anywhere else. This unusual correlation suggests that Amphora had a practical or particular use that may have been suited to people of rural areas. One theory posits that the Amphora were used to store and frequently transport an alcoholic beverage called Pulque, which is thought to be an important trade item among ancient Mesoamericans of the region.

This research examines our own results as well as previously published data to develop a method to evaluate this theory. Samples of pulque were obtained, processed, extracted, and subsequently analyzed with GCMS. This analysis allowed for the identification of the different molecular constituents of Pulque. After several analyses, PCA (principal component analysis) was used to determine which combination of molecular constituents were most probably characteristic of pulque to aid in residue analysis and identification. It is expected that if the same combination of constituents or components of residue analysis are identified in samples from Amphora, it may be possible to confirm that the Amphora would have been used to store Pulque.

Friday, February 24, 2023

AFTERNOON

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

Ecology, Entomology, Evolutionary Biology, and Zoology

Chair: Seung-Joon Ahn

Mississippi State University

Co-Chair: Alex Acholonu

Alcorn State University

Vice-Chair: Nina Baghai-Riding

Delta State University

Thursday, February 23, 2023

MORNING

Room D6

8:00 Welcome

8:10 GUIDED EDUCATIONAL TOURISM AS INFORMAL PHYSICAL ECOLOGY EDUCATION ON ST. HELENA ISLAND, MICHIGAN

Joseph Lane

Delta State University, Cleveland, MS

Guided educational tours are a major activity within informal education. This presentation examines the potential for tour guides of a largely historical tour of St. Helena Island, Michigan, to include physical geography within their existing guided educational tour. Using field data and interview methods, the researchers identified the physical features of the island that could be included based on evidence provided by the tour guides.

8:40 SIMILARITIES AND DIFFERENCES BETWEEN THE LONGLEAF PINE SAVANNA OF THE SOUTHEASTERN UNITED STATES AND THE MIOMBO WOODLAND SAVANNA OF CENTRAL AFRICA

Mac Alford

University of Southern Mississippi, Hattiesburg, MS

Most comparative studies of the forests of the eastern United States focus on the close relationship of this flora with that of eastern Asia and western Europe, in particular the geographical connectivity, refuges, and migrations associated with climate change as outlined in the boreotropical hypothesis. The mixed mesophytic forest (temperate deciduous forest) is not the only forest of eastern North America, though. The modern eastern flora, particularly of the longleaf pine savanna, also has connections with tropical America and Africa, and these will be discussed.

9:10 TERTIARY PALYNOMORPHS FROM OLIGOCENE AND MIOCENE UNITS IN MISSISSIPPI

Nina Baghai-Riding

Delta State University, Cleveland, MS

Oligocene floras of the Gulf Coast region of the southeastern United States remain poorly known. As part of a larger study

of floras of the late Paleogene and Neogene of Mississippi, palynological samples were collected from the early Oligocene Forest Hills and Bucatunna Formations and the late Oligocene Jones Branch member of the Catahoula Formation. These three geologic units possess well-preserved and diverse assortment of 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. These palynofloras also are associated with leaf megafossils from fluvial/deltaic settings.

9:40 CHEMICAL ARMS RACE BETWEEN INSECT AND PLANT

Seung-Joon Ahn

Mississippi State University, Mississippi State, MS

Insects and plants have been co-evolved for a long time, shaping a complex network in their interactions. Plant chemical defense has acted as an important selection pressure where insect herbivores have adapted by evolutionary key innovations. Understanding chemical interactions is, therefore, crucial to figuring out the close relationship between insects and plants. My research focus is the insect-plant interactions using biochemical and molecular tools not only to understand host plant adaptation strategies of arthropod herbivores, but also to develop novel strategies for integrated pest management.

10:10 BREAK

O5.01

10:20 A GLUCOSE-CONJUGATING ENZYME IS HIGHLY EXPRESSED IN THE SILK GLANDS OF MOTHS

Courtney Wynn, Seung-Joon Ahn

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

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. Recently, a genomic analysis of the corn earworm (*Helicoverpa zea*), a serious agricultural pest species feeding on numerous economically important plants, identified 45 different UGT genes. We discovered a UGT gene (UGT34) showed high levels of expression exclusively in the silk gland tissue, but was not expressed in the other tissues, such as central nervous system, guts, fat body, and Malpighian tubules. The insect silk glands play a role in silk production but are not believed to be directly involved in detoxification. Quantitative and real-time PCR were used to analyze the expression levels of UGT34 in different instar stages and silk gland sub-segments, revealing that UGT34 is generally expressed at all instar levels and largely expressed in the middle and posterior subsegments of the silk glands. The soybean looper (*Chrysodeixis includens*), another noctuid moth species, was analyzed and found to have similar gene expression patterns, implying that UGT34 may play an important role in the silk glands of moths. For functional analysis, RNA interference (RNAi) was used, but revealed to be unsuccessful in determining UGT34 function. Silk plays a critical role in feeding, protecting, and metamorphosis in many lepidopteran insect species. Altogether, the present study implies that UGT34 plays an important role in silk glands, yet its molecular and physiological function needs to be determined by further study.

O5.02

10:35 MUTATION FREQUENCY ANALYSIS AND EXPRESSION PROFILING OF INSECT RYANODINE RECEPTOR IN SOYBEAN LOOPER, *Chrysodeixis includens*

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

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

Soybean looper (*Chrysodeixis includens*) (Lepidoptera: Noctuidae) is a serious pest of soybean, causing about 16% of the total insect damage in Mississippi and annually migrates from the Central America to the southern United States. Since the diamide insecticides were introduced to the market nearly a decade ago, its resistance cases have been reported from several insects within a short period of time. Ryanodine receptor (RyR) is known to be a primary target of diamides, which regulates calcium homeostasis in insect muscles. Recently, failures in management of the soybean looper with diamides have been stated by field entomologists. However, no research has been done in term of resistance mechanisms in soybean looper. In this study, we first identified the full-length sequence of RyR gene from soybean looper using molecular cloning method, resulting in a long coding sequence of the receptor (15,360 kb). Secondly, we screened for the potential mutation sites in RyR sequence using a Puerto Rico population, which had shown a significant degree of field resistance. Interestingly, no mutation site was detected at both I4790 and G4946 loci that are known to be associated with the diamide resistance in many other lepidopteran pests. The expression levels of RyR gene also was evaluated in the soybean looper based on the larval tissues, developmental stages, and chlorantraniliprole-induced states in soybean looper. It showed that RyR is highly expressed in the thoracic and abdominal integument and the third instar larvae. In addition, the exposure of sublethal dose of chlorantraniliprole decreased the RyR expression in 96 h. Finally, we are investigating the metabolic resistance mechanism to diamides, based on the transcriptome analysis of detoxification enzymes and synergistic bioassays. Our tentative results imply to develop a resistance management strategy in this economically important insect.

O5.03

10:50 CHROMOSOMES RECOMBINE AT A HIGHER RATE IN FEMALE MEIOIS IN A TROPICAL MAIZE HYBRID

Lee Gwonjin[1], Bailey Didon[2], Meixia Zhao[1]

[1]University of Florida, Gainesville, FL, [2]Delta State University, Cleveland, MS

Meiosis is a specialized type of cell division during which a single round of DNA replication is coupled to two rounds of chromosome segregation. During meiosis, a critical step is homologous recombination, which promotes homologous pairing and generates crossovers. Recombination is studied because plant breeding relies on it to map quantitative traits and introduce desirable traits into elite breeding lines. In many organisms, meiotic recombination differs between sexes. While a great deal is known about sex differences in overall recombination rates, relatively little is known about how and why sexes differ in recombination. Along with the differences in sex recombination, there are specific regions of the chromosomes that have a higher chance of crossing over. To identify genetic variation in sex-specific recombination, the Zhao lab has been using several maize lines including the 25 parental inbreds of the nested association mapping (NAM) populations in order to determine and compare recombination rates between female and male maize. This study examined recombination rates between sexes in a hybrid derived from one tropical maize line CML322 of the 25 NAM parental lines. The data show that recombination rates vary in different genomic regions and are generally lower in pericentromeric regions. Furthermore, recombination rates are overall higher in females compared to males in the hybrid. Together, the data suggest that meiotic recombination differs substantially between females and males in maize. With this crucial information, further studies can be performed to determine why the crossover rate was higher in females.

O5.04

11:05 MULTI STRESSOR IMPACTS ON HONEY BEE PHYSIOLOGY AND GUT MICROBIOME

Urita Agana, Hunter Walt, Angus Catchot III, Priyadarshini Chakrabarti Basu

Mississippi State University, Starkville, MS

Honey bees (*Apis mellifera* L.) are the major insect pollinators of many different crops. A drastic decline in the honey bee populations has been reported over the past decade. While many factors have contributed to this decline, pesticides, poor nutrition, and *Varroa* mites are the most common concerns noted by scientists and beekeepers. Aside from direct toxicity from pesticides, it has been observed that sublethal pesticide doses have effects on honey bee physiology and behavior such as oxidative stress, disruption of foraging and homing, olfactory inhibition and changes to honey bee neurophysiology. In addition, poor nutrition makes honey bees more susceptible to pesticide stress, parasites and pathogens and disrupts their ability to overwinter. The primary objective of this study is to examine the impacts of field realistic pesticide exposures and poor nutrition on honey bee gut microbiome diversity and individual bee physiology. In this study, 16 honey bee colonies were placed in each of the four different locations (Stoneville, Greenwood, Macon, and West Point) across Mississippi along an agricultural intensification gradient and with varying degrees of natural forage availability. Pollen and honey samples have been collected from these field sites to analyze for pesticides residues. In addition, live honey bees have been sampled for physiological assays and gut microbiome analysis. The experiment is currently ongoing, and the information gleaned from the results will reveal valuable insight about the interactions between these two stressors and their impacts on honey bees under field conditions.

11:20 Divisional Meeting

12:00 General Session

Thursday, February 23, 2023

EVENING

3:30 DODGEN LECTURE and AWARDS CEREMONY
Hall B

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

P5.01

AN EVALUATION OF VERNAL POOLS AT DAHOMEY NATIONAL WILDLIFE REFUGE, BOLIVAR COUNTY, MISSISSIPPI

Shelby Wolfram, Jori Lakes, Brianna Greyer, Nina Baghai-Riding

Delta State University, Cleveland, MS

Vernal pools are seasonal depressional wetlands that result from heavy winter rains. They occur in the bottomland hardwood forest at Dahomey National Wildlife Refuge (DNWR), Bolivar County, Mississippi from December to early April. Most are less than an acre in size and are underlain by hard, impervious clay. Vernal pools are important stopover sites for migrating birds as well as breeding habitats for macroinvertebrates and amphibians (salamanders and frogs). Over the past 16 years (2006-2022), during the months of February and March, Dr. Baghai-Riding's Materials and Methods of Environmental Science (BIO 415) class has conducted water quality tests on vernal pools located near the DNWR headquarters building. Each year, five-to-six passive leaf mesh traps are filled with leaf litter from deciduous trees that exist in the forested region. These traps are submerged in the deepest parts of vernal pools (10 – 32 cm) for three to four weeks. Time, date, geographic position, weather conditions, pool depth and pH, turbidity, iron, nitrate, and phosphate values are recorded at each leaf trap location. Following collection of the traps, the number of aquatic invertebrates and species diversity are assessed. Although leaf litter provides an important source of energy to food webs, the number of different taxa recovered each year has varied from three to seventeen species and the quantity of organisms has ranged from 54 – 207 individuals. Thirty-four species have been

noted throughout the past 16 years. Common taxa include chironomid midges, fingernail clams, planorbid snails and scuds; less frequent taxa are water pennies, water bugs, hellgrammites, crayfish, and water beetles. In 2022, 98 individuals were captured in the leaf traps, representing thirteen distinct species. Notable taxa included caddisflies, ticks, a water flea, and hellgrammites Students noted the water quality fluctuated throughout the vernal pools: pH, water hardness, water temperature (°C), soluble salts, and water depth. The shallowest region (11.5 cm) contained the best water quality and yielded the highest diversity of macroinvertebrates (11 species). In comparison, the deepest site (19 cm) only possessed two macroinvertebrate taxa. Students observed that juvenile crayfish, caddisfly larvae and tadpoles were common throughout the vernal pools in 2022. Overall, the water quality was determined to be good to fair based on the abundance of fingernail clams, planorbid snails, redworms, and aquatic sowbugs.

P5.02

MISSING PIXEL RECONSTRUCTION USING SOURCE-AUGMENTED PARTIAL CONVOLUTION: APPLICATION IN LANDSAT 8 LAND SURFACE TEMPERATURE IMAGE PATCHES

Wei Gao[1], Maosi Chen[1], Raja Reddy[2], Rita Deike[1]

[1]Colorado State University Fort Collins, CO, [2]Mississippi State University, Mississippi State, MS

Land surface temperature (LST) is key to monitor Earth's surface energy and water balance related landscape processes and responses. Taking Landsat 8 Analysis Ready Data (ARD) Land Surface Temperature (LST) image as an example, the Source-Augmented Partial Convolution v2 model (SAPC2) is developed to repair missing pixels in a "corrupted" Landsat LST image. SAPC2 utilizes the partial convolution U-Net as the framework and merges the information from a collocated complete source image in the progress. The design of the SAPC2 architecture encourages the two desired properties in the repaired image: smooth transition near the mask boundary and realistic fine textures inside the mask. The dataset (>5 million pairs of 64x64 LST image patches) were prepared on Google Earth Engine and the model was trained on Google Cloud Platform using TPUs. The optimized SAPC2 shows superior performance to four baseline models in terms of both visual inspection and metrics (e.g., 7%-59% lower masked mean squared error (MSE)).

P5.03

AVERAGE DATES AND DURATION OF FLOWERING OF THE KEY HONEY PLANTS IN MISSISSIPPI

Elena Kostyleva

Alcorn State University, Lorman, MS

In nature, honey plants compete for pollinators, seeking to bloom at different times, which is beneficial for beekeeping. The time and duration of flowering of the key honey plants determine the beginning and duration of the honey gathering season. In this regard, we carried out an in-depth study of flowering phenology of the key honey plants in the state of Mississippi. Studies have shown that the flowering season of the 25 key honey plants, which ensure the production of marketable honey in the region, under favorable conditions can begin as early as the first decade of February with the flowering of buckwheat tree, and end in early December with the end of flowering of asters. The seasonal dynamics of the flowering of honey plants is directly dependent on the geographical location of the place of their growth: the flowering of most species of honey plants in the north of the study area can begin, on average, 16 days, and end 17 days later than in the south. In addition to the timing of flowering of honey plants, the duration of their flowering has a significant effect on honey collection. In the southern areas of the study region, the maximum duration of the flowering period is, on average, four days shorter than in the northern areas, which is obviously explained by higher temperatures, contributing to a more active flow of the flowering phase of honey plants.

P5.04

REVIEW OF OSHA/EPCRA RIGHT TO KNOW ACT

Pao-Chiang Yuan[1], Lir Wan Fan[2]

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

The United States Code of Federal Regulations (CFR) is the codification of the general and permanent rules published in the Federal Register by the departments and agencies of the Federal Government. It is divided into 50 titles that represent broad areas subject to Federal regulation. Each title is divided into chapters, which usually bear the name of the issuing agency. Each chapter is further subdivided into subchapters, parts that cover specific regulatory areas. Large parts may be subdivided into subparts. All parts are organized in sections, and most citations to the CFR refer to material at the section level. Three of the regulations that relate to chemicals are 29 CFR Labor, 40 CFR Protection of Environment and 49 CFR Transportation. We will focus on certain parts of 29 CFR and 40 CFR. 49 CFR, dealing with transportation, will not be discussed. 29 CFR 1900 discusses Occupation Safety and Health Standards, specifically dealing with workplace Safety and Health, 1910 Subpart Z, Toxic and Hazardous Substances,1200. With 40 CFR, Chapter 1 discusses the Environmental Protection Agency, Subchapter J: Superfund, Emergency Planning and Community Right-to-Know (EPCRA) program. It requires industries to report on the storage, use and releases of hazardous substances to federal, state, and local governments. It is very clear that the Occupational Safety and Health Administration (OSHA) want employees and employers to know what kind chemicals you are working with, and Environmental Protection Agency (EPA) wants industries to conduct emergency planning for industrial accidents, toxic releases and to inform communities about what chemicals are in their area. Thus, it is your right and my right to know, in case of chemical emergencies at work and in the community.

P5.05

COMPARISON OF COMMONLY USED METHODS FOR EXTRACTION AND PURIFICATION OF ENVIRONMENTAL DNA FROM ENCLOSED STERIVEX FILTERS

Reneisha Sweet, Brent Thoma

Jackson State University, Jackson, MS

The use of environmental DNA (eDNA) is becomingly increasingly commonplace as a non-destructive approach for assessing community composition in marine environments. However, little standardization in methodology exists among various studies. Different filtration methods, preservatives, and extraction protocols have made it difficult to compare results among studies and often result in researchers "reinventing the wheel" to develop methods for their studies. Here we examine common approaches for extraction of environmental DNA from enclosed 0.22 µm polyether sulfone membrane Sterivex™ filters. Using samples filtered from 1-liter of prepared seawater with known concentrations of DNA, we test the recovery efficiency of 10 different extraction protocols. Extractions will be quantified using agarose gel electrophoresis and Qubit 4 Fluorometer. Comparing the results of these extractions will help to determine if any of these commonly used approaches is significantly better at recovery of DNA than the others. Preliminary results suggest that the volume of lysis buffer is a primary determinate in total yield while size of glass beads plays a secondary role. We present these results and discuss their implications for future studies.

P5.06

COMPARISON OF DNA YIELDS USING VARIOUS DNA EXTRACTION METHODS FOR SMALL FECAL SAMPLES FROM MARINE CRUSTACEANS.

Dwan Jackson, Kambrial Love, Brent Thoma

Jackson State Univerity

Although fecal DNA (fDNA) and stomach content DNA (scDNA) metabarcoding have gained increasing popularity in examining diet and clarifying feeding ecology. Many of the methods used in this study required significant volumes of scat or chyme, making this approach problematic for smaller-bodied organisms. While some efforts to use these approaches in arthropods have shown promise, methods of fecal DNA extraction remain inconsistent and published methods have shown varying levels of success in marine crustaceans. We examined the various approaches in extracting DNA from fecal samples in arthropods. We also conducted a series of experiments using these techniques as well as others to determine appropriate methods for extraction of fecal DNA from marine decapod crustaceans. Using a variety of off the shelf fecal or stool DNA extraction kits as well as several "homebrew" approaches (e.g., salt extractions, Chelex) we extracted fecal DNA from the beach ghost shrimp, *Callichirus islagrande*, and the Atlantic mole crab, *Emerita talpoida* (Crustacea: Decapoda). Following extraction, DNA was quantified using agarose gel electrophoresis and a Qubit 4 fluorometer. Here we present the results and provide suggestions on future extraction of fecal DNA from small-bodied organisms.

P5.07

CRISPR/Cas9 GENOME EDITING TOOL: UNDERSTANDING THE MOLECULAR BASIS OF HOST ADAPTATION IN INSECT PESTS

Sujin Lee, Seung-Joon Ahn

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

CRISPR/Cas9 is a genome editing tool that has been used for a functional genetic analysis in diverse fields of biological research. Once known as the bacterial immune system against invading viruses, the Cas9 enzyme with an engineered guide RNA (gRNA) can match the genomic DNA at a specific site that is cut. This triggers a DNA repair system, resulting in precise sequence changes to the gene of interest. We have developed a genome editing tool based on the CRISPR/Cas9 system targeting two important agricultural pest species: the soybean looper, *Chrysodeixis includes* (Lepidoptera), and the tarnished plant bug, *Lygus lineolaris* (Hemiptera). Both organisms are serious pest species of soybean and cotton in the southeastern United States. Even though the heritable genome editing technique has shown a great achievement in a few model species, there has been a critical lack of manipulative genetic tools for agricultural pest species. Here, we demonstrate the CRISPR/Cas9 technique that is optimized in these insects, including an effective method for the precise microinjection of gRNA into eggs. CRISPR/Cas9 technology will promote the exploration of gene functions playing an important role in adaptation of herbivorous insects, providing an insight not only on a comprehensive understanding of plant–insect interactions at the molecular level, but also on a novel pest management strategy based on biotechnology.

P5.08

DEVELOPMENT OF DNA BARCODES FOR *Lepidophthalmus louisianensis* AND THEIR USE IN DEVELOPING BLOCKER PRIMERS FOR FECAL DNA METABARCODING.

Julian Venable [1]

Jackson State University, Jackson, MS

Lepidophthalmus louisianensis is a common prey to several species of conservation or fisheries concern and plays a critical role in estuarine communities both through the bioturbation and aeration of sediments. However, despite their importance in the estuarine environments of the northern Gulf of Mexico, the diet of *L. louisianensis* is currently unknown. While the literature suggests that this species is a filter feeder, observations of "grazing" on their burrow walls has led some to suggest that they might be deposit feeders that use their feces to grow bacterial and fungi in their burrow walls. Our primary objective is to use fecal DNA metabarcoding to determine the diet of *L. louisianensis* and we propose to use environmental DNA (eDNA) metabarcoding of the burrow walls and surrounding water to determine the diet and feeding ecology of *Lepidophthalmus louisianensis* by comparing the genetic composition of the feces to those of the burrow walls and the surrounding water. Metabarcoding of 4 genes COI,

16S, 18S, and rbCL is underway for the fecal, burrow wall, and water samples and these communities will be compared. A critical intermediate step in this process was the development of DNA barcode data for *L. louisianensis* and the use of those barcodes to generate blocker primers to prevent amplification of host DNA in fecal DNA metabarcoding reactions. Here we present the results of these efforts and discuss their importance in evaluating feeding ecology and diet in future studies.

P5.09

POPULATION CONNECTIVITY OF THE CAMP SHELBY BURROWING CRAYFISH, Creaserinus gordoni .

Daija Green, Reneisha Sweet, Brent Thoma

Department of Biology, Jackson State University, Jackson, MS

Creaserinus gordoni, commonly known as the Camp Shelby Burrowing Crayfish, is known only from a small area in Perry County, MS where it is primarily found in pitcher plant wetlands. According to the Mississippi State Wildlife Action plan, *C. gordoni* is considered critically imperiled and is listed a candidate species by the US Fish and Wildlife Service. Extensive sampling efforts in the area indicate that this species may have a naturally limited range making them highly susceptible to disturbance and habitat loss. While *C. gordoni* is a burrowing species and, as such, is not reliant upon streams or rivers dispersal or ensuring gene flow between populations, specimens of *C. gordoni* have been collected from areas that are part of both the Cypress Creek Watershed (Black Creek drainage) and Beaumont Creek (Leaf River drainage). These river drainages are separated by a drier upland area where evidence of these crayfish is rare and thus maintenance of gene flow between these drainages is questionable and suggest that specimens attributed to *C. gordoni* may represent different genetic stocks on either side of this natural BREAK. To examine patterns of gene flow and uncover potential population structure among specimens attributed to *C. gordoni*, tissue samples from approximately 150 individuals, from throughout its range, were collected and cryogenically frozen in the field. In the lab, total genomic DNA was extracted and ~700 bp of the mitochondrial gene cytochrome c oxidase subunit 1 (COI) was amplified using PCR. PCR products were checked for quality via agarose gel electrophoresis before being cleaned via ExoSapIT. Following PCR cleanup, products will be sequenced using a SeqStudio Flex at the University of Mississippi Medical Center's Molecular and Genomics Core facility. Sequences will be cleaned and checked for quality control issues before being aligned. DnaSP will be used to generate a haplotype sequence file and to create a median-joining network that will be used to examine patters of connectivity among the crayfish sampled. This work will be used to inform management decisions for critically imperiled Mississippi endemic.

P5.10

NITROGEN-FIXATING FRESHWATER MICROALGAE FLOCCULATION USING NATURALLY DERIVED BIOMOLECULES

Kaldrian Moore, Catherine Thomas

Tougaloo College, Tougaloo MS, US Army Corp of Engineers, Vicksburg, MS

Over the past 100 years, harmful algal blooms (HABs) have been on a steady rise in the United States, more specifically coastlines and residential bodies of water. HABs are bodies of greenish cyanobacteria that grow in varying bodies of warmer climate water systems that normally form floating mats of algae at extreme levels. The issue with HABs is that they release differing toxins that are harmful to the aquatic ecosystem and humans depending on the specific type of algae. Not only are HABs proving to be detrimental to health, but they are also costing the United States upwards of one billion dollars annually to dispose of. HABs have been plaguing commercial and residential areas and coastal lines and depreciating the values of homes in these areas, due to their ever-present threat level. In the case of this study, we utilized *Anabaena spiroides* and *Microcystis aeruginosa* which were extracted from lake Okeechobee in Florida to test flocculation capabilities. Although both are forms of microalgae, they release a starkly different form of cyanotoxin with *A. spiroides* releasing anatoxins and microcystins, and *M. aeruginosa* releasing only microcystins. The significance of this study is to identify a bio-based compound that can effectively bind and precipitate algal colonies and remain stable over time under varying environmental conditions and increased levels of nitrogen. Due to the setup of the agency, the research project is performed in stages per year with increasing levels of employment and real-world application. Fiscal year one consisted of lab testing amendments such as chitosan, bentonite clay, and a commercially produced flocculant known as GeoFlow & BioFlow to determine which amendment precipitated the algae best, while also raising and lowering the pH level to mimic a body of water. Fiscal year two consisted of mimicking real-world conditions such as adding nitrogen to cultures and building a miniature wave tank to simulate whether the amendments would continue to bind the microalgae together under turbulent and natural conditions. At the completion of stage one, we found that a mixture of both GeoFlow & BioFlow coagulated the different forms of microalgae most efficiently.

P5.11

THE EFFECT OF DIFFERENT SIZE GOLD NANOPARTICLES ON SOIL MICROORGANISMS

Talija Johnson, Matthewos Eshete

Mississippi Valley State University, Itta Bena, MS

Gold nanoparticles (GNPs) have physical and chemical properties that are unique and different from the standard Gold particles due to their high surface area to volume ratio. Research interest in many fields of study for these nanoparticles has significantly increased over the years. They are widely known for their biocompatibility and unique optical properties. Upon synthesis, size and geometrical properties could be controlled and manipulated to be used for

specific applications. Their unique physical and chemical properties make them a good candidate for various applications, including but not limited to genomics, biosensors, laser phototherapy of cancer cells, drug delivery, etc. Research also showed GNPs as inhibitors of the growth of certain microorganisms. The goal of this experiment is to investigate the effect of different size GNPs on soil microorganisms. There are up to 10 billion bacterial cells that inhabit each gram of soil. The five main types of microorganisms that dwell within the soil are archaea, bacteria, fungi, protozoa, and viruses. They are responsible for most enzymatic processes in soil and store energy and nutrients in their biomass. Soil samples were collected from 3 different locations, and the microorganisms were then grown in the lab, and individual cell colonies were isolated. The isolated cell colonies were treated with three different sizes GNPs (10 nm, 30 nm, and 60 nm in diameter) using the spread and patch method. Growth inhibition was noted for some of the isolated microorganisms. The degree of inhibition varies with the size of the GNPs.

P5.12

AN ANALYSIS OF STORM DRAIN ACROSS DELTA STATE UNIVERSITY CAMPUS, CLEVELAND, MISSISSIPPI

Matthew Nichols[1], Connor Jones[2], Justin Trace McNabb[2], Noah Thigpen[2], Leo Edwards[2], Nina Baghai-Riding[2]

[1]Mississippi State University, Starkville, MS, [2]Delta State University, Cleveland, MS

Storm drains are an important part of an urban landscape. They help to prevent flooding by diverting excess water from roads and other paved surfaces. They also reduce erosion and maintain property value. Water that flows into a storm drain usually is not treated by a wastewater treatment plant. It can contain toxic residues generated by motorized vehicles, pesticides, road debris, sediment, fertilizer residues, and more. The stormwater released into channels, streams or rivers can then contaminate wildlife downstream and impact food webs. Additionally, storm drains often are neglected. They can become clogged by leaf litter, grass clippings and mud which may cause damage overtime. There are approximately 400 storm drains on the Delta State University campus in Cleveland, Mississippi. The landscape around the university is flat (elevation around 150 ft.) and is prone to flooding. The university is in the Mississippi River floodplain, locally known as the "Mississippi Delta" with soils consisting of 50-60% clay, 30-40% silt, and less than 5% sand. In February 2022, the BIO 415 Materials and Methods of Environmental Science class surveyed 160 campus storm drains. The students recorded their latitude and longitudinal coordinates by using a Garmin eTrex 10 handheld Navigator. Students also observed and recorded the debris and standing water around and inside each storm drain. Students also determined if the storm drains were clearly marked with a no dumping emblem sticker. The collected field data were entered into ArcGIS Pro for further analysis. Results showed that 51% of the storm drains were in good condition; the storm drain grates were not damaged, leaves and other debris did not cover the grates, and the storm drains were devoid of litter and standing water. Storm drains in the best condition occurred near Highway 8 along the north side of campus. Storm drains needing the most maintenance occurred on the south side of campus. Additionally, 57% of the storm drains were marked with a symbol that reads 'No Dumping'. Students reported these data to facilities management to enhance campus improvements with regards to public safety: reduce flooding, improve drainage conditions, and enhance aesthetics.

P5.13

LOCALLY GROWN FRUIT SPREADS RETAIN THEIR SOIL SIGNATURE

JuEun Yun, Nina Baghai-Riding, Chuck Smithhart, Eldi Seiti

Delta State University, Cleveland, MS

Fruit plays a vital role in our nutrition and economy because many products including juices, ice cream, and jams/jellies can be derived. During the spring semesters (2017-2022), the BIO 415 Materials and Methods in Environmental Science students selected four to six jam spreads and compare their chemistry to the local soils by using the Natural Resources Conservation Service (NRCS) database and geologic maps. In spring 2022, students studied four jam samples: raspberry from northern Kansas City, Missouri; muscadine grape from Altus, Arkansas; cranberry jam from Cape Cod, Massachusetts; and strawberry from Girvan, Scotland. One-hundred-fifty or more grams of each jam sample were placed into an evaporating dish. Each sample was cooked on a hot plate at 85° C for two weeks to remove as much water as possible. Next, the samples were placed into porcelain crucibles, loaded into a benchtop muffle furnace, and heated to 1000° C for 24 hours. This resulted in each sample becoming an ash which was then weighed and preserved. Dr. Chuck Smithhart's CHE 434 Environmental Chemistry class used a JEOL scanning electron microscope with an integrated Energy-dispersive X-ray Spectroscopy (EDS) analyzer to determine the chemical composition and nutrients present in the four ash samples. Eight elements were recognized: sodium, magnesium, silica, phosphorous, potassium, calcium, aluminum, and carbon. All eight elements were present in the muscadine grape; aluminum was not detected in the strawberry and the cranberry. High values of calcium, oxygen and silicon were associated with the strawberry sample, reflecting the property of mafic igneous rocks in Scotland. High carbon values in the muscadine grape reflects an organic rich soil in Arkansas. The Cape Cod cranberry is suggestive of a Pleistocene glaciated till and shoreline deposit. The raspberry sample from northern Kansas City suggests a limey soil due to the high percentage of calcium and magnesium. Additionally, the textures of each jam sample varied; layered, pitted, and wavy; the cranberry sample appeared to possess cellular details. This project and these results enabled students to develop awareness of how elements in the soil and geologic processes can influence the chemical composition of fruit spreads.

P5.14

A PLANT ANATOMICAL INVESTIGATION OF *Hydrocotyle bonariensis Comm. ex Lam*

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

Delta State University, Cleveland, MS

Hydrocotyle bonariensis Comm. ex Lam. (largeleaf pennywort, Araliaceae) is native to the Mississippi Gulf Coast. Its native range is from Argentina to North Carolina, and it is an ecological indicator in coastal areas including estuaries, sand dunes brackish wetlands, riparian habitats, and more. However, a population consisting of over two hundred individuals exist in Bolivar County, MS by a clay-rich ditch bordering the Bear Pen Park softball field. *Hydrocotyle bonariensis* has an underground rhizome; round, orbicular leaves with rounded scalloped serrations, and an umbel inflorescence, which may possess several levels of pedicels. Leaf petioles are slender and attached in the center of the leaf lamina. The flowers are greenish-white and are approximately 2-3 mm in size. Anatomical observations for this plant species have not been described previously. Using fresh samples, anatomical observations and cell measurements on stems, roots, leaves, and inflorescence components were completed. Single-edged razor blades and hand-held microtomes were used in preparing thin-sections. Prepared slides were stained with neutral red dye. Digital photographs were taken using an Olympus BX43 microscope with an attached Q-color 3 camera. Thirty-five measurements were taken on major cell components: parenchyma in petiole, pedicel, 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 µm and width 20 - 81 µm), pedicel epidermal cells (length 8 - 20 µm and width 8 -22 µm) and subsidiary cells on the leaf adaxial surface (length 8 - 45 µm, width 16 - 46 µm). Significant anatomical features include amphistomatic stomata, arrangement of vascular bundles in the petiole (seven in a ring and one in the center), prolate pollen, absence of collenchyma in upper areas of the peduncle and pedicles. Future research includes making cross-sections sections of roots and leaves using a microtome and examining the surface details of petioles and leaf blades using a scanning electron microscope.

P5.15

A PRELIMINARY PLANT ANATOMICAL INVESTIGATION OF *Geranium dissectum* L. (Geraniaceae)

Geona Miles, JuEun Yun, Nina Baghai-Riding,

Delta State University, Cleveland, MS

During the Spring 2022 semester, students in Dr. Baghai-Riding's Plant Anatomy course at Delta State University were assigned a semester group project on an herbaceous weed found in the Mississippi Delta. Our group selected *Geranium dissectum* L. (cut-leaved geranium, cranesbill), an invasive species, that occurs throughout the eastern, southern, and western regions of the United States. This species inhabits waste grounds, grasslands, hedge banks, and other disturbed areas. Cut-leafed cranesbills are in flower from February – April in the Mississippi Delta and grow 12" to 24" in height. Single-edged razor blades were used to take anatomical sections of its leaves, roots, stems, and flowers. Digital photographs were taken with Q-Color 3 camera that was attached to an Olympus BX43 microscope. Longitudinal cuts of the stem possess xylem cells showing secondary annular thickening. The upper epidermis of the leaves has trichome bases and regular epidermal cells that resemble jigsaw puzzle pieces. Leaf lower epidermal peels possess anomocytic stomata since the stomata lack subsidiary cells. Mesophyll containing chloroplasts occurred on leaf peridermal sections. Transverse root sections have the xylem in the center and an abundance of starch grains in the cortex, which is common in dicotyledonous angiosperms. Trichomes were found on the leaves, leaf petioles, stems, and flowers. Pollen grains were present on the petals and anthers. The anatomical features evaluated are typical for other species of geranium. Future work will include measurements of cells and reproductive structures.

Friday, February 24, 2023

MORNING

10:00 FIELD TRIP

MISSISSIPPI AQUARIUM IN GULF PORT, MS

Geology and Geography

Chair: Claire Babineaux

Mississippi State University

Co-Chair: Alyson Brink

University of Southern Mississippi

Thursday, February 23, 2023

MORNING

Room D5

8:20 Welcome

O6.01

8:20 THE POLYPHASE DEFORMATION HISTORY OF THE EMPLACEMENT OF THE DADEVILLE COMPLEX: GROWTH OF THE LAURENTIAN MARGIN DURING THE ACADIAN OROGENY, CUSSETA QUADRANGLE, SOUTHERN APPALACHIAN MOUNTAINS

Jeremy Deans, Timothy Black

University of Southern Mississippi, Hattiesburg, MS

The Dadeville Complex is a volcanic island arc that formed during the Taconic Orogeny (Tull et al., 2018) part of the Inner Piedmont province. During the Acadian Orogeny, the Dadeville Complex was emplaced onto Laurentia to the west, pinned by the Carolina superterrane to the east. The role of terrane emplacement during the Acadian Orogeny is not well constrained. The Cusseta quadrangle is located in east-central Alabama and includes the Dadeville Complex and the Opelika Complex separated by the Stonewall Line. Within the Cusseta quadrangle, the Dadeville Complex includes meta-volcanic, meta-plutonic, and meta-sedimentary rocks containing the Ropes Creek Amphibolite, Waverly Gneiss, and the Agricola Schist, respectively. Foliations are defined by plagioclase and amphibole in the amphibolite and by plagioclase and micas in the gneiss and schist. The strike of the foliations is broadly NE-SW with dips mostly to the SE, however, many foliations dip to the NW and there are some that dip to the NE and SW. Lineations are best recorded in the amphibolite defined by plagioclase and/or hornblende, some of which were measured in the field, others were measured back in the lab after an oriented sample was cut to better delineate the structure. The majority of the lineations plunge broadly to the east (trends range from 060-120), but a few plunge to the north or south. The outcrop pattern of the Waverly Gneiss indicates isolated areas surrounded and separated by the Ropes Creek Amphibolite. The isolated areas have a repeating pattern that has a bearing N-S, but each area also has an arcuate shape that is convex to the east. This repeating and arcuate pattern is consistent with superposed folding, specifically Type 2 (Ramsay and Huber, 1987). In Type 2 superposed folds, the first generation of folding is reclined to recumbent, and the second generation of folding is upright. In this case, the fold axes, and the corresponding shortening axes, are close to perpendicular to each other. It is likely that the N-S trending fold axis was formed first and then the area was refolded with a fold axis trending E-W. Since both fold axes are paralleled by amphibolite grade mineral lineations, and there is little to no greenschist grade overprint, it is likely that both folding events occurred near peak metamorphic conditions during the Acadian Orogeny. One potential explanation could be an initial collision and partial subduction of the Dadeville Complex under the Carolina superterrane when the Dadeville Complex was still outboard of the Laurentian margin (e.g., Huebner et al., 2017). This collision could have caused E-W shortening in the Dadeville Complex. Once most of the oceanic crust of the Laurentian margin was subducted, collision between Laurentia and the Carolina superterrane began, with the Dadeville Complex pinned in between. The Dadeville Complex could have rotated or the strain field between Laurentia and the Carolina superterrane could have rotated such that the shortening direction was mostly N-S. This suggests that some terranes may record a polyphase history before being finally emplaced during the same orogenic event.

O6.02

8:40 NUMERICAL INVESTIGATION OF HEAT TRANSFER IN BASALT

Tomas Mondragon[1], Reena Patel[1], Jeffrey Allen[1], Oliver-Denzil Taylor[2]

[1]US Army Corps of Engineers ERDC ITL, [2]US Army Corps of Engineers ERDC GSL

The mechanical BREAKdown of bulk mineral deposits using traditional grinding methods for purposes of energy extraction or other forms of geotechnical mining processes is known to be highly inefficient. In fact, various sources cite that in some countries (including the United States, Australia and South Africa), these traditional mining processes may require up to 2% of the total national energy asset and return on average only 1% of this energy for useful purposes. Energy losses due to excessive noise and heat constitute the primary liabilities, but other factors, including machine wear, pollution, and rising project costs must also be considered. Some of the currently researched methods to improve these aforementioned liabilities involve heating the rock to induce internal stress fractures that make it easier to extract or remove rock with traditional mining equipment. The goal of this research is to analyze the effect of heat on a homogeneous and isotropic basalt sample using two leading commercial software packages. In this work, a basalt cylinder with 25 mm radius and a 158 mm height is subjected to a surface heat flux approximating the effects of a torch applied to the top of the cylinder. Basalt samples and thermal loads are generated using identical dimensions in both Abaqus and COMSOL. Stress distributions and temperatures obtained from both software suites are compared. Comparable results were obtained using both software for the simple test case used in the current study. Future work will involve using damage models and increasing the complexity of the numerical model to include additional factors such as material heterogeneity.

O6.03

9:00 DISTINGUISHING PRE-LOESS TERRACE DEPOSITS FROM MIOCENE SUBCROP, NATCHEZ, WASHINGTON, AND PINE RIDGE QUADRANGLES, MISSISSIPPI

Tim Palmer

Mississippi Department of Environmental Quality, Jackson, MS

The challenge of mapping and building a stratigraphic framework for the post-Oligocene across the coastal plain is due to a lack of biostratigraphic control, clastic on clastic deposition, loess cover, and locating suitable outcrop for mapping. The section is dominated by fluvial to deltaic depositional environments characterized by a thick sequence of breccias, conglomerates, sands, silts, and clays. However, distinct petrologic and mineral compositions can be determined resulting from varied source terranes. Therefore, detailed lithologic descriptions (e.g., hardness, color, sorting, grainsize, composition, and sedimentary structures) were utilized by the Surface Geology Division for correlating and mapping the post-Oligocene section on the Natchez, Washington, and Pine Ridge quadrangles, Adams County, Mississippi. Preliminary petrologic results indicate that Pre-loess Terrace Deposits are characterized by unconsolidated conglomerate to boulder sized very hard, sub-rounded, and moderately sorted clasts whereas the Miocene subcrop includes consolidated (in-places) brecciated-conglomerates which are sub-angular, and poorly-sorted immature clasts. The work presented here can be used to further post-Oligocene mapping across the coastal plain.

O6.04

9:20 A SURVEY OF POTENTIAL TECHNIQUES TO ENHANCE RECHARGE TO THE MISSISSIPPI RIVER VALLEY ALLUVIAL AQUIFER

Andrew O'Reilly[1], Daniel Wren[1], Kyungwon Kwak[2], Michael Gratzer[3], Gregg Davidson[4], Martin Locke[1], J.R. Rigby[3]

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The Mississippi River Valley alluvial aquifer (MRVAA) is the dominant source of irrigation water in the intensively cultivated Mississippi Alluvial Plain, where declines in groundwater levels over the past 40 years indicate unsustainable groundwater-use practices. Methods for enhancing recharge to the MRVAA are needed that support irrigated agriculture as well as sustain natural ecosystems. Recharge to an aquifer can be enhanced using an array of techniques collectively called managed aquifer recharge (MAR). MAR systems can be generally classified into three types: surface infiltration, subsurface infiltration, and direct aquifer injection. Surface infiltration techniques include excavated basins or trenches, in-stream weirs, and surface flooding. Subsurface infiltration techniques include infiltration galleries and vadose-zone wells. Direct aquifer injection includes gravity-driven and pressurized wells. Potential sources of recharge water include harvested stormwater, surface water, reclaimed water, and transferred groundwater. Three types of MAR will be discussed to illustrate potential applications in the region: surface flooding, vadose-zone wells, and aquifer injection wells. A study completed by the University of Mississippi (UM) on the effects of natural surface flooding at Sky Lake near Belzoni, Mississippi, showed a rise of ~10 ft in MRVAA groundwater level in response to a ~14-ft rise in lake water level. Recharge is attributed to rising lake water levels, caused by flooding in the Yazoo River, spreading over coarse-grained deposits and into surrounding forested wetlands where preferential flow pathways are likely to exist from buried and decaying tree remains. A study completed by the U.S. Department of Agriculture Agricultural Research Service (USDA-ARS) and UM demonstrated hydraulic operation of vadose-zone wells at a site near Ruleville, Mississippi. During a 50-hour test, water was pumped continuously into two vadose-zone wells at rates ranging from less than 10 to 30 gal/min. Resulting recharge to the MRVAA caused small water-table rises ranging from 1.6 in. at the nearest monitor well (20-ft distance) to 0.4 in. at the most distant well (115-ft distance). Small rises likely are due to one or more of the following factors: high hydraulic conductivity of the MRVAA, lithologic variations with depth, screen location of the monitor wells, or backpressure from air in the vadose zone being compressed as sediment saturation increased. The USDA-ARS is conducting a pilot project at Shellmound, Mississippi, in which groundwater filtered by passing through sands adjacent to the Tallahatchie River is extracted, transferred, and injected into a depleted section of the MRVAA via two wells. During an 89-day test, the injection rate averaged ~730 gal/min per well for a total injected volume of ~550 acre-feet, causing a groundwater level increase of ~6.7 ft at the injection site and a decrease of ~4.7 ft at the extraction site. A 204-day test was conducted at a lower rate yielding a total injected volume of ~575 acre-feet, and impacts propagated ~1 mile where the groundwater level increased ~0.3 ft. Overall, results of these studies suggest that a multifaceted approach to enhancing recharge to the MRVAA could be effective by employing MAR techniques that are appropriate for local agricultural and environmental conditions.

O6.05

9:50 SURFICIAL GEOLOGIC MAPPING OF THE STARKVILLE 7.5-MINUTE UNITED STATES GEOLOGICAL SURVEY QUADRANGLE 33088D-7 IN OKTIBBEHA COUNTY, MISSISSIPPI

Jonathan Leard

Mississippi Office of Geology, Jackson, MS

The Starkville Quadrangle is a hotspot for geological research. The Late Cretaceous is represented by the Demopolis Formation in the northeast corner of the quadrangle, followed by the Ripley Formation, and the Prairie Bluff Formation. The K-Pg boundary is exposed in the quadrangle, and the remarkable paleontology is of global importance. The Clayton Formation is the first Paleocene unit. Where the Clayton Formation channel sands are in contact with the underlying Prairie Bluff Formation, springs occur. Springs were a rare source of water in the Black Prairie and spurred the settlement of the area over 10,000 years ago. The Paleocene Porters Creek Formation occurs in the southwest corner of the Quadrangle. Quaternary streams left Holocene to Pleistocene

alluvium and terraces overlying the subcrop. This project provides a modern geologic map and stratigraphic framework as a background for future research in the Starkville Quadrangle.

10:00 STUDENT PROFESSIONAL ROUND TABLE

O6.06

11:00 THE JUDGE SULLIVAN CLOVIS, AN AGATIZED FOSSIL CORAL (FLORIDA) PROJECTILE POINT FROM PERRY COUNTY, MISSISSIPPI

James Starnes[1], *Sam Brookes*[2]

[1]*MDEQ, Mississippi Office of Geology (State Survey), Jackson, MS,* [2]*Retired Archaeologist (USFS)*

Geology is an integral part of archaeology and essential to understanding landscapes, lithic material sources, paleoenvironments, depositional environments, and the geochemistry conducive to the preservation of archaeological resources. Humans first entered the paleontological record in Mississippi during the Pleistocene at some point during the last glacial maxima. The lithic materials they left behind are virtually the only evidence available to study their relationship with their environment. The Native Americans that first arrived in Mississippi encountered an environment quite different than today. The plants of the forests and prairies encountered would be more familiar to much northern climates than to those of Mississippi today, landscape hosted a megafauna that are now long extinct, and sea levels exposed land many miles beyond today's barrier islands in the Gulf of Mexico. The ice-age Paleoindian cultures were highly specialized nomadic hunters as evidenced by their exquisitely made tools and the scarce number of longer-term occupation sites that they left behind. Paleoindian artifact discoveries are typically made by landowners, collectors, and hobbyists, not by field researchers, making the public our principal resource for this earliest period in Mississippi's human prehistory. On June 14, 2022, a Clovis point was found in a creek in Perry County by the Court Judge for the 13th District of Mississippi. The artifact was identified by the authors as a Clovis point, approximately 13,000 years old. McGahey (2000: 3-10) divided Clovis into 3 distinct types. This point falls into McGahey's first and earliest type, the classic Clovis point. It is typical of examples found in Mississippi in that it is not deeply fluted. This is because the local gravel was not well suited to fluting. It appears an attempt to produce a long flute on one side of this high-quality stone. However, there is an opaline silica inclusion that caused the flute to terminate abruptly. The material is the most unusual trait of this point. Clovis found in Mississippi manufactured from non-local raw material are typically chert originating from the Tennessee valley and thus McGahey suggests that the earliest people in Mississippi entered from the north, not the west. The ongoing debate over the origins of the first Americans, genetic evidence suggests a western Asian origin. However, the artifactual remains suggest an eastern cultural origin. Naturally available stone resources in this particular part of southeast Mississippi that the Judge Sullivan Clovis was found are scarce and the stone was identified as a form of chalcedony not native to Mississippi. Additional laboratory data was collected on the point and geological surveys in nearby states were consulted on the findings to help conclude the geologic origins of the stone. The Judge Sullivan Clovis was manufactured from a type of pure chalcedony from agate replacement of fossilized coral, a high-quality, translucent stone found only in Miocene and Pliocene outcrops in Florida. The discovery of The Judge Sullivan Clovis is scientifically significant because it demonstrates the movement of people and material from east to west through south Mississippi during the late Pleistocene.

O6.07

11:20 MISSISSIPPI GEOLOGICAL SURVEY FOSSIL LOCALITY #1, THE MOODYS BRANCH FORMATION AT TOWN CREEK, JACKSON, MISSISSIPPI

David T. Dockery III

Mississippi Office of Geology, Jackson, MS

The numbered series of Mississippi fossil localities began with the 1977 publication of Mississippi Geological Society Bulletin 120 entitled *Mollusca of the Moodys Branch Formation, Mississippi*. The bulletin listed 15 Mississippi Geological Survey (MGS) fossil localities, with locality 1 being the Moodys Branch Formation on Town Creek in Jackson, Mississippi. *The Geology of Mississippi* by Dockery and Thompson (2016) now lists 175 MGS numbered fossil localities. British geologist Charles Lyell collected fossils from MGS locality #1 in 1846 and recognized the fossils to be of Eocene age, an epoch Lyell had named for the earliest Tertiary strata. B.L.C. Wailes collected from this locality and, in 1854, published four plates of fossil mollusks from the site in his book *Agriculture and Geology of Mississippi*, the first geology book on Mississippi. Wailes enlisted the greatest American expert on fossil shells at the time, Timothy A. Conrad, to name his fossils. Conrad later described the Jackson shells in 1865 and named the strata containing them the Jackson Group, the middle group of Conrad's Claiborne-Jackson-Vicksburg Group series (ascending order). Eugene Hilgard mapped these groups in his 1860 *Report on the Geology and Agriculture of the State of Mississippi*. The book's *Geologic Map of Mississippi* was the first credible geologic map of the state. Besides its history, MGS locality 1 has the best preserved and most diverse Late Eocene molluscan assemblage in the Western Hemisphere and is only rivaled by the Late Eocene mollusks of the Paris Basin in France.

O6.08

11:40 DID RUDIST BIVALVES INHABIT THE NORTHERN GULF OF MEXICO DURING THE LATE CRETACEOUS?

George Phillips

Mississippi Museum of Natural Science, Jackson, MS

Postmortem transport of remains is reasonably well-documented in paleontology. It is one of the principal taphonomic concerns when interpreting the fossil record, particularly with respect to establishing geographic and

chronologic occurrence data, reconstructing species associations, and the degree to which one can glean 'communities' from fossil assemblages.

Rudist bivalves (Order Hippuritida) were aberrant, vasiform clams of the Tethys Sea and nascent Gulf of Mexico and Caribbean during the latter Mesozoic, becoming extinct at the end of the Cretaceous. Like gryphaeid oysters and other attached bivalves, most colonial Cretaceous rudists had large lower valves attached to the substrate and often conjoined to neighbors, whereas the upper valve was considerably reduced and covered the lumen of the lower valve. The group consisted of solitary taxa, but reef-building was common among many groups by the mid-Cretaceous. The Radiolitidae was a conspicuous Late Cretaceous family consisting of both ponderous vasiform and small tubiculous species, most with a shell structure of porous, polygonal cells closely stacked in tight columns. Although originally porous (or fluid-filled), calcite deposition in the cells made rudist fossils quite dense in thick-valved species. In the Caribbean and elsewhere, the radiolitids are known to occur in thick aggregations, like the carbonate platforms of the Antillean region.

In North America, rudists are recorded in Upper Cretaceous sediments of the Western Interior Seaway, and in a forthcoming paper (December 2022), the occurrence of rudists of equivalent age is finally documented for the Gulf Coastal Plain. The most common rudists in the Upper Cretaceous of the WIS and GCP are radiolitids (other types of reef-building rudists are known from the Lower Cretaceous of Texas).

Upper Cretaceous radiolitid occurrences in the WIS and GCP are isolated, typically limited to certain strata, and consist largely of individuals or small fragments of colonies; no reefs have been confirmed. The lower valves frequently suffer from severe bioerosion, most are fragmentary, and no upper valves have been documented. The most complete radiolitids occur in the Mooreville Formation (Santonian-Campanian) of the eastern GCP and the Smoky Hill Chalk (Coniacian-Santonian) of Kansas, yet even the most intact specimens contain no discernible peduncle of initial attachment, the bottoms often irregularly eroded or completely missing. Within the thin rudist-bearing Mooreville and Smoky Hill Chalk intervals, the valves do not seem to possess a particular orderly arrangement.

Lastly, no endemic taxa are reported in the current taxonomic assessment of the GCP radiolitids. This, coupled with the porosity of dead shells, the eroded nature of the valves, absence of upper valves, their isolated occurrence, absence of reefs, and certain other aspects of their biology measured against GCP benthic environments, makes the northern Gulf of Mexico an unlikely home for radiolitids rudists. Interestingly, the Antillean region to the southeast contains the same species and in extensive aggregations of frequently articulated specimens. It is thus speculated that dead, buoyant shells were caught in currents that transported Antillean radiolitids northward to their final resting place.

12:00 General Session

Thursday, February 23, 2022

AFTERNOON

Room D5

O6.09

1:20 STREAMLINING A COMMUNITY COLLEGE PATHWAY FOR MISSISSIPPI GEOLOGISTS: PROGRESS, POTENTIAL – AND PERSISTENCE

Renee Clary[1], Athena Owen Nagel[1], Eric Shows[2]

[1]Geosciences, Mississippi State University, Mississippi State, MS, [2]Jones College, Ellisville, MS

Since 2019, online introductory physical and historical geology lecture/laboratory courses have been available to all Mississippi community college students through the Mississippi Virtual Community College consortium. Funded through an NSF IUSE GEOPAths program, the Geo-SPARCC courses begin each unit with Mississippi examples for student geographic relevance. Not only do the GLY courses fulfill a physical science requirement for students, but they also reintroduce geoscience content that most Mississippi students have not been exposed to since 8th grade. Since many geology majors accidentally learn about geoscience majors and career opportunities, an introduction to geological content at the community college level may help to recruit students to the discipline sooner.

An early challenge to the Geo-SPARCC project was that the GLY courses were not widely known beyond their host institution; enrolled students further noted that their advisors enrolled them or told them to take specific courses. Additionally, early GLY student enrollment did not reflect the demographics of the Mississippi community college population, and the pandemic resulted in the forced cancellation of field excursions for 4 semesters/2 years. As the Geo-SPARCC project concludes, progress has been made: 1) Through outreach, community college advisors have been made aware of the online geology course options; 2) GLY student demographics now reflect the Mississippi community college population; and 3) Field excursion opportunities are again available for community college students. Persistence is needed by professional geologists and 4-year institutions to maintain awareness of geology course options at the community college level, and geoscience career opportunities for those who choose to pursue a geology or environmental science degree.

O6.10

1:40 MISSISSIPPI CORE AND SAMPLE LIBRARY RECORD DIGITIZATION

Tranton Holder, Paul Parrish

Mississippi Department of Environmental Quality, Jackson, MS

As part of the nationwide push to bring historical records into digital format, the Mississippi Office of Geology is in the process of digitizing records associated with the State Core and Sample Library. The State Core and Sample library has been curated by the Mississippi Office of Geology in Jackson since 1960. The facility has 14,000 square feet of sample storage and houses over 7000 oil and gas wells and 200+

survey boreholes. This is a multifaceted project that will provide better location information, online geophysical logs and associated documents, and digital media of the cores and samples. The idea is that industry, academia, planning, government, and the public will have the full library at their fingertips for research, planning, teaching, and decision making.

2:00 Keynote Address

UNEARTHING THE SECRETS OF THE UNDERWATER FOREST

Dr. Carl "Andy" Reese

University of Southern Mississippi, Hattiesburg, MS

Thursday, February 23, 2023

EVENING

3:30 DODGEN LECTURE and AWARDS CEREMONY
Hall B

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

P6.01

IMPLICATIONS OF PLANT COMMUNITIES BASED ON PALYNOMORPHS FROM THREE EARLY OLIGOCENE FOREST HILL FORMATION SITES, MISSISSIPPI, U.S.A.

Nina Baghai-Riding[1], Carol Hotton[2], James Starnes[3], Jonathan Leard[3], Brian Axsmith[4]

[1]Division of Math and Sciences, Delta State University, Cleveland, MS, [2]National Institutes oOf Health, National Center For Biological Information, 45 Center Dr Msc 6510, Building 45, Rm 6an.18, Bethesda, MD, [3]Mississippi Department of Environmental Quality, Office of Geology, Jackson, MS, [4]Biology Department, 5871 USA Drive North, Room 124, Mobile, AL

Oligocene floras of the Gulf Coast region of the southeastern United States remain poorly known. As part of a larger study of floras of the late Paleogene and Neogene of Mississippi, palynological samples were collected from the early Oligocene Forest Hill Formation by J. Starnes and J. Leard in Yazoo, Smith and Madison Counties. The Forest Hill Formation (Vicksburg Group) is a nearshore terrestrial unit consisting of laminated sands and dark carbonaceous clays with lignite beds. Four palynological samples were collected by Starnes and Leard in 2020-2021. One palynological sample each was collected from Smith and Madison Counties. Two additional samples were collected from Yazoo County, one from a shale and one from a lignite unit directly overlying it. The Yazoo County samples were collected at the most northern geographical location and represents an up-dip limit exposure of the formation along the axis of the Mississippi Embayment. The Smith County sample is associated with a freshwater riverbank setting that is adjacent to a storm surge zone along the eastern side of the Mississippi embayment. The Madison County site is associated with a coastal environment and is an outlier outcrop on the north flank of the Jackson Dome. All four samples possess diverse palynomorphs of pollen, spores, and algal cysts indicating a warm temperate climate. The samples differed in taxonomic composition. The Yazoo County shale sample indicated a distinct backwater, enclosed bay based on the abundance of *Anemia* (22%) and *Diplopterygium* type (7%) spores. In a 300-point count, angiosperms comprised 49%, conifers 3%, trilete spores 39%, monolete spores 0.8% and freshwater algal forms 9%. The lignite sample possessed 14% angiosperms, < 1% conifers, 65% trilete spores, 9% monolete spores and 11% algal cysts, reflecting more locally derived and hydrophilic vegetation. The Smith County sample represents an oak-hickory-willow coastal forest. In a 300-point count, angiosperms comprised 59%, conifers 11.4%, pteridophyte spores 20.5%, freshwater algal forms 9% and marine cysts 1.5% of the assemblage. This sample is associated with a rich and diverse assemblage of well-preserved plant macrofossils, including palm fronds. In contrast, the Madison County site displayed poorer recovery of identifiable palynomorphs. In a 200-point count, angiosperms comprised 35%, conifers 19.5%, trilete spores 24.5%, and algal cysts 42%. The preponderance of algal cysts suggests a coastal, freshwater environment. Thirty-four taxonomic plant families represented by palynomorphs were documented from these four samples. Families/orders common to all localities include Anemiaceae, Lycopodiaceae, Polypodiaceae, Cupressaceae, Pinaceae, Arecaceae or Liliales, Betulaceae, Fagaceae, Juglandales, and Platanaceae. Families/orders noted only in the Smith County site include, Ericaceae, Onagraceae, Symplocaceae, and possibly Myrtales. Families noted only in Yazoo County include Ophioglossaceae,?Oleaceae, and *Tetracolporites*. Families found only in the Madison County site include Equisetaceae, Asteraceae, Poaceae, (Sapindaceae, Selaginellaceae, *Retisyncolporites* and probable algal cysts (leiospheres). The majority of the palynomorphs probably represent the local vegetation because of the pristine preservation and absence of pyritization or other degradation.

P6.02

UNDERSTANDING THE IMPACTS OF TOPOBATHYMETRIC DATA ON STORM SURGE MODEL PREDICTIONS

Sydni Crain[1], George Raber[2], C. Gowri Shankar[1], Greg Carter[1], Mustafa Kemal Cambazoglu[1]

[1]The University of Southern Mississippi, Long Beach, MS, [2]The University of Southern Mississippi, Hattiesburg, MS

The topographic and bathymetric characteristics of a region are regularly altered by natural and anthropogenic causes. These dynamic characteristics have direct impacts on lateral extent and depth of storm surge inundation during a tropical cyclone. However, the topobathymetric data used in storm surge modeling can often be outdated or have too low of spatial resolution to reflect these changes, potentially resulting in inaccurate representations of storm surge. Toward developing a better understanding of this relationship, the Advanced Circulation (ADCIRC) storm surge model was used to examine the impacts of two recent hurricanes, Hurricane Zeta (2020) and Hurricane Ida (2021), in the Gulf of Mexico using elevation datasets of varying collection date

and spatial resolution. Topobathymetric data from two time periods (2014 and 2020-2021) and at multiple spatial resolutions were interpolated and applied to a publicly available ADCIRC mesh designed to study storm surge in the Gulf of Mexico to evaluate differences due to data collection time period and resolution. Topobathymetric datasets were obtained from General Bathymetric Chart of the Oceans (GEBCO), Mississippi Automated Resource Information System (MARIS), and Shuttle Radar Topography Mission (SRTM, NASA). For the first simulations, a 30 arc-second 2014 GEBCO grid was interpolated to the ADCIRC mesh and used to run surge simulations for Hurricanes Zeta and Ida. For comparison, MARIS and SRTM data were then combined with data from the 15 arc-second 2020 and 2021 GEBCO grids for Hurricanes Zeta and Ida, respectively, and the simulations were repeated, holding all other input parameters constant. The resulting storm surge computations for each storm will be compared to better understand the effects of change in topographic and bathymetric data on model output. Model outputs will also be compared with observations from National Oceanic and Atmospheric Administration (NOAA) tide gauges and locations of debris lines observed in post-storm imagery (National Geodetic Survey, NOAA) to better understand temporal and spatial accuracies of surge hindcasts. Anticipated results include significant improvements in storm surge predictions based on the newer, higher-resolution data. The results of these case studies will help deepen our understanding of the importance of topographic and bathymetric data features in modeling storm surge along the northern Gulf of Mexico coast.

Friday, February 24, 2023

MORNING

Room D5

8:10 Welcome

O6.11

8:20 QUANTIFYING VALUE OF ECOTOURISM AND REDIRECTED REVENUE USING SOCIAL NETWORKING SITES

Kayla Stan[1], Arturo Sanchez-Azofeifa[2]

[1]University of Southern Mississippi, Hattiesburg, MS, USA, [2]University of Alberta, Alberta, Canada

Ecotourism and recreational use of land can be an economic incentive for both communities and policymakers to protect critical environments, while making conservation more economically feasible; however, it can also put pressure on sensitive natural landscapes as human impact is expanded. As a leader in both environmental sustainability and a primary tourist destination for around the world, Costa Rica provides a unique location to analyze patterns of ecotourism and environmental conservation from both an environmental and economic perspective. To better understand the spatial distribution of ecotourism around the country, and to quantify the potential economic incentive to promote sustainable tourism and development, we analyzed ecotourism and recreation use of land across Costa Rica and paired this with the economic value of tourism brought into communities. We combined Social Network site (SNs), government, and infrastructure data to model the spatial distribution of ecotourism, and quantify the value bought into each province and into the currently protected areas. We subsequently project out the impact of redirected ecotourism value from protected areas into private reserves due to strict caps on public access to natural areas. Finally, we use this relationship to project out the value of the priority protection zones to determine and assess them based on a combined biodiversity and ecotourism ranking. Overall, we find strong relationship between the social network site data and the actual reported tourists entering protected areas. We also find that the south and central regions of Costa Rica is more highly utilized compared to the north. These rates and potential income sources can be used by policy makers to offset costs associated with protecting new areas and understand plan the infrastructure needed to accommodate the incoming flow of ecotourists.

O6.12

8:40 A RAILROADING LIFESTYLE: AN ETHNOGRAPHIC EXPLORATION OF PERCEPTIONS AND PERSONAL EXPERIENCES OF AMTRAK CREW MEMBERS

Joseph Lane

Delta State University, Cleveland, MS

Worldwide inter-city passenger rail is often seen as a public indicator representing a country's economic, political, social, and even environmental success. At present, in the United States, the private automobile remains the dominate passenger transport mode, however passenger rail is an increasingly essential element in the integrated transportation network. Amtrak is by far the largest provider of intercity passenger rail service in the United States. Crew members are responsible for the safe and efficient operation of passenger trains. Little is known about these crew members. Data regarding perceptions and personal experiences from on-duty, volunteer, Amtrak crew members were collected via semi-structured in-depth interviews, questionnaires, and researcher observations. Results detail common themes regarding career benefits, drawbacks, influences on quality of life, and impacts on personal life, as reflected by the Amtrak crew members.

O6.13

9:00 IDENTIFYING AREAS IMPACTED BY SEA LEVEL RISE: A GEOSPATIAL COASTAL VULNERABILITY FRAMEWORK APPLICATION

Claire Babineaux[1], Andrew Nagel[2], Kate Grala[1], John Cartwright[2]

[1]MSU - Northern Gulf Institute, Stennis Space Center, MS, [2]MSU - Geosystems Research Institute, Starkville, MS

The identification and monitoring of vulnerable coastal environments are vital with the increase in sea level, as well as storm frequency and duration. As sea level rises, both storm surge and high tide flooding could inundate further inland into areas that may be unprepared for the resulting impacts, thus in need of decision support tools. Existing geospatial tools and custom workflows were used to combine geospatial datasets producing a multi-scale geospatial framework that will allow

for the identification of areas at higher risk of inundation. By utilizing the land cover and inundation data, areas vulnerable to sea level rise can be identified. The multi-scale approach allows coastal resource managers and planners to identify and provide assessments of vulnerable environments at both regional and local scales. An example of this application would allow managers to identify if an area is vulnerable to the impacts of sea level rise but would also provide the percent land cover related to the impact. Identifying vulnerable areas and analyzing potential impacts that incremental sea level rise could have on them can help coastal managers make well-informed decisions and better communicate with impacted populations.

O6.14

9:20 FIELD SURVEYING FOR UNMARKED GRAVES AND CLANDESTINE BURIALS USING GROUND PENETRATING RADAR

David Holt

University of Southern Mississippi, Long Beach, MS

Ground Penetrating Radar (GPR) was used in several projects to identify human remains utilizing a live field scan from a GSSI 400MHz antenna with a SIR 4000 receiver. These projects included mapping of a 29,000-plot cemetery in West Monroe, Louisiana; identifying unmarked graves in targeted areas after the Lee Street Riot of 1942 in Alexandria, Louisiana; locating an unmarked mass grave following a train derailment of 1903 in Kentwood, Louisiana; and multiple clandestine burials for sheriffs of Jackson and Warren Counties, Mississippi. Variations in soil and strata require calibration of the signal gain-to-depth return to allow for anomaly mapping. In all these cases, live scans with field interpretation were utilized with a dynamic range gain to locate anomalies indicative of human burial practices for mapping, preservation, or legal pursuits. In West Monroe, we identified over 70 unmarked graves as part of our larger cemetery mapping project. In Alexandria, we identified 20 unmarked graves at two location, but we could not identify a mass grave as suspected by historians. In Kentwood, we located a trench burial that aligned with the historic information surrounding the 1903 train derailment that killed over 20 African-American individuals that were unceremoniously buried together. Their location was lost to history until our use of the GPR and now efforts of a placement of an historical marker is underway. Surveys for the Sheriff's departments located target areas that both led to confessions and recoveries of the clandestine burials. We show in this talk the process of using in the field analysis to identify and map anomalies.

O6.15

9:40 CHARACTERIZING THE DISTRIBUTION OF PHRAGMITES AUSTRALIS IN MISSISSIPPI'S COASTAL MARSHES WITH RESPECT TO ELEVATION, TOPOGRAPHY, BATHYMETRY, AND SURFACE WATER SALINITY

Margaret Waldron[1], *Patrick Biber*[2], *Carlton Anderson*[1], *Wei Wu*[2], *Gregory Carter*[1]

[1]*University of Southern Mississippi, Long Beach, MS,* [2]*University of Southern Mississippi, Ocean Springs, MS*

Vegetation composition is an important determinant of the functional characteristics of coastal marsh areas in terms of biodiversity, wave energy attenuation, carbon sequestration, and resilience to sea level rise. The increase in extent of the competitive *Phragmites australis* (Cav.) Trin. ex Steud. in several of Mississippi's coastal marsh areas raises questions about marsh development in terms of spatial extent and ecosystem function. Although recent work suggests *P. australis* may help prevent coastal erosion, it is known to aggressively displace more ecologically desirable native vegetation. To better characterize tolerance limits of *P. australis* and estimate future spread potential, we are investigating the elevation range, topography, bathymetry, and surface-water salinity in *P. australis*-dominated areas. Vegetation and salinity measurements were collected during the 2022 growing season in the Pascagoula River, Jourdan River, and Hancock County Coastal Marsh Preserves. Two *P. australis*-dominated and two adjacent non-*P. australis* dominated transects were surveyed (RTK GNSS, Trimble R12i) at each of the three sites to record elevation and species presence at 0.5 m intervals. Transects began in the water 1.5 m before the shoreline and continued landward perpendicular to the shoreline, traversing the entire width of the *P. australis* patch at each site. Surface salinity was recorded at 15 min intervals (Star-Oddi CT/CTD) beginning in August 2022. Bathymetric measurements were collected adjacent to the transect starting points with tracklines parallel to the shoreline using a portable single-beam echosounder (Seafloor Hydrolite Plus integrated with RTK GNSS measurements). While maximum elevations of occurrence were similar among *P. australis*, *Juncus roemerianus*, and *Spartina cynosuroides*, minimum elevations for *P. australis* were the lowest among all species sampled at all sites. Additionally, the lowest-salinity site (Pascagoula) exhibited lower elevations for *P. australis, J. roemerianus, S. cynosuroides,* and *Sagittaria lancifolia* occurrence than the two higher-salinity sites. Future efforts of this project will include data collection at additional sites across the Mississippi Gulf Coast, as well as a synthesis of the site data with aerial image data documenting historical trends in *P. australis* distribution since 1996 to assess the impacts of several physical environmental variables on the inundation tolerance and rate of spread of *P. australis*.

10:00 BREAK

O6.16

10:20 STRUCTURAL ANALYSIS OF THE DADEVILLE COMPLEX IN THE PONDERS QUADRANGLE, ALABAMA, SOUTHERN APPALACHIANS: INVESTIGATING THE POLYPHASE EMPLACEMENT OF AN ALLOCHTHONOUS TERRANE ON THE LAURENTIAN MARGIN

Andrew Williams, Jeremy Deans

University of Southern Mississippi, Hattiesburg, MS

The Dadeville Complex (DC) lies in the Inner Piedmont of eastern Alabama and western Georgia in the southern Appalachian Mountains. The DC contains rocks that were part of a volcanic island arc that formed during the Taconic orogeny (Tull et al., 2018). These rocks were emplaced on to the Laurentian margin during the Acadian orogeny (Devonian-Mississippian Periods). Today, the DC is a major (over 100 kilometers long) allochthonous terrane composed mostly of meta-igneous (basalt to granitoids) and meta-sedimentary rocks. Proposed emplacement mechanisms of the DC include accretion in an orogen-perpendicular direction (Sears et al., 1981) and orogen-parallel translation either along shear zones (Ma et al., 2019) or via forced, orogenic channel flow of the entire Inner Piedmont (Hatcher and Merschat, 2006).

In order to investigate the deformational history and constrain the likely emplacement mechanism of the DC, the Ponders 7.5-minute quadrangle in Tallapoosa County, Alabama was mapped in detail. This quadrangle is well-situated for this study as it contains some of the southern-most exposures of the Dadeville Complex. Outcrop data including lithology, foliations, and lineations were recorded from over 130 locations throughout the quadrangle. In total, 367 foliations and 35 lineations were measured in the DC in the Ponders quadrangle.

Foliations within the DC vary widely in orientation, but most commonly dip shallowly to the east or shallowly to the north-northwest. A cylindrical best fit of all foliations in the DC indicate a shallowly plunging fold axis trending to the northeast (09 --> 052). This structure is consistent with previous studies in the area (e.g., Bentley and Neathery, 1979), however, a closer look at map patterns of folds, namely doubly-plunging folds and distinct fold hinges that can be delineated roughly N-S and E-W, indicate at least two distinct fold orientations exist in the DC: F1 is a set of N-S trending upright and overturned folds and F2 are E-W trending folds, which refolded the F1 folds. Mineral lineations in the Ponders quadrangle are generally shallowly-to-moderately plunging towards the east (74%) and shallowly to the west (23%). The orientation of these lineations is compatible with the F2 folding event. Mineral stretching lineations in the DC are most commonly defined by hornblende or plagioclase feldspar, indicating they were formed under peak, amphibolite-grade metamorphism. This indicates the DC underwent two separate deformation events while at or near peak metamorphic conditions. The earlier event (D1; Acadian orogeny) is marked by E-W directed shortening forming the F1 folds and the later event (D2; Neoacadian) refolded the F1 folds by N-S directed shortening. D1 was likely caused by early collision between the Inner Piedmont and the Carolina Superterrane during east-directed subduction of the Laurentian plate and D2 by final collision between the Inner Piedmont (with the DC), Carolina Superterrane, and the Laurentian margin (e.g., Huebner et al., 2017). These results suggest the emplacement of the DC cannot be solely explained by one of the proposed models and polyphase strain during the same orogenic event must be considered for models of the Acadian orogeny.

O6.17

10:40 PALEONTOLOGICAL SITE CHARACTERIZATION OF UPPER CRETACEOUS STRATA WITHIN AN AGRICULTURAL LIME MINE, CLAY COUNTY, MS

Natalya Usachenko[1], Renee Clary[1], Athena Nagel[1], Darrel Schmitz[1], George Phillips[2]

[1]Mississippi State University, Mississippi State, MS, [2]Mississippi Museum of Natural Science, Jackson, MS

This research focuses on the paleontological characterization of upper Cretaceous deposits within an agricultural lime mine in Clay County, Mississippi. The location exhibits excellent stratigraphic exposure of marl and chalk beds and is rich in well-preserved, in situ marine invertebrate fossils. While previous studies have been conducted on upper Cretaceous paleontology throughout the state, no prior research has been conducted at this locality. The location of the research site within an active surface mining operation additionally places a constraint on future availability of data. Using a combination of field and laboratory methods, this research conducts a complete stratigraphic, biostratigraphic, and paleontological analysis of the site to deliver a detailed site description, confirm the site's general geochronological placement, and compare the sedimentological and paleontological characteristics of the site to those of other units of the same age throughout Mississippi and the rest of the Northern Gulf Coast Plain to further contribute to the knowledge basis of this region's natural history. This project will also generate an educational outreach report to communicate the scientific results for a general audience, that can be used to optimize public understanding of the paleoenvironment of this area and its economic benefits to the community. Research methods, preliminary data, and site characterization of this ongoing investigation will be presented.

O6.18

11:00 A FAUNAL STUDY OF THE CUSSETA SAND

Olivia Wooton, Alyson Brink

University Of Southern Mississippi, Hattiesburg, MS

This project is associated with the Gender Equity Movements in Stem Grant, providing an opportunity to learn the processes of a lab environment that would not be taught in a classroom setting. Dr. Alyson Brink collected matrix from the Cusseta Sand member of the Ripley Formation in 2018. Using this material this semester I have learned to sieve and pick, and then identify fossil fauna using published literature.

Thus far I have found an assortment of vertebrate material including shark teeth, ray teeth, turtle shell fragments, as well as a wide variety of fragmentary invertebrate shell material.

O6.19

11:20 PALEOECOLOGICAL INVESTIGATIONS OF A UNIQUE PRAIRIE BLUFF LOCALITY, OKTIBBEHA COUNTY, MISSISSIPPI

Sydney Stanard[1], Renee Clary[1], Athena Owen Nagel[1], Darrel Schmitz[1], George Phillips[2]

[1]Mississippi State University, Starkville, MS, [2]Mississippi Museum of Natural Science, Jackson, MS

The Prairie Bluff Formation—a Maastrichtian-age chalk formation that runs through western Alabama and northeastern Mississippi—contains some of the most diverse and well-preserved marine fossils from the late Cretaceous. A Prairie Bluff locality found in Oktibbeha County, MS presents a unique opportunity to study a biostrome developed from a mid-shelf hardground community consisting of variety of epifauna from the late Cretaceous Mississippi Embayment. The locality is flat and has experienced little outwash or disturbance with many of the specimens preserved in situ or near-to-life location. The goal of this research is to create a snapshot of the paleoecology of this ecosystem through traditional morphological analysis and quantitative frequency analysis of the genera and trace fossils found at the site. These analyses will provide a quantitative look at the diversity, population density, and overall structure of this ecosystem. Preliminary data and analyses will be presented. Mid-shelf hard ground ecosystems were common in the Maastrichtian Mississippi Embayment, and the findings at this Prairie Bluff locality should be applicable to similar ecosystems within this area, permitting future researchers to explore the differences between the environments of the proto-Gulf of Mexico, the Atlantic, and the Western Interior Seaway. The interchange of organisms located at this juncture is unique, and further knowledge of it will enlighten our understanding of late-Cretaceous marine ecosystems as a whole.

O6.20

11:40 UNDERSTANDING THE IMPACTS OF TOPOBATHYMETRIC DATA ON STORM SURGE MODEL PREDICTIONS

Sydni Crain[1], George Raber[2], C. Gowri Shankar[1], Greg Carter[1], Mustafa Kemal Cambazoglu[1]

[1]The University of Southern Mississippi, Long Beach, MS, [2]The University of Southern Mississippi, Hattiesburg, MS

The topographic and bathymetric characteristics of a region are regularly altered by natural and anthropogenic causes. These dynamic characteristics have direct impacts on lateral extent and depth of storm surge inundation during a tropical cyclone. However, the topobathymetric data used in storm surge modeling can often be outdated or have too low of spatial resolution to reflect these changes, potentially resulting in inaccurate representations of storm surge. Toward developing a better understanding of this relationship, the Advanced Circulation (ADCIRC) storm surge model was used to examine the impacts of two recent hurricanes, Hurricane Zeta (2020) and Hurricane Ida (2021), in the Gulf of Mexico using elevation datasets of varying collection date and spatial resolution. Topobathymetric data from two time periods (2014 and 2020-2021) and at multiple spatial resolutions were interpolated and applied to a publicly available ADCIRC mesh designed to study storm surge in the Gulf of Mexico to evaluate differences due to data collection time period and resolution. Topobathymetric datasets were obtained from General Bathymetric Chart of the Oceans (GEBCO), Mississippi Automated Resource Information System (MARIS), and Shuttle Radar Topography Mission (SRTM, NASA). For the first simulations, a 30 arc-second 2014 GEBCO grid was interpolated to the ADCIRC mesh and used to run surge simulations for Hurricanes Zeta and Ida. For comparison, MARIS and SRTM data were then combined with data from the 15 arc-second 2020 and 2021 GEBCO grids for Hurricanes Zeta and Ida, respectively, and the simulations were repeated, holding all other input parameters constant. The resulting storm surge computations for each storm will be compared to better understand the effects of change in topographic and bathymetric data on model output. Model outputs will also be compared with observations from National Oceanic and Atmospheric Administration (NOAA) tide gauges and locations of debris lines observed in post-storm imagery (National Geodetic Survey, NOAA) to better understand temporal and spatial accuracies of surge hindcasts. Anticipated results include significant improvements in storm surge predictions based on the newer, higher-resolution data. The results of these case studies will help deepen our understanding of the importance of topographic and bathymetric data features in modeling storm surge along the northern Gulf of Mexico coast.

Friday, February 24, 2023
AFTERNOON

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

Friday, February 24, 2023
AFTERNOON
Room D5

1:20 Student Awards & Business Meeting
2024 Chairperson Elections
(Attendance required for award or nomination)

Health Sciences

Co-Chair: Candance M. Howard
University of Mississippi Medical Center
Co-Chair: Edward Florez
University of Mississippi Medical Center
Co-Vice-Chair: Frank Spradley
University of Mississippi Medical Center
Co-Vice-Chair: David Gordy
University of Mississippi Medical Center
Program Coordinator: Olga McDaniel
University of Mississippi Medical Center

Thursday, March 31, 2022
MORNING 8:20 AM-12:00 Noon
Morning 8:20 AM-12:00 Noon
Room:D7
8:20 Welcome

Oral Presentation session A
Topics: Clinical Modeling/Diagnostics/Trials

Moderators: Drs. Frank Spradley and Lance E. Keller
University of Mississippi Medical Center

8:30 Welcome

O7.01

8:35 IMAGING BIOMARKERS TO UNRAVEL PHENOTYPICALLY HETEROGENOUS OBESITY AMONG THE UMMC POPULATION

Merlin Margaret Manogaram[1], *Elliot Varney*[1], *Mohan Pauliah*[1], *Haley Craddieth*[1], *David Gordy*[1], *Candace Howard*[1,2]

[1]*Department of Radiology, UMMC,* [2]*Investigator in Development Program for MCCTR, UMMC*

Obesity is a critical health problem particularly in states such as Mississippi, one of four states with obesity prevalence greater than 35%; among non-Hispanic blacks in Mississippi obesity prevalence is 48.1% This compounds the state's alarming health disparities. Obesity predisposes to a sequence of metabolic risk factors, and its health implications involve multiple organ systems. Studies have shown associations between the commonly defined anthropometric measures of obesity and obesity-related metabolic risk factors and health system effects. However, body fat distribution is inconsistent in obesity, with varying amounts of ectopic fat deposition across individuals despite similar body mass index (BMI). Interestingly, the regional distribution of body fat is thought to be more important in cardiovascular disease (CVD) risk than excess adiposity overall. CT and MR imaging modalities are the gold standard for body composition analysis, and their correlation with obesity-related health effects in the cardiovascular, cerebral, renal, and hepatic systems. We describe a large retrospective cross-sectional analysis at UMMC to identify regional fat-incorporated obesity phenotypes and clinical outcomes in adult men and women and to examine the effects of race/ethnicity, age, and sex on the development and outcomes of the cardiometabolic syndrome and other obesity-related diseases.

Conclusion: Investigation of regional fat-incorporated individual obesity phenotypes and their significance in related clinical cardiovascular and other disease events would help identify imaging biomarkers to substantiate individual obesity phenotypes, personalize and improve management, and elucidate novel molecular targets for personalized interventions to combat obesity.

O7.02

8:45 SIMPLE ANTHROPOMETRIC MEASURES AS PREDICTORS OF CARDIAC CALCIUM SCORES AMONG AFRICAN-AMERICANS (Graduate student)

Elizabeth Kerby, John Overton, Johnny Yang, Zainab Ahmad, Quinn Cottone, Hayley Craddieth, Elliot Varney, Edward Florez, Merlin Margaret, David Gordy, Seth Lirette, Candace Howard

[1]*University of Mississippi Medical Center, Jackson, MS*

Purpose: To identify low-cost predictive anthropometric measures of obesity-related diseases by assessing the correlation of sagittal abdominal diameter, waist circumference and CT measures of cardiac calcium scores in African Americans.

Methods: For this IRB-approved retrospective observational study African American men and women at risk for obesity and cardiometabolic disease presenting for cardiometabolic assessment were included (N = 2006). Limited nonenhanced CT imaging of the heart and lower abdomen were obtained. Anthropometric measures of waist circumference (WC) and sagittal abdominal diameter (SAD) were measured in all subjects through a DICOM viewer (OsiriX MD, v.9.0.2). SAD was measured in the slice centered at the L4-L5 intervertebral disk, at the top of iliac crest; WC was measured on the last slice from cranial to caudal not showing the iliac bone. Visceral (VAT) and subcutaneous (SAT) fat volumes were measured on the full cohort using sliceOmatic's (TomoVision, v.5.0) multi-layer segmentation software. Next, coronary and extra-coronary calcium volumes and scores were obtained using an offline software (syngo.via) and Agatston scores were calculated. Three readers independently assessed a random subset of 300 cardiac calcium scores.

Results: Both SAD and WC showed a direct proportionality with VAT and SAT. SAD showed direct proportionality with VAT, and the linear relationship was significant ($r2=0.58$, 0.76, $p<0.001$). The strongest correlation was found between WC and SAT ($r2=0.79$, 0.88, $p<0.001$), maintaining an excellent linearity with VAT. For every 10cm increase in WC, the odds of moving up one quartile in relative risk for

cardiovascular events in 10 years was 1.17 ($p<0.001$; CI 95% 1.11–1.24). With every 1cm increase in SAD, the odds of moving up one quartile in relative risk for a cardiovascular event in the next 10 years was 1.06 ($p<0.001$; CI 95% 1.04–1.08). The highest odds of moving up one quartile in relative risk for a cardiovascular event with increases in WC and SAD was seen at 40 years of age in both males and females (1.36;1.10 ($p<0.01$) and 1.36;1.11 ($p<0.01$), respectively).

Conclusion: Increasing waist circumference and sagittal abdominal diameter correlate to higher levels of coronary artery calcium indicating that there may be a role for simple anthropometric measurements in the estimation of cardiometabolic risk assessment.

O7.03

8:55 ESTABLISHMENT OF NEW PREDICTORS OF MORBIDITY IN PATIENTS WITH NAFLD – ARE WE DOING TOO MUCH? (Graduate student)

William Varner[1], Elliot T. Varney MD[2], David Gordy[2], Seth Lirette PhD[3], Candace M. Howard MD PhD[2]

[1]School of Medicine, University of Mississippi Medical Center, Jackson, MS, [2]Department of Radiology, University of Mississippi Medical Center, Jackson, MS, [3]Department of Data Science, University of Mississippi Medical Center, Jackson, MS

Objective: To establish a machine learning algorithm to predict the NAFLD Fibrosis Score with demographic and anthropometric data and to determine if liver surface nodularity can be a reliable predictor of NAFLD morbidity.

Materials and Methods: For this HIPPA-compliant, IRB-approved, retrospective study, adult patients with various degrees of NAFLD and non-enhanced CT images of the abdomen and pelvis were selected (N=681). Patients whose CT did not meet the minimum necessary parameters (ie. FOV) and patients without serum laboratory values to calculate an accurate NAFLD Fibrosis Score within 30 days of the CT images were excluded. The final cohort included 298 patients. Anthropometric measurements of waist circumference (WC) and sagittal abdominal diameter (SAD) were obtained from CT images at the level of the L4/L5 intervertebral disk space and the iliac crest, respectively, using a Digital Imaging and Communications in Medicine (DICOM) viewer. Liver surface nodularity (LSN) scores were determined by a validated quantitative software. The NAFLD score was calculated using clinical parameters available in the electronic medical record. Correlation coefficients and logistic regression were used to analyze the relationship between body composition parameters and predictors of liver fibrosis. Odds ratios for developing liver or cardiovascular events in each LSN score category (≥ 3 and <3) were calculated. Lastly, using a bivariate and multivariate regression and random forest models, NAFLD Fibrosis score was predicted using a combination of demographic and anthropometric measurements (age, BMI, WC, SAD) and correlation coefficients and coefficients of variation (CoV) between predicted and actual NAFLD Fibrosis Scores were calculated.

Results: The NAFLD Fibrosis score classified 44% of participants as low risk for liver fibrosis and 16% of participants as high risk for liver fibrosis with the remaining participants classified under the indeterminate category (N=125). Under the LSN classification, 20% of the participants were classified as high risk of liver fibrosis. The majority of patients with high risk for liver fibrosis by LSN score were obese (94.1%, $p<0.001$), non-diabetic (57.4%, $p=0.03$) males (58.3%, $p<0.001$). Additionally, patients with a LSN score ≥ 3 were 2.1 times more likely to develop a liver or cardiovascular event than patients with a LSN score <3 (HR=2.14, $p<0.05$ (95%CI 1.03-4.46). When predicting NAFLD Fibrosis score, random forest models ($R^2= 0.92$ and 0.93, $p<0.001$) significantly outperformed that of the regression model ($R^2= 0.31$, $p<0.001$). Additionally, there was no significant difference in the predictive accuracy of the random forest model that accounted for age, BMI, WC, and SAD (Alt. RF) vs. the model that used just age and BMI (RF). The CoV for the regression, RF, and Alt. RF models were 6.35, 4.51, and 1.70, respectively.

Conclusion: The LSN score, obtained from previous acquired CT scans, shows promise in the prediction of NAFLD related complications, but more importantly, the most common non-invasive test performed in NAFLD patients to predict liver related morbidity, the NAFLD Fibrosis score, can be reliably predicted using random forest modeling accounting only for age and BMI.

O7.04

9:05 IDENTIFICATION OF POTENTIAL ANXIOLYTICS IN A COMPLEX MIXTURE: A CASE STUDY WITH OXIDATIVE METABOLITES OF LAVENDER ESSENTIAL OIL (Graduate student)

William Neal[1], Pankaj Pandey[2], Shamba Chatterjee[2], Ikhlas Khan[1, 2], Amar Chittiboyina[1, 2]

[1]Division of Pharmacognosy, Department of BioMolecular Sciences, School of Pharmacy, The University of Mississippi, University, MS, [2]National Center for Natural Products Research, Research Institute of Pharmaceutical Sciences, School of Pharmacy, The University of Mississippi, University, MS

Lavender (*Lavandula angustifolia) essential oil (EO), prepared from harvested flowering tops, has been traditionally utilized for centuries to treat an array of human psychiatric imbalances*. Oral delivery of lavender EO is touted to induce a calming and relaxing sensation by promoting sleep and easing generalized anxiety disorders. Following ingestion of lavender EO, Phase I metabolism of the EO volatile organic compounds (VOCs), such as monoterpenes, sesquiterpenes, and their oxygenated counterparts, begins through induction of cytochrome P450s, leading to increased functionalization that can produce diverse VOC metabolites and result in a postulated exaggerated target promiscuity. Computational identification of potential targets for functionalized lavender EO VOC metabolites may reveal new or amplified VOC-target associations while mitigating laborious animal toxicological studies. Constituents of lavender EO were

subjected to *in silico* prediction of downstream Phase I metabolites by ADMET Predictor 10.0. Resulting functionalized metabolites were docked in Schrödinger Maestro 12.8 to selected G-protein-coupled receptor (GPCR) targets involved in central nervous system (CNS) effects associated with lavender, e.g., cannabinoid, serotonin, dopamine, melatonin, opioid, and gamma-aminobutyric acid (GABA). Using GlideScore and the interaction profile, 20 metabolites of lavender EO were prioritized for target correlation with SwissTargetPred and Super-PRED to confer the accuracy of docking results. These *in silico* efforts have discovered that functionalized VOC metabolites of lavender EO possess a greater predicted affinity to bind to human receptors involved in anxiolytic activity than parent lavender EO VOCs. Furthermore, synthesis and *in vitro* testing of predicted lavender EO metabolite VOCs are in progress.

9:15 BREAK

O7.05

9:30 A MULTI-INSTITUTIONAL RANDOMIZED CLINICAL TRIAL COMPARING ASSAY-GUIDED CHEMOTHERAPY WITH PHYSICIAN-CHOICE TREATMENT FOR RECURRENT HIGH-GRADE GLIOMA (Graduate student)

Elliot Varney, Seth Lirette, Pier Paolo Claudio, Candace Howard. University of Mississippi Medical Center, Jackson, MS

IMPORTANCE. Patients with recurrent high-grade glioma (HGG) have poor clinical outcomes, owing in large part to the presence of therapy-resistant cancer stem cells (CSCs).

OBJECTIVE. Determine if the selection of a chemotherapy regimen based on the functional ChemoID anti-cancer assay that targets cancer stem cells and bulk of tumor cells improves survival in patients with recurrent HGG when compared to empirically selected treatment in a randomized trial.

DESIGN, SETTING, AND PARTICIPANTS. This parallel-group, randomized, Phase 3 clinical trial, was conducted at 13 clinical sites in the USA. Patients with grade-III/IV recurrent glioma (2016 WHO guidelines) who failed standard of care (SOC) therapy, were treated and followed until unacceptable toxic effects, hospice care or death occurred.

INTERVENTIONS. Patients were randomly assigned (1:1) to one of two intervention groups and given one of fourteen mono or combination chemotherapies based on the results of a ChemoID assay test or physician choice.

MAIN OUTCOMES AND MEASURES. The primary endpoint was overall survival (OS).

RESULTS. The two arms were well balanced, with no statistically significant differences in prognostically important features.

The study met the primary outcome in its first interim analysis (as per protocol), which included an analysis of 50 patients. Survival was significantly greater in the ChemoID group (vs physician-choice). Median OS (mOS) was 12.5 months in the ChemoID group (95% CI, 10.2-14.7) vs 9 months in the physician-choice group (95% CI, 4.2-13.8; log-rank P = .010). The risk of death was significantly lower in the ChemoID assay group (HR = 0.44; 95% CI, 0.24-0.81; P = .008). Median progression-free survival (PFS) was 10.1 months in the ChemoID group vs 3.5 months in the physician-choice group (95% CI, 4.8-15.4 vs 1.9-5.1; log-rank P < 0.001). The risk of progression was significantly lower in the ChemoID assay group (HR = 0.25; 95% CI, 0.14-0.44; P < 0.001).

Results from all 78 patients in an as randomized, intention-to-treat (ITT) analysis showed significant improvement in OS. The ChemoID group showed a longer survival of 4.5 months compared to the physician-choice, which was statistically significant. Median OS (mOS) was 12.0 months in the ChemoID group (95% CI, 10.8-13.2) vs 7.5 months in the physician-choice group (95% CI, 3.5-11.5; log-rank P = .009). The risk of death was significantly lower in the ChemoID assay group (HR = 0.52; 95% CI, 0.24-0.81; P = .008).

CONCLUSIONS AND RELEVANCE. Compared with the physician-choice group, the ChemoID-guided group had significantly longer OS in the PP and ITT-analyzed population. Our findings support that using a patient-specific anti-cancer assay to screen standard cytotoxic chemotherapies is an effective way to improve patient treatment for recurrent HGG.

TRIAL REGISTRATION ClinicalTrials.gov Identifier: **NCT03632135**

O7.06

9:40 HIGHLY WATER-SOLUBLE MAGNETIC NANOPARTICLES FOR SENSITIVE DETECTION OF SARS-COV-2 DELTA VARIANT CORONAVIRUS

Sanjay Singh, Avijit Pramanik, Paresh Chandra Ray, Yongfeng Zhao

Jackson State University, Jackson, MS

The appearance of a double delta mutant variant (B.1.617.2) reduces the efficacy of the vaccine against SARS-CoV-2 infection. Although more than 6.35 million people have died from COVID-19 to date, more than 40% of those infected are asymptomatic carriers due to the body's immune system's ability to fight SARS-CoV-2 infection. Due to the rapid growth of the threat, there is an urgent need to develop rapid and accurate methods to detect the SARS-CoV-2 delta variant (B.1.617.2). Several methods have been developed to detect the COVID-19 virus, but only colorimetric assay provide naked-eye visibility within minutes. Sensitive, reliable and inexpensive biosensors for virus detection have been widely studied. Ideally, these biosensors should be inexpensive and easy to use, especially in resource-constrained environments. Horseradish peroxidase (HRP) is an enzyme widely used in colorimetric biosensors. However, its limitations are that HRP is difficult to purify and is unstable due to denaturation. Here, we developed a highly sensitive, selective, low-cost and reliable colorimetric sensor

based on an filter paper for the detection of the Delta variant of SARS-CoV-2 employing specific COVID-19 antibody conjugated iron oxide nanoparticles (Ab-IONP) for capturing and generated colorimetric signals from peroxidase-like activity of IONP. For this bioassay, we used water-soluble iron oxide nanoparticles as peroxidase mimics (PAA-IONPs) and filter paper with 0.22 μm pore size for colorimetric detection. The catalytic activity of PAA-IONPs is approximately 60 times that of HRP and its solubility in water is very stable. Both COVID-19 antibody conjugated IONP (Ab@PAA-IONP) and free PAA-IONP can easily passes through the filter paper-based sensor. Ab@PAA-IONP successfully binds to surface of pseudo delta virus (PDV), which was confirmed by DLS and TEM analysis. Based on these results, a colorimetric assay for SARS-CoV-2 PDV was established with a linear detection range of 10^1-10^5 PFU/mL and a lower limit of detection (LOD) of 80 PFU/mL. This study provides a potential platform and a new strategy for the diagnosis of COVID-19 based on nano-enzyme-metal catalysis.

O7.07

9:50 GLUCOSAMINE LIMITS ROS-INDUCED UPREGULATION OF INFLAMMATORY AND ECM GENES

Maricica Pacurari

Jackson State University, Jackson, MS

PURPOSE: In acute lung injury (ALI) the onset of oxidative stress (OS) plays an important role in activating inflammatory signaling pathway. ROS regulate redox-sensitive transcription factors and genes associated with inflammation and extracellular matrix (ECM) remodeling in the lungs following a acute stimuli which often leads to irreversible changes such as deposition of ECM.

HYPOTHESIS: In the present study we hypothesized that glucosamine (GlcN) mitigates hydrogen peroxide (H_2O_2)-induced translocation of NF-κB and its regulated inflammatory and ECM genes.

MATERIALS AND METHODS: The A549 cells were exposed either to H_2O_2 or GlcN, or pretreated with GlcN prior to H_2O_2 exposure. In some experiments, catalase was used prior to H_2O_2 (100 μM for 6h) exposure. Total RNA was extracted using TRIzol and cDNA was generated and analyzed by real-time qPCR with gene specific primers. ROS, ELISA, western blot, and fluorescent microscopy were used for subsequent analysis.

RESULTS: GlcN limited H_2O_2-induced upregulation of inflammatory genes and matrix metalloproteinases (MMPs). Pretreatment of cells with GlcN limited H_2O_2-induced upregulation of inflammatory genes or MMPs. GlcN similar to catalase decreased ROS level in samples treated with H_2O_2.

CONCLUSION: These results indicate that GlcN limits ROS-induced genes. GlcN induces post-translational modifications such as protein O-GlcNAC glycosylation which has been shown to limit inflammation. These data suggest that alveolar epithelial cells under external injurious stimuli undergo an inflammatory signaling by upregulating inflammatory cytokines and matrix remodeling factors and that GlcN limits ROS production and ROS-induced extracellular environment and ALI.

Key words: ALI, ECM, inflammation, MMPs, ROS, GlcN,

Acknowledgements: This research was supported by NIH/NIMHD U54MD015929 Sub-Project -6611 to MP at Jackson State University.

10:00 BREAK

10:10 Symposium I:

Theme:

"POPULATION HEALTH DISPARITY AND DISEASE"

Moderators: Drs. D. Olga McDaniel and David P. Gordy

(Speakers information can be found in the section on Divisional symposia and Workshop)

10:15 -12:00 Speakers and Topics

10:15 PATHOPHYSIOLOGY OF PRE-ECLAMPSIA AND POSTPARTUM HYPERTENSION

Dr. Joey Granger, Associate Vice Chancellor for Research,

Univeristy of Mississippi Medical Center, Jackson, MS

10:45 IMMUNE MECHANISMS OF PRE-ECLAMPSIA

Dr. Denise Cornelius,

Univeristy of Mississippi Medical Center, Jackson, MS

11:15 LAPAROSCOPIC AND ROBOTIC SURGERY VS. TRADITIONAL, APPLICATION IN ABDOMINAL DISEASE

TBA

11:45 Symposium I Questions and Discussions

12:00 General Sessions

Thursday February 23, 2023

Afternoon

1:30 -3:00 PM

HEALTH SCIENCES DIVISION INTERACTIVE WORKSHOP

Room D7

Topic: "TECHNOLOGY IN MEDICINE"

Moderator: Dr. D. Olga McDaniel,
Professor, SOM and Surgery, UMMC

Speaker: Dr. Lance E. Keller,
Assistant Professor, SOM-Cell and Molecular Biology, Center for Immunology and Microbial Research, UMMC

"Gene-Editing"

Sickle cell disease-story of a young Mississippi woman (video)

3:05-3:15 PM HSD Business Meeting

Evening

3:30-5:00 PM Awards Ceremony

Dodgen Lecture

5:00-7:00 PM General Poster Session

Coordinators for General Posters:
Drs. D. Olga McDaniel, Michelle Tucci

Coordinators for HSD Posters:
Drs. Maricica Pacurari and David Gordy

Topics:

Population health/Diversity/Social Studies/Policy

P7.01

QUANTIFYING SEVERITY OF MENTAL ILLNESS USING CLINICAL GLOBAL IMPRESSION (CGI) DATA: INTELLECTUAL DISABILITY DISORDER (IDD) VS NON-IDD CIVILLY COMMITTED PATIENTS

Alexandria Hutchison, Mississippi State Hospital, Jackson, MS

This study aims to capture discrepancies in the severity of mental illness and overall improvement of IDD vs non-IDD adult patients on an inpatient psychiatric unit. By reviewing CGI data captured at time of admission and discharge, non-IDD and IDD illness severity was compared. Authors hypothesized that disease severity on admission, and discharge are higher than that on non-IDD patients. They also hypothesize that less improvement in CGI score is seen. Investigation through retrospective chart review compared CGI data from civilly committed individuals with IDD with non-IDD committed patients at the state hospital.

P7.02

CYTOTOXICITY EVALUATION OF VIT D3 ON COLORECTAL CANCER CELLS

Maricica Pacurari[1], Kayode Komolafe[2], Felicite Noubissi[1]

[1]1RCMI Center for Health Disparities Research (RCHDR), Jackson State University, Jackson, MS, [2]Department of Biology, Jackson State University, Jackson, MS

Background: Colorectal cancer still remains a disease with a high incidence and mortality. While some advances have been made in the therapeutic targeting of colorectal cancer, resistance to treatment is a major challenge. Vitamin D3 (1,25-dihydroxyvitamin D3 or calcitriol) has been suggested to benefit colorectal cancer survival and to lower the risk of colorectal cancer.

Hypothesis: In the present study, we investigate whether calcitriol, the physiologically most active form of Vit D3, is cytotoxic to colorectal cells (SW480).

Materials and Methods: SW480 cells were cultured in RPMI medium supplemented with 10% FBS and 1% penicillin-streptomycin until they reached 90% confluency. The cells were then seeded in a 96-well plate in growth media overnight and then treated with different doses of Vit D3 (0.1-1000 nM). After 24 or 48 h, cell viability was measured using the MTS assay according to the manufacturer's protocol (Promega).

Results: After 24 h of Vit D3 exposure, cell viability decreased at concentrations ranging from 0.1-100 nM, whereas at the highest tested dose of 1000 nM, cell viability was not affected. For the 24hour exposure, the calculated IC_{50} was 35 nM. Longer exposure up to 48 h produced a similar trend in cell viability to that observed at 24 h. These results indicate that Vit D3 modulates colorectal cancer cell viability and warrants further investigation into its antitumorigenic mechanism alone or in combination with other chemodrugs.

P7.03

EXAMINING THE IMPACT OF COVID-19 RISK FACTORS ON THE MENTAL AND PHYSICAL HEALTH OUTCOMES OF THE ELDERLY: A PILOT STUDY

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Background: The elderly population are at a significantly higher risk of suffering from mental and physical health outcomes due to their lack of independence, illnesses, separation, isolation, and simply being older. Research shows that the COVID-19 pandemic has exacerbated these negative health outcomes among the elderly. Hence, the purpose of this study is to identify the impact of COVID-19 risk factors on the mental and physical health outcomes on the elderly, specifically at adult daycare facilities and nursing homes in Mississippi.

Methods: This pilot study will utilize a mix method approach to gather and analyze data on risk factors on the mental and physical health outcomes among the elderly population. Trained student interns will survey the targeted population using an expert-validated semi-structured questionnaire and qualitative interviews. A purposive sampling technique will be utilized to determine an appropriate sample size from identified nursing homes and adult daycare facilities in the state of Mississippi.

Results: A thematic analysis will be conducted to categorize the multifarious factors impacting the mental and physical health among the elderly at adult daycare facilities and nursing homes during the COVID-19 pandemic. Additionally, the study will analyze quantitative data identified from the semi-structured questionnaire. Results are expected to enhance an understanding of differences in factors that impact the mental and physical health outcomes among elderly individuals. Hence, this study will result in targeted programmatic recommendations and interventions for mitigating negative health outcomes on elderly persons arising from impact of the COVID-19 pandemic at adult daycare facilities and nursing homes.

Conclusion: Specific guidelines for interventions and policy changes to improve the mental and physical health of the elderly will be developed for adult day care facilities and nursing homes.

P7.04

CLÍNICA MÉDICA: A DESCRIPTIVE STUDY ON THE ESTABLISHMENT OF A FREE CLINIC FOR SPANISH-SPEAKING PATIENTS *(Graduate student)*

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With an estimated 9.6% of United States residents without health insurance in 2021, it is imperative that action is taken to provide healthcare to vulnerable populations. Of those uninsured residents, approximately 31.4% of Hispanic adults lacked health insurance. To alleviate the financial burden of uninsured healthcare costs in the Hispanic population, Clínica Médica (CM) was established in 2021 in Jackson, Mississippi (MS) as a part of the Jackson Free Clinic (JFC), a student-run free clinic. The aim of this study is to describe the challenges and the impact of CM in providing accessible healthcare despite language barriers to the ever-growing Hispanic community. Multiple medical services were available to Hispanic patients such as clinic appointments, vaccinations, and educational health fairs in their native language. Significant challenges included funding for facilities, an electronic medical record, laboratory analysis of specimens, and diagnostic equipment; obtaining Spanish-speaking medical student and physician volunteers; and advertising to Hispanic patients via outreach events. Despite these challenges, within the first fiscal year of operations, 882 Hispanic patients received COVID-19 vaccinations, 60 Hispanic patients have been treated and/or referred to specialty clinics, and the number of Hispanic patient clinic-visits has increased 15-fold in the last year. Establishment of a clinic to serve those in need is not without challenge; however, the impact of the CM in the Hispanic population was significant. Free clinics are not only a means to provide medical care to patients, but they also provide a platform for medical students to positively interact with their community.

P7.05

VITAMIN D DEFICIENCY STATUS, PREVALENCE AND ASSOCIATED FACTORS IN THE US ADULT POPULATION USING NATIONAL HEALTH AND NUTRITION EXAMINATION SURVEY (NHANES) 2015-2018

(Graduate student)

Pratikshya Gautam,

Mississippi State University, Starkville, MS

Introduction: Mississippi being a rural state has a shortage of physicians, particularly in the emergency department (ED). Thus, the objective of this study is to evaluate the healthcare delivery trends in emergency departments across the country for the years 2014 and 2019.

Methods: Retrospective observational study using a database of 43325 visits to ED for the years 2014 and 2019 collected through the National Hospital Ambulatory Medical Care Survey public use linkage file. Among these visits, patients seen by the physicians, nurse practitioners and physician assistant are compared.

Results: In the years 2014 and 2019 there were 19481 and 23844 emergency department visits respectively. Comparing the two years, the rate of emergency department visits with solo nurse practitioners increased from 3.2% for the year 2014 and 5.9% for the year 2019. For solo physician assistant the rate of emergency department visits increased from 4.7% for the year 2014 to 7.6% for the year 2014. Visits handled by solo physician reduced from 84.3% to 76.6% for the years 2014 and 2019 respectively. This shows that most of the tasks performed by the physician are also being performed by the nurse practitioners and physician assistants in the emergency departments across the country.

Conclusion: The national healthcare delivery in the emergency departments across the country shows a growing trend in 2019 compared to 2014 in solo care delivery by nurse practitioners and physician assistant. The rate of visits handled by physicians' shows reduction in 2019 compared to 2014. This result can prove to be useful for healthcare delivery in the state of Mississippi by educating and hiring more of nurse practitioners and physician assistants.

P7.06

SOCIODEMOGRAPHIC FACTORS ASSOCIATED WITH NEVER OR RARELY WEARING A PASSENGER SEAT BELT AMONG MISSISSIPPI ADOLESCENTS: THE YOUTH RISK BEHAVIOR SURVEY, 2019

Precious Patrick Edet

Jackson State University, Jackson, MS ***(Graduate student)***

Background: The Mississippi Department of Transportation reports that 1 out of 2 people who die from a motor vehicle

accident do not use a seatbelt. According to the Center for Disease Control and Prevention, seat belts reduce serious crash-related injuries and deaths by about half. Data investigating the association between sociodemographic factors and never or rarely wearing a seatbelt among Mississippi adolescents is limited. We examined the association between sociodemographic factors (age, gender, and race) and never or rarely wearing a passenger seatbelt among adolescents in Mississippi.

Methods: We analyzed data from the 2019 Mississippi Youth Risk Behavior Survey (YRBS) for 1,699 participants. We examined associations between sociodemographic factors such as age, gender, and race (Non-Hispanic Whites vs Non-Hispanic Blacks) and never or rarely wearing a passenger seatbelt using chi-square tests.

Results: Among Mississippi adolescents, the association between age and never or rarely wearing a passenger seatbelt was statistically significant with the highest prevalence reported among 12 year old adolescents (73.7%) followed by 13 year old adolescents (15.3%) (p=<0.0001). The association between race and never or rarely wearing a passenger seatbelt was statistically significant with a higher prevalence reported among Blacks than Whites (12.8% vs. 5.8%, p=<0.0001). The association between gender and never or rarely wearing a passenger seatbelt was statistically significant with a higher prevalence reported among males than females (11.6% vs. 8%, p=<0.0001)

Conclusion: There is an association between sociodemographic factors and never or rarely wearing passenger seat belts among Mississippi adolescents. Effective public health strategies are needed for promoting consistent seat belt use among adolescents in Mississippi.

P7.07

RACIAL AND GENDER DISPARITIES IN SUBSTANCE USE AMONG MISSISSIPPI ADOLESCENTS: THE YOUTH RISK BEHAVIOR SURVEY, 2019 (Graduate student)

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Jackson State University, Jackson, MS

Background: Tobacco, alcohol, and marijuana are the most used substances among US adolescents and racial disparities exists. Data on substance use among Mississippi adolescents is limited. We examined racial and gender disparities in current cigarette, electronic vapor product (e.g. e-cigarettes), alcohol, and marijuana use among Mississippi adolescents. **Method:** We analyzed data from the 2019 Mississippi Youth Risk Behavior Survey (YRBS) for 1,417participants. We examined associations between current cigarette, e-cigarette, alcohol, and marijuana use by race (non-Hispanic black, non-Hispanic whites) and gender using chi-square tests. **Results:** Among Mississippi adolescents, prevalence of current cigarette (9.7% vs. 3.7%), electronic vapor products (30.9% vs. 12.3%) and alcohol use (34.6% vs. 18.2%) were significantly higher among whites compared to blacks respectively (p<0.001). Prevalence of current cigarette (8.7%vs. 4.9%, p=0.0018) and electronic vapor (23.6% vs. 18.9%, p=0.0409) use were significantly higher among males compared to females respectively. There was no significant racial difference in marijuana use and no gender differences for marijuana and alcohol use. **Conclusion:** Racial and gender disparities in substance use exist among Mississippi adolescents. Target interventions are needed that address substance use disparities among Mississippi adolescents.

P7.08

ACHIEVING EQUITABLE VACCINES POST COVID 19 (Undergraduate student)

Melissa Bustamante[1], Emily Godina[1], Linzsey Lyle[2]

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Influenza vaccinations were higher pre-pandemic, 2019-2020 flu season, than vaccinations this past season (2021-2022). Additionally, there were about 9 million fewer flu vaccinations than the year prior. Research suggests that vaccine hesitancy and mistrust led to a decrease in vaccination rates. Vaccine disparities exist due to the spread of misinformation on social media outlets. It is up to the healthcare and federal organizations to ensure the discretization of misinformation. Programs in place to increase COVID 19 vaccination rates can be effective in raising influenza vaccination rates. Our group decided to look at current efforts nationally and locally to increase COVID-19 vaccination, especially amongst BIPOC communities, and establish effective vaccination program characteristics that can be continued post-pandemic for influenza.

P7.09

IMPACT OF RACISM ON HEALTH: HIGH MATERNAL MORTALITY RATES AMONG BLACK AND AFRICAN AMERICAN WOMEN (Undergraduate student)

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The United States holds the highest rates of maternal mortality among other industrialized countries.[1] Maternal mortality includes the death that can occur during pregnancy (prenatal stage), during the time of delivery, or within a year after delivery (postpartum stage).[2] Maternal mortality can be a result of postpartum hemorrhage, eclampsia, obstructed labor, and sepsis.

Structural racism has impacted the lives and health of Black and African American women all throughout history. Unethical medical experimentation of slaves and the black population over time has further perpetuated stereotypes and harm that has created ongoing health disparities. This has affected many aspects of health among this population including high rates of maternal mortality.

P7.10

THE IMPACTS OF RELATIONSHIP DYNAMICS CONCERNING SEXUAL HEALTH IN AFRICAN AMERICAN WOMEN IN MISSISSIPPI (Undergraduate)

Lauren-Kelli Gatlin

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Objective: The primary purpose of this study is to assess quantitative data on the impacts of relationship dynamics and sexual health of African American women. Next, the study wanted capture the in-depth qualitative data on African American women's sexual health and impacts to relationship dynamics. The researcher also applied a theoretical model to examine the impacts of relationship dynamics and sexual health for women.

Background: Relationship dynamics can be defined as the pattern(s) of behavior that happen between people in the ways one can relate, interact, and communicate with one another other.[1] Sexual health is the awareness of physical, emotional, and social will being in relation to sexuality[2,3]. Examples of dynamics inside relationships may include (1) who controls the decisions surrounding the sex or intimacy between partners; an example of Power; or (2) who determines the role each partnership play in a relationship; an example of Gender.[4,5] The length of the relationship; the amount of trust or closeness of each partner to one another; and the presence or lack of conversation surrounding consent for intimacy (sex) to prevent the transmission of sexually transmitted diseases or infections (STDs and STIs) are all very important, especially to the relationships of African American women[6, 7]. African American women also have a long history of vulnerability to HIV and other sexually transmitted infections, while continuing to have the highest rate of new infections among women in general. [6,7] According to the CDC HIV Surveillance Report of 2019, in the United States, Black/African Americans only made up 13% of the female population but accounted for 58% of diagnoses of HIV infection among females".[8] In retrospect of this literature review, this issue has not addressed the assessment of the relationship dynamics and sexual health experiences specifically of African American women. This study will hypothesize that African American women will report and share experiences of high responses of being influenced under drugs or alcohol during sex; low response of experience anger when their partner(s) ask to use contraceptives or condoms, and low responses of practices of safer sex with their partners as well. **Results:** Within the survey 60 people participated, 54 identified as female while unexpectedly 6 identified as male. For participant demographic responses, 11 (18.3%) of participants were located within the 39212 zipcode area south of Jackson, Mississippi; For Age, 18 (30%) of participants reported being 19 years of age; 11 (18%) reported being 20 years of age; and lastly, a tie was presented for 6 (10%) of participants reported being either 18 or 21 years of age. For Race / Ethnicity, 60 (100%) of participants identified as African American; For Sexual Orientation, 52 (86.7%) of participants identified as heterosexual or straight; For Level of Education, 19 (31.7%) of participants identified as college sophomores. For Relationship status, 38 (63.3%) of participants reported being "Single", while 15 (25%) identified as being in a relationship or dating.

P7.11

DESCRIPTIVE INVESTIGATION OF INTRANASAL ADMINISTRATION OF NICOTINAMIDE ADENINE DINUCLEOTIDE FOR MANAGEMENT OF TREMORS AND SYMPTOMS ASSOCIATED WITH PARKINSON'S DISEASE (Undergraduate student)

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Introduction: Parkinson's disease (PD) is a neurodegenerative disease that causes individuals to experience cognitive impairment and motor dysregulation. Previous research documents a relationship between the neurodegeneration found in PD and the normal depletion of Nicotinamide Adenine Dinucleotide (NAD+) - a coenzyme found in all living cells which depletes with age. In fact, clinicians at Springfield Wellness Center have developed intravenous NAD+ administration protocols for treatment of a number of clinical conditions such as detox from opioid and alcohol, mood and anxiety disorders and symptoms associated with Alzheimer's and Parkinson's Disease. Collaborative efforts with physicians specializing in the use of NAD+ sphenocath/sphenopalatine ganglion block protocols resulted in effective treatment and management of migraine headache pain, suggesting that (IN) NAD+ is an effective strategy for management of symptoms associated with these conditions. We present data from three patients with Parkinson's disease who have undergone an initial 6-day (IV) NAD treatment administration protocol followed by administration of (IN) NAD+ treatment for PD symptom management over a 2 year follow up period. Method: Following the initial 6-day (IV) NAD+ treatment (1000 mg of NAD+ per day), patients were given the option to enroll in a maintenance program using (IN) NAD+ (200 mg/ml NAD in either 0.5% or 2% lidocaine). Patient data during the (IN) NAD+ administration period was analyzed and evaluated using clinic-derived consultation and procedural questionnaires that measured symptoms of pain, stress, energy, and sleep. Tremors and other symptoms were recorded in daily nurse notes and analyzed following treatment of (IV) NAD+. Results: The patients showed varying degrees of overall symptom improvement, ranging from 15% to 75% improvement over time. Nursing reports suggested a 50% reduction in tremors in Patient 1 and Patient 3 within the first three days of the (IV) NAD+ treatment protocol. Patient data indicated that intranasal administration of NAD+ following the initial (IV) NAD+ treatment protocol aided in overall symptom management. Conclusion: These findings indicate that the use of NAD+ administration protocols for initial treatment and follow-up show therapeutic potential in alleviating tremors and improve symptoms of pain and cognitive impairments associated with PD. The use of NAD+ in the treatment of PD could be considered a

supportive add-on to traditional medications and forms of standard care; however, further studies are needed to determine the effectiveness of NAD+ in this patient population.

P7.12

EVALUATING RELIGIOSITY AS A PREDICTOR OF SLEEP QUALITY WHEN CONTROLLING FOR MENTAL HEALTH AND SOCIAL VARIABLES IN MISSISSIPPI AND LOUISIANA ADULTS (Undergraduate student)

Bryanna White[1], Shawna Everman[2], Austin R. Anderson[3], Jennifer L. Lemacks[4], Tammy Greer[4], Sermin Aras[4]

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Sleep quality is the soundness, duration, and depth of an individuals' sleep pattern. Some studies indicate that sleep quality and religiosity are associated. Mechanisms linking religiosity with sleep are not completely identified. Religiosity may impact factors such as mental health and social support, which in turn, impacts sleep quality. Anxiety and depression are among the leading mental health issues in adults in the United States. Anxiety and depression may negatively impact sleep quality due to creating a cycle of agitation surrounding sleeping habits. Stronger relationships with friends and family may help someone to perceive that they are cared for and is considered social support. Fewer sleep disturbances may be aided by those stronger relationships. Being religious may also have stress-buffering benefits when the religious person places their trust in a divine power to take care of all situations. This study sought to determine whether religiosity predicts sleep quality, after controlling for mental health and social support. The 2022 Lifestyle and Mental Health survey was completed by 153 adult participants who live in Mississippi and Louisiana. A multiple regression model tested the relationship between religiosity and sleep quality after controlling for demographic variables and other relevant predictors (anxiety, depression, social support). It was found that anxiety significantly predicted sleep quality (β=.182, p=.006). Alternatively, depression, social support, and religiosity did not significantly predict sleep quality (β=.046, p=0.435; β= -0.121, p=0.617; β=0.319, p=.210) respectively. Future studies should explore and confirm these relationships in a larger sample of the population.

P7.13

BARRIERS IN HEALTHCARE ACCESS FOR IMMIGRANTS IN ICE DETENTION CENTERS DURING COVID-19 (Undergraduate student)

Monia Zein[1], Amber Ellis[2], Maritza Perez[3], Adeline Rosales[4]

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The coronavirus pandemic has affected many people all throughout the United States. In addition to families and essential workers, illegal immigrants in detention facilities face many challenges in accessing adequate healthcare while in those facilities. Through a literature review, as well as an analysis of existing health interventions available in detention facilities, several of the barriers to healthcare access during the coronavirus pandemic were identified. These barriers were found to be inadequate staffing in facilities, a lack of transparency in reporting cases, and a lack of adherence to guidelines in both federal and private institutions. As the coronavirus pandemic is currently ongoing, the barriers still cause some level of harm to detained individuals. Correcting these issues would lead to better health outcomes for detained individuals suffering from coronavirus, fewer cases of coronavirus in detention facilities, and expedited treatment of individuals suffering from coronavirus in detention facilities. The identification of these issues only serves as the first step toward their mitigation.

Topics:Clinical/Diagnostics/Molecular/Technology/Therapeutics

P7.14

IMAGING BIOMARKERS TO UNRAVEL PHENOTYPICALLY HETEROGENOUS OBESITY AMONG THE UMMC POPULATION

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[1]Department of Radiology, UMMC, [2]Investigator in Development Program for MCCTR, UMMC

Obesity is a critical health problem particularly in states such as Mississippi, one of four states with obesity prevalence greater than 35%; among non-Hispanic blacks in Mississippi obesity prevalence is 48.1% This compounds the state's alarming health disparities. Obesity predisposes to a sequence of metabolic risk factors, and its health implications involve multiple organ systems. Studies have shown associations between the commonly defined anthropometric measures of obesity and obesity-related metabolic risk factors and health system effects. However, body fat distribution is inconsistent in obesity, with varying amounts of ectopic fat deposition across individuals despite similar body mass index (BMI). Interestingly, the regional distribution of body fat is thought to be more important in cardiovascular disease (CVD) risk than excess adiposity overall. CT and MR imaging modalities are the gold standard for body composition analysis, and their correlation with obesity-related health effects in the cardiovascular, cerebral, renal, and hepatic systems. We describe a large retrospective cross-sectional analysis at UMMC to identify regional fat-incorporated obesity phenotypes and clinical outcomes in adult men and women and to examine the effects of race/ethnicity, age, and sex on the development and outcomes of the cardiometabolic syndrome and other obesity-related diseases. Conclusion: Investigation of regional fat-incorporated individual obesity

phenotypes and their significance in related clinical cardiovascular and other disease events would help identify imaging biomarkers to substantiate individual obesity phenotypes, personalize and improve management, and elucidate novel molecular targets for personalized interventions to combat obesity.

P7.15

MODULATING THE IMMUNE SYSTEM NOT TO REJECT AN ALLOGRAFT

D. Olga McDaniel[1], *Montiana Roseburgh*[1], *Jack Neill*[2], *Larry McDaniel*[1]

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Background: Currently over 100,000 patients are on a waiting list for a deceased or living donor transplants. 500,000 pts with end-stage renal disease (ESRD) are undergoing dialysis. Organ transplantation is a major therapeutic approach in end stage disease with organ dysfunction. Organ transplant recipients are continually at risk of rejection despite intense immunosuppressive regimens that can have detrimental side effects. The immune system plays a central role in the recovery process including restoration of organ function after allograft transplantation. Previously, we have shown that human recipients can tolerate their transplanted organ when infusing the donor bone-marrow cells, prior to the kidney transplantation. This is known the induction of tolerance through mixed Chimerism.

Methods: Current approaches in regenerative medicine includes cell-based therapeutics. To determine whether persistent mixed Chimerism and tolerance can be established in patients undergoing kidney transplantation, we initially infused allograft recipients with donor bone marrow crude cells. Training stimulatory pathways of immunity that induce macrophage polarization, antigen presentation, T cell activation and cytokine production are included.

Results: Genotype analysis for detection of donor cells and Chimerism in the peripheral blood were tested on a weekly base. The HLA alleles for Class II genes were highly informative. In addition, VNTR polymorphism and SRY, Y-Chromosome were tested. Of the transfused patients. 91.3% who demonstrated Chimerism were rejection free as compared with 8.7% who experienced one rejection episode ($p<0.01$). AIF-1 was detected in monocytes of recipients. AIF-1 treated cells demonstrated 1.25-4.5-fold dose dependent increase in IL-18 ad IL-10 production in human HEK-293 transfected cells with TLR-2.

Conclusions: Modification of bone marrow preparation including depletion of CD-3 positive cells and positive selection for stem cells might improve the level and persistence and prolongation of Chimerism which may allow more successful protocols for the induction of tolerance. Advances in immune modulation through reprogramming of immune system arranges the foundation to train the immunity not to reject through epigenetic modification of the immune microenvironment.

P7.16

SUBSTRATE ANALYSIS OF RECOMBINANT YfdV, A PUTATIVE MEMBRANE TRANSPORT PROTEIN IN *Escherichia coli*.

Mary Tebbe, Nazm Rahat, Samantha Sherman, Cory Toyota

Millsaps College, Jackson, MS

Escherichia coli is able to endure a surprising amount of environmental stress. The bacterium has evolved several different systems to survive acidic conditions and is able to tolerate pH values as low as 2 for hours. A related set of several systems involve the import and decarboxylation of amino acids like glutamate or arginine and share a requirement for a decarboxylase enzyme and antiporter protein. We have previously shown that two enzymes, FRC and OXC, confer an oxalate dependent acid tolerance to *E. coli* and we hypothesize that the *yfdV* gene product is the unknown membrane antiporter in the system. We are developing an LC-MS based system to analyze small organic acid transport across an artificial membrane in a 3D printed assay chamber. The likely substrates of the transporter are oxalate, formate, and/or acetate and our system will detect antiport.

P7.17

DEVELOPING RAPID ASSAY FOR DETECTING NEUTRALIZING ANTIBODY AGAINST SARS-CoV-2

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Mississippi State University, Mississippi State, MS

Background: Coronavirus disease (COVID-19) caused by the SARS-CoV-2 virus affects more than 200 million people and, to date, has killed > 4 million, worldwide. SARS-CoV-2 causes respiratory diseases by binding of SARS-CoV-2 spike protein (S protein) to human ACE2 (angiotensin-converting enzyme 2) protein present in the host cells. Neutralizing antibody (Nab) is a specific antibody that inhibit interaction of S protein with human ACE2, thereby providing protection from SARS-CoV-2. Thus, detection of SARS-CoV-2 NAb is critical to evaluate vaccine efficacy and herd immunity against SARS-CoV-2. However, all currently available NAb tests require well-equipped laboratory and take hours to days to complete.

Methods: We develop a 15 min lateral flow assay to determine SARS-CoV-2 NAb levels by measuring competitive inhibition of NAb against interaction between S protein and ACE2. To demonstrate the sensitivity (percent positive agreement [PPA]) and specificity (percent negative agreement [PNA]) of the LFA, the NAb levels in human sera (n=130) obtained from SARS-CoV-2 PCR test positive patients without previous COVID-19 vaccination were determined by the LFA test and compared to the plaque reduction neutralization test (PRNT), the gold standard method to determine the NAb level.

Results: The LFA established in this study showed the sensitivity of 92.00%, the specificity of 95.00%, and the accuracy of 93.85%, compared to the PRNT test at the 95% confidence interval. Within 14 days of PCR test positive

(n=93), 76.30% and 23.7% were negative and positive, respectively, for NAb. After 15 to 92 days of PCR test positive (n=37), and 75.68% became NAb positive and 24.32% remained NAb negative. These results indicated that natural infections with SARS-CoV-2 did not always develop NAb response.

Conclusions: The 15 min LFA assay established in this study provide highly accurate testing results comparable to the PRNT test. A rapid, semi-quantitative, portable and inexpensive LFA NAb can be used at point-of-care which will be useful for monitoring herd immunity and efficacy of COVID-19 vaccine.

P7.18

GARCINIA KOLA INDUCES APOPTOSIS AND ANTI-PROLIFERATION EFFECTS ON MDA-MB-231 BREAST CANCER CELLS (Graduate student)

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Jackson State University, Jackson, MS

Breast cancer (BC) is the second most diagnosed cancer among women. When compared to Caucasian women, African American women have a lower incidence rate but a higher mortality rate. And although treatment options have improved, adverse side effects often accompany the most common treatments for BC. According to Folkloric Medicine, Garcinia Kola (G. Kola) is a flowering plant found in Central and Western Africa whose seeds, stems, and leaves contain medicinal properties. Nevertheless, the ability for G. Kola to inhibit cell growth and induce apoptosis in BC cells is currently unknown. Therefore, Our study aims at assessing the cytotoxic and apoptotic effects of G. Kola on MDA-MB-231 BC cells at various dose-dependent concentrations for 48 hrs. Our findings demonstrated that G. Kola inhibits cellular proliferation, leading to apoptosis and necrosis cell death in a concentration-dependent manner. Findings from our study provide new insights into the molecular mechanisms of G. Kola as a potential treatment drug for BC.

P7.19

THE POWER OF GREEN: EXAMINING NATURE'S INFLUENCE ON VEGETABLE & FRUIT CONSUMPTION AMONGST WHITE AND BLACK MISSISSIPPI AND LOUISIANA ADULTS (Graduate student)

Dakota Kilcrease[1], Delaney Anderson[2], Antonio Gardener[3], Jennifer Lemacks[4], Tammy Greer[4], Sermin Aras[4]

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Mississippi and Louisiana are known for their escalating obesity prevalence, which is partly attributed to sedentary behaviors and poor overall diet. Evidence points to healthier diets being a key determinant of overall health, especially nutrient-dense green vegetable consumption reducing overall body fat. This insight is especially relevant to Mississippians and Louisianans, who experience multiple barriers to healthy and convenient food options. Although evidence in the literature suggests nature immersion positively influences physical health in urban centers, little research currently explores the relationship between nature and diet in a rural setting. This research determined the relationships between vegetable & fruit consumption and time immersion in nature among Mississippi and Louisiana adults. Survey data was collected from adults (18+) through various community outreach events within Mississippi and Louisiana. Study inclusion was adults self-identifying as either white or African American. A Spearman correlation and MANCOVA analysis analyzed the collected data. While controlling for several demographic covariates, time in nature was a significant predictor of weekly physical activity, monthly green vegetable intake, monthly fruit intake, and self-perceived health ratings. Limitations include a small sample size limited in scope to the rural Southern United States. These results can help contribute to the current knowledge of public health interventions and provide evidence-based strategies toward healthy behavioral habits. Future studies should consider the benefits of nature immersion in rural areas outside the Southern United States and the broader cultural factors influencing nature use.

P7.20 A COMPREHENSIVE DATA MINING AND BIOINFORMATICS APPROACH IDENTIFY GENE SIGNATURES THAT PROMOTE PROSTATE CANCER PROGRESSION IN AFRICAN DESCENT POPULATION (Graduate student)

Victor Bii, Janani Kunrathur Pasupathy, Mississippi Valley State University, Itta Bena, MS

Prostate cancer (PCa) is the second most common cancer type in the United States affecting men with projected 268,490 new cases and 34,500 deaths in 2022. It is estimated that one in seven African American (AA) males will develop PCa in their lifetime. Existing data shows that AA patients are more likely to die from low-grade PCa than Caucasians and have been shown to be widely underrepresented in most clinical trials. We hypothesize that the AA PCa patients might harbor genetic signatures that drive cancer progression that are different from their Caucasian counterparts. We analyzed the gene expression profiles by implementing comprehensive bioinformatics-based data mining approaches on RNAseq data of PCa patients. In our preliminary study, we identified candidate differentially expressed genes in AA PCa patients. We identified significantly over expressed and under expressed genes including; ELOVL fatty acid elongase 2 (ELOVL2), Sorting nexin 31 (SNX31), crystallin beta B2 (CRYBB2), CROCC pseudogene 2 (CROCCP2) and mutS homolog 2 (MSH2). These gene signatures might identify potential pathways that promote cancer disease progression which could be potential biomarker or drug targets that would improve treatment outcomes in AA patients.

P7.21

GREATER RECOMBINATION FREQUENCY FOR THE ACQUISITION OF LARGE ICE COMPARED TO CAPSULE LOCUS (Graduate student)

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Background: Integrative and conjugative elements (ICEs) are mobile genetic elements located on the chromosome. ICEs are capable of self-excision and transfer via conjugation to a recipient, disseminating antibiotic resistance. *Streptococcus pneumoniae* (Spn) carries Tn916-like ICEs encoding resistance to macrolides, but we have demonstrated that their transfer is facilitated by transformation. We investigated the recombination frequency (rF) for the acquisition of ICEs, compared to rF of a known transformation event such **as the acquisition of the capsule locus.**

Methods and Results: We used a double marked pneumococcal strain $D39^{Str\text{-}Tmp}$ as the recipient. The ICE donor was $GA17545^{Tet\text{-}Ery}$, a macrolide resistant strain that carries TnMeg (~51 kb) and we engineered TIGR4 to carry macrolide resistance upstream the capsule locus (TIGR4Ω*ermB-cps4*, ~27 kb). Strains were co-incubated in an *ex vivo* model (BioReactor) to induce genetic recombination. Blood agar plates with the appropriate antibiotics were used to obtain the density of each parent strain and to select for D39 transformants carrying TnMeg ($D39^{TnMeg}$) or TIGR4 capsule genes ($D39^{\Omega ermB\text{-}cps4}$). All D39 transformants were screened using a high-throughput PCR approach including molecular serotyping, D39-specific genes, and mapping different genes along TnMeg, or *cps4* locus. Expression of serotype 4 capsule by $D39^{\Omega ermB\text{-}cps4}$ was investigated using serotype 4-specific Quellung antibodies. With this approach, we identified clones that acquired the entire ~51 kb ICE or the *cps4* locus (~27 kb). Whole genome sequencing of selected clones confirmed the acquisition of TnMeg or *cps4*. Remarkably, the rF for the acquisition of TnMeg was 2.49×10^{-5} whereas the rF for the acquisition of a smaller DNA fragment, the capsule locus, was two orders of magnitude lower at 1.2×10^{-7}.

Conclusion: While transformation facilitates the acquisition of ICEs in pneumococcal strains, our results suggest the potential for specific molecular mechanisms within ICEs that may be important for the dissemination of large genetic elements carrying resistance.

P7.22

ANALYSIS OF THE EMERGENCE OF B.1.1.529 OMICRON VARIANT OF SARS-CoV-2 IN MISSISSIPPI (Graduate student)

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Emerging as novel and unknown, SARS-CoV-2 led to a global pandemic by its ability to rapidly evolve and continuously mutate. Spread by aerosol droplets, this virus is highly transmissible and capable of morbidity and, at times, mortality. Common symptoms of the disease caused by the virus COVID-19 include rhinorrhea, fever, shortness of breath, and fatigue. The omicron variant, B.1.1.529, of SARS-CoV-2 was first identified in Mississippi on December 6, 2021. In order to analyze the presence of the omicron variant in Mississippi and its subsequent impact on the state population, samples were collected from adult patients at the University of Mississippi Medical Center, a large tertiary referral hospital. These samples consisted of a nasopharyngeal swab, buccal swab, blood, and urine. The cohort was prospectively enrolled from December 2021 to August 2022 and consisted of 58 patients who had tested positive for SARS-CoV-2. Males comprised 55% of the cohort while females comprised 45%. African Americans comprised 76% of the cohort, and Caucasians comprised 22%. 78% of the cohort was within the age ranges of 50-79 which indicates a high prevalence of the disease amongst elderly patients. Only 64% of the cohort was vaccinated against SARS-COV-2. Of the total cohort, 16% ultimately passed due to their illness. 78% of the deceased patients were unvaccinated against SARS-CoV-2, indicating that vaccination is a critical prevention measure. Severity of COVID-19 illness was determined using an index score specific to the disease created by the World Health Organization. Utilizing this score, 64% of the cohort was ranked with a score from 6-8, indicating a highly severe disease course including mechanical ventilation and intubation. Plasma samples of the cohort have been further characterized using antibody titer testing, and nasal samples have been analyzed using single-cell RNA-sequencing. While many efforts to blunt the effects of the virus SARS-CoV-2 in communities rely on prevention strategies and public awareness, this empirical information could allow scientists to better target the presence of this virus within high-risk populations.

P7.23

STANDARDIZED AND STRUCTURED HANDOVERS: AN AUDIT OF CURRENT HANDOVER PRACTICE FROM A LOW-MIDDLE INCOME COUNTRY (Graduate student)

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Objective: To assess the current practice of handover and improve the quality of patient handover against standard Royal College of Surgeons of England (RCSEng) protocols.

Methods: After discussing with consultants and medical officers of DHQ Hospital Jhelum in August 2018, it was concluded that patient handovers are lacking in various aspects and require improvement. Subsequently, a handover questionnaire was introduced. We included only those patient handovers that were recorded after a senior's review in the emergency department and conducted 3 consecutive audit cycles, beginning from September 2018 to November 2018,

respectively. During audit cycles, we continuously educated physicians regarding safe patient handover protocols.

Results: 1st PDSA Cycle: Only 20/30 patients handover questionnaires were filled. Many parameters of the handover of patients were ignored. 2nd PDSA Cycle: 30/30 patients handover questionnaires were filled. A few parameters (especially management and resuscitation plans) were not followed properly. 3rd PDSA Cycle: 30/30 patients handover questionnaires were filled. All aspects were mostly followed properly. All parameters were properly followed with a success of >90%.

Conclusion: Initial audit concluded that the current practice of surgical handover lacks structure along with inappropriate documentation. Thorough teaching and awareness through successive PDSA cycles lead to an improvement in the quality of patient handovers.

P7.24

RADIOACTIVITY IN SOILS FROM COAL ASH PONDS (Undergraduate student)

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The demand for energy is increasing drastically. Coal is one of the dominant fossil fuel sources that is abundantly available and is used in thermal power plants. In the United States, coal contributes about 25% of electricity generation. However, the contribution of coal to the world's total energy production is around 40%. During the coal combustion process, coal fly and bottom ashes containing natural radionuclides in higher concentrations are released into the environment. Disposal of the coal bottom ash in open and unlined ponds causes environmental contamination via migration of radionuclides into soils and water. Eventually these processes will increase the concentrations of natural radionuclides in aquifer system. To estimate the levels of natural radionuclides in soils near a coal ash pond in state of Mississippi, a set of 40 samples were collected in the Area of Interest (AOI) and evaluated using gamma-spectroscopic techniques. The mean activity concentrations of Ra-226, Th-232 and K-40 were determined to be (37.56 ± 10.47) Bq kg^{-1}, (38.43 ± 7.68) Bq kg^{-1}, and (260.26 ± 71.19) Bq kg^{-1} respectively, in air dried soil samples. The obtained mean concentration values are statistically compared to the world-wide average concentrations of selected isotopes using a one-tailed t-test at 95% confidence interval (CI). The results of this study were used to assess the various radiation hazard indices of soil to the residents of the area. Based on the activity values obtained from this study, the average outdoor absorbed dose was estimated to be (52.07 ± 0.64) nGy/hr.

P7.25

ARE TOBACCO PRODUCTS SAFE - A RADIO-ACTIVITY BASED STUDY (Undergraduate student)

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

P7.26

RADON LEVELS IN GROUND WATER OF ALCORN STATE UNIVERSITY CAMPUS (Undergraduate student)

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Alcorn State University (ASU), which is located in rural Mississippi within the counties of Claiborne and Jefferson, serves approximately 5,000 students and 500 staff members. The water supply for ASU is provided by wells (Ground-Water) located on the campus. Ground-water primarily consists of Radon (Rn-222), a colorless and odorless radioactive gas that is naturally present in soils and is one of the daughters of Uranium (U-238). Depending on the geography, types of soil, and types of rocky materials in the earth's crust, the levels of radon significantly varies. According to the EPA, it is recommended that the community water suppliers must provide drinking water to the citizens with Radon levels no higher than 4,000 pCi/L. As per Environmental Protection Agency (EPA), Claiborne and Jefferson counties are sunder radon zone 3 (Counties with predicted average indoor radon screening levels less than 2 pCi/L). However, there is limited data on the levels of Radon in groundwater within the region of interest. A pilot study is executed to measure Radon concentration levels in water collected from wells that supply water to ASU community using an Alpha Guard Professional Radon Meter. Multiple

samples were collected (at least 10 samples for a week and for up to 3 months) and analyzed for Radon concentration so that statistically justifiable and reliable results are obtained. The presented data consist of a comparison of measured radon concentration values in drinking water evaluated in this study to the EPA's recommendations on radon concentration in drinking water.

P7.27

INFLUENZA NEURAMINIDASE AND ESTERASE AS TOOLS FOR UNDERSTANDING AND TREATING GLIOBLASTOMA (Undergraduate student)

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Glioblastoma is one of the most common malignant brain tumors in adults, having an average five-year survival rate of 9%. Although there have been advances in treating brain cancers, there is still no known cure. Glioblastoma cells have been shown to contain abundant gangliosides (sialic acid-containing glycolipids). Influenza virus has been shown to bind cell surface sialic acids to enter the cell and initiate infection. The focus of this project is to analyze how the neuraminidase and esterase enzymes of differing flu strains affect the gangliosides present on the surface of differing glioblastoma cell lines and further analyze the types of gangliosides that are present on the surface of the glioblastoma cells. Previous studies indicated treatment of glioblastoma cell lines with a variety of influenza viruses inhibited cell growth, and this effect can be partially reversed with treatment of neuraminidase inhibitors. We wish to test the hypothesis that this growth inhibitory effect is due to the action of neuraminidase on gangliosides. Preliminary data indicate a potentially uncharacterized activity of these influenza glycoproteins. Our investigation into whether influenza can preferentially inhibit glioblastoma cells may lead to new treatment options for glioblastoma patients.

P7.28

DETERMINE THE FREQUENCY OF CMV REINFECTIONS DURING PREGNANCY IN A COHORT OF SEROPOSITIVE WOMEN UTILIZING STRAIN-SPECIFIC RESPONSES (Undergraduate student)

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Cytomegalovirus (CMV) is a frequent cause of congenital infection (cCMV) and the most frequent infectious cause of brain disease and hearing loss in children. CMV can be transmitted from the mother to the fetus in women with primary infection (acquiring CMV infection for the first time during pregnancy) or those with non-primary infection (mothers who have had CMV infection prior to pregnancy). Although, the reasons for the failure of preexisting immunity to prevent intrauterine transmission are not clear, we propose that CMV reinfections in seropositive women plays a role. Recent studies demonstrated extensive genetic diversity among CMV strains. The objective of the study is to determine whether CMV seropositive women with evidence of reinfection during pregnancy are at higher risk for delivering infants with cCMV. Recombinant proteins containing the strain-specific neutralizing epitopes within the CMV glycoproteins H and B from AD169 and Towne strains of CMV were developed in the laboratory. By utilizing these antigens, sera obtained in early gestation and at delivery from a cohort of seropositive women (N=956) were tested to detect the appearance of new antibody specificities during pregnancy as indirect evidence of CMV reinfection. Our preliminary data shows 4.5% CMV reinfection rate. We will compare the frequency of CMV reinfection between women whose infants are born with cCMV (transmitters) and those with uninfected infants (non-transmitters), as well as demographic characteristics and exposure to possible sources of CMV between the groups. This information could allow us to develop interventions to prevent CMV reinfections and subsequent intrauterine transmission

P7.29

ENHANCED SUSCEPTIBILITY TO ISCHEMIC STROKE-INDUCED BRAIN INJURY AND NEUROBEHAVIORAL DYSFUNCTION IN ADULT RATS FOLLOWING INTRAUTERINE GROWTH RESTRICTION (Undergraduate student)

Aswin Arunachalam[1], Jonathan Lee[2], Valerie Quach[2], Adrianna Cooper[2], Emily Turbeville[2], Irene Arguello[2], Norma Ojeda[2], Lir-Wan Fan[2], [1]University of Mississippi University, MS, [2]University of Mississippi Medical Center, Jackson, MS.

Low birth weight children, the main outcome of intrauterine growth restriction (IUGR), has the highest occurrence in Mississippi of over 11% in the past 20 years. Epidemiological and experimental studies suggest a link between IUGR and an increased risk to develop diseases later in life. Previous studies have established that IUGR rats have increased susceptibility to hypoxic-ischemic insult which leads to neurodevelopmental deficits, but there is still little evidence indicating whether IUGR individuals have increased susceptibility for ischemic brain injury. The objective of this study was to investigate the link between reduction in uterine perfusion (RUP)-induced IUGR and the increased risk of developing ischemic brain injury later in life. During late gestation (G14) of the rat dam, RUP was utilized to induce IUGR in the offspring. At 5 months, middle cerebral artery occlusion (MCAO) was used to induce ischemic stroke in IUGR and control groups. 24 hours post-stroke, motor, sensory, and neurobehavioral tests were assessed, and subjects were euthanized to collect brain tissue samples for analysis of ischemic damage. Hypomotor activity, hyperalgesia, allodynia, and decreased brain volume were observed in IUGR rats as compared to control rats. Assessment by the neurological severity score, found that IUGR rats displayed more motor and sensory deficits compared to control rats after MCAO. The current study suggests that RUP-induced IUGR enhanced susceptibility of MCAO-induced ischemic brain

injury and neurobehavioral dysfunction in adult rats. Our model may be practical in creating a better understanding of ischemic brain insult and guiding future studies for potential treatments.

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P7.30

ANTI-CANCER POTENTIALS OF CUBAN OREGANO EXTRACT (Undergraduate student)

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Introduction: The American Cancer Society estimates that about 13,000 women will die from ovarian cancer in 2022. Treatment of ovarian cancer is complicated by late-stage diagnosis, tumor recurrence and drug resistance. Identification and validation of newer therapeutics which could overcome therapeutic obstacles are in high demand. Our current research focusses on finding novel plant-based therapeutics which could trigger cancer cells deaths without affecting the normal cells. We are also interested in studying the anti-cancer mechanisms of novel compounds. Cuban oregano (*Coleus amboinicus*) is known for its application in various traditional medicines and cuisines across the world. Objectives: The Cuban oregano (CO) leaves contain various phytochemicals known to produce anti-inflammatory, antibiotic, and antifungal effects which have therapeutic potentials for human cancer. Past studies have shown that oregano extract could lead to growth arrest and cell death in a dose-dependent and time-dependent manner in colon cancer cells. However, there are no previous reports on the effects of oregano extracts on ovarian cancer (OVCA) cells. Results: Our preliminary results show that ethanol soluble CO leaf extracts (containing phenolic contents) inhibit the growth of drug sensitive (HeyA8) and resistant (HeyA8MDR) OVCA cells in dose and time dependent manner, whereas it promoted the growth of non-cancerous mouse embryonic fibroblast cells which indicate the selective toxicity produced by the CO leaf extract. We further evidenced the dose dependent inhibition of reactive oxygen species (ROS) in HeyA8MDR cells upon treatment with CO leaf extracts. Finally, we report that CO leaf extracts also interfere with microtubule assembly in HeyA8MDR cells detected by microtubule cytoskeleton dye. Preliminary Conclusion: CO leaf extracts have significant impact on ovarian cancer cell growth in a dose dependent manner.

This project is ongoing.

P7.31

EXTRACTS FROM MUSCADINE GRAPES TRIGGERING ANTI-CANCER EFFECTS IN OVARIAN CANCER CELLS (Undergraduate student)

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Introduction: Application of natural ingredients including phytochemicals is known to produce health benefits by acting on critical pathways related to cancer and other diseases. Goal: The research goal of our laboratory is to identify the anti-cancerous mechanisms and health benefits of phytochemicals. Muscadine grapes (MG) are extremely beneficial to our health due to the presence of antioxidants and anti-carcinogenic phytochemicals. Methods: The current research focuses on understanding the chemical and anti-cancer properties of MG seed extracts. Preliminary results indicated that MG seeds contain more phenolic content than MG skins. Therefore, we utilized an ethanolic seed extracts for our study. Results: We focused the current study on the MG seed extracts. We investigated the cell growth and viability after treating cancer and non-cancerous cells with the ethanolic extracts of MG seeds. Our results showed that MG seed extracts could inhibit the cell growth and viability of the cancer cells without impacting the non-cancerous cells. We further found that MG seed extracts reduce the oxidative stress in cancer cells by inhibiting the reactive oxygen species (ROS) formation in dose and time dependent manner. We further identified the degradation of lipid droplet (LD) in cancer cells by activation of lipophagy. Preliminary Conclusion: The ethanolic extracts from MG seeds may have inhibition power on the reactive oxygen species (ROS) formation in dose and time dependent manner. **This is an ongoing project.**

P7.32

WATERCRESS EXTRACT TARGETING ONCOGENIC SIGNALING PATHWAYS IN OVARIAN CANCER

(Undergraduate student)

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Introduction**:** Ovarian cancer (OVCA) is the fifth-leading cause of cancer death in The United States. OVCA patients often develop drug resistance and almost 70% of the patients have a risk of tumor recurrence as well. Identification and validation of newer therapeutics are critical for the treatment of OVCA. For years, natural products are in prominence as anti-cancer therapeutics. Objective: The current study is focused on identification of an appropriate extraction technique. Method: We studied the utility of coarsely crushed

Watercress (*Nasturtium officinale*) leaves which were extracted in water, followed by ethanol and methanol extraction and concentration. The extracts further, filtered through a 0.22-µm filtration units. Furthermore, we used an exploratory HPLC analyses. Results: Our study indicated that ethanol extract from Watercress leaves contains more phytochemicals compared to others. The extracts revealed that Glucose and Rutin (a bioflavonoid), derivatives of the plant flavonoid kaempferol are likely to be abundant in the extracts. Kaempferol is known to produce anti-cancerous effects in various types of cancer cells. Our preliminary studies show that methanolic extract of Watercress (WCM) has therapeutic effects, by inhibiting the cell viability of HeyA8 and HeyA8MDR cells (OVCA) in a dose-dependent manner. However, WCM treatment did not produce any inhibitory effects in non-cancerous mouse embryonic fibroblast (MEF) cells. We further evidenced, increased generation of reactive oxygen species (ROS) in cancer cells upon the treatment with WCM which indicated triggering of oxidative stress. We also evidenced that WCM treatment enhances the autophagy flux which could be induced by oxidative stress as well. Next, we treated HeyA8 cells with a combination of WCM and carboplatin (CBP; chemotherapeutic agent applied in OVCA) to test the impact of combined treatment compared to CBP treatment alone. Preliminary results indicated that WCM sensitizes CBP, impacts the metabolic pathways etc., Conclusion: This study reveals that WCM could be a potentially effective anti-cancer therapeutic agent for the **OVCA. This is an ongoing project.**

Topics: Social Determinants/Health Equity Trackers

P7.33

PREP UPTAKE: IMPROVING OUTCOMES AND IDENTIFYING STIGMAS/MISCONCEPTIONS IN AFRICAN AMERICAN COMMUNITIES (Undergraduate student)

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Introduction: HIV, also known as Human Immunodeficiency Virus, is a disease that attacks normal immune cells that help the body fight infections. The first published report of what would ultimately become known as HIV and AIDS appeared in the Centers for Disease Control and Prevention (CDCP) Morbidity and Mortality Weekly Report in June 1981. PrEP, also known as Pre-Exposure Prophylaxis, is a preventive medicine that when taken as prescribed can lower the person's risk of catching HIV. Currently, HIV prevention tools are more prevalent, but the issue arises when these tools are not offered, used, or merely heard of amongst communities. In 2019 the CDC (Centers for Disease Control) stated, 22% of eligible individuals were prescribed PrEP but only 8% of these individuals were members of the African American community. Objective: The objective of this study is to determine any identified stigmas and misconceptions that are associated with HIV and PrEP. From these findings the uptake of PrEP increased in African American communities. Methods: To help combat this issue, researchers and public health officials have sought to identify any key barriers and attempted to educate these communities on the resources and prevention methods that are available to end this disparity. Results: To perform this study, a survey was conducted, and participants were asked questions about their sexual activity, sexual health, feelings regarding the HIV and PrEP and solutions that could be implemented to help BREAK down these barriers. The data collected from this survey was analyzed and used to interpret the results and conclusion of this study. The hypothesis was supported by the data resulting from contribution of all individuals in the community such as patients, doctors, researchers, and public health officials. A continuum of such efforts will end the HIV disparities and will provide health equity across the nation.

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P7.34

THE IMPACT OF MINORITY HEALTH AS IT RELATES TO HIGH HEALTH INSURANCE (Undergraduate student)

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Introduction: Health insurance pays for some or all of the cost of health services a person receives. This includes doctor's visits, hospital stays, and visits to the emergency room. Many factors have contributed to the fact that why some patients could not afford health insurance. These factors included monthly utility bills, transportation, food and much more. The cost of healthcare insurance has prevented individuals from receiving adequate healthcare services. The objective of the study was to prove that higher costs of insurance has a negative impact on the outcomes of health in minorities. Being uninsured could lead to poorer health outcomes, an advanced stage of illness and diseases, increased disability and higher mortality rates. We hypothesis that lowering the cost of health insurance may improve and create a better health outcome for minorities. Secondary data, from CDC (Center for Disease Control) reported that 31.6 million people were uninsured during the year of 2020, 11.5% of these people were under the age of 65. It is vital for health insurance to be affordable to all people because it will enhance access to preventive care and improve health outcomes. The hypothesis is supported by the fact that 58% of minorities (African-American and Hispanics) may not afford a certain medical care because of the cost. Based on results of this study, health insurance is associated with ineffective usage of the physician services. Thus, does not promote the use of cost-effective schedules of care among those in the minority population. A potential explanation is that the use of healthcare services varies by the type of health insurance coverage due to differences in the design of coverage.

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P7.35

EATING DISORDERS IN ADULT POPULATIONS: SOCIALLY INFLUENCED OR GENETICALLY DETERMINED (Undergraduate student)

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Eating disorders can be defined as any condition that causes an individual to eat abnormally whether it is excessively, or faintly. The effects of having an eating disorder can include becoming obese or frail. It has been observed in health that one's genetics or family history can accurately determine or predict their health in their adulthood. Understanding what one is consuming and what it does to their body can also help predict their health. We hypothesized that awareness and understanding of one's familial health history and genetics determines individual's digestive health and may help them counteract any potential health risks. This research presented and discussed the two important factors; genetics and awareness. Important concepts in food science/nutrition and biology are also discussed and evaluated. Consideration of what social factors that may play a role in adults having eating disorders here in Mississippi are also discussed. This research is quantitative and a survey was given to the targeted age group, adults 18+ in Mississippi. The survey will be used to better understand and prove what one's eating habits or eating disorders are more influenced by. Poor eating habits and eating disorders serve as misconceptions over the past years. Until recent developmental studies, behaviors deemed as normal have now been recognized as eating disorders. Undereating and overeating will be emphasized in this research as eating disorders such as Bulimia Nervosa. In addition, projects conducted by My Brother's Keeper centered on food science and eating habits will be are talking points to discuss and understand the why or what certain factors may have contributed to one's eating habits.

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P7.36

THE EFFECTS OF COVID-19 ON MENTAL HEALTH OF AFRICAN AMERICAN CHILDREN AND ADOLESCENTS (Undergraduate student)

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Mental health is a range of mental, emotional, social, and behavioral operations that can be evaluated from good to poor. Mental health is a growing public health issue among African American children and adolescents. There are a number of factors that affect mental health in African American children and adolescents including lack of mental health care available to them. African Americans are a minority group which has a history of underserved mental health services. The mental health of youth is paramount for the future of our communities. There are many causes for the prevalence of mental health issues in African American children and adolescents, however, with the prevalence of COVID-19 there has been an increase in the need for awareness of mental health. There is little research targeting African American youth in mental health. There is an increased risked for mental illness when factoring in COVID-19. Feelings of anxiety or depression is something that should be addressed in young people since these feeling can become prevalent over the course of someone's life. The objective of this study is to review surveys completed by African American children and adolescents and evaluate them addressing the effects of COVID-19 pandemic on the mental health of African American children and adolescents during the pandemic and as restrictions are being lifted.

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P7.37

THE GROWING EPIDEMIC OF SEXUALLY TRANSMITTED INFECTIONS IN ADOLESCENTS AND YOUNG ADULTS (Undergraduate student)

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STI, also known as sexually transmitted infections, has been an ongoing epidemic in adolescents and young adults for a long time however, it has been well under-researched. The increased rates pronounced in adolescents between ages 10-1years and young adults between ages 18-24years. Within the research, females, and males account for nearly half of the new STIs in the United States. Researchers from the University of California Los Angeles found that 1 in 4 adolescents have been infected with *Chlamydia trachomatis* (CT) every year. This research aims to address the issue of STIs among adolescents and young adults and what are ways to prevent and reduce the rates. This data was collected in second resources, retrieved from My Brother's Keeper, Inc. (MBK), Center for Research, Evaluation, and Environmental & Policy Change (CREEP), and service data. The effects of sexually transmitted infection on adolescents and young adults were categorized based on race, gender, age, sexual orientation, and risk factors. Based on the results of this study, 62 percent of females between the ages of 10-15 are at a higher risk for contracting Chlamydia and Gonorrhea due to their prefrontal cortex still developing throughout adolescence. YMSM are at an even higher risk for STI due to an individual-level risk behavior within the infection of syphilis by making up 58 percent of the population. Based on the data collected, this research can continue to be improved and investigated to reduce the STI rates among adolescents and young adults in

America. There are medical solutions that can be made to reduce this issue.

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P7.38

THE IMPACT AND IMPORTANCE OF ALLERGISTS AND IMMUNOLOGISTS ON PUBLIC HEALTH (Undergraduate student)

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An allergist/immunologist is a medical doctor who specializes in treating and managing allergies, asthma, and health conditions that affect the immune system. Allergy and immunology specialist work with patients directly by providing services that may help to manage symptoms. They evaluate patient's clinical condition by reviewing medical history, family history, medications as well as use questionnaire regarding their life style, including social and food eating habits. They discuss the problem and educate the patient about their condition as well significance of lifestyle and dietary habits to help manage their allergy and overcome unwanted symptoms. After questioning, they perform various tests and procedures to identify problem causing allergen and treat immune conditions. A study was performed of adults in ages ranging 18-54, on their knowledge and use of allergists and immunologist. The results of this study showed that, 61.1 % were aware of what an allergist/immunologist is, where 38.9 % do not. Because it is more common for women to visit doctors more often than men, the percentage of women who were aware of the roles of an allergist and immunologist was much higher than the male percentage. Of this group, only 38.9 %t of them have utilized services from these doctors. The study found that 55.6 % of the participants have allergies, asthma, or immunologic diseases, have either been prescribed over the counter medications, (Zyrtec or nasal spray), or prescription medication (albuterol or a nebulizer) from their doctor. At the conclusion of the survey, more than half of the US, about 54.6 %, suffer from allergic reactions and these clinical physicians have a significant role in public health as it is vital to assure that the most effective treatments are provided to assure a better quality of life. **Acknowledgement:** This work was founded by an Institutional Development (IDeA) Award from the NIGMS under grant number P20GM103476.

P7.39

THE IMPACTS OF SEXUAL HEALTH & RELATIONSHIP DYNAMICS IN AFRICAN AMERICAN WOMEN IN MISSISSIPPI (Undergraduate)

Lauren Kelli Gatlin[1] and Byron Buck[2]

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Relationship dynamics can be defined as the pattern(s) of behavior that happen between people in the ways one can relate, interact, and communicate with one another. This can be affected by many factors including: communication styles, conflicts, socioeconomics, maturity, intimacy expectation, etc. Relationship dynamics changes during difficult times in life. Sexual health is the awareness of physical, emotional, and social wellbeing in relation to sexuality. According to the CDC HIV Surveillance Report of 2019, in the United States, Black/African Americans only made up 13% of the female population but they are accounted for 58% of diagnoses of HIV infection among females. We hypothesized that African American women will report and share experiences of high responses of being influenced under drugs or alcohol during sex; low response of experience anger when their partner(s) ask to use contraceptives or condoms, and low responses of practices of safer sex with their partners as well. The primary purpose of this study is to assess quantitative data on the impacts of relationship dynamics and sexual health of African American women. A survey was conducted using google forms with a target goal of recruiting 50 participants. The questions were grouped into themes of demographics, sexual health, and relationship dynamics. The groupings were derived from socio-economic factors, behavioral/physical factors, and relationship/personal risks factors. The data were gathered and were utilized to analyze the results and conclusion.

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P7.40

ACCESSING THE KNOWLEDGE OF ADOLESCENTS ON REPRODUCTIVE AND SEXUAL HEALTH (Undergraduate student)

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The ICAN project is a community-based initiative designed to increase access to and utilization of reproductive health services among adolescents, aged 13-18, in the Jackson Public School District (located in Jackson, MS). The project used dual comprehensive sex education training programs for school-based nurses/health educators, and student and their parents with the major goal of increasing their knowledge of adolescent health, sexual health, and HIV/STD risks. Each session was held after school to increase interaction and create a safe environment. According to the CDC, Mississippi has been one of the states with leading teen pregnancy, gonorrhea, chlamydia, syphilis, and HIV rates. This project used pre- and post-test assessments to measure the knowledge of each participant on reproductive and sexual health, followed by a participation satisfaction feedback. The assessment consisted of questions about defining puberty, influences of sexual behavior among adolescents, teen birth rates, and transmission

and prevention of STDs and HIV. The satisfaction feedback was used to gauge the participants' knowledge before and after the training session, future plans, and satisfaction with the instructor. At the end of Year 2, students on average had a 16.2% increase in the final post-test. After further analysis, about 73.7% of the student participants increased their post-test score by 1 or more. During year 3, a student outreach session was held, and 159 students were given the same participant satisfaction survey from the training. On a scale from 1 to 10, the students had a mean rate of 7.35 for self-reported knowledge before and a mean rate of 9.25 for self-reported knowledge after the training session. During year 4, the mean score of the students' knowledge before was 6.7, and after the session was 8.5. Also, 95.1% of the participants displayed an increase in knowledge. During year 5, there were 79.5% of the student participants with an increase in knowledge. At the conclusion of each project year, self-reported knowledge among the students increased significantly as a result of the training. After more than 20 training sessions hosted, the ICAN Project was able to educate more than 845 students on sexual and reproductive health, including the basics of HIV and other STIs, how to practice safe sex, and the difference in sexualities.

Acknowledgement: This work was founded by an Institutional Development (IDeA) Award from the NIGMS under grant number P20GM103476.

P7.41

EXAMINING CURRENT KNOWLEDGE SURROUNDING SICKLE CELL DISEASE IN MISSISSIPPI MINORITY POPULATIONS: AN EDUCATION OPPORTUNITY (Undergraduate student)

Mardarius Harper[1] Kozetta Hilliard[1] and Marcus Johnson[2]

[1]Mississippi INBRE Service Scholar, The University of Southern Mississippi, Hattiesburg, MS1Mississippi INBRE Service Scholar, Alcorn State University, Lorman, MS, [2]Open Arms Healthcare Center, My Brother's Keepers Inc., Hattiesburg, MS

According to the Centers for Disease Control and Prevention (CDC) 2021 report, approximately three million people in the United States have sickle cell trait (SCT), but the majority of these individuals are unaware that they are carrier of sickle cell trait. Such individuals inherit one copy of an abnormal sickle cell gene known as HBB and one copy of a normal HBB gene. Genetic screening is a service that is offered to asymptomatic individuals which can help educate those who are at risk of passing certain traits on with prevention, early treatment, and reproductive choices. The objective of the study was to examine current knowledge surrounding sickle cell disease and to see how likely populations would be to receive genetic screening. Sickle cell disease (SCD) is a condition in which red blood cells are sickle-shaped. This causes the cells to stick to each other and to the walls of blood vessels forming clumps which subsequently cause pain and other complications. This was a quantitative study in which participants were asked to complete a survey that presents basic information about genetic screening, the risks and benefits of screening, and how genetics relates to not only a person's health but their potential offspring's health as well. They were also asked about sickle cell disease and how it can be inherited. Demographic information was also gathered including gender, race, and sexual orientation. Based on the results of the data, there was an increased knowledge of 40% pertaining to sickle cell disease by the end of the survey. Raising awareness of SCD is important as the disease and the symptoms associated with the condition are under-represented to minority populations. It is vital for individuals to undergo genetic screening to become more aware of their genotypes and the possible disorders that could be passed on.

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P7.42

THE PROMOTION OF HEALTHY RELATIONSHIPS WITHIN THE HIV POSITIVE POPULATION IN MISSISSIPPI (Undergraduate student)

Latavius Johnson[1] and Tiarra McMillian[2]

[1]Mississippi INBRE Service Scholar, Jackson State University, Jackson, MS, [2]The Center for Research, Evaluation and Environmental Policy Change (CREEP), My Brother's Keepers Inc., Ridgeland, MS

The Healthy Relationships program is a multi-session skill building program designated for men and women living with HIV/AIDS. Individuals who have been diagnosed with HIV/AIDS typically find it difficult to disclose their status to their families, friends, partners, etc. The purpose of Healthy Relationships is for participants to learn problem-solving and decision-making skills to address coping with stress related to safer sexual behaviors and disclosure of serostatus. The participants observed facilitators and modeled the skills they portray, and they were urged to apply these skills in their familial relationships, romantic relationships, and friendships. Getting insight on the mental headspace of each person including who they are comfortable disclosing their status to, and helping implement healthy relationships into the lives of people that live with HIV/AIDs is essential. Participants were given pre and post-tests to gauge where their comfortability was in discussing their status. Of the participants, 22.6% were female and 77.4% were male, and 3.2% identifying as transgender. Data from pre to post shows a 3.2% decrease in the lack of comfort telling a family member or friend, a 3.3% decrease in lack of comfort telling a sexual partner, and an increase of 3.2% in comfort of telling someone you are dating. Participants were also asked which family members know of their HIV status and the top three answer choices were Brother/Sister (15), Mother (11), and Aunt/Uncle (9). Based on the data collected, the Healthy Relationships program has increased the healthy relationships within the HIV-positive community.

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P7.43

PERCEPTION OF DEPRESSION AMONG TEENAGERS (AGES 13–19) IN JACKSON, MISSISSIPPI (Undergraduate student)

William Jones[1] and Brandon Holmes[2]

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Major Depressive Disorder (MDD, also utilized as "depression") is one of the most common health conditions in the world. Often times people with depression suffer greatly with persistent feelings of hopelessness, dejection, constant worry, poor concentration, a lack of energy, an inability to sleep and, sometimes, suicidal tendencies. The causes of depression are poorly understood, but involve some combination of genetic, biologic and environmental factors. In 2017, approximately 17.3 million adults in the United States experienced a major depressive episode in the past year (about 7.1% of the population). Of these, 35 percent received no treatment. The sad reality is many teens are depressed within our Jackson, Mississippi Metropolitan Area and is steadily increasing. In the life of teenagers, the perception of depression is an issue met by the first resource the internet, to help them to understand their situation. The aim of this study is to assess the capabilities of digital technologies to offer a solution that addresses the needs of teenagers successfully identifying depression and seeking proper treatment. The hypothesis will be tested using qualitative focus group research design. To perform this study, two focus groups were conducted, and participants were asked questions that provided natural feedback to provide solutions that could be implemented to help BREAK down barriers around depression thoughts, beliefs, and feelings. Recruit and selection of participants are offered by voluntary response sampling and stratified sampling. Digital flyers were created to assist in the voluntary response sampling that allows finding participants based on individuals interest in the subject matter. Stratified sampling was necessary to capture the particular age and location characteristic of interest for the study. The data collected from the focus group is being analyzed and used to interpret the results and conclusion of this study. Future research studies addressing the perception of depression among teenagers should conduct surveys to ensure the anonymity of respondents, which may influence their desire to speak freely.

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P7.44

THE IMPACT OF WELLNESS PROGRAMS & ACTIVITIES ON QUALITY OF LIFE FOR ELDERLY HIV-AGING INDIVIDUALS (Undergraduate student)

Teia McCormick[1] and Deja Abdul-Haqq[2]

[1]Mississippi INBRE Service Scholar, Jackson State University, Jackson, MS, [2]Headquarters (HQ) Organizational Development Dept., My Brother's Keepers Inc., Ridgeland, MS

Research shows that people worldwide are living longer. The World Health Organization states, "By the year of 2050, the world's population of people aged 60 years or older will double (2.1 billion). WHO also states, "The number of persons aged 80 years or older is expected to triple between 2020 and 2050 to reach 426 million." This may be seen as a step in the right direction for the health of those in the U.S; however, we now must examine the necessary steps to improve the quality of life for those aging. Studies have shown that aging results from the accumulation of a wide variety of molecular and cellular damager over time and the stiffening of the blood vessels and arteries. These changes can lead to fragility, hearing loss, cataracts, osteoarthritis, pulmonary disease, diabetes, depression, dementia, and many more life- altering side effects. To combat these changes, the implementation and use of geriatric wellness programs are necessary. Geriatric wellness programs encompass daily activities that include physical activity to reduce the risk of falling and improve mobility, cognitive abilities to improve memory and using different parts of their brain, and social interactions to prevent mental health crisis. Research indicates these are all risks factors for and can lead to cardiovascular disease, cancer, and mortality if not addressed by the aging population and aging populations living with HIV. This analysis is an internal case study with the goal to identify the distinguishing factors between general geriatric wellness programs and the Lifestyle Program facilitated by My Brother's Keeper with a focus on wellness for aging individuals living with HIV. This hypothesis and data focus on the proving that participation in the Lifestyle Program, as opposed to other geriatric programs, will significantly improve quality of life, decrease the likelihood of preventable health complications, and improve mental stability for aging communities.

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P7.45

THE CORRELATION OF THE PRESENCE OF INFECTIOUS DISEASE LEADING TO MENTAL ILLNESS (Undergraduate students)

Akumcha Mobit[1] and Dr. Edna Lampkin[2]

[1]Mississippi INBRE Service Scholar, Holmes Community College, Goodman, MS, [2]Center for Community Based-Programs, My Brother's Keepers Inc., Ridgeland, MS

The several viewpoints as to why infections may lead to a later diagnosis of mental illness is of great importance to obtain proper treatment and assistance from medical personnel. A nationwide study, published in Psychiatry issue of JAMA, reveals that some infections in childhood could lead to the development of mental illness later in life.1 My objective is to identify aspects of positive correlations between infectious disease and the gradual development of mental illness. Another literature review indicates that physiological (physical) and psychological (mental) stressors has in turn

lead to the prolonged activation of the immune system. Furthermore, causing it to weaken over time, which would make the host susceptible to various infections of communicable diseases. Infectious diseases coming into contact with the human central nervous system and the immune system, causes alteration further allowing infective agents to circulate into the brain causing mental illness. A survey was created and distributed through a form-site link with the hope of recruiting 30 participants. Through my survey, there is an established correlation, 13 agree (41.9%), and 16 (51.6%) strongly agreed that there is a correlation between physical infection of widespread diseases and mental illnesses. Although the results cannot prove causality, these findings provide evidence for the involvement of infections and the immune system in the etiology of a wide range of mental disorders. Studies in the near future could access specific populations and timeline of when these mental disorders are diagnosed medically.

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P7.46

THE IMPACT OF THE MAKING PROUD CHOICES CURRICULUM ON ADOLESCENTS IN MISSISSIPPI (Undergraduate student)

Kirsten Moore[1] and Tiarra McMillian[2]

[1]Mississippi INBRE Service Scholar, Tougaloo College, Jackson, MS, [2]The Center for Research, Evaluation and Environmental Policy Change (CREEP), My Brother's Keepers Inc., Ridgeland, MS

Making Proud Choices is an evidence-based curriculum that provides adolescents with sexual health knowledge to reduce their risk of sexually transmitted infections (STIs), HIV, and pregnancy. Research shows that teen pregnancy is an alarming issue across the United States but is especially prevalent along the Southwestern border of Mississippi. This fact led to the curriculum's implementation across Warren, Claiborne, Jefferson, Adams, and Wilkinson counties. By administering the Making Proud Choices curriculum, teen pregnancy and STIs among adolescents would decrease as a result of an increase in sexual health knowledge. Four organizations dispersed the curriculum to adolescents within 5 counties and provided pre and post-tests to measure their proficiency. In 2018, the four organizations conducted 17 five-hour sessions of the Making Proud Choices curriculum. The implementing organizations reached 116 participants between ages 11-19. Adolescents within the study were given a pre-test to measure their prior sexual health knowledge and a post-test to measure an increase in knowledge. The post-tests showed condom use prevention beliefs increased by 24.05%, condom knowledge increased by 30.62%, pregnancy knowledge increased by 31.25%, and HIV knowledge increased by 13.6%. The Making Proud Choices curriculum was implemented to educate adolescents about sexual health. The goal was to expand the ideal health of adolescents and reduce STIs and teen pregnancy within high-risk communities.

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P7.47

EXAMINING THE EFFECTS OF SEX EDUCATION ON MISSISSIPPI YOUTH (Undergraduate students)

Kaylan Richard[1], Daebreon Shanks[1] and Marcus Johnson[2]
1Mississippi INBRE Service Scholar, 2Alcorn State University, Lorman, MS

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Sexual Education is education that involves the human sexual anatomy of one's body, reproductive health, contraception's, and emotional relations. Sex education can be viewed as a preventative measure to combating health disparities such as teen pregnancy and sexually transmitted diseases (STD). In 2011, the state of Mississippi mandated its school districts to adopt a sexuality education curriculum. Statistics show that, "Of Mississippi's 151 school districts and four special schools, 81 districts chose to implement abstinence-only programs, 71 chose abstinence-plus programs, and three chose a combination of abstinence-only and abstinence-plus programs based on grade level". Mississippi students that have been introduced to abstinence-plus programs may practice safe and have better knowledge of contraceptives. We believe that Mississippi has resulted in higher rates of STD contraction and teen pregnancy rates because of our youth not being provided with proper information during their early reproductive years. It's been 11 years since the Abstinence programs have been implemented and Mississippi remains the second highest teen birth rate in the country, at 29.1 births per 1, 000 teens reported by the CDC. African American teenagers who don't have the proper education and access to health care were shown to have more babies than white teenagers by 50%. This is a major problem, because teen mothers are less likely to finish high school and more likely to live in poverty. They are also more likely to have children who suffer from development issues. If we don't work to save our youth, then who will.

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P7.48

UNDERSTANDING DISPARITIES IN HEALTHCARE FOR TRANSGENDER PEOPLE IN JACKSON, MISSISSIPPI (Undergraduate student)

Jaylen Sandifer[1] and Byron Johnson[2]

[1]Mississippi INBRE Service Scholar, Jackson State University, Jackson, MS, [2]Open Arms Healthcare Center, My Brother's Keepers Inc., Jackson, MS

Transgender is an umbrella term for persons whose gender, gender expression or behavior does not conform nor associate with their assigned birth sex.1 Currently, limited data is available on the healthcare disparities transgender people

experience in the deep south. The research study wanted to explore possible examples of health care disparities (ie, visual non-conformity, medical mistrust, access to healthcare, healthcare experiences, and transgender competent care).1-4 The aim of this study is to assess the experiences of transgender persons especially those who identify as gender fluid, and/or gender-nonconforming and their relationship to medical care experiences in the Jackson, Mississippi Metropolitan Area. This study will hypothesize there would be high reports of discrimination, lack of medical trust, and postponement of medical care due to fear of discrimination. The hypothesis will be tested using quantitative cross-sectional research design. The search findings discovered that 33% of the respondents (n=13) indicated that there would postpone preventive medical care due to "fear of discrimination"; 11% would postpone preventive medical care due to being "unable to find a provider who would see them"; 78% indicated they would "have to teach their medical provider" about aspects of their healthcare needs; and 38% indicated "not trusting their medical provider". In conclusion of the study, barriers in healthcare for transgender, gender fluid, and/or gender-nonconforming people exist for those residing in the Jackson, Mississippi Metropolitan Area. The concluding data for this study also revealed a lack in physician trust and trans competent care may also exist in this local healthcare system. The significance of this study gives light on the fact that transgender persons in the healthcare system in the Jackson, Mississippi Metropolitan area are possibly being overlooked.

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P7.49

MISSISSIPPI VERSUS EVERYBODY: THE MENTAL HEALTH IMPACTS OF COVID-19 ON COLLEGE STUDENTS (Undergraduate student)

Ané Scott[1] and Kendra Wright[2]

[1]Mississippi INBRE Service Scholar, Tougaloo College, Jackson, MS, [2]Headquarters (HQ) Organizational Development Dept., My Brother's Keepers Inc., Ridgeland, MS

The Coronavirus (Covid-19) pandemic changed the lives of people all over the word. Covid-19 was considered a pandemic on March 11, 2020, which is when most Colleges and Universities across the United States of America and Mississippi were still in session. Colleges and Universities began to close in response to the Covid-19 pandemic, which in turn affected the lives of college students in a multitude of ways including their mental health. On June 8, 2021 "Impact of COVID-19 on the mental health of US college students" was published in BMC Psychology and the article reported that mental health for the surveyed college students declined. The research article and its data were used as the basis of comparison for our research. Our research replicated portions of the aforementioned research to ensure that an accurate comparison occurred. The 2021 article allowed straightforward analysis on how Covid-19 impacted the mental health of Mississippi college students compared to US college students. It was hypothesized that Mississippi college students' mental health would also see an impact because of Covid-19, and that Covid-19 would have resulted in greater impacts on mental health for Mississippi College students than US College students. Many of the Mississippi College students reported increased levels of anxiety. The majority of survey participants were not first-generation college students, which is in contrast to US college students where 58% were first generation. The survey also showed few students felt Covid-19 impacted their relationships with friends and family. Conversely, however 73.5% US college students felt Covid-19 impacted relationships with friends, while 63.5% felt Covid-19 impacted relationships with family. While Mississippi college students were impacted by Covid-19, it cannot be easily stated that Covid-19 caused a greater impact on Mississippi college students than on US College students.

Acknowledgement: This work was founded by an Institutional Development (IDeA) Award from the NIGMS under grant number P20GM103476.

Friday, February 24, 2023

Morning 8:30 -9:30 AM

Room: D8

Oral Presentation Session B1

Moderators: Drs. Ritesh Tandon and Larry S. McDaniel, University of Mississippi Medical Center

Topics: Molecular Diagnostics/Material Science/Experimental Cell Biology

O7.08

8:30 CELL WALL STRUCTURE ALTERS ANTIBIOTIC SUSCEPTIBILITY AND IS MEDIATED BY OLIGOPEPTIDE TRANSPORTERS IN STREPTOCOCCUS PNEUMONIAE

Courtney Thompson[1], Waldemar Vollmer[2], Nicolas Fitzkee[3], Larry McDaniel[1], Lance Keller[1] 1University of Mississippi Medical Center, 2Newcastle University, 3Mississippi State University

Infections cause by *Streptococcus pneumoniae* are commonly treated with cell wall targeting antibiotics. Typically, resistance to beta-lactam antibiotics is associated with mutations in pneumococcal transpeptidases. Mutations in other proteins have also been observed with beta-lactam resistance, such as *clpL* and cell division proteins *gpsB* and *ftsL*. Previous studies examining transcriptional and proteomic variations of wildtype nonencapsulated *S. pneumoniae* strain MNZ41 and an isogenic mutant lacking oligopeptide transporters AliC and AliD have shown expression variations in *clpL* and some cell division proteins. We hypothesized that AliC and AliD expression will increase resistance to cell wall targeting antibiotics. Clinical MIC scores to various antibiotics were determined using the Vitek system as well as growth rate analysis during growth with various cell wall targeting antibiotics; carbenicillin,

amoxicillin, cefdinir, and vancomycin. To determine the mechanism behind antibiotic resistance variations in cell wall structure was examined. Surface charge, surface rigidity, and cell wall peptide cross linkages were tested. We observed significant increases in pneumococcal resistance to beta-lactam antibiotics when AliC and AliD are present. There is also a decrease in bacterial electronegativity when AliC and AliD are present as well as variations in cell wall rigidity. Mass spec analysis indicates increases in muropeptide branching in AliC and AliD containing strains. Also, expression of AliD in strains that lack AliD recapitulate these phenotypes in tested experiments. The current work demonstrates that through varying gene expression of certain cell wall modulating proteins, an increase in beta-lactam resistance through altering cell wall phenotype occurs. This is a previously unknown mechanism for beta-lactam resistance in *S. pneumoniae* and can aid in developing novel treatment options for the growing concern of antibiotic resistance.

O7.09

8:40 TLR7 STIMULATION RESULTS IN A SELECTIVE INTERFERON RESPONSE IN CHANNEL CATFISH LEUKOCYTES (Graduate student)

Kristianna Felch, Eva Bengtén, Melanie Wilson

University of Mississippi Medical Center, Jackson, MS

Toll-like receptors (TLRs) are important components of innate immunity, and they play a pivotal role in initiating adaptive immune responses. As a group, TLRs recognize microbe-associated molecular patterns (MAMPs). In mammals, TLR activation results in secretion of inflammatory cytokines and interferons. The channel catfish is an important aquaculture crop in the United States, and a model for studying immune phylogeny. In the catfish genome, 20 different TLRs genes, 16 Type I interferon (IFN) and two Type-II IFN genes have been identified. In comparison, there are only 10 TLR genes, two type I and one type II IFN genes in humans. Currently, our laboratory has established a model to identify channel catfish TLR ligands. Full-length catfish TLRs were cloned into P3X-FLAG-CMV9, a protein FLAG-tagged expression vector, and transfected into Human Embryonic Kidney (HEK)-Dual Null cells. These cells have been engineered to express a secreted embryonic alkaline phosphatase (SEAP) reporter gene controlled by an NF-κB promoter and do not express endogenous TLRs. Using this model, potential MAMPs and synthetic ligands were screened and imiquimod was identified as an agonist for catfish TLR7. Furthermore, RT-PCR analyses demonstrated that catfish leukocyte cultures stimulated with imiquimod, expressed increased levels of IFN-ß, IFNc, and IFN-γ well as CXCL8 and TNF-α. In contrast, the expression of IFN-α mRNA was reduced after TLR7 activation. These studies provide information about TLR directed immune responses that in the future may be used to augment fish vaccines and enhance immune responses to emerging fish pathogens.

O7.10

8:50 DEVELOPMENT OF ELP FUSION PEPTIDES TARGETING CAPSID-TEGUMENT INTERFACE AS AN ANTIVIRAL AGAINST CYTOMEGALOVIRUS INFECTION. (Graduate student)

Komal Beeton[1], Dipanwita Mitra[1], Gene L. Bidwell III[2], Ritesh Tandon[1, 3]

[1]1Center for Immunology and Microbial Research; 2Department of Cell Biology; [2]2Department of Cell Biology; 3Department of Neurology; 4Department of Pharmacology and Toxicology, [3]5Department of Medicine, University of Mississippi Medical Center, 2500 North State Street, Jackson, MS, [6]Department of Biomolecular Sciences, University of Mississippi, Oxford, MS,

Cytomegalovirus (CMV) is a common, medically important human herpesvirus. The infectious virus particles consist of a dsDNA genome surrounded by capsid layer, tegument, and lipid envelope. The tegument proteins play important roles in virus replication, gene expression, immune evasion, and virion maturation. The tegument protein pp150 is specifically known to be essential for final stages of virus maturation and mediates its functions by interacting with capsid triplexes and small capsid protein. Our laboratory has earlier identified the specific residues in pp150 important for pp150-capsid interactions. We designed peptides similar in sequence to pp150 critical regions with a goal to competitively inhibit capsid-pp150 interactions. Treatment with peptides targeted to pp150 conserved region 2(PepCR2) leads to a significant reduction in HCMV and MCMV virus growth as well as spread in cell culture. This treatment renders pp150 sequestered in the nucleus of the infected cells as visualized by immunofluorescence microscopy. This data correlate with a proposed mechanism where pp150-peptides would interfere with virus maturation in the cytoplasm. Peptide therapeutics are a promising new strategy for targeted therapy; however, peptides can rapidly degrade in an *in-vivo* environment because of their poor pharmacokinetic parameters and poor tissue and cell membrane permeability. To enhance the bioavailability of PepCR2, we developed a biopolymer-stabilized elastin-like polypeptide (ELP)-PepCR2 fusion protein. Treatment with ELP-PepCR2 showed a significant reduction in virus growth and spread in cell culture. Upon injection in mice, the pharmacokinetics parameters examined established that ELP conjugation of PepCR2 enhances its bioavailability for a prolonged time. Biodistribution of fluorescently labeled ELP-PepCR2 demonstrates that ELP-PepCR2 accumulates to higher levels in mouse liver and kidneys compared to unconjugated PepCR2. Thus, ELP-CR2 has the potential to be developed into an effective antiviral therapy against CMV infection.

O7.11

9:00 LOSS OF SESN2 INDUCES AN EARLY ONSET OF AGE-RELATED VESTIBULAR DYSFUNCTION IN MICE (Graduate student)

Matthew Donald[1], Tianwen Chen[2], Caroline Sit[2], Youguo Xu[2], Zelma Guisela Iriarte[2], Bradley Walters[2], Xuan Li[3], Ji Li[4], Wu Zhou[2], Hong Zhu[2]

[1]MD Program, University of Mississippi Medical Center, Jackson, MS, [2]Department of Otolaryngology and Head & Neck Surgery, University of Mississippi Medical Center, Jackson, MS, [3]Department of Physiology and Biophysics, University of Mississippi Medical Center, Jackson, MS, [4]Univeristy of Southern Florida, Tampa, FL

Introduction: The function of the vestibular system declines with age. Oxidative stress is thought to contribute to the aging process. Sestrin 2 (Sesn2) is a stress-inducible and age-related protein. It acts as an anti-aging agent mainly by its antioxidant function as well as by regulation of adenosine monophosphate-activated protein kinase and mammalian target of rapamycin complex 1 signaling. It has been reported that SESN2 plays an important role in the protection of auditory hair cells against gentamicin and age-related hearing loss. In a previous study, we showed that loss of SESN2 potentiates noise-induced vestibular deficits in mice. In the present study, we examine the role of SESN2 in age-related vestibular dysfunction by measuring the vestibulo-ocular reflex (VOR) responses and vestibular afferent activities in SESN2 KO mice.

Methods: SESN2 KO mice (male and female) aged 4 and 12 months, and age-matched wild-type mice (C57BL/6J) were used in the study. The expression of SESN2 in the vestibular epithelium was determined by immunohistochemistry with cryo-sectioned samples. VOR responses to sinusoidal head rotation (0.2~4Hz) (rVORs) and translation (0.2~2Hz) (tVORs) were recorded using an infrared eye tracking system. Single unit recordings of the vestibular afferents were conducted under ketamine anesthesia. Vestibular afferent spontaneous firing rates, regularity and sensitivity to head rotation and translation were analyzed. We analyzed vestibular afferents for spontaneous firing rates, regularity, and sensitivity to head rotation and translation.

Results: Similar to the cochlear end organs, we confirmed SESN2 was expressed in the hair cells and supporting cells of the cristae and maculae in WT mice. At 4 months of age, SESN2 KO mice exhibited similar VOR responses to WT mice. At 12 months of age, while WT mice did not exhibit significant changes in the VOR, SESN2 KO mice exhibited significant decreases in rVOR gains and increases in phase leads. Interestingly, we found that the female SESN2 KO mice showed larger decreases of rVOR gains than the male SESN2 KO mice. As for the tVOR, a gain decrease was only observed at 2Hz in the 12-month-old SESN2 KO mice. Single unit recordings were made from a total of 643 vestibular afferents in WT mice and SESN2 KO mice at 12 months of age. While the loss of SESN2 exhibited little effect on afferent spontaneous firing rates, it significantly reduced afferent sensitivities to head rotation or translation.

Conclusions: These results support the hypothesis that SESN2 plays an important role in the age-related decline of vestibular dysfunction. Supported by NIHR01DC018919 and NIHR01AG073151.

9:10 BREAK

O7.12

9:15 NONENCAPSULATED STREPTOCOCCUS PNEUMONIAE OLIGOPEPTIDE TRANSPORTERS AID IN HYDROGEN PEROXIDE RESISTANCE (Graduate student)

Courtney D. Thompson, Shelby G. Holcomb, Larry S. McDaniel, Lance E. Keller

University of Mississippi Medical Center, Jackson, MS

Nonencapsulated *Streptococcus pneumoniae* (NESp) colonize the nasopharynx and cause both invasive and noninvasive infections. NESp are isolated worldwide with increasing prevalence, possibly due to widespread vaccination, which targets the pneumococcal capsule that NESp lack. NESp specific proteins, AliC and AliD, have been previously shown to be required for virulence and systemic survival, but the mechanism of action is unknown. Past research has shown that wildtype NESp strain MNZ41 has reduced rates of phagocytosis compared to the isogenic AliC/AliD mutant and that deletion of AliC and AliD alter the transcriptome and proteome of MNZ41. We hypothesize that these downstream genes are responsible for reduced phagocytosis and increased survival through resistance to reactive oxygen species (ROS) upon phagocytosis. To test our hypothesis, a mutant library of AliC/AliD regulated genes was created for use in *in vitro* and *in vivo* models. Resistance to ROS was tested through growth in hydrogen peroxide (H_2O_2) and examining variations in growth rate over time, as well as quantifying bacterial counts after exposure. A modified surface killing assay was also used to calculate resistance to phagocytosis in our mutant library. A *Galleria mellonella* larva model of infection was used to determine Lethal Dose 50% (LD_{50}) and calculate survival curve analyses. Our results showed variation in resistance to H_2O_2, phagocytosis, and virulence in the larva model. Two genes in our mutant library, CDT04 (*lytA*) and CDT05 (*mgtC*), displayed greater sensitivity to H_2O_2 killing and phagocytosis and had higher LD_{50}values compared to wildtype MNZ41. The current research demonstrates that genes regulated by AliC/AliD alter susceptibility to host-derived mechanisms for bacterial clearance. Through regulating gene expression, NESp strain MNZ41 effectively increases bacterial survival in response to ROS, which causes DNA damage and bacterial death upon phagocytosis.

O7.13

9:25 THE IMPACT OF SEX AND RACE ON ENDOTHELIAL HEALTH IN TYPE II DIABETIC PATIENTS (Undergraduate student)

Natalie Hampton[1], Naomi Hamburg[2]

[1]Tougaloo College Biology Department, Tougaloo, MS, [2]Boston University School of Medicine, Whitaker Cardiovascular Institute, Boston, MA

Overeating and sedentary behavior, or activities that require little to no energy, can potentially cause abnormal vascular function and insulin resistance, eventually leading to peripheral artery disease, diabetes, and/or a heart attack. The specific goal of this project is to investigate and understand how endothelial cells can have adverse effects on the human body. During this experiment, cell collection occurred. Within this process, the J-Wire was inserted into the inside of the lower arm, where the vessel wall was scratched, and cells were retrieved. Once inserting this dye into cell plates, the cell's appearance under the microscope was able to assist us in comparing both diabetics and non-diabetics by sex and race. Once gaining this data, we are able to further study how to improve vascular health within this capacity and extend our research to analyze other social determinants of health.

O7.14

9:35 NEONATAL LIPOPOLYSACCHARIDE EXPOSURE ENHANCES MACHINE LEARNING-BASED ANALYSIS OF METHAMPHETAMINE-INDUCED REINSTATED BEHAVIORAL SENSITIZATION AND ALTERATIONS IN STRIATUM DOPAMINE TRANSPORTER EXPRESSION AND [3H] DOPAMINE UPTAKE IN ADULT RATS

Jonathan W Lee[1], Lu-Tai Tien[2], Norma B Ojeda[1], Haifeng Wang[3], Michelle A Tucci[4], Asuka Kaizaki[5], Sachiko Tanaka[6], Lir-Wan Fan[1]

1Department of Pediatrics, Division of Newborn Medicine, University of Mississippi Medical Center, Jackson, MS 39216, USA, 2School of Medicine, Fu Jen Catholic University, Xinzhuang Dist, New Taipei City 24205, Taiwan, 3Department of Industrial and Systems Engineering, Mississippi State University, Mississippi State, MS 39762, 4Department of Anesthesiology, University of Mississippi Medical Center, Jackson, MS 39216, USA, 5Department of Pharmacology, Toxicology & Therapeutics, Division of Toxicology, School of Pharmacy, Showa University, Shingawa-ku, Tokyo 142-8555, Japan, 6School of Pharmacy, Showa University, Shingawa-ku, Tokyo 142-8555, Japan

Our previous studies have shown that neonatal brain inflammation via intracerebral injection with lipopolysaccharide resulted in long-lasting dopaminergic injury and enhanced methamphetamine (METH)-induced increase of locomotion in the adult male rat. To further investigate the effect of neonatal systemic LPS exposure-induced dopaminergic injury, we used our neonatal rat model of LPS exposure (1 or 2 mg/kg, intraperitoneal injection in postnatal day 5, P5, rats) to examine the METH sensitization as an indicator of drug addiction in adult rats. On P70, animals began a treatment schedule of 5 daily subcutaneous (s.c.) administrations of METH (0.5 mg/kg) or saline (P70-P74) to induce behavioral sensitization. Ninety-six hours after the 5th treatment with METH or saline (P78), animals received a single dose of 0.5 mg/kg METH (s.c.) or saline. Neonatal LPS exposure enhanced both the level of development of behavioral sensitization including distance traveled and the reinstated behavioral sensitization to METH administration in adult rats. Six unsupervised machine learning models were applied to extract the feature interaction patterns among the collected high-dimensional locomotor data. Our approaches identified neonatal systemic LPS exposure and METH-treated dates as features significantly associated with methamphetamine-induced behavioral sensitization, reinstated behavioral sensitization and perinatal inflammation in this experimental model of drug addiction. Neonatal LPS exposure also enhanced METH-induced increase in the striatum IL-1β and cyclooxygenase-2 (COX-2) concentration, and reduction of striatum dopamine transporter (DAT) expression and [^{3}H] dopamine uptake after METH administration in the P78 adult rat. These results indicate that neonatal brain LPS exposure produces a persistent lesion in the dopaminergic system, as indicated by enhanced METH-induced behavioral sensitization, and reduction of the striatum DAT expression and [^{3}H] dopamine uptake later in life. These findings show that early-life brain inflammation may enhance susceptibility to the development of drug addiction later in life, which may be associated with the chronic inflammation-induced alterations in striatum DAT expression and [^{3}H] dopamine uptake.

Friday, February 24, 2023

Morning 8:30 -9:30 AM

Room D7

Oral Presentation Session B2

Moderators: Drs. Maricica Pacurari and Candace Howard.

Jackson State University and University of Mississippi Medical Center

Topics: PopulationHealth/Noninvasive-Diagnostics/ Technology

O7.15

8:30 DATA DRIVEN MODELS FOR HEALTH APPLICATIONS

Yufeng Zheng. University of Mississippi Medical Center, Jackson, MS

With the trend of data science leading, biomedical research and health applications are advanced by machine learning (ML) technologies and data driven models. In this presentation, we illustrate such a trend by presenting three health applications that take the advantages of ML. First, a neural network model predicts suicide ideation at the accuracy of 77%, which was trained with the Mississippi Youth Risk

Behavior Surveillance System (YRBSS) data. The predictions may help better target the risk behaviors and hence effectively prevent adolescent suicide in Mississippi. Second, a random forest (RF) model can accurately predict benzodiazepine prescriptions based on the UMMC electronic health records (EHR), which could assist in prevention efforts thus reduce the public health burden. Third, a You-Only-Look-Once (YOLO) fusion model can detect the location and predict the risk of early-stage breast cancers using digital (X-ray) mammograms as accurate as 92%. Screening mammograms plus computer-aided detection is an essential and effective tool to identify early-stage cancers, More intelligent ML models will lead to more smart health applications, which may be evolved to artificial intelligence (AI). ML and AI will help reduce disparity and improve healthcare.

O7.16

8:40 GARCINIA KOLA INDUCES APOPTOSIS AND ANTI-PROLIFERATION EFFECTS ON MDA-MB-231 BREAST CANCER CELLS (Graduate student)

Michael-Ryan Lowe , Ariane T. Mbemi, Paul B. Tchounwou, Jackson State University, Jackson, MS

Breast cancer (BC) is the second most diagnosed cancer among women. When compared to Caucasian women, African American women have a lower incidence rate but a higher mortality rate. And although treatment options have improved, adverse side effects often accompany the most common treatments for BC. According to Folkloric Medicine, Garcinia Kola (G. Kola) is a flowering plant found in Central and Western Africa whose seeds, stems, and leaves contain medicinal properties. Nevertheless, the ability for G. Kola to inhibit cell growth and induce apoptosis in BC cells is currently unknown. Therefore, Our study aims at assessing the cytotoxic and apoptotic effects of G. Kola on MDA-MB-231 BC cells at various dose-dependent concentrations for 48 hrs. Our findings demonstrated that G. Kola inhibits cellular proliferation, leading to apoptosis and necrosis cell death in a concentration-dependent manner. Findings from our study provide new insights into the molecular mechanisms of G. Kola as a potential treatment drug for BC.

O7.17

8:50 PROSPECTIVE ASSESSMENT OF THE UTILITY OF COLORED NONENHANCED HEAD COMPUTED TOMOGRAPHY IMAGES IN THE SETTING OF A CODE GRAY. (Graduate student)

Elliot Varney, Allison Stacks, Charolette Taylor, Jeffery Hooker, David Gordy, Andrew Smith, Seth Lirett, Candace Howard. University of Mississippi Medical Center, Jackson, MS

PURPOSE: To improve diagnostic speed and accuracy for detection of acute ischemic stroke in the setting of a Code Gray by evaluating paired grayscale and colored nonenhanced head CT (NECT) and grayscale CT arteriogram (CTA) head images.

METHODS: This single-center multi-reader prospective observational study was HIPAA-compliant and approved by the Institutional review board (IRB). The study included 100 consecutive Code Gray adult patients from 2/1/2018 to 3/17/2018 with grayscale NECT and CTA head images and a reference-standard confirmatory brain MRI. Grayscale NECT and CTA head images were collected, and colorized NECT images were generated using a custom, fully automated software designed to color the intracranial contents on the head CT images and increase conspicuity of ischemic strokes. All images were de-identified, and two randomized imaging sets were generated from each patient's CT exam including Grayscale (containing only grayscale NECT and CTA images) and Color+Grayscale (containing paired colored and grayscale NECT and grayscale CTA images). Four experienced readers (2 senior level general radiology residents and 2 expert neuroradiologists) independently assessed each reading set. Reading sessions were separated by at least 2 weeks to minimize recall bias. The mean accuracy, sensitivity, specificity, and time of assessment were compared between readers and the two groups of readers using Grayscale and Color+Grayscale images in a multivariate model.

RESULTS: Among the 4 readers, the mean accuracy/sensitivity/specificity for correctly diagnosing acute ischemic stroke were 72%/46%/87% using only grayscale images and 69%/36%/86% using Color+Grayscale NECT images ($p=0.08$/$p=0.006$/$p=0.858$). Mean time of interpretation of 59 seconds using grayscale only images decreased by an average of 19 seconds using Color+Grayscale images ($p<0.001$).

CONCLUSION: Non-enhanced CT imaging has a very important diagnostic role in the setting of a Code-Gray, and rapid assessment and diagnosis is crucial for optimal patient outcome. Significantly decreasing the time of assessment without degrading and potentially improving diagnostic accuracy could be widely applicable among all radiologists with no additional patient expense or radiation exposure while also potentially improving patient outcomes.

O7.18

9:00 DEVELOPMENT OF FLUORESCENT CARBON DOT NANOMATERIALS FOR THE EARLY DETECTION OF LUNG CANCER (Graduate student)

Lauren Corby,

Jackson State University, Jackson, MS

Lung cancer has been the leading cause of cancer mortality for decades, with nearly 235,760 diagnosed in 2021, due to its difficulty to diagnose at an early stage. Lung cancer is categorized into two main types as small cell lung cancer (SCLC) and non-small cell lung cancer (NSCLC), referring to the appearance of these cells. Although consider "less aggressive," NSCLC is responsible for approximately 85-90% of these deaths. There is an urgent need to improve the current detection and treatment/therapy methods. Nanoparticles in lung cancer studies have shown increased biocompatibility, stability, circulation time, imaging, etc., when compared to current forms of detection and drug therapy. The goal of this study is to determine whether carbon dots can be used to image NSCLC at an earlier stage and observe the toxicity of Y-CDs when introduced to lung cancer cells. For this purpose,

yellow-carbon dots (Y-CDs) were synthesized using a one-pot hydrothermal method. We will discuss the details synthesis procedure we have used for the synthesis of Y-CDs. We will also discuss the characterization of Y-CDs using TEM microscopic technique, fluorescence, absorption, and FTIR spectroscopy techniques. The anticancer properties for Y-CDS were determined using NCI H-1299 NSCLCs. Results from the cell assays showed low toxicity of Y-CDs in contact with lung cancer cells. Details of luminescent detection properties and mechanism for possible toxicity will be discussed.

9:10 BREAK

O7.19

9:15 EFFECT OF NEUROPEPTIDE Y1 RECEPTOR ANTAGONIST COMPARED TO STANDARD ESTROGEN THERAPY ON VAGINAL SMEARS

Kenneth Butler[1], Lamar Hamil[2], Michelle Tucci[1], Hamed Benghuzzi[3]

[1]University of Mississippi Medical Center, Jackson, MS, [2]Belhaven University, Jackson, MS, [3]Global Training Institute, Flowood, MS

Studies have documented that sustained estrogen delivery can modulate or sustain normal female reproductive functions. However, the literature lacks scientific evidence regarding the mechanism of estrogen and a neuropeptide Y (NPY) antagonist effect on the hypothalamic-pituitary-gonadal axis. This study aimed to explore the role of sustained delivery of estrogen and its effects on reproductive function compared to an NPY antagonist. There were 75 adult female rats divided into five groups (n=15/group), including the intact control, ovariectomized, ovariectomized-sham, ovariectomized + estrogen, and ovariectomized + NPY antagonist). Animals in four groups were surgically sterilized, and three groups were implanted with a TCP delivery device loaded with no drug or biological (sham), estrogen, or an NPY antagonist. At the end of each study phase, animals were euthanized, and vaginal smears and tissues were evaluated at 2, 4, and 8 weeks post-implantation. Vaginal smears were obtained from each group at all three-time intervals over 5 days, beginning at baseline and 5 days leading to the endpoint. Vaginal tissue was collected at necropsy and submitted for histological evaluation. The results of this study revealed statistically significant differences in vaginal smear and tissue sample patterns of the ovariectomized + estrogen, and ovariectomized + NPY antagonist compared to the control groups at endpoints ($p<0.05$). This analysis indicated that true cyclic activity was observed only in the intact control group. The ovariectomized estrogen-treated animals demonstrated persistent estrus but no cyclic activity. NPY antagonist-treated animals produced proestrus cell patterns predominantly but no true cyclic activity. Overall, this study demonstrated that the release of estrogen and an NPY antagonist at sustained levels results in observable morphologic changes in female vaginal smears and tissues compared to control groups.

O7.20

9:25 ASSOCIATIONS BETWEEN CARDIAC CALCIUM SCORES, LIVER SURFACE NODULARITY, AND BONE MINERAL DENSITY IN A HIGH-RISK POPULATION USING ABDOMINAL CT IMAGES (Graduate student)

Quinn Cottone[1, 2], Elizabeth Kerby[1, 2], John Overton[1, 2], Johnny Yang[1, 2], Zainab Ahmad[1, 2], Elliot Varney[3], Edward Florez[2], Merlin Margaret[3], David Gordy[3], Seth Lirette[4], Candace Howard[3, 5]

[1]Department of Radiology, UMMC, [2]School of Medicine, UMMC, Jackson, MS, [3]Department of Radiology, UMMC, Jackson, MS, [4]Department of Data Science, UMMC, Jackson, MS, [5]Investigator in Development Program for MCCTR, UMMC, Jackson, MS

Purpose: To assess the associations between cardiac calcium scores, liver surface nodularity and bone mineral density.

Methods: For this IRB-approved retrospective observational study African American men and women at risk for obesity and cardiometabolic disease presenting for cardiometabolic assessment were included (N = 359). Limited nonenhanced CT imaging of the heart and lower abdomen were obtained with a bone density phantom in place. Patients without the proper image parameters (ie. FOV) and patients with insufficient imaging of the liver were excluded (N=209). The final cohort was 150 patients. Two readers independently measured liver surface nodularity (LSN) on the CT images of the abdomen using an offline, previously validated semi-automated software (Liver Surface Nodularity, LLC, v0.92). Two readers independently assessed bone mineral density (BMD) calculated from CT images within the vertebral bodies of L1 and L2 using the validated quantitative computed tomography (QCT) technique. Next, three readers independently assessed coronary and extra-coronary calcium volumes and scores were obtained using an offline software (syngo.via), and Agatston scores were calculated. Linear and non-linear correlations and the coefficient of correlation were used to determine associations between LSN scores, BMD, and cardiac calcium scores. Intraclass correlation coefficient (ICC) with 95% confidence intervals was used to assess inter-observer agreement of LSN, BMD, and cardiac calcium scores among the individual readers.

Results: LSN score showed a positive correlation with coronary artery calcium scores throughout this cohort and was shown to be at least partially predictive of coronary artery calcium score. More specifically, for every 1 unit increase in the LSN score, the odds of moving up one quartile in relative risk for cardiovascular event in the next 10 years was 1.48 ($p<0.001$; CI 95% 1.27-1.71). This effect was drastic among males in their 40s with data suggesting double the odds of moving up one quartile in relative risk for cardiovascular event in the next 10 years. Increasing BMD interestingly showed a partial protective effect on coronary artery calcium. For every 10 g/cm2 increase in BMD odds of moving up one quartile in relative risk for cardiovascular event in the next ten years was 0.96 ($p=0.001$; CI 95% 0.94-0.98).

Conclusion: Overall, there appears to be a protective effect of increasing bone mineral density and a permissive effect of increasing liver surface nodularity as it relates to the development of cardiac coronary calcium scores. Additionally, there appears to be a sex difference showing that BMD is more protective in men than women while LSN is more permissive in men than women.

O7.21

9:35 HOW DO NONINVASIVE TESTS FOR STAGING HEPATIC STEATOSIS MEASURE UP?

(Graduate student)

Zachary Wilson[1], Elliot Varney, MD[2], David Gordy, PhD[2], Seth Lirette, PhD[3], Candace Howard, MD PhD[2]

[1]School of Medicine, University of Mississippi Medical Center, Jackson, MS, [2]Department of Radiology, University of Mississippi Medical Center, Jackson, MS, [3]Department of Data Science, University of Mississippi Medical Center, Jackson, MS

Purpose: To prospectively compare the diagnostic performance of multiple noninvasive tests for staging hepatic steatosis in all patients with chronic liver disease using histology from biopsy as the reference standard.

Methods: This is a prospective pilot study including adults with chronic liver disease and/or hepatic steatosis referred for liver biopsy. All patients underwent the random liver biopsy and non-contrast CT imaging of the upper abdomen. Liver attenuation measurements of the liver parenchyma were obtained using a circular Region-of-Interest (ROI). Serum labs within 30 days of liver biopsy were obtained and used to calculate the Non-alcoholic fatty liver disease (NAFLD) fibrosis score (NFS) and Hepatic Steatosis Index (HSI). Magnetic Resonance (MR) imaging of the abdomen was performed with calculation of focal hepatic and full-liver Percent Density Fat Fraction (PDFF). The concordance of focal MR-PDFF (MR-PDFF ROI), full-liver MR-PDFF (MR-PDFF Segmentation), CT Liver attenuation, NFS, and HSI with histologic Non-alcoholic steatohepatitis (NASH) Clinical Research Network (CRN) staging of hepatic steatosis were assessed using Harrell's C statistics.

Results: 29 patients (22 female; age range 21 – 72 years, mean 54) were included. The histologic range of hepatic steatosis includes stages 0 (<5% of steatosis) to 3 (>67% steatosis). The C-stat concordance for MR-PDFF ROI, MR-PDFF Segmentation, CT Liver attenuation, NFS, and HIS was 0.92, 0.98, 0.86, 0.47, and 0.61, respectively. Odds of moving up one steatosis stage per one-unit increase were 1.18 ($p=0.008$), 1.8 ($p=0.001$), 0.86 ($p<0.001$), 1.22 ($p=0.398$), and 1.0 ($p=0.492$), respectively.

Conclusion: In this pilot study, MR-PDFF segmentation and MR-PDFF ROI were the superior methods for assessing the degree of hepatic steatosis, not limited by a previous NAFLD diagnosis. Additionally, validated serum markers for NAFLD showed overall poor performance in staging hepatic steatosis.

Friday, February 24, 2023

Morning 8:30 -9:30 AM

Room: D6

Oral Presentation ***Session B3***

Moderators: Drs. Frank Spradley and David P. Gordy, University of Mississippi Medical Center

Topics: ***Health Care Policy/Regulations/Statistics***

O7.22

8:30 AN EVALUATION OF PLASTIC SURGERY RESIDENT ACGME REPORTING ACCURACY AT AN ACADEMIC MEDICAL CENTER

Karen Marble, Judy Gordy, Nicollette Davis, Peter Arnold

University of Mississippi Medical Center, Jackson, MS

Background: Current Procedural Terminology (CPT) is used to provide a uniform language that describes medical services, surgery, and diagnostic services.[1] CPT codes are used for multiple reasons, including reporting provider healthcare services to insurance companies for payment, and for reporting cases that residents are in to the Accreditation Council for Graduate Medical Education (ACGME). CPT coding is a tested skill on the plastic surgery board exam. There have been studies researching the accuracy of CPT code reporting by general surgery residents to the ACGME, but there have not been studies that look at the accuracy of plastic surgery resident CPT code accuracy.

Methods: At a large academic hospital, 100 Case logs for 14 plastic surgery residents were reviewed and the CPT codes reported were compared to the CPT codes that were used to bill the same cases to insurance. CPT codes used to bill cases to insurance were first selected by the plastic surgeons attending the cases. The codes were then passed through a claim scrubbing software that looked for any coding errors, and if errors were found, the codes were then reviewed by certified coding staff for correctness. Resident cases with CPT codes that did not match CPT codes billed out to insurance were deemed to be incorrect. A survey was sent to residents requesting their feedback and suggestions regarding coding for ACGME case logs.

Results: An average of 21% of resident case logs were found to have correct CPT codes. This is considerably lower that then the 50% accuracy that was found in similar studies of general surgery resident ACGME reporting. Survey results were varied among residents demonstrating that there are complex issues regarding coding performance by residents.

Conclusions: Education needs to be offered to plastic surgery residents to improve their CPT coding skills.

O7.23

8:40 CLÍNICA MÉDICA: A DESCRIPTIVE STUDY ON THE ESTABLISHMENT OF A FREE CLINIC FOR SPANISH-SPEAKING PATIENTS (Graduate student)

Brandon McDaniel, Licy Yanes-Cardozo, Alex Fratesi, University of Mississippi School of Medicine, Jackson, MS

With an estimated 9.6% of United States residents without health insurance in 2021, it is imperative that action is taken to provide healthcare to vulnerable populations. Of those uninsured residents, approximately 31.4% of Hispanic adults lacked health insurance. To alleviate the financial burden of uninsured healthcare costs in the Hispanic population, Clínica Médica (CM) was established in 2021 in Jackson, Mississippi (MS) as a part of the Jackson Free Clinic (JFC), a student-run free clinic. The aim of this study is to describe the challenges and the impact of CM in providing accessible healthcare despite language barriers to the ever-growing Hispanic community. Multiple medical services were available to Hispanic patients such as clinic appointments, vaccinations, and educational health fairs in their native language. Significant challenges included funding for facilities, an electronic medical record, laboratory analysis of specimens, and diagnostic equipment; obtaining Spanish-speaking medical student and physician volunteers; and advertising to Hispanic patients via outreach events. Despite these challenges, within the first fiscal year of operations, 882 Hispanic patients received COVID-19 vaccinations, 60 Hispanic patients have been treated and/or referred to specialty clinics, and the number of Hispanic patient clinic-visits has increased 15-fold in the last year. Establishment of a clinic to serve those in need is not without challenge; however, the impact of the CM in the Hispanic population was significant. Free clinics are not only a means to provide medical care to patients, but they also provide a platform for medical students to positively interact with their community.

O7.24

8:50 A SYSTEMATIC REVIEW OF SYSTEMIC LUPUS DISEASE IN THE UNITED STATES

(Undergraduate student)

Faith Iseguede, Jung Lee.

Jackson State University, Jackson, MS.

Background: Systemic lupus is a complex chronic autoimmune disease that impacts patients' quality of life. Despite several studies, data on systemic lupus treatment pathways and racial disparities is limited. The aim of this systematic review was to summarize available evidence on systemic lupus treatment pathways and racial disparities.

Methods: We conducted systematic review in electronic bibliographic databases of Embase.com, PubMed, Scopus, Ovid, and Medline to identify relevant studies. A total of 20 articles were selected.

Results: Our findings revealed that racial disparities in systemic lupus treatment pathways was highest among African Americans than in Hispanics and Whites.

Conclusions: Racial disparities in systemic treatment pathways exist among African Americans. Interventions and policies are needed to eliminate these disparities.

O7.25

9:00 USING ENROLLMENT METRICS FOR STANDARDIZED EVALUATION OF EFFECTIVENESS OF RECRUITMENT STRATEGIES IN AN ALZHEIMER'S DISEASE INTERVENTION TRIAL (Graduate student)

Stacee Naylor, Kenneth Butler, Karen Winters, Lei Zhang, Laree Hiser

[1]University of Mississippi Medical Center, Jackson, Mississippi

Various interventions have attempted to improve recruitment into Alzheimer's disease and related dementia (ADRD) clinical trials. Scientific research on clinical trial recruitment effectiveness is limited. This study aimed to determine which recruitment strategies are most effective in generating research interest and enrollment in community-dwelling adults aged 70-84. At the Jackson, Mississippi site of the multisite ACHIEVE study, staff engaged 2,999 persons from the study population catchment area (N=24,598). Those interested in participating in a study were divided into two groups: existing study participants and other (de novo) community-dwelling adults. A variety of traditional and non-traditional recruitment strategies, including print media, community or educational events, referral (word of mouth), broadcast media, web-based media, and were used. Targeted and general audience events aimed to engage, generate participation interest, screen those showing interest, and ultimately enroll study participants. The 859 persons expressing interest in the trial (n=604, 70% de novo; n=255, 30% existing participants) were female (67%), African American (61%), attended or completed college (81%), and in professional management occupations (59%). Ultimately, there were 241 (28%) participants who enrolled in the trial (n=178 de novo, n=63 existing participants). Metrics of recruitment rate (RR), enrollment rate (ER), enrollment yield (EY), and screen failure rate (SFR) were calculated for each strategy. Overall, for the recruitment phase, the RR=0.035, ER=0.99, EY=0.28, and SFR=0.41. Print media demonstrated a stronger RR (0.017) and ER (1.0), but a weaker EY (0.25) and SFR (0.30) compared to several other strategies. Community outreach and referral strategies produced stronger ERs (0.98 and 1.0) than broadcast- or web-based media (0.68 and 0.51, respectively). The EY was highest using broadcast media (0.54), followed by referral (0.31), community outreach (0.26), print media (0.24), and web-based media (0.23). The SFR was highest in referral and community outreach (0.55 and 0.51, respectively). The findings of this study demonstrate that enrollment metrics for each strategy can be an effective tool in assessing the effectiveness of recruitment strategies and supplementing data for resource allocation in future planning for recruitment in ADRD clinical trials. In addition, these simply calculated enrollment metrics, at a minimum, should be standardized across clinical trial reporting sites for proper reporting and

evaluation of recruitment strategies and techniques as the field of recruitment science evolves.

9:10 BREAK

O7.26

9:15 PREDICTION OF LIVER FIBROSIS RISK USING MACHINE LEARNING ALGORITHMS IN AN ADULT POPULATION WITH NAFLD (Graduate student)

John Overton[1], Edward Florez PhD[2], Johnny Yang[1], Quinn Cottone[1], Zainab Ahmad[1], Elizabeth Kerby[1], Elliot T. Varney MD[2], Merlin Margaret MD[2], David Gordy[2], Seth T. Lirette PhD[3], Candace Howard MD PhD[2, 4] [1]School of Medicine, UMMC, [2]Department of Radiology, UMMC, [3]Department of Data Science, UMMC, [4]Investigator in Development Program for MCCTR, UMMC

Purpose: To predict fibrosis risk as determined by NAFLD score in a diverse population with NAFLD through artificial intelligence (AI) classification models using anthropometric measures from CT images, serum biomarkers, and demographics.

Methods: For this HIPAA-compliant, IRB-approved retrospective study, 591 adult patients with various degrees of NAFLD and non-enhanced CT images of the abdomen were enrolled. Of those, 268 had lab parameters to calculate NAFLD fibrosis score (NFS). The NFS was calculated using clinical parameters available in the electronic medical record. Anthropometric measures of waist circumference (WC) and sagittal abdominal diameter (SAD) were measured in all subjects through a DICOM viewer (OsiriX MD, v.9.0.2). SAD was measured in the slice centered at the L4-L5 intervertebral disk, at the top of iliac crest; WC was measured on the last slice from cranial to caudal not showing the iliac bone. Visceral (VAT) and subcutaneous (SAT) fat volumes were measured on the full cohort using sliceOmatic's (TomoVision, v.5.0) multi-layer segmentation software. Liver surface nodularity (LSN) scores were determined by a validated quantitative software. Linear and non-linear AI classification models were trained and tested to predict the fibrosis risk in patients with NAFLD. All models were implemented in Python. Using bivariate and multivariate analyses, multiple AI models were tested and classified based on accuracy.

Results: Bivariate analysis included the parameters of age and SAD. The multivariate analysis included several parameters including age, sex, fat volumes, WC, SAD, LSN and serum laboratory tests (ie. liver function tests, platelets, albumin) The various AI classification models used for both the bivariate and multivariate analyzes included: logistic regression (LR), K-Nearest Neighbors (K-NN), Naïve Bayes (NB), support Vector Machine (SVM) and Kernel SVM, decision tree (DT), and random forest (RF). Through all the analyzes, the multivariate models far outperformed that of the bivariate analyses. Linear regression, SVM and RF models were the most accurate for both bivariate and multivariate analysis. Using the bivariate analysis, $R^2 = 0.79$ for the LR, SVM and RF models. LR outperformed all other models in the multivariate analysis with $R^2 = 0.96$ with SVM and RF models also performing excellently well (R^2= 0.93 and 0.89, respectively).

Conclusion: Advanced AI classification models can predict risk of liver fibrosis with high accuracy and precision using simple bedside anthropometrics & demographics from patients with NAFLD. Appropriate modeling may allow clinicians & population health studies to accurately monitor risk of liver fibrosis without clinical delay or cost associated with imaging & laboratory tests.

O7.27

9:25 FRAME WORK FOR PRECISION IMAGING: MULTI-MODAL APPROACH TO RADIOMICS & NANOPARTICLE DRIVEN KNOWLEDGE-BASED PREDICTIVE INFORMATICS (Undergraduate student)

Zainab Ahmad[1, 2], Merlin Margaret Manogaram[2], Elliot Varney[2], Candace Howard[2, 3], Mohan Pauliah[2]

[1]School of Medicine, UMMC, [2]Department of Radiology, UMMC, [3]Investigator in Development Program for MCCTR, UMMC

Precision imaging plays a vital role in the diagnosis and treatment of disease. By integrating functional and metabolic imaging technologies, increasingly more sensitive and specific read-outs reflecting the biological status of tumors may be obtained which, in turn, may improve characterization, direct targeted biopsy efforts & therapeutic responses. Translational imaging research blends clinical studies with advanced computational modeling of radiologic imaging-based Artificial Intelligence (AI) and Deep Learning (DL) methods by incorporating quantitative multi-dimensional data generated from structural, functional, and metabolic imaging in conjunction with nanoparticle-based hybrid imaging probes. This opens new avenues for precision image-driven applications in the field of theranostics. Furthermore, novel technologies with molecularly targeting imaging probe designs coupled with state-of-art advances in imaging technologies allow real-time image guidance techniques with the potential of leading to first-hand more efficient approaches for early-stage detection and image-based treatment assessment and therapy. Unparalleled understanding of the Hybrid Imaging Modalities and Multi-parametric technology, particularly MRI/PET, offer greater insights into the disease process. Besides, the accurate detection and physiological image quantification of diseases remain vital biomarkers for disease staging and clinical outcomes. This study outlines the framework for data workflow and pipeline for precision imaging metrics from these tools and the reporting needs of clinical centers, radiologists, and trial sponsors.

Conclusion: Newer radiological image acquisition protocols and novel post-processing algorithms offer greater insights into the disease process and pathophysiological status of disease and response. Data imaging pipelines and workflow informatics afforded from these tools offer greater potential to not only improve the accuracy of targeted disease and its image-guided surgical or radio therapeutic interventions but to transform decision-making for personalized patient treatment through image-driven applications.

O7.28

9:35 COMPARISON OF VIRULENCE AND PATHOGENICITY BETWEEN CLINICAL *Staphylococcus aureus* ISOLATES FROM HUMAN DIABETIC FOOT ULCERS USING T2DM MOUSE MODEL (Graduate student)

Carol Baker[1], Jooyoun Park[1], Keun Seo[1], Justin Thornton[2], Stephen Pruett[1]

[1]Department of Comparative Biomedical Sciences, College of Veterinary Medicine, Mississippi State University, Mississippi State, MS, [2]Department of Biological Sciences, Mississippi State University, Mississippi State MS

Every year, over 130,000 lower-extremity amputations are performed on Type 2 Diabetes Mellitus (T2DM) patients with diabetic foot ulcers (DFU) that failed to respond to conservative treatment. Staphylococcus aureus is one of the most common bacteria isolated from severe DFU infections that leads to these amputations. The pathogenesis of S. aureus is largely dependent on bacterial adhesion to skin tissues, cytolytic toxins that damage host immune cells and tissues, and synthesis of a glycocalyx that facilitates formation of biofilm. There are many different strains of S. aureus and each have a different set of virulence factors that can change the severity of disease. In this study, we tested 8 clinical S. aureus isolates with different clonal lineage from human DFU patients to compare the differences in the virulence and pathogenicity they expressed in-vitro and in-vivo. We demonstrated clear differences between clinical strains in their genetic profile, biofilm formation, cytotoxicity and disease severity in the T2DM model mice (Tallyho) while non-diabetic mice did not show any/very minor tissue necrosis, suggesting that diabetic metabolic conditions are also another important factor affecting S. aureus pathogenicity. This proves that some virulence factors in specific diabetic conditions are more likely to lead to severe DFU and are the targets that need more focus when finding possible treatments for DFU patients.

Friday, February 24, 2023

Morning

Room: D8

10:10 AM Symposium II

Theme: OMICs APPLIED IN THE DISEASE DIAGNOSTICS

Moderators: Drs. D. Olga McDaniel, Lance E. Keller
University of Mississippi Medical Center

10:10 -12:00 Noon Speakers and Topics

(Speakers information can be found in the section on Divisional symposia and Workshop)

10:15 Genomic Technology: SARS-CoV-2 Sequencing Biosurveillance in Mississippi

Dr. Michael Garrett, Professor and Director Molecular and Genomics Core, Pharmacology/Toxicology, UMMC

10:45 HumMod: "Physiological Simulation for Virtual Clinical Trials"

Dr. Robert L. Hester, Director, Center for Computational Medicine, Professor of Physiology and Orthopedic Surgery, UMMC

11:15- Nanotechnology: Targeted therapies at the interface of nanotechnology and immuno-oncology

Dr. Thomas Werfel, Assistant Professor, Biomolecular Sciences, University of Mississippi.

11:45 Symposium II Questions and Discussions

11:00 -12:00 PM Poster session II

(MAS High School Posters)

P7.50 RADIOACTIVITY IN SELECTED FERTILIZERS AND THEIR RADIOLOGICAL HEALTH IMPLICATIONS (High School student)

Ben Billa[1], Charles Nettles[1], Masoud Beitollahi[2], Steve Adzanu[2], John Adjaye[2]

[1]Mississippi School for Mathematics and Science, Columbus, MS, [2]Alcorn State University, Lorman, MS

Fertilizers are part of farming industry and they play a major role in improvement of plant growth and enhancement of crop yields. One of the essential elements, potassium, helps in root growth and drought resistance of plants. Depending on soils fertility, farmers tend to provide potassium in the form of potash fertilizer which is derived from potash rock cored from earth's crust. Rocks derived from the earth's crust consist of trace quantities of Naturally Occurring Radioactive Materials (NORM) and NORM concentrations significantly vary based on rock type, geographical location, and concentration of the rock. Potash is a commonly used fertilizer derived from potash rock and to increase concentration of potassium, manufacturers increase percentage of potash which can eventually enhance radioactive concentrations (specifically

K-40) in fertilizers. To exactly estimate and experimentally verify the levels of radioactive K-40 in selected fertilizers (0-0-60), a study was performed on fertilizers available in local market. K- 40 was theoretically estimated by considering the half-life; molar mass; and decay constant while experimental studies were carried out by performing gamma-spectroscopy. Obtained results for radioactivity concentrations of K-40 from theoretical estimation and gamma spectroscopy are 15, 110 and 15, 162 Bq kg^{-1} respectively. Results suggest that both experimental and theoretical K-40 values are compatible. Further, obtained results are compared to average K-40 concentration in soils within the US. Lastly, radioactivity based radiological health hazard indicating parameters are computed. Results indicated that radiological health hazards to living organisms from potassium enhanced fertilizers considered in this study are significantly higher to the world-wide averages of health hazard indicating parameters. This study strongly suggests that it is imperative that stringent recommendations are developed in handling and usage of these radioactivity enhanced materials.

P7.51

PROGESTERONE LOWERS AT1-AA AND BLOOD PRESSURE IN RESPONSE TO EARLY-ONSET PREECLAMPSIA (High School student)

Dorianne Hines[1], Morgan McCray[2], Kymberlee Evans[2], Kyleigh Hankton[3], Nathan Campbell[2], Evangeline Deer[2], Owen Herrock[2], Nicole Ingram[2], Kedra Wallace[2], Ty Turner[2], Ariel Jordan[2], Babbette LaMarca[2], Lorena Amaral[2], [1]Murrah High School, [2]University of Mississippi Medical Center, [3]Alcorn State University

Background: PE is characterized by new onset hypertension associated with progesterone deficiency, inflammation, elevated AT1-AA and endothelial dysfunction. Normal pregnancy (NP) is associated with elevations in progesterone and T helper 2 (TH2)/uterine natural killer cells (NK cells) favoring immunotolerance of the fetus. Activated lymphocytes during NP express progesterone receptors, which stimulate an anti-inflammatory protein called Progesterone Induced Blocking Factor (PIBF). Objective: This study was designed to test the hypothesis that 17-hydroxyprogesterone caproate (17-OHPC) lowers AT1-AA and inflammation while reducing maternal blood pressure in patients with early-onset preeclampsia (EO-PE). **Methods:** EO-PE participants, <34 weeks of gestation, received 17-OHPC (250 mg, I.M.) and blood draws were collected before and after 17-OHPC. Placentas were collected at the delivery. **Results:** Progesterone and PIBF levels were 332+/- 65 ng/mL (n=7), 18.0 +/-1.0 pg/mL (n=6) in NP, 15.4 +/- 45.6 (n=12, $p< 0.05$), 14.4 +/- 1.0 pg/mL in PE (n=10, $p< 0.05$), which increased to 155+/-57.0, 16.39 +/-0.74 ($p< 0.05$ vs. PE) in PE+17-OHPC (n=6). TNF-alpha and IL-6 were 41.3 +/- 3.9 pg/mL (n=8), 20.1 +/-7.9 (n=11) in PE, which decreased to 21.1+/-5.5 (n=6, $p< 0.05$ vs. PE), 5.2+/-2.1 in PE+17-OHPC (n=5). Placental NK cells were 6.5 +/- 2.8 % gate in NP, 20.9 +/- 6.8 in PE, which significantly reduced to 4.8 +/- 1.0 % gate in PE+17-OHPC ($p< 0.05$). Endothelin-1 (ET-1) was 2.53+/-0.4 pg/mL in NP (n=5), 6.7 +/- 1.4 in PE (n=18, $p< 0.05$) and 4.9 +/- 1.3 in PE+17-OHPC. Placenta ET-1 increased 1.5-fold change in PE (n=4) compared to NP and reduced to 0.96 in PE+17-OHPC (n=4). AT1-AA and sFlt-1 were 23+/-5.2 ΔBPM and 3391 pg/mL in PE (n=5), which significantly reduced to 10.38 +/- 2.1 ΔBPM and 2611 +/- 138 pg/mL in PE+17-OHPC (n=7, $p< 0.05$). Maternal blood pressure was 117+/- 5.0 in NP, 148 +/- 3.7 mmHg in PE (n=19) and significantly decreased to 136+/-4 in PE+17-OHPC (n=14, $p< 0.05$). **Conclusion:** 17-OHPC reduces AT1-AA, inflammation and markers of endothelial dysfunction while lowering blood pressure and prolonged time to delivery in response to PE.

P7.52

A BRIEF REVIEW OF THE PATHOPHYSIOLOGY, SIGNS AND SYMPTOMS, DIAGNOSIS, AND TREATMENT OF HASHIMOTO'S THYROIDITIS *(High School student)*

Lilian Hamil[1], Gary L. Hamil[2], Kenneth R. Butler[3]

[1]High School, [2]Belhaven University, 3University of Mississippi Medical Central ***(Science education)***

The purpose of this project is to review the current body of knowledge on the pathophysiology, diagnosis, treatment, outcomes, and future considerations for research on Hashimoto's thyroiditis. Hashimoto's thyroiditis is an autoimmune disorder where the immune system makes antibodies that attack the thyroid gland. Hashimoto's thyroiditis (aka Hashimoto's disease) occurs in 5 out of 100 Americans and is the most common cause of hypothyroidism in the US. Many people with Hashimoto's disease have no symptoms until the disease progresses into later stages. Early in the disease, the thyroid may enlarge and release higher levels of thyroid hormone resulting in hyperthyroidism. As the disease progresses, hypothyroidism ensues as more damage to the thyroid occurs. The most common signs and symptoms include fatigue, weight gain, cold intolerance, joint and muscle pain, constipation, dry skin, dry thinning hair, heavy or irregular menstrual periods, infertility, and slow heart rate. Risk factors include female sex, family history, other autoimmune diseases, history of certain viral infections, pregnancy, excessive iodine intake, poor psychological well-being, and radiation exposure. The diagnostic workup for Hashimoto's thyroiditis includes thyroid function tests (TSH, free thyroxine (fT4)) to confirm a hypothyroid state. Coupled with thyroid peroxidase antibodies (TPO), the diagnosis of Hashimoto's thyroiditis can be confirmed. Thyroid ultrasound is often used to detect a goiter or nodules. Treatment includes pharmacologic therapy with levothyroxine (standard dose = 1.6-1.8 mcg/kg/day) to restore the euthyroid state. Patients >50 years of age are treated with 25 mcg/day with reevaluation in 6-8 weeks. Patients undergo thyroidectomy in the later stages of the disease because of higher cancer risk. Current clinical trials are exploring dietary supplementation, laser light therapy, Identity Oriented Psychotrauma Therapy (IOPT), and Eye Movement Desensitization and Reprocessing (EMDR). Future research should include therapies targeted at the pathophysiological autoimmune mechanisms causing the disease.

P7.53

DEVELOPING GOLD NANOPARTICLE-GRAPHENE OXIDE HETEROSTRUCTURES FOR THE INHIBITION OF OMICRON VARIANT OF SARS-COV-2 *(High School student)*

Rithik Benerjee,

Madison Central high school (Chemistry) Madison MS

We live in a world inundated with millions of types of viruses, and this is rapidly becoming one of the biggest concerns for the future state of human health. Throughout recent history, there have been multiple accounts of viruses substantially impacting society, such as influenza, zika virus, hepatitis B, and HIV. More recently, since the outBREAK of the COVID-19 virus in December 2019, researchers have spent more and more resources toward the development of enhanced nanomaterials that can interact with these viruses and defunctionalize them significantly. Specifically, spherical gold nanoparticles (AuNPs) are attracting significant attention from researchers because of their high surface-to-volume ratio, non-toxicity, and ability to quench fluorescence. These properties create a phenomenon called fluorescence resonance energy transfer (FRET), which indicates that decay rates of fluorescent molecules, including viruses, can be significantly increased through interaction with AuNPs. However, one problem with AuNPs by themselves is that they have a high tendency to agglomerate, which notably reduces their antiviral activity. Therefore, they often need to be conjugated with another nanomaterial in order to stabilize and optimize antiviral activity. Another very promising nanomaterial for researchers is graphene oxide (GO). Synthesized from pure graphite, graphene oxide is one of the most important carbon-based nanomaterials because of its very interesting two-dimensional nanosheet structure, solubility in water, and strong antiviral properties. The properties of AuNPs and graphene oxide seem impressive on their own, but when they are fused together to create a GO-AuNP nanocomposite heterostructure, that becomes an even more interesting phenomenon. These nanocomposites have a three-dimensional layered sheet structure with spherical AuNPs floating around on the surface of the sheets, which allows for strong surface interactions with viruses, especially through the adsorption of fluorescence proteins. Overall, the bioconjugation of graphene oxide and AuNPs is a very new and exciting field that researchers are delving into, and it could provide many useful applications for the development of antiviral medicines in the future.

P7.54

LINEAR-ATTENUATION COEFFICIENTS OF VARIOUS SHIELDING MATERIALS *(HIGH SCHOOL STUDENT) PORTERS CHAPEL ACADEMY* *(Physics and Engineering)*

Corbin Bass,

Porters Chapel Academy (Physics and Engineering)

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

P7.55

K-40 RADIOACTIVITY IN WATER-SOFTENERS *(High School student)*

Joey Courville, Porters Chapel Academy (Chemistry and Chem Engineering)

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

P7.56

PRENATAL EXPOSURE TO REDUCED UTERINE PERFUSION PRESSURES RESULTS IN RETINAL VASCULAR CHANGES IN ADULT MOUSE OFFSPRING (*High School student*)

Zyon Davis,

University Mississippi Medical Center (Neuroscience)

Background: Studies have shown that children exposed to hypertensive disorders of pregnancy develop smaller retinal arterioles and venules during childhood. It is not clear why this happens and a time-course of changes in retinal vascular structure after exposure to hypertensive pregnancy disorders

has not been done. Reduced uterine perfusion pressure (RUPP) is used to mimic the clinical hypertensive disorder of pregnancy, preeclampsia. It is not known whether RUPP-exposed offspring develop changes in retinal vascular structure during adulthood.

Objective: To determine whether prenatal exposure to RUPP leads to changes in retinal arteriole and venule caliber and pericyte coverage during adulthood.

Methods: Pregnant Smooth Muscle Actin – Green Fluorescence Protein (SMA-GFP) reporter mice underwent no, sham, or RUPP surgery on gestational day 13.5 and were allowed to deliver. At 2 and 6 months of age, eyes were collected and retinas dissected from male and female offspring and flat-mounted onto slides. Retinas were imaged using a confocal microscope and the number and diameter of arterioles and venules measured. Additionally, the number of pericytes on the surface of venules were counted and divided by the area of the venule to calculate venule pericyte density. Data are presented as Mean ± SD.
Results: At 6 months of age, there was no difference in arteriole number (5.4±0.5 in Sham vs. 5.0±1.0 in RUPP; p=0.241) or diameter (20.8±3.0 in Sham vs. 23.9±6.4 μm in RUPP; p=0.188), but a significant decrease in the number of venules (4.8±0.8 in Sham vs. 4.0±0.0 in RUPP; p=0.050) and increased venule diameter (31.0±2.0 in Sham vs. 33.9±2.6 μm in RUPP; p=0.058) in offspring from RUPP mice. Additionally, no difference in venule pericyte density (0.0014±0.0002 in Sham vs. 0.0012±0.0001 pericytes/μm in RUPP; p=0.114) was observed.

Conclusion: Our results indicate that in adult mice, prenatal exposure to RUPP affects primarily the retinal venules with no change in arterioles. Increased retinal venule number and diameter could be compensatory. Ongoing studies are geared at increasing the sample sizes and assessing whether retinal vascular changes are also evident at earlier time-points

P7.57

DENTAL IMPLANT STABILITY QUOTIENT IN SIMULATED BONE OF VARYING QUALITY *(High School student)*

Anabel Morgan[1] Megha Satpathy[2], Kartikeya Jodha[3], Firas Mourad[3], Jason Griggs[3]

[1]Murrah High School, [2]Prismatik Dentalcraft Inc., [3]University of Mississippi Medical Center

1Murray High School, Basie Pair (Physics and Engineering)

Introduction: Our goal was to create synthetic bone that mimics the range of structures found clinically in the mandible and maxilla and to verify that implants placed in the simulated bone *in vitro* have the same range of implant stability quotient (ISQ) scores as implants placed clinically. We hypothesized that implants placed in D2 bone would have the highest ISQ scores and that ISQ scores would range from below 60 to above 70.

Methods: Bone having four different levels of quality according to Lekholm and Zarb (1985) classification was simulated using custom-ordered bilayered blocks from SAWBONES USA (sawbones.com). D1 bone had a 3 mm thick cortical layer of short fiber-filled epoxy (#3401-02) and a cancellous layer of 20# cellular foam (#1522-12). D2 bone had a 2 mm cortical layer (#3401-01) and a 12.5# cancellous layer (#1522-11). D3 bone had a 1 mm cortical layer (#3401-07) and a 10# cancellous layer (#1522-210). D4 bone had no cortical layer and a 7.5# cancellous layer (#1522-09). A high-speed handpiece (WS-75 L, W&H, Sweden) at 1000 rpm was used to create a pilot hole using consecutively wider drill bits (2.0x15 mm, 2.75x15 mm, 3.0x15 mm, 3.25x15 mm) with the latter two only penetrating the cortical layer. Commercially pure titanium dental implant bodies (3.25x15 mm parallel walled with external hex connection, 3i T3, Biomet 3i Dental, USA) (n=4) were placed into each simulated bone specimen using an Implantmed unit (SI-1015, W&H, Sweden) at 15 rpm and 30 N-cm maximum torque. A magnetic post (SmartPeg Type 1, W&H) was screwed into the coronal portion of each implant body. ISQ score was measured using a magnetic resonant frequency analysis unit (SI-SQ, W&H) from the four sides on each implant body. The mean ISQ scores were compared using repeated measures two-way ANOVA.

Results and Discussion: The data passed tests for normality (Shapiro-Wilk, p=0.74) and equal variance (Brown-Forsythe, p=0.37). ISQ scores for individual implants ranged from 1 to 72. There was no difference in ISQ based on the direction of measurement (p=0.16), and there was no interaction of direction and bone type (p=0.82). There was a highly significant difference in ISQ based on bone type (p<0.001). Subsequent pairwise testing with Tukey's HSD revealed that D4 bone had a significantly lower mean ISQ score (26) than all other bone types (55 for D1, 67 for D2, and 61 for D3). D2 had the highest mean ISQ score, which agrees with clinical observations, but this score was not statistically different from those of D1 and D3 bone with the current sample size (n=4).

Conclusion: The hypothesis that implants placed in D2 bone would have the highest ISQ scores was accepted. The hypothesis that ISQ scores would range from below 60 to above 70 was accepted. These types of simulated bone exhibit an acceptable range and ranking of ISQ scores to use in a future study to validate the accuracy of finite element models for predicting ISQ scores.

P7.58

STATISTICAL ANALYSIS BETWEEN VEGETATION INDICES DERIVED FROM UAV-BASED RGB IMAGES AND MAIZE Yield *(High School student)*

Max Feng[1], Yanbo Huang[2], Ardeshir Adeli[2]

[1]Mississippi School for Mathematics and Science, Columbus, MS, [2]USDA-ARS Genetics and Sustainable Agriculture Research Unit, Mississippi State, MS, Mississippi School of Math and Science (Agriculture and Science)

Unmanned aerial vehicles (UAV) are becoming more prevalent in agriculture as they can autonomously and quickly gather data about plant stresses in agroecosystems. This data can then be analyzed and interpreted to help farmers understand exactly where to implement field operations which

ultimately maximizes yield and profit while minimizing the environmental footprint. However, current well-researched and widely used remote sensing techniques require expensive accessories, such as high-grade infrared sensors or LiDAR (laser-based Light Detection and Ranging scanner), which hinders the adoption of UAVs in the farming community. In this study, we explored an inexpensive and entry-level remote sensing method by comparing 17 different red, blue, and green (RGB) derived vegetation indices such as the normalized difference photosynthetic vigor ratio, green-red ratio index, and green-red vegetation index on the growth of maize. Finding the vegetation index with the highest correlation at a certain time of the growing season will provide a clearer understanding of which vegetation index is the most applicable at certain growth stages for maize. This will result in more accurate measurements for monitoring maize growth and estimates for grain yield. To achieve this, a consumer-grade UAV equipped with a portable digital camera was flown over a maize experiment field located at the Mississippi Agricultural and Forestry Experiment Station in Pontotoc, Mississippi. The experiment field comprises of 7 fertilizer treatments, including 1) no fertilizer (control); 2) broiler litter; 3) broiler litter + flue gas desulfurization; 4) 1-ton flue gas desulfurization + lignite; 5) 2-ton flue gas desulfurization + lignite; 6) 3-ton flue gas desulfurization + lignite; 7) urea ammonium nitrate, all of which were with and without cover crops. The fertilizer treatments were replicated three times with complete random arrangements on 6 blocks creating 42 plots in total. Six total flight missions were carried out over all plots in the entire field during the crop-growing season in May, June, and July 2022. The UAV flight missions were planned and controlled by using Pix4Dcaputre (Pix4D S.A., Prilly, Switzerland). After each flight, the acquired images were processed on Pix4Dcloud (Pix4D S.A., Prilly, Switzerland) to create the orthomosaic image that fully covers the experiment field. Then by using the raster calculator and zonal statistics tools in QGIS (https://qgis.org/en/site/), an open-source GIS (Geographic Information System) software, the RGB band data were extracted from the orthomosaic images for each treated plot to calculate different vegetation indices. As results, statistical regression models were established based on each vegetation index at different growth stages and crop yield. The results indicated that a consumer-grade UAV can detect differences in maize growth and yield as affected by cover crops and fertilizers using RGB-derived vegetation indices. This study provides the farming community with an inexpensive method to quickly scout their large fields for identifying plant stress and health allowing for a smart precision application of fertilizers at the right location.

P7.59

PARAMETRIC OPTIMIZATION OF RESPIRATORY MEASUREMENT IN RATS USING A CUMULATIVE-DOSING PROCEDURE AND WHOLE-BODY PLETHYSMOGRAPHY (*High School student)*

Aaron Araujo[1], Loc Pham[2], Kevin B. Freeman[3] ,1Base Pair Program, Murrah High School; 2Program in Neuroscience, University of Mississippi Medical Center; 3Department of Psychiatry and Human Behavior, University of Mississippi Medical Center *(Neuroscience)*

Rationale: Last year more than 100,000 people died from drug-related overdoses, and most of these cases involved the administration of a mu opioid agonist. Fatalities from opioid overdose occur through opioid-mediated depression of autonomic respiratory function. Recently, novel opioids have been developed that may decrease pain without affecting respiration to the same degree as typical opioids. However, rigorous preclinical *in vivo* assessments comparing these compounds to typical opioids requires optimization of the technical procedure with prototypical opioids such as fentanyl.

Objectives: The aim of the current study was to measure respiratory responsivity of machine-delivered serial infusions of the opioid agonist, fentanyl, over varied inter-infusion intervals to determine if interval variance affected the cumulative dose-response relation for fentanyl.

Methods: Male and female Sprague-Dawley rats (4 males and 4 females) with chronic indwelling intravenous catheters were placed in sealed whole-body plethysmography chambers. Respiratory performances (breath frequency and tidal volume) were measured and recorded over the course of a sessions that varied in time according to the inter-infusion intervals. Breath frequency and tidal volume were used to calculate minute volume, and data were compiled as average performance over serial 10 and 5-minute bins.

Results: Minute volume was relatively high at the session's outset but stabilized after approximately 25 minutes. Machine-delivered serial infusions of fentanyl produced dose-dependent decreases in most respiratory parameters across all infusion intervals. The average fentanyl's durations of effect across all doses appeared to be approximately 3.5 minutes within the intervals, with the higher doses producing more robust and longer lasting effect.

Conclusions: Machine-delivered serial infusions of fentanyl renders dose-orderly effects on respiratory performances in whole-body plethysmography, thus allowing for rapid throughput for comparisons across numerous compounds. Fentanyl's relatively short duration of effect indicates that shorter inter-infusion intervals are needed to capture the cumulative effects better.

Funding: This work was supported by R01DA039167 to KBF and F31DA056209 to LP.

P7.60

DESIGN OF ANTIBODY CONJUGATED MAGNETIC NANOPARTICLES FOR THE SEPARATION, IDENTIFICATION AND DESTRUCTION OF MRSA SUPERBUGS ***(****High School student)*

Sanjay Singh, Gautam Ray, Yongfeng Zhao

Jackson State University (Chemistry and Chemical Engineering

In the twenty first century, one of the greatest health challenges worldwide is an infectious disease caused by drug resistant pathogens or superbugs. To address this problem, there is an urgent need to discover a novel antimicrobial agent

for killing as well as early-stage screening of superbugs. Herein, we present the design of bio-conjugated polyacrylic acid (PAA) coated iron oxide based magnetic nanoparticle (PAA-IONP), which has the capability for magnetic separation, calorimetric immunoassay-based detection and killing of methicillin-resistant Staphylococcus aureus (MRSA). For the capturing of MRSA, we have used immunomagnetic separation. After capturing, for the identification of superbugs, we have used magnetic nanoparticles-mediated TMB (3, 3', 5, 5'-tetramethylbenzidine)-H_2O_2 colorimetric system. For the selective identification from complex mixture, we have modified PAA-IONP with anti-MRSA antibody. After separation, we have used an artificial enzyme to produce green colour by catalysis of TMB into oxTMB in the presence of H_2O_2. Once the bacteria were captured and detected, killing process was begun with photo thermal therapy (PTT) effect of oxTMB by using a laser of 808 nm. Experimental results show 88% capture efficiency for antibody attached magnetic nanoparticles with colorimetric detection limit of 10^2 CFU/mL. Using 808 nm near infrared (NIR) light, we have observed 100% of MRSA killed.

12:00 HSD Students Awards Certificates and group photo

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 23, 2023

MORNING

Room D12

8:50 **Welcome**

O8.01

9:00 CHARLES R. KNIGHT'S PAINTINGS OF EARLY HOMININS: REFLECTIONS OF UNSCIENTIFIC PRESUPPOSITIONS

Renee M Clary

Geosciences, Mississippi State University, Mississippi State, MS

In the mid-1800s, the first European Neanderthal fossils were found, followed by the discovery of Cro-Magnon remains in France in the latter part of the 19th century. With Darwin's 1859 publication of *On the Origin of the Species*, an evolutionary Tree of Life context existed for the interpretation of early hominins. Charles Knight (1874-1953), one of the premier paleontological artists of the 20th century, exhibited an early interest in 'cave men' and was an obvious choice to render artistic depictions of early humans. Henry Fairfield Osborn (1857-1935) served as Knight's mentor at the American Museum of Natural History, and commissioned Knight to paint murals of prehistoric humans for the Hall of the Age of Man. A eugenics supporter who advocated for a 'dawn man' human lineage outside Africa, Osborn wanted two distinct types of prehistoric humans in the murals: the shorter, darker, brutish Neandertals and the taller, artistic, pale-skinned Cro-Magnons. Knight's friendship with anthropologist Henry Field also influenced the prehistoric human dioramas in the Field Museum's Hall of the Stone Age of the Old World; Knight constructed four small paintings that would potentially serve as background templates. Field Museum correspondence reveals a predetermined progression of hominins from savage Neanderthals to cultured Swiss Lake dwellers. Knight's hominin stereotypes continued with his 1942 *National Geographic* article and a 1949 book; the article became a reference for other artists who furthered the misconception of brutish, dark-skinned Neanderthals. Ironically, genomic sequencing and additional research now indicate that lighter-skinned *H. neanderthalensis* interbred with darker-skinned *H. sapiens* Cro-Magnons.

O8.02

9:30 EPISTEMOLOGICAL AND ONTOLOGICAL CONFUSIONS REGARDING EMERGENT PROPERTIES

Paula Smithka

University of Southern Mississippi, Hattiesburg, MS

Complex systems, such as biological systems, because of their complexity, seem to display qualitatively novel properties (emergent properties) at each level of organization that are not found in the component parts at the level in question; i.e., not found in the level just below the level in question. By contrast, properties that are found at both the level in question and the level below are resultant properties, i.e. properties of the whole which are also possessed by some of its parts. Emergent and resultant properties are level-relative concepts. So, life is an emergent property of cells, but a resultant property of a multicellular organism (Mahner & Bunge, 1997). Emergent properties have typically been associated with the position of anti-reductionism, which defends the view that, colloquially, "the whole is more than the sum of its parts." Yet, reductionism as a research strategy has been central to science in the endeavor to explain higher-level phenomena in terms of lower-level phenomena, i.e. to explain "the whole as simply the sum of its parts." Many kinds of complex systems, such as [non-molecular] biological systems and social systems (as argued by Niklas Luhmann, 1995), are not amenable to such traditional reductionist explanations. But, conceptual confusions abound in the discussions of reductionism, anti-reductionism, and emergent properties, which have led to misinterpretations and scholars "talking past each other." For example, emergence has historically been characterized in epistemic terms; namely, that the novel properties cannot be predicted or explained by knowledge of the properties and relations of the individual component parts. Luhmann's systems theory embraces such an epistemological approach in the fields of sociology and social theory, wherein he argues that the emergent order of a system is entirely excluded from the parts or substratum—what he refers to as *Totalausschluss*. Poe Yu-ze Wan (2012), however, argues that Luhmann's approach is out of sync with contemporary science and instead embraces Mario Bunge's position that emergence is ontological, not epistemological (e.g., 1979; with Mahner, 1997). This epistemological vs. ontological approach to emergence is one confusion. Other epistemological confusions include: the failure to distinguish between 'reduction' and 'reductionism' (Wan, 2012); 'explanation' and 'prediction', and realizing that functional explanations play a role across molecular levels (e.g., molecular biology and biochemistry) (Baetu, 2012). Among ontological confusions, Baetu (2012) contends that a distinction needs to be drawn between 'entity', i.e., the level being explained, and 'whole', i.e., the level below 'entity' in which terms the 'entity' is explained. Confusing the two has led to the presumption that emergence necessarily entails anti-reductionism, which he argues is flawed. Furthermore, reductionism and anti-reductionism can be considered from an epistemic or ontological standpoint. The epistemic standpoint focuses on the predictive value of observations or inter-theoretic explanation and the ontological standpoint addresses whether properties or entities at higher-levels (wholes) are results of lower-level components (parts). Thus, in order to make progress in the reductionism/anti-reductionism debate concerning emergent properties of biological systems, increased conceptual clarity is needed.

10:00-10:15 BREAK

O8.03

10:15 INFERENCE TO THE MOST "RESEARCH-FOSTERING" EXPLANATION IS INFERENCE TO THE BEST EXPLANATION

Tori Cotton

University of Arkansas, Fayetteville, AR

The popularity of Inference to the Best Explanation (IBE) has, in recent years, seen a significant surge across multiple philosophical fields. Many consider it obvious that a justified theory will be the best available explanation of the data collected. Epistemologists have attempted to espouse IBE as a means of describing justification, while others have argued that IBE is intrinsically linked to how all of philosophy is conducted and that it is necessary for the sort of judgments scientists make regarding the superiority of one theory over another. Many philosophers of science have remained skeptical about the theory's usefulness. Largely, these skeptics fall into two camps: (1) Those who seek to reduce Inference to the Best Explanation to a slogan with no real definition, and (2) those who seek to raise issues with the framework as a method of tracking the truth. Others take disparate and individualistic approaches. However, there are objections that target IBE from several sides. In this paper, I provide some overview of the arguments for and against IBE and claim that with proper revision, IBE is a strong contender for arriving at a good scientific explanation. I conclude that adding a research-fostering consideration for explanation allows for IBE to fall in line with the goals of scientific practice.

O8.04

10:45 FUNCTIONALISM AND THE SPECIAL SCIENCES: A CASE FROM ECONOMICS

Gregory Johnson

Mississippi State University, Starkville, MS

Functionalism in the philosophy of mind has it that mental states are functional states meaning that any adequate characterization of them must be given *only* in terms of their tasks, roles, or functions. Since, these descriptions are only functional, they will not include the structural properties or the materials of which the states might be made. Fodor (1989) argues that functionalism is pervasive throughout the special sciences. Hence, the components that figure in explanations in the special sciences can be defined only in terms of the tasks, roles, or functions that they perform in a system. From there he draws the further conclusion that cognitive psychology is just another of the special sciences and as ontological secure as are any of they. I will examine a model from economics, the partial equilibrium competitive model, which describes the interaction of supply and demand for a good under perfect

competition. This model is not consistent with functionalism. Although some concepts—for instance, *supply* and *demand*—can be given a gloss in purely functional terms, to provide complete explanations of how changes to one or the other affect the equilibrium price and quantity, we must invoke physical entities (for instance, the good whose supply and demand is being modeled or the inputs required to produce the good). This is only one case, but it is a central for economics and, arguably, for the special sciences. Hence, it seems that the application of functionalism is not a common as, at least, Fodor assumed. This does not entail that functionalism, as it pertains to cognitive psychology, is flawed. But it does license the conclusion that, insofar as cognitive psychology is based on functionalism, it is unique among the special sciences.

12:00 General Session

Thursday, February 23, 2022

AFTERNOON

Room D12

O8.05

1:00 IT IS ENGINEERING THAT COUNTS

John Bickle[1,2]

[1]*Dept. of Philosophy and Religion and Shackouls Honors College Faculty, Mississippi State University, Starkville, MS,* [2]*Dept. of Advanced Biomedical Education, University of Mississippi Medical Center, Jackson, MS*

The title of my talk is a famous quip from philosopher Ian Hacking. Hacking offered this quip forty years ago, when discussing late-20th century advances in microscopy. But it applies with equal vigor to the past seven decades in neurobiology. Research in my own area of neuroscience expertise, the field of molecular and cellular cognition (MCC), is especially driven by engineering advances. The field's very inception in the early-1990s relied on gene targeting techniques, which were brought into neuroscience from 1980s developmental biology. More than a decade ago, MCC researchers were quick to capitalize on developments in optogenetic and chemogenetic technologies. More recently, new research tools have greatly expanded the reach of MCC experiments, enabling researchers not only to image and manipulate individual molecular mechanisms in behaving organisms with an unprecedented temporal, sub-cellular and cellular specificity, but now even with circuit-wide specificity. A premier example of these new tools is the head-mounted florescent miniscope, miniature one- or two-photon microscope small enough to be installed on the heads and into the brains of behaving rodents, and capable of imaging activity in thousands of neurons simultaneously down to single cell resolution in deep brain structures while the animal is actively moving about its environment. These bioengineered research tools are impacting broader philosophical concerns about neuroscience in at least two ways. First, they appear to open a new research field in neuroscience, "molecular systems neuroscience" (Shen et al. 2022). Second, results with these new tools are offering a new "levels-less" image of the behaving organism, in its full causal-interactive complexity, with its molecules, cells and circuits combined and interacting within the single system that it is (Bickle et al. 2022). This new image stands in opposition to the traditional "levels" image of the behaving organism, and even the initial sketch provided of it so far offers hope for avoiding the dreary metaphysical debates about "emergence" and "downward causation," and even the reduction versus anti-reduction dispute itself, since all of these disputes are generated by the traditional "levels" image of the behaving organism.

O8.06

1:30 THE END OF ALGORITHMS

J. Adam Jones

Mississippi State University, Mississippi State MS

2:00 BREAK

O8.07

2:15 CRITICAL THINKING IN THE SCIENTIFIC LAW OF THERMODYNAMICS

Aspen Powell, Lamar Hamil

Belhaven University, Jackson, MS

Unlimited access to technological networking has allowed for interesting discussions in the scientific community. The process of scientific verification has been aided by quick access to intelligent sources; however, the rapid accessibility to countless opinions has allowed for excessive doubt in heavily experimented scientific laws. Some people in the social media community have attacked the first law of thermodynamics, a basis upon which physicists and engineers have rooted machines and life in the assumed fundamental structure of the universe. The reality of the composition of the universe is reliant upon the first law of thermodynamics. The first law of thermodynamics states, "the total amount of energy in the universe is constant and conserved" (Choi, 2018). Vehicles would not exist; technology would be primitive. All the creations of the 21st century depend upon the first thermodynamic law. The history behind discovering this primary law of energy is essential to our understanding of the first law of thermodynamics today and the current threats to its validity. Unfortunately, few documents have recorded the events that led to the full statement of the first law of thermodynamics in 1850, and the recognition of women's role in this area was overshadowed by the progress made by male physicists in pursuit of a functional steam engine. Despite the errors made and delays in scientific discovery, the first law of thermodynamics remained unquestioned until recently. However, new technology is needed to verify the current counter theory and has paused the research into this threat. Just like before, physicists are on the cusp of discovery and are waiting for advancements to resume this fundamental discussion.

Thursday, February 23, 2023

EVENING

3:30 DODGEN LECTURE and AWARDS CEREMONY
Hall B

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

Friday, February 24, 2023

MORNING

Room L5

8:50 Welcome

O8.07

9:00 THE IMPLICATIONS OF A TRANSDIAGNOSTIC APPROACH ON MENTAL ILLNESS AS A SOCIAL IDENTITY

Gabriel Tugendstein

Florida State University, Tallahassee, FL

The dominant diagnostic conception of mental illness is as a collection of discrete, potentially interacting, categories, in the style of the *Diagnostic and Statistical Manual of Mental Illness*. This framework has been criticized within the field of psychology for a wide array of faults, including widespread comorbidity, interrater unreliability, and high rates of "Other Specified/Unspecified" diagnoses. It has also been criticized by philosophers of science who hold that many, if not all, psychopathological categories fail to constitute natural kinds. These taxonomical shortcomings can and have created hurdles to clinical research and led to undertreatment.

The leading alternatives are "transdiagnostic" approaches. I focus on the most promising such alternative: the Hierarchical Taxonomy of Psychopathology (HiTOP). The HiTOP framework involves a series of nested, continuous dimensions, without demarcation between normal and pathological, whose relationship to one another are determined quantitatively.

A diagnosis of mental illness, however, is not only a classification. It often functions as the basis for a social identity, or understanding by oneself and others of one's characteristics and abilities in virtue of belonging to a group. Here I focus on mental illness as a social identity *affirmed* by they who identify, on the model of "coming out" as disabled, bracketing work which emphasizes mental illness as a social identity *imposed* by institutions and the non-diagnosed. These identity groups almost universally run along the traditional, categorical delineations of mental illness. It is thus worth asking: If, following the HiTOP, the latter is replaced, what will happen to the former?

As the social and ethical implications of transdiagnostic approaches to psychological nosology have received no attention in the philosophical literature, this is a broad and preliminary inquiry. First, I locate a key downside. The lack of proper labels provided by the HiTOP could act as a roadblock to forming affirming identities and communities for populations in need. I compare this to the social environment preceding the rise of mental illness as an affirming social identity, as well as to the implications of the "mere difference" model of disability proposed by Elizabeth Barnes, where the normative implications of disorder are diminished while the social identities themselves are maintained.

I then suggest a possible upside. Jessica Laimann has argued that human kinding frequently suffers from "biased conceptualization," or the tendency to attribute the behavior of the members of a kind to their intrinsic, typically physical, properties, instead of their social and political treatment. Proper kinding must be more sensitive to the extremely complex ways in which these two interact. It has been argued that something like this biased conceptualization is reinscribed by the increasing role of mental illness as a social identity, particularly on the internet. Behavior is attributed to fundamental, perhaps fixed, facets of the individual, which legitimizes forms of treatment of those in and out of the community. Introducing skepticism of the relationship between the properties of the psychopathological labels on which social identities are formed and the behavior of the diagnosed can work to interrupt this process of biased conceptualization.

O8.08

9:30 ETHICAL DILEMMAS IN THE USE OF ARTIFICIAL INTELLIGENCE IN HEALTHCARE DECISION MAKING

Gary Hamil[1], Kenneth Butler[2], Lillion Hamil[3], Stacee Naylor[2]

[1]Belhaven University, Jackson, MS, [2]University of Mississippi Medical Center, Jackson, MS, [3]Mendenhall High School, Mendenhall, MS

Artificial intelligence (AI) strives to mirror human cognitive functions. The use of AI in healthcare decision-making is a current example of the periodic paradigm shift that Thomas Kuhn described as an extreme change in a well-accepted model or assessment of events. The shift toward dependency and reliability of AI to diagnose and treat patients may have the power to interfere with or alter the judgment of healthcare providers caring for individual patients. Numerous ethical issues confront society due to the use of AI in healthcare decision-making. These issues include privacy, possible discrimination, and the philosophical challenges in the role of human judgment. In addition, there are several concerns regarding AI resources becoming a new source of inaccuracy and data breaches. Most healthcare datasets are incomplete and may not account for all patient variability. Mistakes in a procedure, diagnosis, treatment protocol, or judgment in clinical decision-making when using AI technologies by healthcare team members can have severe adverse consequences for the patient. Currently, there are no well-defined regulations or ethical guidelines to address such issues that often arise due to the use of AI in healthcare settings for making medical decisions. In this project, we aim to address these critical issues focusing on the need for transparency in the development of algorithms, the use of personal data and privacy, and the protection of all the beneficiaries involved in using AI in healthcare decision-making.

10:00 BREAK

O8.09

10:15 A DESIGN APPROACH TO THE CONSTRUCTION OF MUSCLE

Robert Waltzer

Belhaven University, Jackson, MS

The purpose of this talk is to build muscle from the ground up (as if an engineer were designing it) in order to provide insights into its structure and function and generate questions for future research. In addition, this approach is meant to support the idea that intelligent design can help to add new scientific knowledge. Motor proteins are the key force generators in muscle. Myosin is a good candidate partly because its tracks are made of actin, which is the smallest of the motor protein tracks. Since a high density of protein is required, saving space will be critical. The myosin molecules are arranged within a repeated cylindrical unit called the sarcomere. It measures about 2.3 um long and 1 um in diameter. Thin filaments made of actin serve as the tracks to which myosin attaches. The thin filaments are attached to disks on each end of the sarcomere. Bundling the myosin molecules provides a way to generate greater force. At the center of the sarcomere interdigitated between the free ends of the thin filaments are bundles of myosin (thick filaments) arranged in a centrally located lattice. The heads of the myosin are at the ends of the thick filaments in a mirror-image arrangement while their shafts are in the middle. In addition, the heads stick out at all angles around the thick filament, attaching to one of the 6 thin filaments that surround it. The arrangements of the myosin molecules within the thick filament and the surrounding thin filaments ensure that the ends of the sarcomeres are pulled evenly toward its center. Now there must be a high number of sarcomeres in the cell and they would have to arranged so their forces and movements are additive. The modified cell found in muscle is referred to as a fiber and is unusually long, possibly extending the length of the muscle. The sarcomeres, being short cylinders, can be arranged in series (attached end-to-end) to stretch the entire length of the fiber. This is called a myofibril. Since the fiber is 100um in diameter and the myofibril is 1 um in diameter, multiple myofibrils can be contained in a muscle fiber and multiple fibers are arranged in parallel. The result is that the force of contraction is oriented toward the long axis of the muscle. Questions for future research include the following: How are the lengths of the thick and thin filaments so consistent within and between sarcomeres of a muscle? Do the sizes and numbers of filaments within a sarcomere vary between and within species? How are the thick and thin filaments spaced so evenly and how is that distance between them optimal for their function? Answers to such questions can lead to new knowledge about muscles and their function and also support intelligent design as a valid approach to science.

O8.10

10:45 THRESHOLD FOR DISBELIEF: HOW A WORD GAME HIGHLIGHTS DISCREPANCIES IN ACCEPTED PRACTICAL PROBABILITIES

John Neiswinger

Belhaven University, Jackson, MS

Advances in empirical science over the last several hundred years have substantially increased our understanding of what is necessary for life to be maintained, but where did the first "living thing" come from? The cause of the origin of the first self-replicating cell has puzzled scientists for generations. In an attempt to find the truth of the matter regarding past events, humans intuitively reason to the best explanation amongst a series of probable causes, using our experiences with cause-and-effect relationships derived in the present to find the singular cause that is most adequate for the job in question. If an explanation is deemed too improbable, it is eliminated as a potential cause…or is it? There appears to be a disconnect between the evidence (and the improbabilities associated with it) and what many scientists believe regarding the origin of life. This is not an empirical science question, but a historical science question, involving multiple competing hypotheses that attempt to explain what happened in the distant past. Numerous theories have been proposed as to how unguided chemistry and physics could have performed such a feat, including electric sparks in a reducing atmosphere, organic syntheses in both deep-sea thermal vents or icebergs, or that life was simply seeded from space (though, this merely pushes back life's origin to a different planet). While much work has been done in the laboratory by scientists like Stanley Miller and Jack Szostak to simulate how biological building blocks could have emerged prebiotically, what often is overlooked from their work are the considerable hurdles that would need to be overcome in order to create a replicating system from these building blocks should they have formed: amino acid chirality, metabolome co-localization, bond-forming specificity, side-reaction occlusion, amongst others. Also eliminated from contention is any theory involving a higher power or intelligent deity as a causal agent, even though we know intelligent agents can actualize many things resembling life (robotics, circuits, feedback systems, etc). This, however, is not too surprising, as a poll surveying over 2,000 scientists from the American Association for the Advancement of Science (AAAS) has shown that only about one-third of these scientists believe in God or a higher power compared to eighty-three percent of the general public. Consequently, the question arises as to why there is such a vast difference in belief between these two groups, especially when it pertains to the origin of life. Using the popular word game Wordle, we will examine the belief/disbelief threshold that humans intrinsically have and ask how we use this to make rational inferences regarding historical science questions. In the search for the truth of our origins, which of the competing theories is the most likely to be true given the evidence? How much are we willing to suspend disbelief in adherence to our philosophical worldview?

11:15 BREAK

O8.11

11:30 THE PRE-HISTORY (AND FUTURE) OF VIRTUAL REALITY

J. Adam Jones

Hi5 Lab, Computer Science & Eng, Mississippi State University, Mississippi State, MS

As is often the case, seemingly over-night revolutions are a long time in the making. The recent technological advances in Virtual Reality (VR) are no exception. Though the technologies that enable current VR systems are remarkable feats of modern engineering, they all have their roots in discoveries from at least half a century prior. In this presentation, we will be discussing the pre-history and future of VR. This presentation will loosely address four topic areas. We will begin by discussing early stereoscopic 3D displays and other means of visual immersion. We then move on to advances in simulation, modeling, and display technology enabled by early digital computers. This will lead us to the first wave of what we now refer to as VR in the 1980s and 1990s. Finally, we will conclude our talk with a discussion of the current state of VR, its limitations, and potential future directions.

12:00 Divisional Business Meeting

Friday, February 24, 2023

AFTERNOON

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

Marine and Atmospheric Sciences

Co-Chair: Courtney Roper

University of Mississippi

Co-Chair: Duanjun Lu

Jackson State University

Vice-Chair: Remata Reddy

Jackson State University

Vice-Chair: Francis Tuluri

Jackson State University

Thursday, February 23, 2023

MORNING

Room L7

8:20 Welcome

O9.01

8:30 ASSOCIATION OF REGIONAL ENVIRONMENTAL AND AIR QUALITY ON HEALTH IMPACTS

Francis Tuluri, Remata Reddy, Nathaniel Smith

Jackson State University, Jackson, MS

The mechanism of interplay between weather and air quality is complex, and similarly their impact on health. The present study aims at the study of weather and air quality at a regional level in order to find trends that would be detrimental to health caused by a pandemic such as COVID 19. The study considers 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 region of study is Mississippi, USA. 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.

O9.02

8:50 EXTRACTION SOLVENT SELECTION IMPACTS CHEMICAL AND TOXICOLOGICAL INTERPRETATIONS OF FINE PARTICULATE MATTER

Amelia Craze[1], Christopher Bartle[2], Courtney Roper[1]

[1]Department of BioMolecular Sciences, University of Mississippi, University, MS, [2]University of Mississippi, University, MS

Ambient air pollution was estimated to cause 4.2 million premature deaths in 2016. Fine particulate matter ($PM_{2.5}$) is a complex mixture of air pollution 2.5 microns or smaller in aerodynamic diameter that has been hypothesized to cause detrimental health effects via oxidative stress. Components of $PM_{2.5}$ vary based on sources or season, but commonly include black carbon, elements such as transition metals, and chemicals generated from combustion of fuels such as polycyclic aromatic hydrocarbons (PAHs). To better

understand the risks of exposure to this complex mixture, $PM_{2.5}$ is collected onto filters and concentrations are determined by state and federal agencies. Assessing the toxicity and chemical composition of these samples commonly requires particles to be removed from filters. However, there is not a standardized method for filter extraction, which creates the potential for methods biases and thus variable chemical and toxicity responses. The objective of this study was to extract evenly split $PM_{2.5}$ filters in different solvents to determine if the extraction method used impacts the chemical composition and oxidative potential of $PM_{2.5}$. This study utilized previously collected filters from the Arkansas Department of Environmental Quality at four locations during the same 24-hour collection period for days across multiple seasons (n=20). Black carbon (BC) data was collected before filters were quartered prior to sonication in: 1) MeOH 2) DCM, 3) DI water or 4) 0.9% saline. Oxidative potential for each filter quadrant extract was determined using the dithiothreitol (DTT) assay. Chemical analysis was performed using ICP-MS to characterize elements present (n=16) and GC-MS to identify parent PAHs (n=14). DCM extracted fractions had significantly lower DTT consumption versus all other extraction solvents. Variation existed when comparing correlations between $PM_{2.5}$, BC, DTT, and elemental analysis results based on extraction solvent. For example, DTT consumption was correlated with three elements (U, V, and Ga) for MeOH extracted samples, but Saline extracted samples had ten elemental correlations with DTT consumption (Cd, Ba, Co, Th, U, Cr, Mn, Cu, Ni, and Ga). We concluded that extraction solvent had an impact on our subsequent analysis, thus identifying a methods bias in $PM_{2.5}$ research based on extraction methods. Future directions for this study include method standardization for extraction of $PM_{2.5}$, and how samples from different regions, sources, or meteorological conditions impact these findings.

O9.03

9:10 ROLE OF RAGE SIGNALING ON CARDIORESPIRATORY RESPONSE TO RESPIRABLE GUNSHOT RESIDUE *in vivo*

Samuel C. Smith, Emmanuel R. Hodges, James A. Stewart Jr., Courtney Roper

Department of BioMolecular Sciences, University of Mississippi, University, MS

Gunshot residue (GSR) is comprised of organic and inorganic compounds released after shooting a firearm and includes components with known environmental and human health effects such as Pb, Ba, and black carbon (BC). The particle size of GSR is a key factor in health effects since particles less than 2.5 microns in aerodynamic diameter, $PM_{2.5}$, can penetrate the respiratory tract and potentially enter the bloodstream. Currently, there is very limited research investigating the effects of GSR particle size and composition on cardiopulmonary health however the high concentrations of toxic compounds in GSR and epidemiology studies indicate the need for further research. One potential mechanism of action involved in GSR-related responses is the advanced glycation end products (AGEs) and their receptor (RAGE) signaling cascade which plays a role in inflammation and oxidative stress. This study collected $PM_{2.5}$ during a University of Mississippi law enforcement firearms qualification. The GSR samples were used to determine the chemical composition of characteristic GSR and the in vivo effects of exposure with a focus on RAGE-mediated in responses. Following collection, samples were pooled together, concentrated, and resuspended in saline for *in vivo* exposures or DI water for chemical analysis. $PM_{2.5}$ samples and controls (vehicle, blank filter) were used to conduct *in vivo* exposures in male wild-type (C57BL/6) and RAGE knockout (RKO) mice at 0 or 100 µg/mouse -(n=7-8/group). Pre- and 24 hr-post exposure physiological parameters were measured using echocardiography to determine cardiac function in the left and right ventricle. Tissues (heart and lung) were collected for histological and proteome analysis. In our preliminary findings we measured GSR characteristic elements (i.e. lead, barium) in the collected $PM_{2.5}$ samples and calculated elemental and BC concentrations in the air and in the 100 µg/mouse GSR dose. Following exposures in the wild-type mice, we observed a trend of reduced ejection fraction and observed over 1-fold differences in inflammatory markers in lung (i.e. CXCL1) and heart (i.e. CXCL1, BCA-1, IL-13) between GSR treatment and controls. Histological analysis is underway with staining for markers of cellularity and inflammation. These findings will help establish the cardiopulmonary effects of exposure to respirable GSR and determine if RAGE plays a role in the effects.

O9.04

9:30 EXAMINING DIFFERENTIAL BEHAVIORAL RESPONSES AND GENE EXPRESSION OF TWO ZEBRAFISH STRAINS EXPOSED TO PM2.5

Shayla Victoria, Connor Necaise, Courtney Roper

University of Mississippi, University, MS

Fine particulate matter ($PM_{2.5}$) is the solid and liquid portion of air pollution that is 2.5 µM or less in aerodynamic diameter. $PM_{2.5}$ exposure has been associated with various human health conditions, especially those affecting the cardiorespiratory system. Even though $PM_{2.5}$ contains particles small enough to enter the blood stream, little research has been conducted to determine the effects of $PM_{2.5}$ on other organ systems, such as the reproductive system. Therefore, we aimed to identify the effects of $PM_{2.5}$ exposure on the expression of genes related to reproductive function and oxidative stress in two zebrafish strains. Zebrafish embryos (6 hpf) from two wild-type strains (AB and 5D) were exposed to 12.5, 25, 50, 100, and 200 µg/mL whole particle and soluble fractions of $PM_{2.5}$ standard reference material (n=33/group). Health, morphology, and a behavioral endpoint (larval photomotor response) were measured and we observed differences in behavioral response to $PM_{2.5}$ exposure between concentrations and between zebrafish strains. RT-qPCR will be conducted to compare responses of the two strains to $PM_{2.5}$ exposure on the expression of genes involved in the oxidative stress response, including superoxide dismutase and catalase, and in markers of reproductive function, including vitellogenin, estrogen receptors, and thyroid hormone receptor. Overall, this study is exploring differences in morphological, behavioral, and molecular responses based on the concentration of exposure and zebrafish strain. This information will aid in comparing

studies between research groups in the expanding field of utilizing zebrafish to study the effects of particulate matter exposures.

O9.05

9:50 LOCAL AND LONG-RANGE TRANSPORT SOURCES OF BLACK CARBON IN SEVERAL CITIES IN MISSISSIPPI, USA

Hang Nguyen, Courtney Roper

University of Mississippi, University, MS

Mississippi is located in the United States' Deep South, bordered on the west by the Mississippi River, and on the south by the Gulf of Mexico. The state has numerous natural gas, crude oil, and refined product pipelines that connect to ports on the Gulf of Mexico and the Mississippi River. As a result, Mississippi is an excellent location to research the factors affecting the environmental behavior of pollutants. Fine particulate matter filter samples were collected every third day at three sampling locations for 15 months (Sept 2013 – Dec 2014). Sampling locations included Grenada, Jackson, and Pascagoula, MS. Each filter sample represented a 24-hour collection and following collection black carbon (BC) concentrations were measured using a Sootscan at 880 nm. The results showed that the highest average BC concentrations for the study period were observed in Jackson, followed by Pascagoula and Grenada. Assessments of the effects of local sources on BC distribution confirmed that the increase in BC pollution was caused by a combination of local sources near the sampling sites (e.g., vehicular emissions, residential areas) at low wind speeds. Back-trajectories analysis revealed that long-range transport influenced BC concentration with the accumulation of the pollutant enhanced by short trajectories connected to air masses coming from continental areas. In contrast, the low BC concentrations in fast-moving air masses originated in both the ocean and continental areas with lower emission levels. Findings in the study suggest that the variation of source processes affected the distribution of atmospheric BC in these study sites.

O9.06

10:10 TROPICAL CYCLONES/HURRICANES: UNDERSTANDING, PREDICTION, AIR-SEA INTERACTIONS, HIGH WINDS, HEAVY PRECIPITATION, HIGH IMPACT, AND RESILIENCE, USING SATELLITE, BUOY AND RADAR DATA

Remata Reddy[1], Kayla Hudson[1], Jordon Ambrose[1], Francis Tuluri[1], Brian Blanton[2]

[1]Jackson State University, Jackson, MS, [2]University of North Carolina, Raleigh, NC

Under the U.S. Department of Homeland Security (DHS) Summer Research Team (SRT) 2022 Program for Minority Serving Institutions, the study investigates air-sea interactions, heat fluxes, high winds, precipitation variability, high impacts and resilience associated with hurricane Harvey over the Gulf of Mexico using Satellite and RADAR data. The study uses bulk and empirical models for better understanding and prediction of air-sea interactions associated with Hurricane Harvey. Hurricane Harvey was a category four storm that made landfall in Texas near the Gulf of Mexico on August 25, 2017. It created 180 billion dollars' worth of property damage and caused a total of eighty-two fatalities. We developed an empirical model to calculate the large-scale heat fluxes using pressure gradient force and air-sea interface associated with hurricane Harvey and bulk model used to calculate vertical heat fluxes, Momentum and Moisture fluxes. We used RADAR, satellite data and NOAA NDBC, and NWS upper air observations.to collect wind speed, air pressure, air temperature and ocean temperature and precipitation. We collected data from RADAR, NOAA NDBC, and NWS Hurricane Harvey was its strongest pointon 26 August 2017 with the low pressure, 938 mb with a wind speed 150 miles/hour. There is an inverse relationship between pressure and large-scale heat fluxes and 2–5-day oscillation in vertical heat fluxes. The air-sea interface was highest 6.2^0C, large atmosphere cooling with lager precipitation variability. The results show that Harvey's maximum large-scale heat fluxes were 7960 J/s/m^2 and Heat Fluxes were in good argument with sea level pressure associated with Hurricane Harvey. In the future, we could use satellite data and our empirical model to determine the severity, hurricane resilience and track of land falling Atlantic Hurricanes and will form an early warning system to predict land falling hurricane associated with severe weather.

O9.07

10:30 STATISTICAL ANALYSIS OF ENTERIC DISEASES AND WATER QUALITY PARAMETERS IN THE STATE OF MISSISSIPPI

Remata Reddy, Mehri Fadavi

Jackson State University, Jackson, MS

According to the recent WHO report an estimated 1.9 million rely on water supplies. The quality of the drinking water which is characterized by the water quality parameters like BOD, DO, E.coli, TDS, TSS determine the cause of Enteric diseases in the State of Mississippi. Enteric diseases prevalent in the State for the period 2004-2014 is retrieved from the MS Department of Health data reports. The data is collected from NWIS (National Water Information System and STORET (the EPA STOrage and RETrieval Data Ware House. Analysis covers seasonal variations, (summer/winter) covering River basins of the relevant counties in the Health district V. They are statistically recorded and analyzed using SAS 9.4 and disease outBREAKs for various years, various health districts, and the correlation between the water quality parameters and the related enteric diseases for the various counties in the Health district 5, for different years and for summer and winter, seasons are studied. There is a significant difference among the health districts 2 and 3, 7 and 3, 6, 4 and 5 and 8 and 5 about the Total Enteric diseases. Among the diseases, Salmonellosis, and Shigellosis showed significant difference over the years and over the health districts. Hepatitis A and Salmonellosis showed a significant variation over the years. The number of outBREAKs of Hepatitis A is the highest in 2004 and that of Salmonellosis in 2011. Total enteric diseases showed the highest number in 2007.Water is one of the most precious natural resources for all living beings on the Earth. Sufficient quantity of quality water is very essential for a healthy living. According to the recent WHO report (February 2016), an estimated 1.9 million people rely on water supplies

that are contaminated with feces. Sustainable Environment for the future generation" is a vital ecological goal to be achieved on a macro scale across the globe. The quality of the drinking water which is characterized by the water quality parameters like BOD, DO, E.coli, TDS, TSS determine the cause of Enteric diseases. The focus is on the surface water in the State of Mississippi. Enteric diseases prevalent in the State for the period 2004-2014 is retrieved from the MS Department of Health data reports. The data is collected from NWIS (National Water Information System and STORET (the EPA STOrage and RETrieval Data Ware house. Analysis covers seasonal variations, (summer/winter) covering River basins of the relevant counties in the Health district V. They are statistically recorded and analyzed using SAS 9.4 and disease outBREAKs for various years, various health districts, and the correlation between the water quality parameters and the related enteric diseases for the various counties in the Health district 5, for different years and for summer and winter, seasons are studied. There is a significant difference among the health districts 2 and 3, 7 and 3, 6, 4 and 5 and 8 and 5 about the Total Enteric diseases. Among the diseases, Salmonellosis, and Shigellosis showed significant difference over the years and over the health districts.

O9.08

10:50 INVESTIGATING PLANETARY BOUNDARY LAYER PROFILE USING DRONE DATA

Duanjun Lu, Makezie Firth, Kendall Parks, Jayla Iglehart

Jackson State University, Jackson, MS

The forecast errors result from many factors including an inappropriate description of planetary boundary layer (PBL) processes. Conventional data collection means, e.g, weather balloons, collecting weather observations that have a gap for meteorologists. Drone observations, on the other hand, allow us to obtain data and measurements in the lower PBL that can fill this gap. In this work, we performed a few field campaigns where a drone with meteorology sensors was launched to observe the atmospheric profile for some parameters including temperature, wind, humidity, and pressure at the lower atmospheric levels. The comparison study was conducted to investigate the difference of lower atmospheric profile between drone data and weather balloon. The study also investigates spatial variation over land and water collected by using drone observations.

11:10 GRADUATE SCHOOL STUDENT PANEL

11:30 GRADUATE SCHOOL STUDENT PANEL AND LEADERSHIP MEETING

11:50 DIVISIONAL BUSINESS MEETING

12:00 General Session

Thursday, February 23, 2023

EVENING

3:30 DODGEN LECTURE and AWARDS CEREMONY

Hall B

5:00 GENERAL POSTER SESSION

Hall C (immediately following Dodgen Event)

P9.01

THE ASSESSMENT OF CLIMATE CHANGE RISKS IN MARYLAND'S SOUTHERN REGION

Yaw A. Twumasi[1], Duro Olagbegi[2], Samson Emeakpor[3], Jude Offiah [2], Alsarari Mohammed [2], Marshand Crisler[2], Emmanuel Nwagboso[4], Edmund Merem[2]

[1]Departments of Urban Forestry and Natural Resources Southern University, Baton Rouge, LA, [2]Department of Urban and Regional Planning, Jackson State University, Jackson, MS, [3] Department of Environmental Science and Biology, Jackson State University, Jackson, MS, [4] Department of Political Science, Jackson State University, Jackson, MS

The state of Maryland for all intents and purposes stands out as a pacesetter in different aspects of environmental planning more than other states. Known for having the first established planning commission in the United States decades ago before its neighbors and a longstanding tradition in orderly planning. One would think such illustrious trajectory, that Maryland enjoys, guarantees immunity from common exposures to climate change dangers on the basis of experience. However, that is not really the case in the Mid Atlantic zone. The same state that boasts of some of the most successful farming operations and flourishing economy heavily reliant on a stable ecosystem, now finds itself at the receiving end of climatic uncertainty along the coast. Accordingly, the lower side of Maryland has seen full share of climate change induced threats like ice storms, flooding and elevated temperature. With all these resulting in widespread damages to society, economy, and the surrounding ecosystem, amidst the vulnerability of many sectors. The situation in the coastal environments is compounded by sea level rise, potential displacements, degradation, destruction of assets and anticipated inundation of low-lying settlements in the coming years. Notwithstanding the gravity of these issues, very little has been done to capture the risks sufficiently in the literature. Consequently, this enquiry will fill that void notably by analyzing the changing climate risks in southern Maryland using mix-scale methods of GIS and descriptive statistics. Emphasis is on the trends, issues, factors, impacts and efforts towards a containment of the hazards. Accordingly, preliminary results of the trends show widespread risks exposure through periodic damages to the ecosystem, along with fiscal losses in some sectors of the economy. With all these attributed to ecological, socio-economic, policy and climatic uncertainty. The paper proffered solutions ranging from education, strengthening of policies, the design of regional climate information system and the recourse to coastal zone planning.

P9.02

DRONE AND WEATHER COMPARISONS

Jayla Iglehart[1], Latrice Maxie[2], Duanjun Lu[1]

[1]Jackson State University, Jackson, MS, [2]WFO/NOAA, Jackson, MS

NWS connects a radiosonde with the weather conditions before we discharge it into the air. The weather conditions have been around since 1896 and they have been powerful yet can drones supplant weather conditions inflatables. Uniquely fabricated robots can likewise gather similar information as weather conditions swell. Weather drones are uncommonly evolved drones that are utilized in climate information assortment. They fly in the least layer of the world's environment, the purported limit layer. Furnished with extraordinary sensors, they can gather data about temperature, dampness and wind in the climate. In this work we compared the data from the drone and the weather balloon. We fly the drone over the surface level and then fly over the lake. We do this to compare the land data and the water data to see if anything changed. Using our results to see if the drone may be more accurate at the lower levels than the weather balloon. The balloon can last up to 2 hours whereas the drone can last up to 27 minutes.

P9.03

A MICROCLIMATIC STUDY OF JACKSON STATE UNIVERSITY AND THE SURROUNDING JACKSON AREA

Cameron Bennett, Loren White

Jackson State University, Jackson, MS

A microclimate is a focused area of climatic conditions that affect temperature, solar radiation, air pressure, wind speed and ground temperature. We will investigate the microclimate of Jackson State University (JSU) and the surrounding metropolitan area of Jackson, Mississippi. Jackson State University is located in an urban area, surrounded by concrete and asphalt with its own unique climate. The campus is located in west Jackson, a moderately sized city filled with buildings and very little green space. The campus is a climate within a climate, where tightly packed buildings, plenty of summer sunshine and limited airflow contribute to the heat island effect seen in most cities. This study will help identify the characteristics of the microclimate of the Jackson State University campus and also show how the urban heat effects during the summer affect the campus population. The study will look at the potential effects of heat stress on the campus population. Using a uniquely built weather backpack, observations will be collected around the JSU campus that include solar radiation, temperature, air pressure and dew point. The observations will be compared with synoptic ASOS data from the National Weather Service(NWS) for three observing stations within the Jackson metropolitan area: Hawkins Field (KHKS), Jackson-Evers Airport (KJAN) and Raymond Airport (KJVW). We walked around JSU campus for data collection on three dates: July 1, 6, and 8 of 2022. Archived ASOS data was accessed from the University of Iowa's website. The National Weather Service website was used to collect data for comparison to data collected by the backpack.

P9.04

A COMPARATIVE STUDY OF DRONE SENSORS GATHERING METEOROLOGICAL DATA OVER LAND VERSUS OVER WATER

Makenzie Frith, Duanjun Lu

Jackson State University, Jackson, MS

This summer, my peers and I researched a comparative study of drone sensors gathering meteorological data over land versus over water at the Lakeshore Recreational area near the Mississippi Reservoir. We did this to see if the drone data can be applied to improve future meteorological research and forecast. My research aims to investigate if a drone can be used to get meteorological data observations, if we can use it to improve our understanding of PBL (Planetary Boundary Layer) compared to weather balloon, and if the data found from the drone is accurate.

P9.05

SEVERE WEATHER AND CLIMATE IMPACTS IN THE SOUTHEAST REGION OF THE UNITED STATES

Makenna Collins[1], Remata Reddy[1], Latrice Maxie[2], Ashlyn Jackson[2]

[1]Jackson State University, Jackson, MS, [2]National Weather Service, Jackson, MS

Global warming is the subtle increase in Earth's overall atmospheric temperature. This long-term heating of the atmosphere is caused by the emission of greenhouse gases due to human activity like the burning of fossil fuels. Global warming has been a problem that scientists have kept their eye on since the 1800s during the industrial revolution. Climate variability is the differences in temperature and precipitation that define climate change. These temperature and precipitation differences are ones that are not normal and worth recording for overall climate change data. States that border the Gulf of Mexico like Alabama and Mississippi have been susceptible to higher climate change and variabilities over the years. Temperatures in Mississippi have not seen an overall increase in the last 50- 100 years, but other climate factors have proved climate change to be a prominent factor in the Gulf Coast region. Sea levels are rising, soil is becoming drier, and rainfall has increased. A similar change in climate is seen in Alabama. In Birmingham, according to the National Weather Service, there was 70.4 inches of rain recorded in 2021 with an average rainfall of 56.6 inches per year. That is almost fourteen inches above the average rainfall. These climate changes are all due to human activity which leads to global warming and severe weather impacts. In Georgia too, temperatures are increasing allowing more frequent rainy days and an increase in severe weather events. Temperature, precipitation, and severe weather (tornado) data was collected and used to draw conclusions about severe weather and climate impacts in the southeast region of the United States. El Nino Southern Oscillation (ENSO) patterns were also studied to draw further conclusions about our changing climate. This data was entered into R-studio to be coded and produce visual graphs of changes in temperature, precipitation, and severe weather. In the end impacts were seen in all three focus areas: Mississippi, Alabama, and

Georgia. Of the three states, Georgia has the least gulf influence, so it saw the least amount of change. However, with the continued burning of fossil fuels, and other high carbon emission activities, the gulf influence will not be a big determining factor in these climate impacts. Human activity will induce severe weather and global temperature increases.

P9.06

A STUDY OF TWO LONG TRACK TORNADOES AND THE ENVIRONMENTAL CONDITIONS THAT LED THEM ON A SIMILAR PATH THROUGH SOUTHEAST MISSISSIPPI

Jerry Brown[1], Latrice Maxie[2]

[1]Jackson State University, Jackson, MS, [2]National Weather Service, Jackson, MS

One widespread fallacy about tornadoes is that many people don't think the same place can be hit twice. However, in places like tornado alley they often take similar paths. The southeast states are also prone to tornadoes, especially Mississippi and Alabama. For many years, portions of central Mississippi had more tornadoes per capita than any other place in the country. Between 2019 and 2021, 350 tornadoes were reported in Mississippi and an additional 103 tornadoes were reported during the first half of 2022. Shear, lift, instability, and moisture are the four primary elements that need to be present for a thunderstorm to produce a tornado. The warm and moist climate of the Mississippi make it favorable for tornado development any time of the year. On February 5, 2020, an EF1 tornado devastated portions of Jasper, Clarke and Lauderdale counties and on April 13, 2022, an EF2 tornado took a similar path. This study will shed light on the reasons why these storms had similar destructive paths.

P9.07

A STUDY OF FLOOD CONTROL IMPROVEMENTS IN HUSTON AND ON-GOING VULNERABILITY TO EXTREAME HEAVY RAIN AND INLAND FLODDING FROM TROPICAL SYSTEMS

Nicholas Price[1], Latrice Maxie[2]

[1]Jackson State University, Jackson, [2]National Weather Service, Jackson, MS

This project describes the extremes of widespread heavy rain and massive flooding in the Houston area over the past 20 years related to tropical storms, focusing on Tropical storm Allison (2001), Hurricane Harvey (2017) and Tropical Storm Imelda (2019). The infrastructure and topography of Houston play a huge role in how rainwater moves through the city and the magnitude of damage with each respective storm. Houston has a generally flat urban landscape with an average height of 87 ft above sea level. Deforestation, impervious surfaces, and slow-moving waterways make the city prone to flooding. Each tropical storm event has led to some improvements including updates to drainage systems, the installation of retention and detention ponds and proposed improvements like tunnels and additional dams. The goal of this project is to identify ongoing vulnerabilities to tropical flooding for Houston and assess future proposed improvements.

P9.08

FORMATION, INTENSIFICATION, HEAT FLUXES, HEAVY PRECIPITATION, HIGH WINDS AND RESILIENCE ASSOCIATED WITH HURRICANE HARVEY

Kayla Hudson[1], Jordan Ambrose[1], Remata Reddy[1], Brian Blanton[2]

[1]Jackson State University, Jackson, MS, [2]University of North Carolina (UNC), NC

Under the U.S. Department of Homeland Security (DHS) Summer Research Team (SRT) 2022 Program for Minority Serving Institutions, Communities across the country are increasingly vulnerable to natural disasters and long-term change to the atmosphere and ocean. Our ability to withstand and recover is called resilience. The true test of resilience is how well we can bounce back. Resilience is societal, economic, and ecological. Understanding risk and preparing today can help protect the things we care about. Communities can mitigate flooding through natural shorelines, and we can work to understand how chemical and biological changes to our ocean impact marine life and habitat. We cannot overrule Mother Nature, but there are actions that we can take together to build resilient communities and support a healthy ocean, sustainable fisheries, and thriving communities and economies. NOAA provides businesses, resource managers, decision makers, community planners, and individuals the tools and environmental intelligence to build resilience, adapt, and thrive. Understanding the genesis, evolution and intensity/track of tropical cyclones limited by a shortage of observations and knowledge of key processes (atmospheric, oceanic, and air-sea interactions). Hurricane Harvey is known as the second most costly hurricane to hit the U.S. since 1990. The devastating natural disaster occurred in was a devastating tropical cyclone ripped apart Texas as well as Louisiana, however this paper focuses on the Texas area. Harvey occurred August 17, 2017, through September 2, 2017, starting off as a tropical wave. That one small weather disturbance turned into rain bands that led to storm surge as well as a deadly category four Hurricane. The hurricane set many records including being the largest rain event in U.S. history. The research aims to seek clarification about heat fluctuations, provide facts to assist in public communication as it relates to hurricane resilience. The analysis of RADAR, satellite data and NOAA NDBC buoy data, to collect wind speed, air pressure, air temperature and ocean temperature and precipitation and storm surge to see the impact it has on the intensification of hurricane itself. My research and analysis aids in showing why the storm was continuous and how the simple understanding of the formation of a hurricane can aid in displaying how Hurricane Harvey was put in the exact conditions to wreck extreme havoc on Southeast Texas.

P9.09

ANALYSIS OF HURRICANE PATTERNS IN A CHANGING CLIMATE

Kendall Parks, Duanjun Lu

Jackson State University, Jackson, MS

This study analyzes and compares hurricane data from The

National Hurricane Prediction Center(NHPC) to that of past climatology to determine if hurricane patterns have been influenced by climate change as well as the possibility that air pollution affects the frequency and intensity of hurricane formation. Data will be used from the past 20 years of hurricanes. ArcGis Pro will be used to visualize the data and make conclusions. This study will focus on those hurricanes that form in the Atlantic ocean and gulf of Mexico due to the proximity to population centers and recent hurricane impacts.

P9.10

HURRICANE HARVEY: UNDERSTANDING RAPID INTENSIFICANE, MOMENTUM FLUX, VERTIVAL FLUX AND SEA LEVEL PRESSURE

Kayla Hudson[1], Remata Reddy[2], Brian Blanton[3], Jordan Ambrose[2]

[1]Jackson State University, Jackson, MS, [2]Jackson State University, MS, [3]University of North Carolina, NC

Under the U.S. Department of Homeland Security (DHS) Summer Research Team (SRT) 2022 Program for Minority Serving Institutions, the study investigates Understanding Rapid Intensification, Momentum Flux, Vertical Flux and Sea level pressure associated hurricane Harvey. Hurricane Harvey was a deadly Category 4 Hurricane that caused up to $125 Billion Dollars of damage across portions of Texas and Louisiana. Harvey started off as a small tropical storm on August 17, 2017. Although Harvey did not intensify much from August 17-August 23rd, once it entered the Gulf of Mexico, it rapidly intensified from a 40MPH tropical storm to a 130 MPH Category 4 Hurricane in a matter of two days. Lack of steering currents and Rapid Intensification led to Harvey becoming the biggest rain maker by any storm system in United States History. The research targets the upper atmospheric data from the days prior, and during Harvey's time in the Texas and Louisiana area. My goal is to see if there was any correlation between the upper atmospheric values the days prior to and after landfall to indicate that a rapidly intensifying hurricane was headed to the Texas coast. This will help save more lives, and help citizens be more prepared to deal with hurricanes because this data can be used to help better forecast events like this in the future.

P9.11

COMPARISON OF BLACK CARBON BETWEEN ON-CAMPUS FILTERS AND RURAL FILTERS

Courtney Roper, Lauren Whitmore, Amelia Craze

University of Mississippi, University, MS

Comparison of Black Carbon Between On-Campus Filters and Rural Filters Lauren Whitmore, Amelia Craze, Courtney Roper Global air pollution is a documented health threat that has the life expectancy in the most heavily polluted countries by 5.9 years. Fine particulate matter (PM2.5), is a complex mixture of air pollution composed of microscopic airborne particles or droplets with a width of two and a half millimeters or less. These small particles or droplets can penetrate deeply into an organism's lungs and the smallest fraction can diffuse into the bloodstream, leading to respiratory and cardiovascular disease, cancer, and even birth defects. The particles can also collect poisonous compounds that enter the body directly and have an indirect impact on both humans and animals through the food chain. Black carbon (BC), a component of fine particulate matter. is linked to health issues and has been shown to have an impact on climate change. As a result of the incomplete combustion of fossil fuels, biofuels, and biomass, BC is created both naturally and through human activity. The main contributors include wood burning, cook stove emissions, diesel engine pollution, and forest fires. In addition to its negative effects on human health, BC also reduces visibility, damages ecosystems, lowers agricultural production, and hastens global warming. When BC is suspended in the atmosphere, it contributes to warming by converting incoming solar radiation to heat due to its ability to absorb heat. BC aerosols can alter the pace of atmospheric heating and affect precipitation by absorbing solar radiation. The clouds, relative humidity, and precipitation quickly change as a result of the increased heat. To better understand BC levels and how they impact our communities, my research is to analyze the BC concentrations in Oxford, Mississippi. The aim of this project is to perform BC analysis on PM2.5 filters collected weekly on campus at the University of Mississippi (Anderson Hall) and at the University of Mississippi Field Station during Summer and Fall of 2022. Analysis will be conducted using a SootScan Optical Transmissometer, which is an absorbance technique comparing a collected filter to a blank filter. After BC analysis, I will organize the collected weather data for each week, including the weather and humidity rates, to incorporate meteorological events. Subsequently, I will perform statistical analysis on the collected data to compare the two locations. We hypothesize that the on-campus location, Anderson Hall, will have higher BC concentrations than the Field Station due to elevated traffic and ongoing construction. The goal of this project is to visualize the collected data to identify trends and comparisons to better understand BC concentrations in Oxford, Mississippi.

P9.12

ANALYSIS OF FINE PARTICULATE MATTER (PM2.5) COLLECTED FROM GRADE SCHOOL COMMUNITIES IN GEORGIA

Imani Buford, Amelia Craze, Courtney Roper

University of Mississippi, University, MS

Air pollution can cause asthma, pneumonia, cancer, and obesity in children. Fine particulate matter (PM2.5) is solids or liquids that form into tiny droplets 2.5 microns or smaller in the atmosphere. These droplets are formed from cars, factories, and farming. Black carbon (BC), one part of PM2.5, is produced by incomplete combustion of fossil fuels. It is a solid of carbon that absorbs light at all wavelengths. There have been previous studies supporting that black carbon can be harmful to the human body and the environment. Because it absorbs light, black carbon supplies extra heat to the environment.Black carbon can also be harmful to the cardiovascular and respiratory system for adults. But, small children are at a much higher risk of developing health problems because their bodies are still developing. The lungs continue to develop for years after a child is born, making children more susceptible to respiratory complications. Additionally, children typically spend more time outside than adults, which can increase their exposure. . To better

understand these health impacts, I will be analyzing the black carbon concentrations at two elementary schools in two different cities of Georgia with contrasting populations throughout various seasons. There are several risk factors that contribute to increased exposure of children in these locations, including: recess times, population, demographics, and the number of cars and buses during drop-off/pickup times. To complete this research, I will analyze previously collected PM2.5 filters donated by the Georgia Department of Environmental Quality using a Sootscan Optical Transmissometer. This project will include filters from Rome, GA and Columbus, GA from January 2015 to September 2015. The filters compared were collected 3-4 days per week. Filters will be measured by blank comparison, and then analyzed using statistical analysis. We hypothesize that we will measure black carbon to be more elevated at locations that are more populated. The purpose of this project is to measure BC concentrations at grade school sites at two different locations to understand how population, demographics, or location can influence BC concentrations collected at the same time.

P9.13

GENERATION OF DNA BARCODE DATA FOR *Callichirus islagrande*, A BEACH GHOST SHRIMP, AND GENERATION OF BLOCKER PRIMERS FOR FECAL DNA METABARCODING

Brent Thoma[1], *Kambrial Love*[1]

[1]*Jackson State University, Jackson, MS*

Callichirus islagrande, the beach ghost shrimp, is a burrowing shrimp endemic to the northern Gulf of Mexico where it is among the most abundant macroorganisms in shallow sand beach habitats. *Callichirus islagrande* is a common prey item of stingray, Florida pompano, Gulf whiting, and Gulf sturgeon. Although *C. islagrande* are known filter feeders and eject large amounts of fecal pellets from their burrows, which likely alter the nutrient and trophic dynamics of the nearshore environment, it is unclear if they are generalist, feeding on everything suspended in the water column or if they selectively target certain food items. In this study, we aim to analyze the diet of *C. islagrande* using fecal DNA metabarcoding. Before beginning metabarcoding analysis, we amplified and sequenced 3 loci (COI, 16S, and 18S) from *C. islagrande* and generated blocker primers to prevent amplification of *C. islagrande* DNA while conducting metabarcoding of fecal DNA and eDNA samples. DNA metabarcoding of 4 loci (CO1, 16S, 18S, and *rbc*L) will be conducted for both the fecal DNA and environmental DNA (eDNA) samples collected from the surrounding water and we will compare the community composition recovered from these analyses to determine how the community recovered from fecal DNA analyses compares to that recovered from the eDNA analyses. Here we present the results of these efforts and provide additional insights into the diet and feeding ecology of *C. islagrande*.

P9.14

AGAINST THE CLOCK: UNCOVERING DIURNAL TIME INTERVAL DECISION DIFFERENCES DURING TORNADO WARNINGS FOR LOWER MISSISSIPPI VALLEY RESIDENTS

Stephen Wooten, Kathleen Sherman-Morris

Mississippi State University, Mississippi State, MS

With the improvement in tornado warning lead times, I sought to determine the time, in minutes, it took to reach a decision on shelter-seeking after receiving a hypothetical warning in a daytime and nighttime scenario. Residents of Alabama, Arkansas, Kentucky, Mississippi, and Tennessee (N = 487 for each sample) were surveyed due to their increased exposure to tornadic activity, including a higher number of nocturnal events. I utilized latent class analysis (LCA) to create class memberships, based on both scenarios, to associate with the generated time intervals. Four actors were identified for each scenario: Tech Users, Traditional Actors, Non-Reactors, and Social Actors for the day sample, Tech Users, Traditional Actors, Passive Actors, and Non-Reactors for the night sample. All class assignments except one, Traditional Actors within the night sample, used more time than allotted in an average tornado warning lead time (~15 minutes). Future studies may be necessary to determine a reduction in time needed for decision-making, such as establishing the most impactful warning sources.

P9.15

DAILY AND SEASONAL DIFFERENCES IN BLACK CARBON CONCENTRATIONS IN GEORGIA

Kate Brozovic, Maggie Craze, Courtney Roper

University of Mississippi, Oxford, MS

Air pollution is linked to 7 million premature deaths each year. Fine particulate matter (PM 2.5) is a form of air pollution that is 2.5 microns or smaller in diameter. It is harmful to human health, with research finding associations between PM 2.5 exposure and cardiovascular disease, cancer, and birth defects. PM 2.5 includes many compounds, but one component of interest is black carbon (BC). Gas and diesel engines, coal-fired power plants, and other forms of combustion produce BC. It is important to investigate BC concentrations due to its impact on the environment, with seasonal variation occurring. Studies have also shown human health effects with significant associations between black carbon inhalation and respiratory-related issues, including asthma. The objective of this study is to compare the black carbon concentrations throughout the year at a sampling location in Atlanta, Georgia. PM 2.5 samples were collected for 24 hours on a weekday (Tuesday) and weekend day (Saturday), each week from January 2015 to December 2015 by the Georgia Department of Environmental Quality. Samples will be analyzed for BC concentrations using a SootScan Optical Transmissometer with comparisons to blank filters. Day of week and seasonal comparisons will be made for PM 2.5 and BC concentrations and correlation analysis will be conducted to determine trends between the pollutants. Due to the location where samples were collected and sources present, it is anticipated that all samples will contain black carbon.We hypothesize that samples taken

during dates when people typically commute (Tuesday) will contain higher concentrations of black carbon than those taken on weekends (Saturdays).Overall, the purpose of this study is to compare the black carbon concentrations of different days of the week and determine the concentrations present in an understudied region of the United States.

P9.16

SENTIMENT ANALYSIS OF TWITTER DATA

Khaela Jones, Audria Jackson, HuiRu Shih

Jackson State University, Jackson, MS

The focus of this study is to categorize people's opinions by analyzing their views on Twitter. Analyzing sentiments is a task of natural language processing (NLP). We built machine learning models that can analyze tweets and help determine public opinion about certain topics.

We have applied for and got the Twitter developer account. We have set up a set of credentials that can be used to authenticate with Twitter and gather tweets automatically using the API. We used "Tweepy", which is a Python library for accessing the Twitter API. Python with pandas, Scikit-Learn, NLTK (Natural Language Toolkit), Regular Expression, and other libraries can be used for implementing machine learning.

Sentiment analysis includes several steps. The first step is initialization. The data gathering and data cleaning are performed. Data cleaning involves tasks such as punctuation removal, stop word removal, tokenization, stemming, etc. The second step is feature extraction which is the process of transforming data into numerical features. There are different methods of feature extraction with text data such as CountVectors, Bag-of-Words, and TF-IDF. The third step is training. The data will be split into training and test datasets. The training dataset will be used to develop different models using supervised machine learning techniques. The final step is to apply machine learning algorithms such as Support Vector Machine, Decision Tree, Random Forest, and Naïve Bayes for classification.

Evaluating the machine learning models is the most important task in the sentiment analysis project. The performance of sentiment classifications has been used to evaluate the model's predictions. The comparison of the performance of the models was made based on the classification metrics, such as precision, recall, F1-score, and accuracy to determine how the effects of the analysis can be generalized to a dataset.

This study can provide a starting point for further research. The focus of this study is on the information posted on Twitter. Future studies can be extended to other platforms.

P9.17

DETECTING VOLATILE ORGANIC COMPOUNDS RELEASED FROM PLANTS: LITERATURE REVIEW AND PRELIMINARY DATA COLLECTION

Christopher Bartle, Amelia Craze, Courtney Roper

University of Mississippi, Oxford, MS

A paper published in 2011 by Lit Et al. showed that scent detection dogs are highly susceptible to handler bias. This could be a major contributing factor to the average 600,000 marijuana related arrests each year. A new methodology for drug detection must be developed in order to eliminate the inherent bias behind the current methods of detection. For years, Gas Chromatography-Mass Spectrometry (GC-MS) has been the standard for identifying illicit drugs such as cannabis in a laboratory setting by first separating substances within a sample by way of gas chromatography and then identifying the substances that make up the sample by way of mass spectrometry. GC-MS samples prepared with thermal desorption (TD) are the gold standard for identifying odorous compounds such as those detected by drug detecting dogs. Most detection methods deal with samples physically collected, but our proposed method will be used to detect the presence of cannabis growth in the air. In order to create this method, a combination of air sampling and GC-MS analysis of volatile organic compounds (VOCs) associated with cannabis growth is needed. Preliminary investigation of this research is underway via literature review and pilot data collection. For this experiment, six small growth chambers will be constructed using PVC pipe and a wooden baseboard and sealed using plastic sheeting. Four pots will be placed into each of the chambers: 2 chambers growing cress, 2 growing beans, and two with only soil to act as a negative test control. Air samplers will be placed in each chamber, and air will be collected continuously onto filters for 2 weeks. Following filter collection, samples will undergo solid phase microextraction, analytes will be extracted from the sample filter, and then analyzed using GC-MS to identify VOCs present, and determine if the plants can be differentiated by the VOCs emitted during growth. Further tests confirming a VOC fingerprint for cannabis will be required, as well as tests to test how proximity and total plant mass affect the detected levels of VOCs. Further refinement of this technique could allow for a quantitative method of determining the location of illicit cannabis groves, and could eliminate the handler bias inherent to the use of drug detection dogs. The methodology could also be extended to detect other substances, like other drugs or even explosives.

gradual diffusion of risks on clusters of areas deemed epicenters of disasters along heavily impacted spots over time, due to a set of factors from socio-economic forces to physical variables. To address the risks, the paper proffered solutions in the form of education, enactment of effective policies, the design of regional climate risks info systems and the installation of advanced early warning devices to alert communities at risk while ensuring public safety.

Friday, April 1, 2022

AFTERNOON

12:00-3:00 Mississippi INBRE/ Millsaps Symposia

Mathematics, Computer Sciences and Statistics

Co-Chair: Ping Zhang

Alcorn State University

Co-Chair: Jamil Ibrahim

Independent Scientist

Thursday, February 23, 2023

MORNING

Room D4

8:20 Welcome

O10.01

8:30 STUDENT PERCEPTIONS OF ONLINE AND IN-PERSON EDUCATIONAL EXPERIENCES IN HIGHER EDUCATION

Saja Ibrahim[1], Jamil Ibrahim[2], Ibrahim J Ibrahim[3], Hidaya Ibrahim[4], Waseem Ibrahim[5]

[1]University of Jordan Medical School, Amman, Jordan, Jordan, [2]UMMC, Jackson, MS, USA, [3]Arab American University, School of Dentistry, Jenin, West Bank, Palestine, [4]Al-Najah University, School of Pharmacy, Nablus, West Bank, Palestine, [5]Arab American University, School of Medicine, Jenin, West Bank, Palestine

Higher Education institutions are facing increased budget constraints, often resulting in reduced funds to support various educational activities. Online course delivery format is often instituted as a cost-effective alternative to traditional methods. Over the years, substantial efforts have been made to compare the effectiveness of traditional course formats to online methods. The coronavirus disease 2019 (COVID-19) pandemic has greatly affected higher education teaching and learning. As academic institutions across the world continue to deal with the global health crisis, there is a need to examine different instructional modalities including online, and hybrid learning methods. COVID-19 lockdown phenomenon enabled Higher Education stakeholders to reflect on dealing with new technologies, changes in lifestyle and livelihoods, and the impact that they had on teaching and learning. With the improvement of technology, there has been a rapid increase in these approaches. With the improvement of technology, there has been a rapid increase in these approaches. The process for evaluating courses and faculty varies greatly from institution to institution.

Experts agree that student opinions are valuable to faculty and institutions. Practically every college and university spends significant time, money, and effort to collect, analyze, and distribute opinion surveys as an important component of institutional assessment planning. This study sought an answer to the following question: What are the differences in students' perceptions of the quality of instruction of online modality as compared to traditional modality? The general purpose of this observational study was to determine whether there was a significant difference in quality of instruction between the two modalities (online vs. face-to-face) as reported by students. The specific purpose was to compare the effectiveness of an online course to a traditional lecture course taught by the same instructor. A total of 2400 questionnaires were sent to students. Of these, 1185 responses were received for an approximately 49.38% percent response rate which is ~ 2% higher than the Fall of 2016 rate (47.41%).

The IBM Statistical Package for the Social Sciences (SPSS 24) and Minitab 15 were used to analyze the data. The test for significance was specified at the p =.05 level. Statistical analyses were conducted using independent samples t-tests and supported with a non-parametric Mann-Whitney U test, and Chi-square test. Other appropriate qualitative and quantitative techniques were used for analyzing the results.

O10.02

8:45 MANAGE EVENT-DRIVEN PROCEDURES IN VISUAL BASIC

Lixin Yu, Ping Zhang, Ronnie Davis, Jordan Daniels

Alcorn State University, Lorman, MS

The sequence of procedure calls is usually determined by the flow of the program. When a procedure (caller) calls another procedure (callee), the caller will pause execution to allow the callee to finish its job. The caller will resume execution when the callee has completed its work. However, event-driven procedures in an event-driven programming language like Visual Basic can be triggered by user actions (such as a keyboard key press) in addition to traditional procedure calls. Therefore, the execution sequence of procedures is not fully determined by the programmers. In a research project in deep learning on keystroke and mouse dynamics in 2021, the researchers observed a "nondeterministic" procedure execution problem when a user types fast – the data of a keypress may be recorded after the data of the next keypress is processed time by time so the recorded data are in wrong order. The cause of the problem was assumed to be that the next event can start the second procedure before the first procedure is completed, which lead a parallel execution of two procedures running at the same time. This research project is a follow-up of that study. Programs are developed to make further analysis of the procedure execution pattern. The result shows that the previous study had an incorrect interpretation of the observed problem, even though it found a technical solution to solve the problem. The Visual Basic event procedures do not execute like parallel-running processes or threads. The observed phenomenon is due to the fact that when a key is pressed down, the computer can still detect other keypress before the previous key is released. Therefore, the key-down time of the next key could be before the key-release time of the previous key. This is a useful feature for the fast typists since it can avoid skipping some keystrokes especially when a typist has a pattern of pressing down a key before the previous key is fully released. However, this feature creates an illusion as if two procedures are racing at the same time because unpredictable result is produced based on the user's typing speed and pattern. This research also find a programming solution to solve the unpredictable result problem.

O10.03

9:00 USING MULTIPLE REGRESSION ANALYSIS TO EXAMINE THE RELATIONSHIP BETWEEN PREADMISSION ACADEMIC VARIABLES MCAT AND UGPA, AND ACADEMIC PERFORMANCE IN THE 1ST-YEAR OF MEDICAL SCHOOL

Jamil Ibrahim[1], Saja Ibrahim[2], Waseem Ibrahim[3], Ibrahim J Ibrahim[4], Hidaya Ibrahim[5]

[1]UMMC, Jackson, MS, USA, [2]University of Jordan Medical School, Amman, Jordan, Jordan, [3]Arab American University, School of Medicine, Jenin, West Bank, Palestine, [4]Arab American University, School of Dentistry, Jenin, West Bank, Palestine, [5]Al-Najah University, School of Pharmacy, Nablus, West Bank, Palestine

Student admission into the medical school is very competitive and it is dependent on many predictors such as the undergraduate grade point average and the MCAT scores. These factors affect medical students' performance in the medical program especially during the first two years of basic medical education. Identifying these factors would help in offering counselling to students and help the admission officers in the selection process for medical school.

The purpose of this retrospective observational study was to investigate the relationships between preadmission academic variables, and the academic performance in the 1st-year of medical school as a main outcome measure. The study group comprised of 340 students in the classes of 2011, 2012, and 2013 at an Academic Medical Center.

Proper statistical data analyses were performed using multiple linear regression by entering all independent variables in a single step and constructed regression models to identify an optimal combination of predictors of first year courses' performance. The three preadmission variables were used in a regression model to predict the first-year scores in the medical program. The findings of this study revealed that the physical MCAT subscore, biological MCAT subscore, and UGPA were significant predictor variables for the main outcome measure scores (R^2 = 0.203). In this case, MCAT Biological Science subscore (beta=.351) have a greater impact on first year cumulative scores than other variables. All statistical analyses were calculated with Statistical Program for the Social Sciences (SPSS) statistical software for Windows, version 24.0 and excel.

O10.04

9:15 PARALLEL COMPUTING WEB APPLICATION

Emmanuel Asuquo

Mississippi Valley State University, Itta Bena, MS

The problem I will be addressing in my computer science project is parallel computing. Parallel computing refers to the process of BREAKing down larger problems into smaller, independent, often similar parts that can be executed simultaneously by multiple computers/processors communicating via shared memory, the results of which are combined upon completion as part of an overall algorithm.

Parallel computing infrastructure is typically housed within a single data center where several processors are installed in a server rack; computation requests are distributed in small chunks by the application server that is then executed simultaneously on each server. So basically, the project is a web application that uses parallel computing to solve problems. The purpose of my project is to make problem-solving faster using parallel computing i.e. BREAKing down a problem into different tasks and different computers taking on different tasks and the main computer divides the task into several sub-tasks and then distributes the sub-tasks to each computer and gets the results and then shows the overall result of the problem. My project's significance is to increase computation power's ability for faster application processing and problem-solving.

O10.05

9:30 KOCH SNOWFLAKES SIMULATION IN PYTHON USING GPU

Javid Ibrahimov, X Wu

Mississippi Valley State University, Itta Bena, MS

Fractals are very common in math and in the natural world and are used extensively in the industry. Python is a powerful computer language. In this project, we will use Python GPU programming to simulate snowflakes. The advantage of GPU programming is that it uses the power of a Graphic Card to accelerate computation.

Snowflakes will be drawn with the help of the Koch Snowflake algorithm. This algorithm creates the same pattern using different sizes. In order to simulate a snowflake, initially, we draw a right triangle. For each side of the triangle, we divide into three equal parts and use the middle parts to draw three right triangles outside. After removing the middle part, we repeat this process several times to obtain snowflakes.

O10.06

9:45 THE BOOKSTORE: AN eCOMMERCE BOOKSTORE

Onyebuchi Oparandu

Mississippi Valley State University, Itta Bena, MS

They say knowledge is power, but to have this power, you need to have access to it, and the easiest way to access this type of power is through reading books. However, factoring in the current process of getting a book from the MVSU bookstore, this becomes a tiring process. First, you fill out a form with all the books you need. Next, you have to walk to the bookstore and join a possibly long queue of students. If you happen to get to the front of the line in time, you will need to go to the back room and move from shelf to shelf in search of the books. Finally, you rejoin the queue for checkout. Given this tiring process, it is easy for students to weigh the benefit of obtaining the books needed to gain that powerful knowledge.

O10.07

10:00 CYBER ATTACK DETECTION IN IIOT

Manogna Sai Nandi[pati, Niharika Cherukuri, Hardikkumar Arvindbhai Malaviya, Ilemona Atawodi

The University of Southern Mississippi, Hattiesburg, MS

While the internet of things is growing into the industrial space, it's important to bring the security of

these devices to the forefront as any form of tampering can go from loss of financial investment to loss of life. For the small devices used in Internet of Things networks, the most accessible way to attack them is by hijacking the transmission between devices. As such, building ways to detect intrusions on the transmission layer seems logical.

The UNSW-NB15 dataset used to train our machine learning model comprises normal and attack network traffic. The types of attacks include analysis, fuzzers, backdoors, denial of service exploits, reconnaissance, generic, shellcode, and worms. The approach explored for this project is twofold for the sake of comparison; we trained our model on the K nearest neighbor algorithm using both Binary class targets and Multiclass targets.

In the experiment, we discussed the significance of each feature to make the model more efficient and effective, we prioritized the features and selected the top 20 to be used in the model. We used K nearest neighbor (KNN) algorithm there are 44 features in our data set, and we checked for null values but there are no null values in our dataset. There are categorical values in our dataset, and we converted that categorical values to numerical values by using label encoding and applied the KNN algorithm. After that we performed Feature Scaling by using Feature Selection technique and extracted top 20 features which impacts the independent variable that is the output label and again, we tested the results with these top 20 features. This increased the prediction accuracy from 80% to a little over 90% and increased our training time.

O10.08

10:15 FACIAL EXPRESSION RECOGNITION USING MACHINE LEARNING

Poojitha Uppu[1], Praveen Chaganti[1], Sarbagya Ratna Shakya[2], Zhaoxian Zhou[1]

[1]The University of Southern Mississippi, Hattiesburg, MS,
[2]Eastern New Mexico University, Portales, NM,

Automatic recognition of human affects has grown more interesting and challenging in the fields of artificial intelligence, human connection, and object recognition. One of the most important elements to understand human emotion is facial recognition (FR) . Facial Recognition (FR) has received important interest from daily human interaction. For the purposes of evaluating health care, analyzing human affect, and interacting with computers, psychologists and computer scientists are needed. Emotions are exhibited by people in number of ways including body gesture, word, vocal and facial Recognitions. Because the face may express mainly emotions, recognition is a significant channel for expressing emotion data from various persons. In our study, we have done research works related to Facial Recognition. Typically, the studies describe the following universal Recognitions: anger, disgust, fear, pleasure (or happiness), sadness, neutral and surprise. The research looks into the specifics of the facial dataset, feature extraction techniques, comparison results, and future studies of the emotion recognition system. In our project we will be using Convolution Neural Network (CNN) which will be compared with existing edge detection method. Currently, we have observed 88% of the accuracy through our CNN model. Our project will be helpful for solving facial recognition problems.

O10.09

10:30 FINITE AUTOMATA - A GIFT TO PATTERN MATCHING (CHARTING DNA SEQUENCES)

Puneeth Kumar Bolugallu Padmayya, Manoj Bolugallu Padmayya, Ping Zhang, Lixin Yu

Alcorn State University, Lorman, MS

The study of individual genes, their involvement in disease, and their pattern of inheritance is referred to as human genetics. The double-stranded helix of DNA is made up of four distinct base pairs arranged in different ways. The set of encoded instructions that make up DNA, also referred to as the 'source code of life'. DNA is perfect for the transmission of genetic information due to its numerous outstanding properties. Any alteration to the base-pair sequence has the potential to alter the genetic code, leading to a variety of illnesses. Therefore, it is crucial to examine human genetics or DNA patterns in order to not only understand the etiology and pathophysiology of a disease but also to diagnose, cure, and prevent it.

In domains including medicine, statistics, and mathematics, a variety of techniques have been employed to investigate the DNA pattern. Finite automata are gifted at matching patterns. Pattern recognition is important for DNA problem recognition. In computer science, finite automata are also used to plot DNA sequences. By first transforming DNA sequences into Non-Deterministic Finite State Automata (NFA), and subsequently into Deterministic Finite State Automata (DFA), we present a method for charting and analysis in this research. The only goal of our use of finite automata is to track and record any duplication or alteration of DNA sequences.

O10.10

10:45 DIGITAL AUTOPSY - THE NEW NOW IN FORENSICS

Puneeth Kumar Bolugallu Padmayya, Manoj Bolugallu Padmayya, Ping Zhang, Lixin Yu

[1]Alcorn State University, Lorman, MS

The autopsy is from the Greek word autopsia meaning "to see with one's own eyes'. The traditional method of doing an autopsy, known as conventional autopsy, involves extensively dismembering the corpse using tools such as an electric saw, scalpel, and other autopsy tools. The reports from autopsies are based on an arbitrary, descriptive methodology. Modem medicine has benefited from technological BREAKthroughs in recent years. One such development that is unbiased, non-invasive, and non-destructive is digital autopsy. It is quickly acquiring significance in the forensics community.

In place of a traditional autopsy, a digital autopsy use digital equipment like a digital scalpel and knife to perform the autopsy. It uses scanning and imaging technologies to detect findings in the corpse. In addition to radiology, image processing, computer graphics, physics, and biomechanics, digital autopsy is a multidisciplinary approach. The corresponding software solution offers 3-D images in the highly protected DICOM (Digital imaging and

communications in medicine) format.

This study focuses on the development of 3D Visualizer for the DICOM data, the benefits and distinctions between traditional and digital autopsies with the aid of demonstration over the digital body.

O10.11

11:00 MISSING IMAGE DATA IMPUTATION USING AUTOENCODERS

Chaoyang Zhang, Drona Akshay Kumar Devarasetty

[1]University of Southern Mississippi, Hattiesburg, MS

Missing data is a recurrent problem when dealing with real-world contexts and is usually handled with imputation strategies that replace the missing values with new data. Several deep-learning techniques have been used to address this issue, and one of them is the Autoencoder and its Denoising and Variational variants. These models can learn a representation of the data with the missing values and produce plausible replacement values for the missing ones. The goal of this work is to perform a comparative study between different imputation techniques including Autoencoder and its Denoising and Variational variants. In this study, MNIST, ART, and Brain Tumor MRI image datasets were used to compare imputation methods. All images were injected with missing values under different missing rates for the Missing Completely At Random (MCAR) and a specific block pixel in the image was removed for Missing Not At Random (MNAR) mechanisms. Denoising Autoencoders showed better imputation results when the background is common i.e., for the MNIST dataset for both MCAR and MNAR mechanisms. The Linear imputation showed better results for the MCAR mechanism when the background is complex i.e., for Art and Brain Tumor image datasets.

O10.12

11:15 IDENTIFICATION AND MITIGATION METHODS OF MULTICOLLINEARITY IN DATA ANALYTICS AND MACHINE LEARNING PROCESS

David Rop

Jackson, State University, Jackson, MS

In this study, a multiple linear regression equation that can be used to predict values when the explanatory variables are highly correlated due to serial correlation was constructed. It was discovered that when the explanatory variables are highly correlated, some of the linear regression assumptions are violated. The linear model also gave poor predictions. One of the violated assumptions is that the residual graph showed linear correlation with the response variable. The coefficients were also larger compared to the coefficients computed from uncorrelated explanatory variables.

One of the challenges was identifying serial collinearity. Richard Anderson derived the distribution of serial correlation coefficient and gave a table of serial correlation coefficients with various lags. Anderson and other statisticians discovered in the 1940s that ordinary Pearson correlation coefficient critical values are invalid when the data is serially correlated. There are several lag cases a case where lag equals N/2, N was considered. Anderson computed some of these critical values. His critical values stopped at L = 50 but with big data, higher values of L and thus N, are needed. So, computing new critical values was required. This was done by finding probability distribution functions that are equivalent to Anderson's pdfs. Serial correlation coefficient critical values corresponding to up to L = 1000, N =2000 was computed. The comparisons between some of the computed critical values and Anderson's are included in the paper.

After computing serial correlation coefficient for the data and comparing with corresponding critical value in new table, it was realized that the data was serially correlated and therefore the explanatory variables were correlated. This is because the data is ordered in time, and older data values were used as explanatory variables.

The next task was to mitigate multicollinearity. Each explanatory variable, X1 and X2, was mean-centered. Then one of the variables was regressed on the other. The gradient of the linear correlation line was normalized. A column vector of the normalized gradient and a unit vector orthogonal to the gradient was formed. When the mean centered data was multiplied by this vector, a matrix with uncorrelated variables was formed. This conclusion was reached after computing serial correlation coefficient of the transformed data and comparing it with corresponding critical value in the new table.

Finally, the response variable was regressed on the transformed data. None of the linear regression assumptions were violated and the prediction was more accurate than when correlated explanatory variables were used.

There are two new things to note in this study; computing new serial correlation coefficient critical values and how the data was transformed.

O10.13

11:30 PREDICTING THE E-COMMERCE SALES USING MACHINE LEARNING ALGORITHMS

Poorna Chand Gorijavolu[1], Manoj Kumar Putta[1], Sarva Siddi Ganesh Babu Yarra[1], Zhaoxian Zhou[1], Sarbagya Ratna Shakya[2]

[1]University of Southern Mississippi, Hattiesburg, MS, [2]Eastern New Mexico University, Portales, NM

E-commerce is a platform where users may purchase and sell things. The primary goal of e-commerce is to give customers with the ease of not having to visit a physical store to make a purchase. Because they will be able to purchase the item online and have it delivered to their home within a few days. In recent years, significant national policy support has also fostered a favorable climate for the expansion of the e-commerce business. The importance of the e-commerce business in the growth of the national economy has grown increasingly significant as a result of the pandemic. This results in increasing the competition between e-commerce platforms and e-commerce enterprises. If a platform wants to keep its competitive edge, it must be able to better satisfy the demands of users and perform well in all aspects of coordination and administration. At this period, an accurate projection of e-commerce platform sales volume is very critical. There is numerous research on predicting e-commerce sales at the moment, but we are currently studying the prediction model that can be better utilized in many

circumstances. The goal of this research was to develop machine learning algorithms capable of predicting e-commerce platform sales. In this paper, we try and examine three machine learning algorithms K-Nearest Neighbor, Random Forest, and Multi-Layer Perceptron. The dataset we have taken was on retail sales made up of actual transactions that take place during the year 2010 and 2011. We had done Feature Engineering to normalize the different kinds of data. The data provided by the feature engineering was used to predict the sales using three machine learning algorithms. We examined the accuracy of these three-machine learning algorithms and analyzed their performance. The results show that Multi-Layer Perceptron slightly outperforms the Random-Forest and K-Nearest Neighbor Algorithm.

O10.14

11:45 ETHICAL ISSUES WITH A.I.

Olorunfunminiyi Akinlua[1], *Christian Davis*[1], *John Ford*[1], *Katie Breaux*[1], *Trevor Rester*[1], *William Armistead*[1]

[1]*University of Southern Mississippi, Hattiesburg, MS*

Artificial Intelligence also known as A.I. is already making a difference in our society and in the day-to-day businesses of various companies. The most important aspect of A.I. is the data, as A.I. uses the data collected to work and be efficient. But because of this, there are risks and therefore ethical issues in the use of A.I. especially in relation to data. These risks are seen in the violation of customers' data privacy and therefore need to be solved. This paper will be looking at these risks as well as its solution from the company's side, government and individuals. In addition, the data A.I. uses and how it uses it has raised ethical concerns in advertisement. Advertisers use A.I. to decide who sees their advertisements and they work so well but it has concerning issues. With this type of technology, advertisers can target groups of people based on age, gender, and even race. This has brought up major ethical concerns with the targeting power A.I. as it has begun discriminating against people based off these conditions. Also, as A.I. and its practical applications expand, so too does its less than practical applications. Neural networks and learning algorithms have rapidly expanded the visual recognition capacity of A.I., and even resulted in imperfect visual generation. One of the many variations of this generation is the use of A.I. in generating artwork mimicking the works of humans to surprising results with varying degrees of canniness. As these techniques of art generation develop and creep closer to the level of human craftsmanship, a number of questions regarding the replacement of human artists and the artistic validity of art created by machines emerge. In addition, as A.I. emerges into healthcare, more questions begin to arise. A.I. in healthcare can have huge impacts on patients, some positive, some negative. A.I. can help with diagnosis, clinical decision making and personalized medicine. It can also extend to physical tasks like robotic prostheses and robotic surgical instruments. But as doctors and hospitals use more A.I. in their everyday interactions with patients the question comes up is it safe? Can Artificial Intelligence diagnosis a patient correctly? And if not, who is responsible ethically? Also, the use of artificial intelligence and machine learning applications in law enforcement has increased over the years, and the number of ethical concerns it raises has increased along with it. While A.I. technology can be used for objectively good things such as finding missing persons, it can also be used in ethically questionable ways such as predictive policing. Predictive policing, while having been around in various forms for a while, has just now started implementing artificial intelligence-powered algorithms. All these things raise important questions. Does this technology violate people's freedoms? Can this technology be abused? Can the algorithms be trained on bad data? Overall, is artificial intelligence in law enforcement a positive or negative net? The various ethical issues concerning data privacy, data in advert, art, health and law are the basis of this paper.

12:00 General Session

Thursday, February 23, 2022
AFTERNOON
Room D4

1:00 DIVISIONAL MEETING

O10.14

1:30 THE ILLICIT USE OF CRYPTOCURRENCY

Minh Tran[1], *Bilal Abu Bakr*[1]

[1]*Collin College, Frisco, TX*

Cryptocurrency uses encryption to secure digital or virtual transactions. The decentralized system uses encryption, validates transactions, and keeps records instead of a central authority. Bitcoin and other decentralized cryptocurrencies offer an available avenue for personal wealth. Cryptocurrency is a bank-independent digital payment method. It is a peer-to-peer technology that permits payments from anywhere. Digital entries in an online database explain cryptocurrency transactions. Using wallets and public ledgers allows individuals to store cryptocurrency and be their bank. All cryptocurrency transactions are recorded on a distributed public ledger, blockchain, held by currency holders. Among the most significant benefits of cryptocurrencies are transactional independence, security, and convenience. Even though they have not yet attracted a large user base or been widely adopted, many cryptocurrencies are built to offer distinct advantages over fiat money or the conventional banking system. The problem is cryptocurrency misuse. Crooks began using unregulated cryptocurrency. Scammers duped people into sending cryptocurrency for "airdrops" that temporarily doubled their money. Other frauds use counterfeit coins whose producers promise a significant return. Money laundering uses cryptocurrency-tumbling services to obscure traceable transactions. Cryptocurrency tumblers exchange cryptocurrencies for cleaning up or disguising transactions. Criminals that use cryptocurrency tumblers can "clean" or "mask" bitcoins associated with activities such as ransomware, illegal goods, information, or services. "Cleaned" bitcoin can be converted to fiat currency safely. Once in fiat money, criminals can use it anywhere without penalties. We suggested numerous ways to stop thieves from

exploiting our currency. Governments should provide instruments to educate people about cryptocurrency concerns. People will be warned about bitcoin frauds, scam offers, and suspicious websites. Eliminate bitcoin money-laundering services because they help criminals wash money. Banning illegal tumbling services renders them unproductive since it prevents average users from using them and encourages criminals to limit "dirty" transactions. "Dirty" transactions can confine and simplify the criminal activity. Each nation's citizen may register to use and be linked to a government-backed checkpoint or cryptocurrency. Cryptocurrencies cannot swap for fiat money directly; they can swap for a government-backed cryptocurrency, which can then be swapped for fiat money. Seizing, identifying, and tracking suspicious transactions or activities may also be government-backed cryptocurrency features. We seek to stop criminals from exploiting our currency by implementing these ideas. Criminals are limited to bitcoin but can make transactions. The implementation will help authorities track illicit cryptocurrency activity. Ethically using cryptocurrencies in a specific context reduces risks while maintaining benefits. This restrictive approach is necessary to protect the fiat money we all use. The plan does not control cryptocurrencies or create an intermediary; it employs a check system when exchanging for fiat. People can continue utilizing cryptocurrencies without exchanging them for fiat or local cash. The purpose is to curb criminal conduct, secure our fiat money, and prevent criminals from exploiting our system.

O10.15

1:45 STRENGTHENING THE SECURITY OF SMALL BUSINESSES

Manny Hameed, Bilal Abu Bakr

Collin College, Frisco, TX

Every day, security breaches in prominent businesses worldwide are reported in the media. These assaults demonstrate the vulnerability of data and the absence of comprehensive security policies in businesses of all sizes. Data security is essential to the health of the firm as a whole. Safeguarding trade secrets, financial records, consumer data, and employee records is necessary. If hacked, firms could incur financial and reputational losses. Small businesses are a distinct category of organizations with significant cybersecurity issues that are typically disregarded. These businesses are especially susceptible to cyberattacks due to the often-valuable information they handle and their overburdened and undertrained Information Technology staff. The attackers quickly access a sufficient number of customers' and workers' Personally Identifiable Information. Consequently, small businesses are forced to pay ransom to regain access to their vital data. The employee and customer data had already been compromised despite surviving the ransomware attack. This information could be for sale on the dark web, with potentially fatal consequences. These unforeseen repercussions of small businesses failing to protect sensitive data include employee and customer identity theft, income loss, credit rating damage, and more. There are millions of Small businesses throughout the world. Suppose each company attempts to secure a single piece of employee or customer data. In such a circumstance, this might be seen as a significant stride in the digital footprint security shield. There are numerous ways to strengthen an organization's data security plan, including identifying possible hazards, frequently updating computers, and providing personnel with security training. There are various reasons why small organizations do not prioritize data protection. The workers provide all their information with maximum assurance during the onboarding process. However, the company's lack of data classification knowledge exacerbates security concerns. In this abstract, we propose methods for improving the data security of small enterprises in various industries, including Information Technology service providers, e-commerce, drafting, and design services, patient care services, and others. The lack of security training, a security policy, ongoing maintenance of perimeter security, and layered data protection appears to be the primary factor affecting the security of Personal Identifiable Information in small businesses. Security training is essential to boost small businesses' self-help expertise to ensure they are on the right side. We believe that if a small organization maintains and continuously improves its security practice, it will considerably reduce security incidents. Utilizing the already available technology with built-in features and the suggested techniques will help small businesses maintain the confidentiality, integrity, and availability of their employee and customer data.

O10.16

2:00 EASY ONLINE ORDER

Kexin Jiang

Mississippi Valley State University

In today's fast-paced era, when everyone is usually in a rush to complete most tasks, people are very selective in the establishments and applications used to place orders. For most businesses, customers are attracted to the restaurants that all orders to be placed online. The covid pandemic force many businesses to offer online ordering options to avoid being closed. Even though the restrictions of the pandemic are not as great as before, there is still an increased need to provide those online ordering options to customers. Having an online ordering option, customers can conveniently examine the menu, compare the prices, navigate through the ordering process. The purpose of this online business application is to create a system that will allow businesses to provide its customers with the option to place orders online. This provides a clear and easy method for the restaurant’s customers to have the same experiences as placing orders in the store but the added convenience of not having to be present in the store. This application will help businesses stay vital and have greater longevity as they adapt to constant changes in technology and the available uses and resources offered by the internet.

O10.17

2:15 CLUSTER DETECTION IN NANOFIBROUS MATERIALS USING STATISTICS

Albert Jackson

Mississippi Valley State University

Scan statistics is a very valuable tool that has many applications in various disciplines. One of the applications it is commonly found to be useful for is scanning images, specifically images of nanofibers. The goal of this project is to create an algorithm that will scan through provided images of the nanofibrous material to determine the location of any defects present. To start, the program processes the images by reading the images into matrices and converting them into a black and white scale. After the image has been scanned and processed the algorithm obtains a scan statistic by taking the summation of a set window size and saving the values into a matrix. A critical value function is then run-on images within the normal group to find what is the critical value to then compare against the anomalous images. If the critical value is higher than what was found on the normal images, then there is a cluster present. Future work looks to improve these algorithms by altering parameters and testing more images.

O10.18

2:30 AUTONOMOUS VEHICLE SYSTEMS: NEW CHALLENGES IN PRIVACY AND TRUST

Bilal Abu Bakr[1], Jared Trogden[1]

[1]Collin College, Frisco, TX

Unusually quickly, autonomous vehicles have moved from science fiction to reality. The general public just recently heard about it as science fiction. They are currently operating on public roadways with outstanding performance and safety records—rare for such a new technology. A self-driving car features a variety of sensors for simultaneously recording audio, video, driving behavior, and physiological signals. The driver's voice and videos are recorded with multiple-channel microphones and cameras. Pressure sensors, potentiometers, velocity pulse counters, distance sensors, and brake and gas pedal pressure sensors are used to monitor steering angles, vehicle speeds, and following distances. It is equipped with physiological sensors that monitor the driver's pulse rate, skin conductance, and sweating brought on by emotions. While operating a vehicle on urban and interstate roadways, four different task circumstances were used to capture the multimedia data. The focus of researchers, engineers, and the media, however, is primarily on their technical capabilities and limitations as a result of this unusual rise, and little attention is paid to the growing use of autonomous cars and other vehicles or, more specifically, the data that these vehicles are gathering to ensure that their autonomous nature is safe and reliable. The increasing privacy and trust concerns are discussed in this abstract because they are crucial for promoting public acceptance of autonomous vehicles on public roads. When numerous vendors and suppliers are engaged in the car production process, it is very challenging for makers of autonomous vehicles to apply meaningful privacy and security precautions. Although the daily amount of data generated by autonomous vehicles is known, how the data will be used (e.g., real-time broadcasting and offline analytics) is unknown. Individual worries about privacy are brought up by the risks of data collecting in autonomous car systems. For example, when location data is paired with personal data, details about a person's wealth, occupation, sexual orientation, and religion can be inferred. Someone is also more vulnerable to physical harm or stalking when previous and current travel patterns are misunderstood. Specific data must be shared in real-time or released for analysis or research due to mutual benefits or restrictions. What happens to the data after it has been used immediately by autonomous vehicles to ensure their safety? Where is it processed to improve autonomous driving efficiency? We think it is essential to know whether these sensors and cameras may be able to see personal information and how they might use that information. In addition to the technical difficulties with infrastructure and safety, privacy and data protection have caught our interest. The rising privacy and trust concerns that are crucial to encouraging the acceptance of autonomous vehicles driving on public roads are discussed in this abstract.

O10.19

2:45 PREDICTING THE E-COMMERCE SALES USING MACHINE LEARNING ALGORITHMS

Poorna Chand Gorijavolu[1], Manoj Kumar Putta[1], Sarva Siddi Ganesh Babu Yarra[1], Zhaoxian Zhou[1], Sarbagya Ratna Shakya[2]

[1]University of Southern Mississippi, Hattiesburg, MS, [2]Eastern New Mexico University, Portales, NM

E-commerce is a platform where users may purchase and sell things. The primary goal of e-commerce is to give customers with the ease of not having to visit a physical store to make a purchase. Because they will be able to purchase the item online and have it delivered to their home within a few days. In recent years, significant national policy support has also fostered a favorable climate for the expansion of the e-commerce business. The importance of the e-commerce business in the growth of the national economy has grown increasingly significant as a result of the pandemic. This results in increasing the competition between e-commerce platforms and e-commerce enterprises. If a platform wants to keep its competitive edge, it must be able to better satisfy the demands of users and perform well in all aspects of coordination and administration. At this period, an accurate projection of e-commerce platform sales volume is very critical. There is numerous research on predicting e-commerce sales at the moment, but we are currently studying the prediction model that can be better utilized in many circumstances. The goal of this research was to develop machine learning algorithms capable of predicting e-commerce platform sales. In this paper, we try and examine three machine learning algorithms K-Nearest Neighbor, Random Forest, and Multi-Layer Perceptron. The dataset we have taken was on retail sales made up of actual transactions that take place during the year 2010 and 2011. We had done Feature Engineering to normalize the different kinds of data. The data provided by the feature engineering was used to predict the sales using three machine learning algorithms. We examined the accuracy of these three-machine learning algorithms and analyzed their performance. The results show

that Multi-Layer Perceptron slightly outperforms the Random-Forest and K-Nearest Neighbor Algorithm.

O10.20

3:00 EFFECTIVE CONTENT SEARCHING WITH TAGGING FOR STACK OVERFLOW QUESTIONS

Rahul Reddy Ramasagaram, Ananya Beeravalli, Rakesh Nomula

University of Southern Mississippi, Hattiesburg, MS

O10.21

3:15 SENTIMENTAL ANALYSIS OF STOCK MARKET USING MACHINE LEARNING ALGORITHMS

Yashaswini Vuppunuthula[1], Zhaoxian Zhou[1], Sarbagya Shakya[2]

[1]University of Southern Mississippi, Hattiesburg, MS, [2]Eastern New Mexico University, Portales, NM

In the finance world, stock trading is one of the most important activities. Nowadays, many people are indirectly or directly related to this sector. As investors and market analysts study the market behavior and plan their investment strategies accordingly, they are interested in forecasting stock price. Stock market prediction techniques such as time series analysis and statistical analysis have been active research areas for a long time. It is also typically believed that the stock market is correlated with sentiments of the market participants and therefore can be predicted by sentimental analysis. Most recently, machine learning algorithms have been utilized for stock market prediction. In this project, we first reviewed various datasets that can used in sentimental analysis, such as the large-scale collection of tweets from twitter.com. We then performed sentimental analysis by using various modern machine learning techniques on selected datasets. Various classification algorithms were implemented to automate sentiment detection. From bag of words, polarity is determined and in turn the future market is predicted. If the polarity value is positive, we state that this news has positive impact on the market, so more chances of stock price go high. If the polarity value is negative, the stock market will be affected to go down in trend. After the model was tuned carefully, the results were discussed. It is concluded that the public mood can be captured from the social news feeds and in turn the stock market movements can be predicted by means of machine learning techniques. Detailed result of the prediction accuracy of different algorithms will be presented.

Thursday, February 23, 2023

EVENING

3:30 DODGEN LECTURE and AWARDS CEREMONY

Hall B

5:00 GENERAL POSTER SESSION

Hall C (immediately following Dodgen Event)

P10.01

A SHARP-INTERFACE LATTICE BOLTZMANN FREE SURFACE METHOD AND ITS APPLICATION IN BOLUS FLOW DURING SWALLOWING

Caixia Chen[1], Yong Yang[2], Yonghua Yan[3], Tyler Hickman[1], Dwight Ross[1], Matthew McKee[1]

[1]Tougaloo College, Tougaloo, MS, [2]West Texas A&M University, Cayon, TX, [3]Jackson State University, Jackson, MS

P10.02

RAISING THE DRAWBRIDGE: A STRAIGHT-FORWARD APPROACH TO NETWORK SECURITY

Christopher Morgan, Bilal Abu Bakr

Collin College, Frisco, TX

Hackers today are sophisticated and powerful organizations of hostile actors, including expert hacker groups, criminal syndicates, and government-sponsored teams with virtually unlimited resources. These hackers want to make money through extortion or other means or to cause harm to organizations and individuals in support of a cause or national flag. These hackers are becoming more sophisticated and using novel tactics. This Abstract presents Drawbridge, a system meant to mitigate a portion of the global threat posed by hackers to individuals and companies. Hackers are developing tools to breach computer networks by exploiting extremely specialized software flaws in giant corporations that cause security weaknesses. These hackers seek targets by routinely searching the Internet and probing businesses and PCs using software with these flaws. These weaknesses may exist in proprietary enterprise solutions or widely-used free and open-source software programs. Regardless of the number of resources devoted to safeguarding these projects, they will invariably have security flaws that increase the likelihood of a security breach, which might cost businesses millions of dollars in recovery costs and expose millions of sensitive details about individuals. These software vulnerabilities are known to hackers but unknown to security professionals; they are known as "zero-day exploits." Since they are entirely unknown to security defense teams, it is exceedingly difficult to avoid these attacks with software upgrades and other methods. In addition, it is frequently impractical to deploy foolproof risk mitigation strategies. Hackers can exploit most of these vulnerabilities since they can connect to compromised computer systems over the public Internet. If the hackers could not access the target systems over the Internet, they would be unable to detect or exploit the security flaw in the organization's computer network. The drawbridge technology prevents hackers from gaining access to a target computer system by telling network security devices to temporarily

modify their security rules to enable access to a trusted user on demand and only for that trusted user while blocking all other access attempts. Once a trustworthy user completes their task and logs off, Drawbridge promptly revokes their access. The Drawbridge technology employs encryption and a series of data exchanges, making it extremely difficult for hackers to produce valid access requests. Access granted to trusted users is limited by the time they request to connect and the machine they are connected from. It may be helpful for various use cases because it is simpler, easier to set up, faster, and has lower latency than alternative options. This solution operates by customizing current network security services to permit and deny traffic at the network level, giving users a great deal of deployment freedom. A Drawbridge implementation might be deployed on a network switch, router, firewall appliance, server, or any other computer hardware, making it applicable in virtually any situation where the number of authorized users with access to a computer system is restricted. It is decentralized and only uses the PC it is defending. Therefore, it is not likely to be a single point of failure.

P10.03

WHY IS A RELIABLE VULNERABILITY GAUGE NECESSARY?

Sudhana Punjabi, Bilal Abu Bakr

Collin College, Frisco, TX

Enterprise environments must have a risk-based approach to their security for several reasons, not the least of which is the possibility of a data breach or service interruption. Enterprise software, operating systems, and related add-ons may introduce vulnerabilities that give nefarious parties access to IT infrastructure. Regular system updates and vulnerability patches are essential for ensuring that "gaps" are filled. The vulnerability patching process involves examining operating systems, software, apps, and network components for flaws that might allow a malevolent user to gain access to the system and harm it. Patching is known to apply focused updates to a piece of software, an operating system, or supporting information. A patch's two main functions are to either upgrade the system to a more recent version (as many older versions eventually stop being maintained) or to provide code to address an issue that has already arisen. Vulnerability patching aims to solve issues that might let someone access a network or system. A public program called the Common Vulnerability Scoring System (CVSS) was created to solve this problem by providing a framework for evaluating and quantifying the effects of software flaws. The purpose of CVSS is to make it easier to get reliable scores that appropriately reflect the severity of vulnerabilities. According to the National Institute of Standards and Technology (NIST), the two common uses of CVSS are calculating the severity of vulnerabilities discovered and as one of the factors in prioritization of vulnerability remediation activities. However, in most organizations, it is the sole factor of prioritizing vulnerability, which also defines the SLA (Service Level Agreement) for the remediation process. SLA specifies the timeframe for vulnerability remediation. The higher the score, the more critical the severity and the sooner it is patched. However popular, this procedure does not consider the other aspects of vulnerability severity. For example, a low CVSS score vulnerability in a highly critical system for a business operation will be lower in priority than a high CVSS score vulnerability in a less critical system. A low CVSS score vulnerability in a system that stores or processes highly sensitive data may not be patched in time and result in a disastrous data breach. We proposed that a solution to avoid such pitfalls is to develop a wholesome vulnerability severity calculator that considers all the factors that could define the remediation plan. Have an inventory of all the assets and score them based on their importance to the business functions. Map data and attach labels to it to identify the digital assets that hold or process sensitive data. Combining all these factors to arrive at a more precise score will help define the SLAs for remediation efforts resulting in the timely patching of critical vulnerabilities.

P10.04

THIRD-PARTY VULNERABILITIES IN CYBER-SECURITY

Shazaib Khan, Bilal Abu Bakr

Collin College, Frisco, TX

Organizations opt to outsource product-related work to reduce expenses. Some may pick offshore sites with cheaper economies and labor forces to save money on salaries. Others could choose outsourcing to avoid wasting money on recruiting, especially during training. Unquestionably, outsourcing services give organizations a competitive advantage since numerous activities traditionally provided in-house, like payroll, become the responsibility of experienced specialists outside the firm, allowing them to save money and time. This enables businesses to become more focused on core business tasks and, over time, remain at the top of their respective industries. Companies that outsource must be aware that, while there are numerous benefits to hiring external assistance for corporate operations, there are also numerous downsides. Outsourcing numerous operations to third-party contractors are inherently subject to security threats. This could endanger their intellectual property. In order to execute their responsibilities, these vendors are permitted varying degrees of access to vital confidential information and assets. This creates a significant oversight for many businesses, as the security standards of these third-party vendors do not align with those of the businesses they serve. The business's security does not include these third-party vendors within its scope, so the security disparity goes unnoticed and unchecked. As a result, attackers can exploit a significant security vulnerability by targeting third-party vendors to obtain access to the core company. In light of this, organizations must ensure confidentiality while outsourcing services. In this Abstract, many solutions are proposed. Businesses and organizations can manage the security risk posed by vendors in several ways. First, strike a balance between vendors' access to the business, granting adequate access for the vendor to do its duties while limiting and isolating it so that it cannot be exposed to other sections of the organization. A significant aspect of reducing exposure is ensuring that all employees who contact the vendor know its restrictions so they can be enforced. The scope of the company's security measures must include and account for the risks of sharing confidential information with these external

parties. The extent of the business's participation in the vendor's security should be proportional to the level of access to the business so that the business's information and assets are adequately protected when handed to the vendor.

P10.05

COMMERCIAL AV SYSTEMS NEED UP-TO-DATE SECURITY MEASURES

Martin Moore, Bilal Abu Bakr

Collin College, Frisco, TX

Commercial and professional A/V (Audio/Video) technology has developed significantly. High-level A/V systems may include projectors, large-screen displays, video conferencing systems, A/V switchers, audio DSPs (Digital Signal Processors), and other technologies that bring people closer together and enhance their engagement with the provided content. A centralized control system directs these systems' units. If someone wants to join a video conference, a control system can instruct the video conference unit to connect to the remote system, turn on the camera and display in the room, select the proper inputs and outputs on all the devices, set the sound and lighting levels, and even close the blinds in the room, all at the press of a single button. Since its inception, professional A/V communication and control relied on localized serial, relay, and I/O (Input/Output) communications. A lack of industry-recognized security practices introduces vulnerabilities to a network, allowing threat actors to gain a foothold and set up a base of operations to continue their attacks. A popular installation scenario is creating localized networks for A/V devices to communicate amongst themselves without outside access. While this segmentation protects the A/V network and the larger organization's network from interfering, it also represents a significant failure in a founding tenant of the CIA (Confidentiality, Integrity, and Availability) Triad. Incorporating these technologies into the organization's network, monitoring their status, and managing their usage would significantly increase ROI (Return on Investment), improve the user experience, and simplify the necessary support apparatus. Once the decision has been made to place these devices on the network, it is necessary to observe security best practices to protect the devices and the organization. Many integrators who place devices on organizational networks do not try to secure those devices from external threats. Even fundamental configuration changes can go a long way to hardening the A/V systems. A/V devices need to be able to communicate with the organization's network. Their ability to communicate on the network benefits both users and technical staff. Proper subnetting, VLAN management, and security system design can give many of the same security benefits as a physically separated network while still allowing devices to communicate. When it comes to securing devices and the organization's network, many of the tools necessary to implement even simplistic forms of security are already incorporated into these network devices. Utilizing fundamental technologies such as LDAP (Lightweight Directory Access Protocol) authentication services, Syslog logging services, and certificates from reputable certificate authorities would goa long way toward safeguarding client networks and ensuring visibility into required systems. The industry of A/V integration continues to develop and expand its influence in our daily lives. What was once limited to boardrooms, classrooms, and multimillion-dollar homes can now be placed in any house or business worldwide. Digital signs and interactive media have brought A/V into marketing and commercial environments. Integrators continue to introduce weaknesses in networked systems without proper security. With increased use, integrators must use modern security methods and optimize their network connections.

P10.06

PROTECTING PRODUCTION FACILITIES AGAINST VULNERABILITIES IN OLDER CNC MACHINES

Jody Cantello, Bilal Abu Bakr

Collin College, Frisco, TX

The security threat landscapes are constantly changing, but computer numerical control, or CNC, technology cannot keep up. CNC machinery utilizes pre-programmed instructions created in computer-aided manufacturing (CAM) or computer-aided design (CAD) software to manufacture parts from solid materials. Standard CNC machines provide automated milling, plasma-cutting, laser-cutting, water jet-cutting, lathe, and grinding of raw materials during the manufacturing process. It can be cost prohibitive to upgrade CNC machine control computer systems to modern hardware and operating systems; therefore, older legacy hardware running outdated operating systems like Windows XP or Windows7 is left on the network. How can manufacturers maintain network security without affecting production? A combination of network segmentation, access control lists, firewalls, and removing the machines from any directory services assists in minimizing the threat vectors. Due to suppliers no longer releasing security patches or firmware updates to their products, legacy systems provide a greater security risk to any network environment. Additionally, legacy platforms are no longer supported by the latest endpoint protection solutions. Flat network architecture, in which every system is on a single subnet, is another issue that smaller manufacturers must address. If the CNC machines are disconnected from the network employing manual updates to the machine program instructions, a flat network, while not optimal, would suffice. However, if the requirement for CNC machines to be connected to the network to obtain their program instructions currently exists, or if processes change, such as through automation, a flat network is not desired. Complete visibility of the workstations and servers on the same logical network increases the risk of attack propagation when CNC machines are connected in a flat network architecture. We propose a few methods to mitigate these threats. The first step in network segmentation is to link the CNC equipment to a separate VLAN to isolate it from the rest of the network. The next step is to create access control lists (ACLs) in the switching environment to prevent the CNC machines from being able to talk to each other or any other devices on the network other than those required to send the CNC program files to the machines. At the same time, a compromised machine could potentially still target authorized systems. ACLs reduce the available threat vectors. To address this, enable the host-based firewall on all CNC machines and

route all traffic from the CNC VLAN through a firewall that supports Advanced Threat Protection and virus scanning to block any malicious traffic. The final configuration item is to remove the CNC machines from any directory services, such as Active Directory or Azure Active Directory. An attacker's ability to access domain computers from a compromised workstation will be restricted if the machines are configured in a workgroup, slowing down the attackers' assault on the network. Removing old systems from the infrastructure in manufacturing environments may not be practical. However, the previously mentioned procedures will restrict access to other network resources and lower the overall risk to the business.

P10.07

MULTI-ACCESS EDGE COMPUTING FOR PEDESTRIAN-VEHICLE COMMUNICATION

Zahraa Hamza, Bilal Abu Bakr

Collin College, Frisco, TX

Building an intelligent transportation system is a component of the broader development and monitoring of smart surroundings for an intelligent city strategy. This system entails the construction of new vehicles that considerably enhance the safety of passengers, drivers, and pedestrians, a trend that is anticipated to continue in the coming years. The proliferation of smartphones gives a unique opportunity to design a system that can significantly decrease the hundreds of pedestrian traffic fatalities annually. Wireless vehicular communication has the potential to enable a multitude of new applications, the most essential being a class of safety applications that can prevent crashes and save thousands of lives. The automobile industry is developing a dedicated short-range communication system for vehicle-to-vehicle and vehicle-to-roadside communication. We believe that pedestrian-vehicle communication can alert both the motorist and the pedestrian so that they can avoid a collision by taking evasive action. There are many challenges and possible approaches to reducing false positives, minimizing spectrum and channel congestion, and improving security and localization. The effectiveness of vehicle-to-vehicle and vehicle-to-roadside communication technologies strongly relies on interoperable cooperative standards. By exchanging context information, car-to-pedestrian communication has enormous potential for minimizing possible collisions between pedestrians and vehicles. Similar communication principles for Car-to-Car communication have been investigated for quite some time and are now being implemented as an extra safety mechanism. Unfortunately, these technologies do not cover Vulnerable Road Users such as walkers and bikers. Regarding pedestrians, we investigate the sharing of pertinent safety measures between walkers and automobiles utilizing existing LTE networks' widely available communication capabilities. Users' cell phones must execute the necessary activity and collision detection algorithms to determine the severity of the situation. In this abstract, Multi-access Edge Computing is recommended for improving both the overall system latency and the energy efficiency of smartphone applications. Multi-access edge computing is a network architecture that gives capabilities for cloud computing and an IT service environment at the network's edge. This technology aims to reduce latency, assure highly efficient network operation, and expedite the delivery of services.

P10.08

LOW-COMPRESSION VIDEO STREAMING ACROSS LANS

Benjamin Ehrhard, Bilal Abu Bakr

Collin College, Frisco, TX

Recent advancements in display technology have permitted increased resolution and dynamic range. While the demand for display link bandwidth is growing dramatically, the available bandwidth from the physical layer cannot keep up. Although this mismatch could be resolved by adding more wires to the links or by using other costly ways, such approaches have significant downsides regarding system cost, power consumption, and compatibility with legacy systems. The Display Stream Compression (DSC) standard of the Video Electronics Standards Association (VESA) is widely regarded as a low-cost, visually lossless encoder for display communications. However, as the prevalence of high dynamic range (HDR) and wide color gamut (WCG) technology increases, so makes the apparent quality loss. Multiple techniques exist for transmitting a display signal from a device to a peripheral. Cables with uncompressed signals have a relatively short range, and streaming services use quality-degrading compression techniques to make their content available even with slow Internet rates. This abstract aims to find a medium ground between these two methods, utilizing less compression to preserve quality and reduce hardware needs but not so little compression as to overload a network so that a display signal can be sent to almost any device on a local network. It is potentially eliminating the requirement for cables. This can also be advantageous in the future, as internet speeds increase and enable the transmission of video streams with improved quality. The first phase of our suggested methodology is determining how much compression is required to meet the bulk of use cases. DisplayPort generation 2 is the maximum bandwidth display connection currently available and serves as a baseline for uncompressed bandwidth. The existing Wi-Fi standard, 802.11 ax, will serve as a baseline for the compression goal, with no allowances for network dependability outside the display signal. The DisplayPort bandwidth for generation 2 is listed at 77.37 Gbps by VESA, the group behind the standard. According to Cisco, existing Wi-Fi standards offer a maximum bandwidth of 4.8 Gbps. The display's usable bandwidth would be less than this maximum to guarantee network dependability. Compare this to the standards for compression for video streaming. Netflix recommends a minimum Internet connection speed of 15 Mbps for the best streaming experience. Using the same techniques for video streams within a local area network, where network rates are typically considerably quicker, reduces their usability and quality. Existing approaches for compressing video streams extensively use compression to ensure Internet access when it is not always necessary. With the proper support, reduced compression can enable practically lossless streaming from any device to any device on a local area network, with or without wires.

P10.09

INADEQUATE MULTI-FACTOR AUTHENTICATION SYSTEMS

Robert Adams, Bilal Abu Bakr

Collin College, Frisco, TX

Two-factor authentication (2FA) is used in the modern world to protect logins to websites, virtual private networks (VPNs), and applications. This is a combination of the username, password, and an additional authentication factor. We believe the demand for more robust authentication systems has emerged in light of previous attacks, such as the 2FA exhaustion attack on Uber. This attack is known as "Multi-factor Authentication Fatigue." With the development of these new sophisticated attacks, we now need more complex authentication solutions. In this abstract, we propose the implementation of three-factor authentication (3FA) or a superior multifactor authentication (MFA) schema as a solution to this challenge. One would use their username and password for the initial login to a system. The system would then route the sign-in request to the configured multifactor application. The application will then send a message to the user's multifactor mobile device, configured to anonymously check a locally created and stored cookie on the device. The cookie may be created by scanning the Quick Response (QR) code on the user's Radio Frequency Identifier (RFID) badge during the configuration of their MFA application, or it could be delivered to the user's mobile using Duo and kept there. This cookie contains the user's locale or a list of locations from which the user is authorized to log in, which can be configured in the user's Active Directory settings and appended to the QR code the employee scans while configuring the multifactor application. If the sign-in request originates from one of the permitted locations, the Duo program will launch a push message on the user's mobile device that must be accepted for the login to proceed, similar to the current 2FA apps. If the cookie does not match, the system never sends the push notification to the user and drops it silently. Employers may change a user's acceptable login location and even rotate them using policies and procedures, similar to how we presently rotate passwords. This would require a hacker to not only harvest and crack a user's password but also determine their cookie value, which is never transmitted over the wire and is stored locally on the device from the time it was created. This setup could also include an up-to-date list of permitted IP addresses or subnet ranges that the company or user can maintain. This would prevent Multi-factor Authentication Fatigue assaults by never bombarding the user with push notifications, and it would drop all unwanted attempts without exhausting the user with multitudes of requests.

P10.10

HOW CYBERSECURITY CAN HELP CONSUMERS AND SMALL BUSINESSES

Zackharie Venable, Bilal Abu Bakr

Collin College, Frisco, TX

It is well known that most large corporations are significant targets for threat actors. Compared to smaller companies, large businesses have a more significant opportunity to pay for security, as money may not be an issue. Numerous mom-and-pop shops, small businesses, and franchises lack established cybersecurity procedures. The cost of security may be prohibitive for some businesses, preventing them from implementing the appropriate security policies and procedures. The problem with the lack of security in these small businesses is that their owners have no actual liability. Numerous consumers access small businesses and websites, which may frequently disclose their customers' personal information. Small cafés and gaming establishments may provide free Wi-Fi, but who monitors their network? Are their security measures dependable? Moreover, have they updated their systems to the most recent patches to remain current? We propose multiple solutions for small businesses and consumers in this abstract. Implementing security frameworks is optional but highly recommended. These frameworks, such as ISO (International Standards Organization), SOC2 (Service Organization Control), and NIST (National Institute of Standards and Technology), may be of assistance to smaller businesses and may even protect them from lawsuits and data loss. In the same way, a restaurant must have a health inspector, and small businesses should have an information security inspector. Although there are security standards for small businesses, no one monitors their activities. By applying minimum requirements and adhering to the frameworks, locations hosting their services could create a safer environment for themselves and their customers. We cannot always depend on other businesses. The Internet's final output is its consumers. Any PII (Personal Identifiable Information) could be sold or used for malicious purposes. We must possess the knowledge necessary for safety. Although easier said than done, there are three fundamental ways a person can safeguard themselves. Passwords can be managed using password managers such as LastPass, Keeper, and Bit Warden. This additional layer of security will benefit users who provide information to other businesses. Password Managers prevent repeated use of the same password by saving passwords generated at random in a password vault. Multi-Factor Authentication, also known as MFA, adds a second identification method. Having an MFA application or the opportunity to utilize MFA will aid in staying secure. This may involve phone calls, text messages, codes, or biometrics such as a fingerprint or face scan. A second authentication attempt may prevent an unauthorized user from accessing the user account from a different device. Using a VPN (Virtual Private Network) in a location with public Wi-Fi will create a secure gateway from one site to another. This keeps network packets encrypted and prevents attacks such as a Man-In-The-Middle attack that a hacker may attempt to implement. Reducing vulnerability makes it difficult for threat actors or hackers to access private information. Influencing hackers to proceed to less complicated and unprotected targets. Keeping businesses in line and adhering to these fundamental security standards will reduce the likelihood of risks.

P10.11

ELECTRIC BILL PREDICTION VIA SMART HOME APPLIANCES

Justin Kennedy, Bilal Abu Bakr

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Sustainable energy is a means to use energy in a way that both meets the needs of the modern world and is also efficient. Smart home applications are many, complex, and widely used thanks to the Internet of Things (IoT). IoT applications use energy, and IoT devices' numbers and needs are still expanding. Smart devices at home are not sophisticated enough. Although energy-efficient devices have been on the market for some time, no measurements show how much electricity each device uses. As a result of the nationwide increase in the cost of electricity, the appliances in a smart home should be able to monitor the amount of power consumed by each appliance and provide an estimate of the monthly cost of electricity. Customers will be able to monitor better the gadgets they use, keep an eye on their monthly expenditures, and adjust usage accordingly. Smart houses must therefore be able to use energy effectively and manage the problems that come with it. We offer a smart home system including energy efficiency features. Standard household equipment should have wireless power metering interfaces to access energy usage data. These data are utilized to track and assess energy consumption at the device level in almost real time. Additionally, precise data on energy use can be utilized to program and operate home appliances effectively based on various variables, such as the cost of electricity. User interface difficulties continue to grow as data becomes more accessible to end users. Consequently, we finish the smart home system with user-friendly interfaces that present energy usage information in settings that are useful to the end users and make it possible for them to interact with their surroundings. We contend that the combination of a technically advanced application for smart homes with concurrently transparent and user-friendly interfaces showing information regarding energy usages, such as information regarding the price of energy, the source of energy, standby consumption, and other similar information, has the potential to make the dream of an energy-efficient smart home a reality.

P10.12

COOKIES AND THE PRIVACY CONCERNS OF ONLINE DATA COLLECTION

Aram Boivin, Bilal Abu Bakr

Collin College, Frisco, TX

The Internet is an indispensable resource in our daily life. Due to its ease of information transfer, most people have transformed the Internet into a virtual space where they store diverse information and conduct everyday business and personal activities. As a result of the digital footprints people leave during numerous web sessions, the volume of data deposited on the web facilitates the surveillance of individuals. The usage of cookies to create individual profiles has raised significant privacy issues. Almost every service offered on the Internet is designed to treat the user as a resource to be abused. Many of us unintentionally "agree" to different sorts of tracking anytime we use an online service, including tracking cookies. These businesses are currently not doing a good job protecting customer data, as seen by the numerous high-profile breaches we witness yearly. Large organizations, like corporations, become unstoppable targets for street organizations and even competing foreign nations when they amass enormous volumes of customer data. The solution would be a combination of impetuses and punishments. Because there is much money to be earned from selling data for analytics, corporations have been granted unrestricted control over the Internet's front end. The impetus would consist of providing incentives to firms that do not track user traffic throughout the Internet and only retain the bare minimum of user data necessary to supply whatever services they provide to their consumers. These incentives could originate from municipal, state, and federal government legislation, as well as from privacy-focused groups and commercial sector entities. The punishment would include constraints on what data these firms might acquire, how they can use it to create a profit, and transparency requirements for users. These limits would be enforced by municipal, state, and federal governments, with stiff fines levied upon firms that fail to comply. Strict privacy regulations, like the General Data Protection Regulation (GDPR) in the European Union (EU), are urgently needed and should be harmonized at the national level. The new legislation must specify which information is being gathered, why it is being collected, what it might be used for, how long it is being retained, and the motivations and penalties that may result from doing so. When a customer withdraws their consent, businesses must be forced to stop collecting their information.

P10.13

AN IMPROVED MONITORING AND DRIVING SYSTEM FOR SMART VEHICLES

Bilal Abu Bakr, Saida Meftah

Collin College, Frisco, TX

To make use of the knowledge contained in the collected data, comprehend what is happening in the environment, and eventually take actions to maximize their usefulness, intelligent systems and technologies have been developed. The Internet of Things (IoT) era is defined by billions of smart gadgets connecting, interacting, and exchanging data. Automobiles play a crucial role in modern society, so automobile manufacturers seek innovative IoT solutions that support drivers and increase safety. Recent research efforts have focused increasingly on intelligent healthcare monitoring systems employed for patients and advised for seniors, athletes, drivers, and homemakers. If an intelligent healthcare monitoring system is accessible in automobiles at a reasonable price, it can be utilized by the driver community to take preventative actions, reducing the likelihood of road accidents. Diabetes has been identified in many of those with a driver's license. According to a study, a sudden drop in blood sugar levels might cause a blackout, posing a grave threat to the driver and other motorists. We suggest a smart steering wheel that utilizes an integrated electrocardiograph and oximeter to detect crucial health or sleepiness factors, such as heart rate, heart rate variability, and blood oxygenation. A pulse sensor on the intelligent steering wheel monitors and

analyzes the driver's heart rate and movement patterns. The objective is to provide a unique monitoring system for the driver. The intelligent steering wheel periodically monitors the driver's health status. If there is a significant deviation from the standard value, the relevant information is conveyed to healthcare service providers. The output can be shown as a spectrum and saved in a digital audio format to assist clinicians in diagnosing the condition of the heart. Using the heart rate variability method, the state of the heart and the driver's stress levels can be determined based on the analysis of heart sounds. A smart steering wheel in a vehicle will facilitate the driver's ability to make route decisions based on his heart health. Smart steering wheels centered on the deployment of IoT in autos for driver safety to reduce road accidents.

P10.14

MCIS DEPARTMENT SOCIAL NETWORKING PLATFORM

Stacy White[1], Oluwaseyi Advisor[2]

[1]Advisor, [2]Presenter

For my senior project, I plan to design and implement a departmental social networking platform which will be an internet-based web application that helps the faculty, staff, and students of the mathematics, computer, and information sciences (MCIS) department to stay connected. This networking platform will create an avenue for students in the department to build social networks or relationships with one another especially if they share similar personal/career interests, backgrounds, activities, courses, and so on. It also provides a means for the faculty and staff members to share general information/announcements relating to the department without the use of emails (which students may not check frequently). This platform can be a great tool for students to learn and communicate as it allows them to connect with their course mates and instructors in a new way. For instructors and professors, this platform can be used as a means of sharing additional knowledge in a way that works for themselves and students while also combating the issue of information overload associated with tools like canvas. It also makes the instructors more accessible to students in a more informal sense than it would be in a classroom or office environment where questions may not be properly asked/left unanswered. In society today, people are always on their phones and glued to social media platforms which have led to a significant increase in online learning with more and more people using online content or information shared online to learn. The social networking platform being proposed could be a powerful tool for students to learn outside of the classroom when the appropriate resources are provided to them through it. In addition to the academic benefits, this platform could be used as a means of self-care for students in the department struggling with mental health or emotional issues in that students can be socially connected to one other to ease stress, anxiety, and depression, boost self-worth, provide comfort and joy, prevent loneliness, and increase their overall quality of life.

P10.15

STUDENT SERVICES FACILITATOR

Khaled Sabahein

Mississippi Valley State University

In this project, the focus is on some of the current limitations faced by mainly students but can also be applicable to other staff and non-staff employees of Mississippi Valley State University. Currently, there are various areas of student life that lack ease, and there have been no remedy, or insufficient remedies to improve some of these areas. Some of these areas include student transportation, tutorial services, reuse of common items used by student amongst others. What this project aims to achieve is to bolster the efforts put in place to assist students in these areas. It is important for students because ease of student life, can support students in having a good balance between student life and personal life. For example, easy access to transportation can help save time and money, which in turn can leaves time to focus more on academics. Another reason this project is needed because, it is more of a need than want. Students need flexible tutorial hours, easy access to transportation and ability to sell off unused items that can be valuable to another student. The benefits that can be derived from this project are highly valuable.

P10.16

QUICK LIBRARY: A LIBRARY MANAGEMENT WEB APPLICATION

Oluwapelumi Olutimehin

Mississippi Valley State University

For the longest, libraries have always served as gateways to knowledge and culture, and a backbone of education and literacy. They provide various resources and opportunities for learning. Over the years, several studies show there has been a declining usage of libraries despite the various benefits they offer. A library management web application can help reduce this trend by providing easy and convenient access to library resources. With this web application, students and other learners are able to easily browse through the library's catalog and learn about the other available resources. From the library administration's perspective, I can imagine manual bookkeeping would be a big hassle. Such an application would be beneficial as it offers efficient management of data, such as issue and return details, book details, student information, and much more. This application makes it easier for the staff to keep records of the many logs in an organized manner.

P10.17

AMERICAN SIGN LANGUAGE INTERPRETER AND TRANSLATOR

Adedapo Adeola

Mississippi Valley State University

Sign Language is a system of communication using visual gestures and signs, as used by deaf or hearing-impaired people. It is achieved by simultaneously combining hand shapes, orientation, and movement of the hands, arms, body, or facial expressions. Different parts of the world have their standards/forms of sign language; one is the American Sign Language. American Sign Language is a natural language that

serves as the predominant sign language of Deaf communities in the United States and most of Anglophone Canada. The primary purpose of this project is to bridge the communication gap that still exists in our current time. With the present advanced technologies, we would think that communication would not be a problem between individuals, but that's not the case. What happens when we want to communicate with a deaf person and do not know sign language? It might seem like a minor inconvenience on a typical day, but in the scenario of an emergency, knowing or not knowing sign language might just be the defining factor of life and death. Even educationally, this hurdle exists. For example, I doubt the Mississippi Valley State University, or the Mathematics, Computer, and Information Science department have any technology or software in place to accommodate deaf students or help them have a seamless conversation with other students or teachers. This project will serve as a huge leap into BREAKing language barriers.

P10.18

IDENTIFYING STATE OF A DRIVER USING YOLO

Vijayaprasad Chaitanya Pasupula, Zhaoxian Zhou

University of Southern Mississippi, Hattiesburg, MS

Distracted driving is the most common reason for automobile accidents in the United States. Main distractions that drivers must deal on the road is cell phone, sending a text, answering a call or by taking their focus off the road and other distraction include eating while driving, feeling sleepy and yawning symptom of drowsiness. Face recognition is the challenge of recognizing an individual in a snapshot on their appearance. Humans can easily complete this task, even under different lighting conditions and with faces that have changed with age or are obscured by accessories and facial hair. Nevertheless, until recently, it remained a difficult computer vision challenge. To identify the state of a driver we collected different images and labelled them with their respective states such as OnCall, Texting, InGest, NoFocus, Active, Sleepy and Yawning. Later we trained YOLOv5 with labelled image and built a model with 7 classes. We used Google CoLabs GPU for training the data set, with 500 epochs, 10 batch and for weights used pretrained weights like yolov5s. The results were impressive, the proposed model was able to identify the state of a driver with 0.995 mean average precision(mAP). By predicting the state of a driver, we can warn the driver based so that driver can contrate on the road and drive safely.

Friday, February 24, 2023

MORNING

Room D4

7:50 Welcome

O10.22

8:00 SIBLING RIVALRY: BROTHER V BROTHER – WHO'S BETTER?

Jalin Walker

Mississippi Valley State University, Itta Bena, MS

In sports across America, there are various examples of sibling rivalries within the same sport where there seems to be a better sister or brother. Some athletes who come to mind are Stephen and Seth Curry, Venus and Serena Williams, as well as Eli and Peyton Manning. It is simple to say who is most successful by debating statistics from each league, but this study will support the notion with an in-depth view of a Player's Efficiency Rating (PER). Using multiple linear regression with various contributing independent variables to a PER score such as points-per-game, rebounds-per-game, etc. (dependent variable), a comparison will be made between thirty sibling pairs across three American pastime sports – basketball, baseball, and football. Once the comparison is made between the pairs, the results will be analyzed to truly decide if a younger sibling will be more successful than their older sibling at a sport. This paper will answer the age-old question of "Who's better?" between siblings.

O10.23

8:15 SALES ANALYSIS USING PYTHON WITH PANDAS LIBRARY

Cyrus Kunwar, Ping Zhang, Stephen Love

Department of Mathematics and Computer Science Alcorn State University, Lorman, MS

Success in sales used to depend on subjectivity and intuition. Technology have improved in the field of data analysis. A few years ago, data were collected in a laborious and tedious manner. Data cleaning was an extremely time-consuming procedure, and the available tools were limited. In this presentation, the literature survey has been conducted. It is concluded that both small and large businesses have changed their way of gathering data. The analysis of these collected data is used to make significant decisions for the business. Understanding the sales trends, using the statistics to develop strategies, and project future sales and revenues can be implemented with data analysis. By keeping track of prior sales data, revenue, clients, orders, etc., it enables us to compare trends and have a better grasp of the present trends. The objective of sales data analysis is to make use of the information at the disposal. The data is collected, cleaned, analyzed, and presented. For the implementation of this project, a simulated company's annual sales data are examined to determine the month with the highest sales and the most popular product using python libraries, such as NumPy and Pandas. Results and sales data for each month are visualized using the matplot lib package. Following data analysis, the information can be utilized to further advise the organization on how to improve its strategies for the upcoming year.

O10.24

8:30 REVIEW OF FACE RECOGNITION INTELLIGENT ACCESS CONTROL ALGORITHM AND IMPLEMENTATION

YuZhong Huang, Ping Zhang

Dept. of Math and Computer Science, Alcorn State University, Lorman, MS

As a typical biometric identification technology, face recognition has high uniqueness and stability. Recently, the access control system has been developed rapidly from the initial single form of password recognition, fingerprint recognition, iris recognition to multiple detection methods, which connect mobile APP and QR code, multi-system, cross-platform operations. This presentation reviews the characteristics and development prospects of mainstream face recognition access control systems from the core algorithm to system design. This review is mainly focused on the following three methods for face recognition access control system:

1) Face recognition smart door based on OpenMV machine vision module

2) Access control system based on MTCNN algorithm and FaceNet algorithm

3) Smart door lock system based on Jetson Nano computer and OpenCV (Open Source Computer Vision Library)

First of all, the face recognition intelligent door lock system uses the OpenMV machine vision module to intelligently collect face information, recognize and judge the face information by comparing the image LBP operator.

Secondly, in the access control system, MTCNN algorithm + FaceNet algorithm are employed for face recognition. The system can effectively recognize faces and perform unlocking operations.

Finally, an intelligent door lock system based on Jetson Nano computer and OpenCV is introduced. The system uses OpenCV to develop a novel face recognition algorithm and the algorithm is embedded into the Jetson Nano small artificial intelligence computer. Some face recognition applications are also introduced in the presentation.

O10.25

8:45 A COMPARISON STUDY OF HIGH-RESOLUTION FINITE DIFFERENCE SCHEMES FOR SUPERSONIC FLUID FLOW

Shiming Yuan[1], Demetric Baines[1], Yong Yang[2], Yonghua Yan[1], Caixia Chen[3]

[1]Jackson State University Jackson, MS, [2]West Texas A&M University, Cayon, TX, [3]Tougaloo College, Tougaloo, MS

A comparison study of three different high-resolution numerical schemes based on the WENO (weighted essentially non-oscillatory) scheme was carried out to explore their ability to solve the governing equations of supersonic fluid flow. Three high-resolution schemes proposed in recent years-6th-order WENO scheme, 5th order bandwidth-optimized WENO scheme, and the Modified Weighted Compact Scheme were selected and compared with the classic 5th order WENO scheme. We study and compare the results of these numerical schemes for solving the governing equations of supersonic fluid flow. The results show that the Modified Weighted Compact Scheme has a higher resolution. We also checked the performance of various numerical formats under different flux splitting methods, and the results show that the Modified Weighted Compact Scheme has the least deviation of the results obtained under different methods. In addition, in terms of numerical stability, Modified Weighted Compact Scheme is obviously not as good as other schemes, especially the boundary conditions have a huge impact on the results.

O10.26

9:00 NUMERICAL SIMULATION OF THE MVG CONTROLLED HYPERSONIC FLOW

Demetric Baines[1], Shiming Yuan[1], Yonghua Yan[1], Yong Yang[2], Caixia Chen[3]

[1]Jackson State University Jackson, MS, [2]West Texas A&M University, Cayon, TX [3]Tougaloo College, Tougaloo, MS

The MVG (Micro Vortex Generator) is a kind of passive control device for controlling supersonic boundary layer flow. In our previous study, it has proved that the vortex structure it produces, especially the spanwise vortex structure, is very effective in reducing the separation zone caused by the shock wave in the supersonic flow. In this study, LES (Large Eddy Simulation) was performed on MVG-controlled high-speed flow at hypersonic velocity (Ma>5.0). In previous studies, our numerical results found that within the supersonic flow with a higher Ma number, the profile of the vortex structure produced by the MVG is lower, resulting in more interactions with the vortex structure in the lower boundary layer. In the hypersonic flow at Ma 5.0, the profile of the vortex structure produced by the MVG is even lower. In this study, numerical simulations provided detailed information about the 3D flow field, especially the vortex structure generated by the MVG. The results show that at hypersonic speed, the formation of spanwise vortices is affected to some extent. The spanwise vortices do not form immediately behind the MVG, and the weaker spanwise vortex forms and develops only when the momentum deficit region is raised in the downstream flow. The results show that the vortex structure generated by MVG becomes more complex in high-speed flow due to more interference with the underlying flow, but the development of spanwise vortices is limited.

O10.27

9:15 NUMERICAL STUDY ON THE VORTEX STRUCTURE GENERATED BY TWO MVGS ARRANGED IN TANDEM

Yonghua Yan[1], Yong Yang[2], Caixia Chen[3], Demetric Baines[1], Shiming Yuan[1]

[1]Jackson State University Jackson, MS, [2]West Texas A&M University, Cayon, TX, [3]Tougaloo College, Tougaloo, MS

MVG (micro vortex generator) is a thin passive control device used to control the supersonic boundary layer flows. It turns out that the vortex structures it produces, especially the ring-like vortices, are very effective in reducing the shock-induced separation zone in supersonic flows. In this study, LES (Large Eddy Simulation) was performed on a supersonic flow controlled by two MVGs arranged in tandem under the influence of different inflow conditions. In previous studies,

usually only the flow field of one MVG is studied. However, in specific engineering applications, the effect of multi-row arrangement of MVGs on the flow has not yet been studied. The influence of different arrangements of MVGs on the flow is a prerequisite for further optimization of MVG configurations. In this study, numerical simulations provided detailed information on the 3D flow field, especially the vortex structures generated by two MVGs. The results show that the vortex structures produced by two tandemly arranged MVGs have a strong mutual influence downstream, and both the spanwise vortex and the streamwise vortices undergo a large number of merging processes. In the process of flowing downstream, although the vortex structure generated by the MVG becomes more complex, it is strengthened, so that it has a better flow control effect on the supersonic boundary layer.

O10.28

9:30 A COMPARATIVE STUDY OF MACHINE LEARNING ALGORITHMS FOR PREDICTING SUICIDE RISK AMONG YOUTHS

Saswati Bhattacharjee[1], Meng Song[1], Lei Huang[1], Lei Zhang[2], Bo Wang[3], Ping Gong[4], Chaoyang Zhang[1]

[1]The University of Southern Mississippi, Hattiesburg, MS, [2]University of Mississippi Medical Center, Jackson, MS, [3]University of Massachusetts Chan Medical School, Worcester, MA, [4]U.S. Army Engineer Research and Development Center, Vicksburg, MS

Suicide is the second leading cause of death among youths. The assessment and early prevention of suicide are very challenging tasks. Recent studies show that machine learning approaches have provided great potential for the prediction of suicide risk using survey data but the prediction accuracy may not meet the need of clinical diagnosis due to the intrinsic characteristics of survey datasets such as high dimensionality, presence of missing values, multiple data types and class imbalance. Thus, in this study, we perform a comparative study of six representative classification algorithms using Youth Risk Behavior Survey datasets and investigate the effectiveness of several data handling techniques to improve the overall performance of suicide risk prediction.

Six predictive classification algorithms including naïve Bayes (NB), logistic regression (LR), support vector machine (SVM), multilayer perceptron (MLP), random forest (RF), and bagging were used to predict suicide risk among youths. The dataset was selected from the survey conducted on 136 high school students in the United States of America in 2019. The questionnaire in the survey includes 78 different health risk-related questions. We used missing value imputation and feature selection methods to preprocess and then selected 13,437 responses from the cleaned data. In addition, sampling techniques such as random under sampling, random oversampling, and synthetic minority oversampling technique (SMOTE) were used to deal with the class imbalance problem with an imbalance ratio of 4. After that, the preprocessed dataset was partitioned into a training dataset (70%) and a test dataset (30%) using a stratified partitioning method. The prediction performance was evaluated using four metrics including precision, recall, F2 score, and area under the receiver operating characteristic curve (AUROC). The results showed that LR classifier achieved a recall of 0.800, F2 score of 0.689, and AUROC of 0.843, and it outperformed all the other five classifiers. It is also found that oversampling and feature selection methods significantly contributed to the improvement of prediction performance when different classifiers were used. Therefore, the machine learning algorithms selected in this comparative study, combined with feature selection and oversampling techniques, can provide a powerful supplementary tool to identify approximately 80 percent of adolescents with a high suicide tendency based on the survey of their behaviors, which can greatly facilitate the clinical diagnosis and early prevention.

O10.29

9:45 BRAIN TUMOR ANALYSIS USING MACHINE LEARNING

Viswanath Davuluri, Gireesh Chaitanya Kota, Nithin Samudrala

The University of Southern Mississippi, Hattiesburg, MS

The International Agency for Research on Cancer (IARC) estimates that the mortality rate due to brain tumors is 76%. It may cause death if not detected in the initial stages. Despite numerous significant efforts and positive outcomes in this area, exact segmentation and classification remain challenging. Because of the differences in tumor location, shape, and size, detecting brain tumors is extremely difficult. In this project we will use image processing techniques for brain tumor analysis. We employed Convolution Neural Network (CNN) because of its efficiency and precise image analysis which is possible by adding activation layers (ReLU). We detect tumor based on the gray matter and white matter contents in the brain which can be best depicted by MRI images. We used brain images dataset from Kaggle and NIH websites to test and train our model. We resized our images into a uniform image with fixed dimensions. We built our model in a way that it takes 70% of data for training and 30% of data for testing purpose. Our model is more efficient than existing ones as we expect to achieve an accuracy of 90% which will be presented later.

O10.30

10:00 ARTIFICIAL INTELLIGENCE: FRIEND OR FOE?

Brannin Jackson, Tyreek Brasfield, Adrian Jackson, William Wroten, Yaju Shrestha, Zohaib Chaudhary.

School of Computing Sciences and Computer Engineering, University of Southern Mississippi., Hattiesburg, MS

Artificial intelligence (A.I.) can be quite a daunting undertaking when attempting to understand the direction that technology is leading to. A.I. is layered with a multitude of applications that include mathematics, philosophy, and probability, along with a multitude of other diverse applications. While there are several different subsets of machine learning, Artificial Neural Networks (ANN's) are a substantial part of leading designs furthering the development of artificial intelligence. ANN's are modeled after the make-up of neurons of the human brain and function similarly to brain neurons as well. The neurons or nodes communicate to compute the desired output of an algorithm. This paper

attempts to explain the workings of different machine learning models like ANN'S, k-nearest neighbor (KNN), Decision Tree algorithms, Random Forrest algorithm's and RIPPER algorithm's. Not being limited to only machine learning algorithms, this paper will also investigate different real world use cases of A.I. One of them being image processing for computer vision.

In addition, this paper will shed insight on the history of A.I. development. It will address the fathering of the term artificial intelligence in 1950 until 2014, where an advanced chat-bot named Eugene Goostman fooled human researchers into believing it was a person. Here we also discuss the ethicality of A.I. This will be shown by three main topics that include the use of A.I., autonomous weapons, the threat of job security, automation posed by A.I., as well as privacy, and security being taken away as a result of artificial intelligence becoming the forefront of most government intelligence agencies. Finally, we attempt to explain the challenges of A.I. development, as it has shown a posing risk in computing power which limits the capability to excel in the oncoming ice age of A.I.

O10.31

10:15 CRIME SCENE DOCUMENTATION USING IMAGE STITCHING SOFTWARE

Puneeth Kumar Bolugallu Padmayya, Manoj Bolugallu Padmayya, Ping Zhang, Lixin Yu

Alcorn State University, Lorman, MS

Evidence is vital to demonstrating or refuting guilt or innocence, and the court's decision is based on the facts as they were witnessed. The documenting of crime scenes is essential for the administration of justice. The victim's or the deceased's voice will be heard through the evidence found at the crime scene. Justice will be obstructed even slightly by a mistake in the gathering of the evidence and documenting the same. Therefore, gathering and documenting the majority of the evidence found at the crime scene is crucial for the forensic professionals. One such type of document is a photograph.

One of the subfields of forensic sciences is forensic photography. The crime scene photo alone will tell a story. The value will be increased by a better demonstration and a better understanding of the scene if the photos are in order or sequence, though. In this paper, I would want to use 'Image Stitching Software' to show how to simulate a crime scene, document the findings, and walkthrough with ease. In addition, I will show how the photographs taken at the crime scene and the walkthrough created using the same photos differ in their aesthetic appeal. This kind of documentation at the crime scene is crucial for improved comprehension and better documentation, both of which will result in better justice.

O10.32

10:30 FACIAL EXPRESSION RECOGNITION USING MACHINE LEARNING

Poojitha Uppu[1], Praveen Chaganti[1], Sarbagya Ratna Shakya[2], Zhaoxian Zhou[1]

[1]The University Of Southern Mississippi, Hattiesburg, MS,
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Automatic recognition of human affects has grown more interesting and challenging in the fields of artificial intelligence, human connection, and object recognition. One of the most important elements to understand human emotion is facial recognition (FR) . Facial Recognition (FR) has received important interest from daily human interaction. For the purposes of evaluating health care, analyzing human affect, and interacting with computers, psychologists and computer scientists are needed. Emotions are exhibited by people in number of ways including body gesture, word, vocal and facial Recognitions. Because the face may express mainly emotions, recognition is a significant channel for expressing emotion data from various persons. In our study, we have done research works related to Facial Recognition. Typically, the studies describe the following universal Recognitions: anger, disgust, fear, pleasure (or happiness), sadness, neutral and surprise. The research looks into the specifics of the facial dataset, feature extraction techniques, comparison results, and future studies of the emotion recognition system. In our project we will be using Convolution Neural Network (CNN) which will be compared with existing edge detection method. Currently, we have observed 88% of the accuracy through our CNN model. Our project will be helpful for solving facial recognition problems.

O10.33

10:45 SKIN DISEASE CLASSIFICATION USING MACHINE LEARNING ALGORITHMS

Meeravali Kocherla[1], Babavali Kotcherla[1], Puneet Alla[1], Sarbahya Ratna Shakya[2], Zhaoxian Zhou[1]

[1]The University of Southern Mississippi, Hattiesburg, MS,
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Skin diseases can lead to a significant negative impact on the quality of life and health of the patients. It is evident that skin diseases pose a major problem for societies due to the psychological and physical effects that they have on their patients. To treat skin diseases effectively, it is crucial to detect them at an early stage. Specialist doctors are required to have the necessary skills and experience to diagnose and treat skin injuries. It is imperative that the diagnostic process be accurate and timely. The most recent study has proposed a method which is not only effective but also efficient in identifying certain skin conditions. The development of automated approaches is required in order to improve the diagnostic accuracy of numerous skin disorders. In the context of this proposed system, a novel identification approach was able to differentiate between three different types of skin disorders, namely acne, rash, and erosion skin disease. Initially, filtering and modification were used on skin photos as part of the preprocessing step to eliminate noise and extraneous background. After that, the grey-level co-occurrence matrix (GLCM) technique was implemented as a means of segmenting pictures of skin diseases. It was possible to acquire precise renditions of the texture and color characteristics of a variety of skin diseases. These features are preprocessed with different filters enabling them to identify the overall change in specific conditional parametric such as area and perimeter of the segmentation. These metrics are utilized to create new features enabling the minute change in images can verify with different filter design aspects. The next

step was to use the support vector machine (SVM) and other classification algorithms, which allowed for the identification of three distinct skin disorders. The results of the tests show that the plan that was presented works and is possible. Experimental results show that the proposed system can detect dermatological diseases with high accuracy despite the small dataset. The created program is portable and is suitable for devices with modest system requirements and a user-friendly interface.

O10.34

11:00 BANK FRAUD DETECTING USING SMOTE TECHNIQUE AND LOGISTIC REGRESSION IN MACHINE LEARNING

Vinay Basa[1], Raveendra Chowdary Chadalawada[1], Sarbagya Ratna Shakya[2], Zhaoxian Zhou[1]

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[2]Eastern New Mexico University, Portales, NM

As we are advancing in Technologically with the development of computing and communication technologies, bank frauds are growing enormously. Mainly, In the banking sector, Personal loans and Credit card frauds are becoming a serious problem in financial services. Personal loan transactions are sanctioned by financial institutions by either physically or digitally. The number of digital transactions in 2015 throughout globe was at about 3.2 billion and increased in 2019 to about 4.6 billion. With the rise of personal loan or credit card usage, the number of fraud cases has also been speedily increased. Hackers or Fraudsters use the internet as their identity and location are hidden and they can sit from anywhere in the globe and easily can be hacked our accounts due to low security methodologies using by the financial institutions. Merchants and Retailers are losing billions of dollars due to personal loan and credit card frauds every year. There is significant research is going about detection of fraud transactions in the banking sector. Even though most of the predictive models are complex models so we are trying to implement our project that anyone can easily understands. Research studies on analyzing real-world personal loan and credit card data owing to confidentiality issues. In this project, we are using machine learning as a primary domain and implementing algorithms to detect personal loan or credit card frauds. We have made a lot of research work on literature review related to financial fraud transactions and found few machine learning models are already implemented using Random Forest techniques and it is having less efficiency. So, firstly, we planned to use Linear regression algorithm and worked for few weeks and got to know that binary classification is not suggested in Linear Regression technique. But we are using a feature called 'Class' to define whether data is Fraud or Non-Fraud. So, Linear regression technique is not much useful here so later we have started working on Logistic Regression algorithm. We took the dataset from online and it contains 30 features and few mandatory properties. We are planning to implement new Logistic Regression algorithm on dataset and also planning to apply synthetic minority oversampling technique (using SMOTE). We also planning to train our machine learning model by using 70% of the dataset and using 30% of the dataset is being used for testing. We will calculate the accuracy of the model. As we already mentioned above significance of this paper is to help the financial institutions for analyzing fraud detection.

O10.35

11:15 THE 21'S STORE: AN ECOMMERCE APPLICATION USING MICROSERVICES ARCHITECTURE

Prashanth Kumar Machani, Maneesh Reddy Yalamareddy, Reshma Swaraj Kurra

The University of Southern Mississippi, Hattiesburg, MS

In today's fast-paced business environment, it is critical to be able to respond to client needs in the most effective and efficient manner possible. Maximizing agility to stay ahead of the curve is an obvious priority in fast-paced, hyper-competitive industries like retail and e-commerce. However, incorporating agility into the backend systems can be more difficult than it appears, especially when running a monolithic legacy platform. Microservice architectures aim to address the shortcomings of monolithic architectures, which manage all the application's logic and data in a single deployable unit. "The21'sStore" is a web-based lifestyle e-commerce application built using the microservices architecture, which sells a wide range of fashion and lifestyle products. This is a project with the objective to develop a website that allows users to explore various products and purchase desired items. This project includes a discussion of various aspects of developing an e-commerce website, as well as the planning process, which begins with determining the use case and continues with domain modelling and web application architectural pattern and describes how the properties of microservice architecture facilitate scalability, agility, and reliability at "The21Store". The development process is divided into two sections: front-end development and back-end development. The configuration of the database is also discussed, with an increased focus on its relational connectivity. The end result of this application is that a user can create an account, view the products listed on the site, add a product to the cart and finally place an order.

O10.36

11:30 AIR POLLUTION PREDICTION OF PM2.5 USING REGRESSION ML MODELS

Rajesh Kantamneni[1], Naga Sahithi Pavuluri[1], Sarbagya Ratna Shakya[2], Zhaoxian Zhou[1]

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In the developed countries, urbanization and industrialization have been growing over the past few decades, and they are now struggling with the severe problem of air pollution. Governments and the public have grown more concerned about how air pollution affects human health and have advocated sustainable development as a solution to the world's pressing air pollution problems. The result of modern industrialization is dispersed in the atmosphere as liquid droplets, solid particles, and gas molecules. The high concentration of PM10 and PM2.5 particulate matter has a detrimental impact on human health. By measuring the amount of particulate matter in the air, we can improve human health, which is of utmost importance. The s main objective

of our project is to compare the various machine learning models used to forecast PM2.5 (PM2.5). The number of particulates (PM2.5) required to set off an alarm when certain threshold values are reached can therefore be predicted by this model with the least amount of error in a timely manner. We worked on the three Regression models, first one is the decision tree regression model, in this model we obtained an accuracy of 82.706%, then we worked on the XGBoost Regression model and obtained an accuracy of 88.306%, XGBoost having given the best result compared to the decision tree regression model. Finally, we worked on the Random Forest model Regression model and obtained an accuracy of 90.6%, After comparing the accuracy of the three models Random Forest has given the best accuracy compared to remaining Two Models, So Random forest regression model is the best suitable for our project.

O10.37

11:45 HAND GESTURE RECOGNITION

Venkata Sainath Kolla

The University of Southern Mississippi, Hattiesburg, MS

Hand gestures are commonly used for computer - human communications. Hand gesture recognition system can be used for interfacing between computer and human using hand gesture (Human- Computer Interaction [HCI]). Gesture recognition being a non-cognitive computing user interfaces, allows machines to understand the human gestures and execute commands based on those gestures. Recent advances in deep learning and sensors have made it possible for the machines and computers to understand human activity completely. Using some of these technologies, we are trying to provide a working- code for hand gesture- recognition in a real- time system. This piece of code can be implemented in applications for its dynamic and various uses. The actual development of the human hand produces signals, and hand motion acknowledgment prompts the progression in robotized vehicle development framework. In this project, the human hand motions are identified and perceived utilizing convolutional neural networks organizations (CNN) characterization approach. We have used some complex libraries like tensor flow for classification. To get the outline of the recorded hand, we used hull model. It is defined as the smallest linear subspace of a vector space containing a given set or the union of all linear combinations of points in the set. To work accurately we defined a set of set of points in the code. We have used SGD (stochastic gradient descent) as an optimizer. It is defined as an iterative method for optimizing the objective function with suitable smoothness properties.

As of now, I have executed with the testing, training, and compiling of the images that I have taken. Now I was implementing a code for the video detection in which we can analyze frame by frame and can implement our project by using the trained images.

Friday, February 24, 2023
AFTERNOON

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

Friday, February 24, 2023
AFTERNOON
Room D4

O10.38

1:00 A.I. SOCIETY AND ETHICS

Tamar Gibbs, Khadichabonu Valieva, Patrick ONeill, Christopher Reed, Paul Mackay

University of Southern Mississippi, Hattiesburg, MS

The world of A.I. is often plagued with misinformation and bias in relation to how it plays out in society. This paper seeks to clear any misconceptions regarding A.I. and its effect on society. First, this paper covers the basics of what A.I. is. And then it goes into detail about how A.I. performs, what its functions are, and how they are generally created. After that, any common myths related to A.I. are debunked. These myths can be anywhere from positive or negative, or just neutral. The morality and ethics of A.I. is another important topic in relation to society. A.I. ethics has its own set of principles that determines the end product of an A.I. and is related to all topics covered in this paper.

Another goal of this research work is to give insight into A.I. as it relates to the healthcare industry and the ethical dilemmas that arise from such a relationship. While A.I. can be properly utilized to effectively improve healthcare, ethical questions including questions on privacy and surveillance, bias and discrimination, and the question of how much power should man forfeit to machine are explored. Although A.I., if harnessed effectively, can support a plethora of health-related roles including epidemiology, personalized care, and operational efficiency, the ethical questions that accompany such discoveries.

In all theories of learning and intelligence, learning comes from interaction. There are three types of machine learning: reinforcement learning, supervised and unsupervised learning. Reinforcement learning is an approach to what to do—how to map situations to actions—to maximize a numerical reward signal. It is different from supervised learning, the kind of learning studied in most current research in the field of machine learning. The supervised learning method involves learning from a set of labeled examples provided by a knowledgeable external supervisor. Unsupervised learning, which typically involves discovering structure in collections of unlabeled data, is also different from reinforcement learning. Unlike other approaches to machine learning, reinforcement learning is much more focused on goal-directed learning from interaction.

We will explore the machine learning approaches and limitations in the A.I. application fields. While A.I. has its usefulness, the consequences can be catastrophic. The dangers of A.I. include techno-solutionism, disinformation, privacy concerns, the weaponization of A.I., concerns regarding Democracy, and the general danger of connecting

everything. To combat the potential dangers of artificial intelligence, states have crafted various anti-artificial intelligence laws; however, as of the date of this paper, no federal comprehensive artificial intelligence legislation exist.

The rate at which artificial intelligence continues to grow is unabated with worldwide and widespread adoption. This has caused a strain because existing regulations struggle to deal with all of the emerging challenges that come with the growth of artificial intelligence. Governments across the globe are moving quickly to ensure that the laws of today remain relevant. Our paper also provides deep insight to the existing law and regulations on A.I.

O10.39

1:15 WORD LEVEL SIGN LANGUAGE DETECTION

Viswanath Davuluri, Gireesh Chaitanya Kota

The University of Southern Mississippi, Hattiesburg, MS

It is very hard for the deaf and dumb people to communicate, understand and express their feelings to others. According to World Health Organization global report, 434 million people are suffering from hearing and speaking disabilities. To help these people from our side, we came up with an idea using Deep Learning to solve this problem. The primary aim of our project is to communicate with people having hearing and speaking disabilities by creating a deep learning algorithm that can translate hand gestures to normal speaking language. We employed Convolution Neural Network (CNN) in our project because of its efficiency and precise image analysis which is possible by adding activation layers (ReLU). We used American sign language symbols dataset acquired from Kaggle website, to test and train our model. We capture Input video for a user-defined time slot that collects pre-defined set of gestures that are required to form a word that user wanted to say and display that respective word. We built our model in a way that it takes 70% of data for training and 30% of data for testing purpose. Our model is more efficient than existing ones as we expect to achieve an accuracy of 90% which will be presented later.

O10.40

1:30 DETECTION OF FAKE SOCIAL NETWORK PROFILES

Caleb Wingard, Bilal Abu Bakr

Collin College, Frisco, TX

Online social networks play an essential part in contemporary society. There are numerous positives and negatives associated with social networks. These networks fundamentally alter how people communicate and open a new avenue for malicious activity, such as identity theft and the distribution of fraudulent information. Online social network users experience an abundance of ads, the dissemination of false information, and significant security issues due to the widespread establishment of fraudulent accounts. A false profile can be made on social media under the name of a nonexistent person or company to participate in malicious acts. Cloning user profiles is a severe issue in which information from already-existing users is taken to create duplicate profiles, which are then utilized to harm the identity of the original profile owner. Malicious actors from these cloned accounts can launch threats, including phishing, stalking, spamming, and more. The structure and makeup of false accounts that disseminate spam have been the subject of prior research. However, these earlier studies are either outdated or ineffective due to the rapid advancement of fake account creation. In this study, we suggested a novel approach to detecting bogus accounts using machine learning and natural language processing. Machine Learning and Natural Language focus on a new model of fake accounts based on user activity patterns. We use machine learning to predict whether an account is controlled by a malicious user who might not only automatically post or comment but also spam with advertisements or disseminate further social engineering activities or phishing links. The detection mechanism automatically uses big data to identify distinct fraudulent account patterns. The accuracy rate for identifying bogus accounts will be increased using machine learning and natural language processing and reporting metrics from end users who are unsure of the account's reputation. In addition, a plugin or browser extension that can alert an end user when someone tries to copy their social network account may be another avenue to explore. This method may spot suspicious account activity and provide metrics or measures of the suspicious account's trustworthiness or "genuineness." The method could identify a compromised account that has altered all publicly available information and is attempting to assume a different identity. It automatically uses information from big data to identify typical fraudulent account patterns. This study could advance the detection of bogus accounts to an entirely new level, thus increasing users' security and online reputation.

O10.41

1:45 BUSINESS GROWTH PROJECTION

Brian Diyaolu

Mississippi Valley State University, Itta Bena, MS

There are new business ideas popping up this day and age, however the major thing stopping these ideas is that upcoming entrepreneurs do not know how their business will grow in the upcoming years. Being able to predict how business grow in the following years will allow users to perform good business strategies based on these informed predictions. This web application main purpose is to predict your business. To serve as a guideline to make good business decisions. It also checks aspects of the business that are severely lacking. It will give backed up advice on how to improve certain aspects of the business that are lacking. This web application works in two ways for both new and continuing business. It will show new business owners a forecast on how their business will grow. However, for businesses that have already started, this forecast will be based on their business performance over the previous years.

O10.42

2:00 PROBABILITY THEORY FOR FIRST ORDER LOGIC

Kenneth Presting

North Carolina State University, Raleigh, NC

Previous studies of probability for first-order (1^o) languages

have mostly taken the perspective of Bayesian subjective probability or abstract measure functions on sentences [see Hailperin for a review]. This paper defines standard probability spaces in the Kolmogorov manner as a measure space (O, *F*, mu), where O is the domain, *F* is a sigma-field of subsets of O, and mu() is a probability measure on the members of *F*. The novelty here is to take O as a product space, the Cartesian product of two infinite sequences, one of domain elements, and the other, sequences of domain subsets. If D is the usual domain of a 1^o model, then $O = D^N \times (2^D)^N$.

It is common in model theory of 1^o logic to take the extensions of open (quantifier-free) formulas as subsets in the set of infinite sequences from the domain. This allows relations of arbitrary adicity (number of free variables) all to be represented in the same field. In these models, universally quantified variables must be satisfied by the entire domain, or else the sentence is false. The model here interprets quantified variables as ranging over subsets, which allows these expressions to take a full range of measures from the empty set to the full domain – not just 0 or 1.

Allowing quantified variables to range over subsets is motivated by observing that the subset relation is expressed in 1^o language by a quantified conditional such as, (x)(Fx à Gx), and by comparing this to representation of set relations in propositional calculus and in modal logic. Additionally, note that an atomic predicate expression 'Fa' literally means 'a' denotes an element in the extension of 'F'. This suggests that set membership and the subset relation are at the foundation of 1^o logic, even more so than in the propositional calculus.

Thus, extensions of 1^o formulas are interpreted as measurable sets in *F*, and the predicates and relations in the base vocabulary of the language can generate a basis for the sigma-field *F*. The constructed probability space is a variation on first-order model theory. It shares the feature of providing sequences of domain elements to be denotations of free variables, while adding domain subsets to serve as denotations of bound variables. After these constructions, events in the probability space (O, *F*, mu) are extensions of expressions in the 1^o language.

As examples, we demonstrate probability calculations for a variety of relational expressions, both open and closed, some as basic as 'x>y', and some from contemporary research. Perhaps the most interesting is that the Ramsey conjecture is true for first order conditionals – the probability of a quantified conditional is equal to the conditional probability of the consequent, given the antecedent. That is, P('(x)(FxàGx)') = P('(x)(Fx)' | '(x)(Gx)').

Neuroscience

Chair: Lainy Day

University of Mississippi

Co-Chair: Scoty Hearst

Mississippi College

Thursday, February 23, 2023

MORNING

Room D8

8:00 Welcome and Opening Remarks

O11.01

8:20 CURE NEUROSCIENCE: BRINGING NEUROSCIENCE RESEARCH INTO THE UNDERGRADUATE TEACHING LABORATORY

Scoty Hearst

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

Course-based undergraduate research experience (CURE) is a learning experience where undergraduate students pursue research questions or problems with unknown outcomes during a semester long laboratory course. The approach of involving undergraduate students in a research project utilized in an undergraduate laboratory course has been shown to increase scientific thinking skills and improves persistence learning in science and medicine. Faculty find the CURE approach as a useful method to scale up their own research interests and embed these experiments into a lab course. Using this approach students working in small groups learn research skills while feeling ownership to the project. For the past two semesters, we have incorporated the CURE approach into many undergraduate chemistry lab courses. Here, we will discuss applying Neuroscience research project-based learning into the undergraduate biochemistry lab course.

O11.02

8:40 BACK-FLIPPING BLACK MANAKIN: DISCOVERY OF HIGH-SPEED ACROBATIC DISPLAY AND MECHANICAL SONATIONS IN *XENOPIPO ATRONITENS*, AN UNDERSTUDIED SPECIES

Lainy B. Day[1], *Willow R. Lindsay*[2], *Jesse C. Haag*[3]

[1]*Department of Biology and Interdisciplinary Neuroscience Minor, University of Mississippi, Oxford, MS,* [2]*Department of Biological and Environmental Sciences, Göteborg University, Götteborg, Sweden,* [3]*3Department of Geological Sciences, Stockholm University, Stockholm, Sweden*

Courtship behaviors are highly diverse across bird species, but mating systems are typically shared within avian families. In manakins (family Pipridae), groups of often colorfully plumed males congregate to attract cryptically colored females to lekking grounds with noisy and visually

alluring acrobatic feats. Only some males succeed, often mating with multiple females. This suite of family traits - sexually dimorphic coloration, elaborate courtship behaviors, and a lek mating strategy - is thought to be absent or uncoupled in some species of manakins. Because many current theories of mate system evolution entwine polygyny, lekking, and display elaboration, the manakin family has been proposed to offer important insight into how these traits coevolve under varying strengths of sexual selection. Those manakin species that could provide the most critical nodes for understanding trait loss and gain are, unfortunately, often the least studied due to drab sexual monomorphic plumage and/or presumed lack of engaging displays. The black manakin (*Xenopipo atronitens)* is one such species, with previous reports indicating "undemonstrative" display and the possibility of monogamy or loosely aggregated leks. Courtship display in many manakins involves high-speed motor performance, elements of which occur at speeds outside of human visual perception. We thus address claims that black manakins have simplistic displays by employing high-speed videography. Along with focal male behavioral observations, high-definition video recordings and audio recordings were used to fully document display elements and sound repertoires. Additionally, we describe the spatial arrangements of apparent leks, male territories and display areas including perch sites, and gathered morphological measurements of both sexes. We conclude that black manakins are sexually dimorphic with males displaying in aggregates, supporting a lek breeding system, but with males also defending territories beyond central display areas consisting of multiple display perches at various heights. Notably, we discovered several novel acrobatic elements indicating sophisticated male courtship behavior, the most remarkable being the production of a back flip that occurs in about a quarter of a second, faster than can be seen by the human eye. We documented at least six distinct vocalizations and two novel mechanical sonations produced during the performance of the back flip, including a distinct broad frequency "snap" and a very low frequency succeeding "whir". These findings indicate that the black manakin, like most members of the Pipridae, presents the common pattern for lekking birds in having sexual dimorphism and elaborate displays. These discoveries encourage further investigation of this species, and other manakin species, presumed to have unelaborated displays and advance questions into what we know of animal ethology based primarily on human visual observation.

O11.03

9:00 DIFFERENTIAL SERUM LEVELS OF CACNA1C IN SUBJECTS WITH BIPOLAR DISORDER

Obie Allen IV[1], Brandon Coombes[2], Mahmoud Eladawi[3], Rammohan Shukla[3], Robert McCullumsmith[3], Barbara Gisabella[1], Joanna M. Biernacka[2, 4], Mark A. Frye[4], Matej Markota[4], Harry Pantazopoulos[1]

[1]Department of Psychiatry and Human Behavior, University of Mississippi Medical Center, Jackson, Mississippi, [2]Division of Computational Biology, Department of Quantitative Health Sciences, Mayo Clinic, Rochester, Minnesota, [3]Department of Neurosciences, University of Toledo, Toledo, OH, United States, [4]Department of Psychiatry and Psychology, 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 for a single nucleotide polymorphism in the L-type voltage-gated calcium channel alpha subunit 1 c (CACNA1C) with BD. This polymorphism may alter neuronal excitability and contribute the symptomology of BD. Furthermore, somatostatin (SST) has 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 CACNA1C genotype and serum protein level can be used to identify people with BD that may benefit from calcium channel blockers.

Methods: The present study measures the expression of CACNA1C and SST 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 CACNA1C, SST and the clock molecule ARNTL between control subjects and subjects with BD. Ongoing analysis will examine relationship of serum protein levels with symptom severity, treatment responsiveness, and genotypes.

Results: ELISA demonstrated robust increased of CACNA1C protein levels in the blood of subjects with BD vs. control subjects ($p < 0.0008$). Further, we observed significantly increased levels of SST in the blood of subjects with BD compared to control subjects ($p < 0.0001$) and decreased levels of ARNTL ($p<0.025$).

Conclusions: CACNA1C upregulation may have implications in response to 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. Importantly, future work will investigate the concordance of CACNA1C, SST and ARNTL levels with genetic markers, severity of manic and depressive symptoms , psychosis, and treatment responsiveness, with the goal of identifying subgroups of patients who may benefit from calcium channel blocker therapies and/or chronobiology based therapies.

O11.04

9:20 MACHINE LEARNING-BASED FEATURE EXTRACTION FOR SLEEP STAGING USING POLYSOMNOGRAPHY SIGNALS

Jolly Ehiabhi[1], Minal Patel[2], Lir-Wan Fan[2], Norma Ojeda[2], Zhiqian Chen[1], Harun Pirim[3], Haifeng Wang[1, 2]

[1]Department of Industrial and Systems Engineering, Mississippi State University, Mississippi State, MS, [2]University of Mississippi Medical Center, Jackson, MS, [3]North Dakota State University, ND

In recent years, there has been emerging research work on sleep studies based on the machine learning approaches. When it comes to classification and predicting sleep stages, time and frequency have been widely used. In this paper, sensor data from different bioelectrical devices outputting polysomnography (PSG) records were used. These time series datasets include different human body signals, such as electroencephalogram (EEG) signals, electrooculogram (EOG) signals, electromyogram (EMG) signals, and electrocardiogram (ECG) signals. These signals are multichannel with various modalities. We used public datasets from two different sources. The Welch Power Spectral Density (PSD) techniques were used for feature extraction to classify the recommended sleep stages by the American Academy of Sleep Medicine (AASM) and Rechtschaffen & Kales. Sleep stage model performance was also determined. These stages are categorized into Rapid eye movement (REM) and Non-Rapid eye movement (NREM). We analyze the effect of changes to the EEG waveform frequency, which is done in six frequency bands, namely, Delta, Theta, Alpha, Beta, Sigma, and Gamma. The accuracy, sensitivity, precision, and F1 Score after every frequency band modification were analyzed for changes in model performance.

O11.05

9:40 INFLUENCES OF POST-FLEDGING PROTEIN SUPPLEMENTATION IN JUVENILES AND ADULTS ON SPATIAL COGNITION IN ZEBRA FINCHES (*Taeniopygia guttata*)

Mathew Thibodeaux[1], Belinda Bagwandeen[1], Carley Craig[1,2], Woods Young[1,2], Mary Lindley Tharp[1], Gabrielle Morris[1], Lainy Day[1,2]

[1]Department of Biology, University of Mississippi, Oxford, MS, [2]Interdisciplinary Neuroscience Minor, University of Mississippi, Oxford, MS

All vertebrates require dietary protein, especially during periods of growth, reproduction, or illness. In mammals, protein malnutrition reduces brain growth, coincident with deficits in learning and memory. Wild zebra finches consume soft or half-ripe seeds from around twenty species of grass, coordinating breeding around rainfalls that produce this protein rich resource. Captive seed-eating birds can live on a low protein, dried birdseed diet in sufficient quantities, but seed-only diets may produce subtle adverse consequences. Providing a protein rich diet for birds during the nestling period improves learning. Whether a protein rich diet fed post-nestling period produces similar results is unclear. Thus, we tested the effects of increased dietary protein in zebra finch starting at approximately 36 days old for juveniles, and in adults over 1 year old of both sexes (n=5-7/group). All groups received a standard seed diet with the protein supplement groups receiving approximately 20 grams of boiled chicken eggs daily for 90 days. Birds were transferred from experimental cages where they received dietary treatments to aviaries to allow full flight for 10 days prior to testing spatial learning. To test spatial cognition, we used the Day Lab Escape Maze, a dry analog of the Morris Water Maze. We are in the early stages of analyzing data. We expect that increased dietary protein will improve spatial memory, particularly in juveniles. These results will be important in determining the impact of dietary protein supplied after the nestling phase, when parents stop supplying resources, and in understanding how age may alter susceptibility to low protein in a songbird. Such results will be informative for captive bird husbandry, understanding species diversity in response to low protein diets, and determining if zebra finches can model low protein impacts on mammals despite physiological differences.

10:00 BREAK

O11.06

10:20 DRUG ABUSE-MEDIATED EXTRACELLULAR MATRIX ABNORMALITIES

Jake Valeri[1], Sinead O'Donovan[2], Charlotte Stiplosek[1], Ratna Bollavarapu[1], Lindsay Rexrode[1], Donna Platt[1], Barbara Gisabella[1], Craig Stockmeier[1], Harry Pantazopoulos[1]

[1]University of Mississippi Medical Center, Jackson, MS, [2]University of Toledo, Toledo, OH

Rationale: Emerging evidence points to a critical role of extracellular matrix (ECM) molecules as mediators of drug memories. Chondroitin sulfate proteoglycans (CSPGs) are a subset of ECM molecules that form perineuronal nets (PNN) around inhibitory neurons. PNNs restrict synaptic connections and help maintain synapses. Rodent models suggest that PNNs are degraded by endogenous proteases to allow for the formation of reward memories and then reconsolidate around synapses involved in reward memory to protect these memories from erasure. Despite this compelling evidence, there is currently a lack of information regarding PNNs in the brain of people with SUD.

Methods: We used human postmortem brain samples of the hippocampus from subjects with SUD and unaffected control subjects to test the hypothesis that PNNs are increased in subjects with SUD. A cohort of 84 human postmortem hippocampi from donors with substance use

disorders (n=20), SUD and comorbid major depressive disorder (n=24), major depressive disorder (n=20) and healthy controls (n=20), plus a cohort of 12 monkeys with (n=7) or without (n=5) chronic alcohol self-administration, was used to histochemically label CSPGs using Wisteria floribunda agglutinin lectin, and gene expression was determined using qPCR. Samples labeled with WFA were quantified using stereology-based software and stepwise linear regression analysis of covariance was used to test for effects of diagnosis group and confounding variables.

Results: Our analyses uncovered increased densities of PNNs and CSPG-labeled glial cells in SUD, coinciding with decreased mRNA expression of the ECM protease MMP9, and increased expression for the excitatory synaptic marker VAMP2. Similar increases in PNNs were observed in monkeys with chronic alcohol self-administration.

Conclusions: Our findings suggest that PNNs are increased in SUD, possibly stabilizing contextual reward memories as suggested by preclinical studies. Our findings also point to a previously unsuspected role for CSPG expression in glial cells in SUD. Heightened levels of CSPG-labeled glia suggest enhanced CSPG biosynthesis in astrocytes in SUD. Our observations suggest that targeting PNNs to weaken contextual reward memories is a promising therapeutic approach for substance use disorders.

O11.07

10:40 NEUROVASCULAR UNCOUPLING IN TGF344-AD RATS IS ASSOCIATED WITH REDUCED CEREBRAL CAPILLARY ENDOTHELIAL KIR2.1 EXPRESSION

Xing Fang, Jane Border, Reece Crumpler, Luke Strong, Richard Roman, Fan Fan

University of Mississippi Medical Center, Jackson, MS

Background: Alzheimer's disease (AD) is an emerging global health care crisis. Although reduced cerebral blood flow (CBF) is an early and persistent symptom in developing cognitive deficits, the underlying molecular and cellular mechanisms remain unclear. Recent studies suggested that restoration of capillary endothelial cells (ECs) inward-rectifier potassium channels (Kir2.1) currents reversed cerebral hypoperfusion and enhanced neurovascular coupling in AD mice. The present study aims to investigate whether capillary ECs Kir2.1 expression is reduced in TgF344-AD rats and whether it contributes to neurovascular uncoupling and cognitive deficits.

Methods: Three to six months old TgF-344 AD rats expressing mutant human APP and PS1 and their age-matched wildtype (WT) rats were studied. An eight-arm water maze was used to test spatial learning and short and long-term memory. Brain perfusion was mapped with a laser speckle imaging system. Whisker stimulation-induced functional hyperemia was measured using laser Doppler flowmetry *in vivo*. Brain Kir2.1 expression was compared using western blot. Cerebral parenchymal arterioles (PAs) with attached capillaries were freshly isolated from AD and WT rats and mounted in a pressure myography. PAs response to capillaries focally injected KCL (10 mM) and Kir2.1 inhibitor (ML133) was compared.

Results: AD rats exhibited learning and memory dysfunction at 6-month of age compared with WT controls. However, cerebral hypoperfusion was observed in AD rats starting from 4-month of age. Similarly, impaired functional hyperemia in AD rats started at 4-month of age, which was exacerbated in 6-month old AD rats. The expression of Kir2.1 in 6-month AD brain tissue was significantly lower than in WT rats. AD PAs displayed less vasodilation (110.96 ± 3.92 % vs. 122.93 ± 1.97 %) and vasoconstriction (92.16 ± 3.47 % vs. 78.04 ± 2.96 %) in response to capillary administered KCL and ML133, respectively, compared to WT vessels.

Conclusion: Reduced brain perfusion precedes cognitive impairment in AD rats, associated with attenuated capillary EC Kir2.1 expression and neurovascular uncoupling.

O11.08

11:00 INVESTIGATING THE ROLE OF THE ENDOCANNABINOID SYSTEM IN SEIZURE SENSITIVITY IN A MOUSE MODEL OF PREECLAMPSIA AT GESTATIONAL DAY 18.5

Maria Jones-Muhammad[1], Tyranny Pryor[2], Qingmei Shao[2], Kevin Freeman[3], Junie P. Warrington[2]

[1]Neuroscience Program, [2]Department of Neurology, [3]Department of Psychiatry, University of Mississippi Medical Center, Jackson, MS

Eclampsia, a disorder diagnosed in pregnant women with new onset seizures, is associated with high maternal and fetal morbidity and mortality. Eclampsia most frequently affects women with preeclampsia, a hypertensive disorder of pregnancy. The mechanisms contributing to increased likelihood of seizures in preeclampsia patients are not fully known. One potential mechanism could be abnormal endocannabinoid system activity, with important neuro-modulatory function in the brain. Indeed, studies have reported increased cannabinoid receptor 1 (CB1R) expression in placentas and reduced serum concentration of anandamide, a ligand that activates the CB1R, in preeclampsia patients. Despite these findings, it is unclear whether dysregulated endocannabinoid system contributes to increased seizure sensitivity in pregnancy. We hypothesized that reduced uterine perfusion pressure (RUPP) in the mouse leads to differences in hippocampal expression of endocannabinoid system components and that inhibiting CB1R will increase seizure sensitivity in the RUPP mouse. Pregnant mice underwent sham (n=5) or RUPP (n=5) surgery on gestational day (GD) 13.5. On GD 18.5, the hippocampus was harvested and processed for Western blot to analyze the expression of CB1R and

enzymes, N-acylphosphatidylethanolamine phospholipase D (NAPE-PLD), Diacylglycerol lipase (DAGL), and monoacylglycerol lipase (MAGL). To determine if blocking CB1R increases sensitivity to pentylenetetrazol (PTZ)-induced seizures, additional sham (n=7) and RUPP (n=7) mice were pretreated with 10 mg/kg of rimonabant, video monitored for 15 minutes, injected with 40 mg/kg of PTZ and video monitored for an additional 30 minutes before being sacrificed. Seizures were scored using a modified 7-point Racine scale. In RUPP mice, hippocampal CB1R ($p=0.056$) and NAPE-PLD ($p=0.056$) increased, with no change in DAGL ($p=0.452$), and a significant reduction in MAGL expression ($p=0.032$). Immunofluorescence analysis showed increased CB1R colocalization on both glutamate- and GABA- releasing neurons within the CA1 of the hippocampus ($p=0.029$; $p=0.057$, respectively). CB1R blockade, while inducing a maximum seizure score of 4 in both groups, led to higher seizure scores over time in RUPP mice ($p=0.025$). PTZ injection after rimonabant pretreatment increased seizure scores in sham ($p<0.001$), non-significantly increased scores in RUPP ($p=0.075$), increased duration of seizures in sham but not RUPP mice ($p=0.021$; $p=0.245$, respectively), and reduced latency to seizures in sham mice ($p=0.019$) while there was no further decrease in seizure latency in RUPP ($p=0.374$) mice. Furthermore, during the first 15 minutes of PTZ exposure, RUPP mice had a lower seizure score over time than sham mice [$p(\text{Time}\times\text{RUPP})=0.002$] following CB1R blockade. These results suggest that RUPP induces abnormal activity of the endocannabinoid system at baseline, causing RUPP mice to be more sensitive to seizure activity after CB1R blockade, while protecting against worse seizures when challenged with the pro-convulsant PTZ.

O11.09

11:20 INFLUENCES OF DIET ON STRESS RESPONSIVITY IN A RODENT MODEL OF JUVENILE TRAUMATIC BRAIN INJURY

Allie Smith, Zyra Warfield, Seth Johnsons, Alicia Hulitt, Daniela Ruedi-Bettschen, Christiano Dos Santos, Bernadette Grayson

University of Mississippi Medical Center , Jackson, MS

Traumatic brain injury (TBI) is one of the leading causes of death for children in the United States, and juveniles are more likely to sustain TBIs than most other age groups. Furthermore, many children consume diets that are high in saturated fats and refined sugars. Therefore, the goal of the current study was to identify a potential relationship between high-fat diet consumption and TBI on hypothalamic-pituitary-adrenal (HPA) axis function in dealing with stress in juvenile rats. In the present study, male juvenile Long-Evans rats were fed either a combination of a high-fat diet with a high-fructose corn syrup solution or a standard chow diet. On post-natal day 30, subjects sustained either a sham TBI or a TBI via the Closed-Head Injury Model of Engineered Rotational Acceleration (CHIMERA). Subjects participated in a trial of the elevated plus maze either 1 day post-injury or 4 days post-injury. One group of subjects also participated in a trial of the open field test 4 days post-injury, while a separate group underwent an acute restraint stress test 7 days post-injury. All subjects were euthanized 7 days post-injury, and brain and blood plasma samples were collected for use in QRT-PCR, immunohistochemistry, and corticosterone or adrenocorticotropic hormone (ACTH) assays. Neither consumption of a high-fat diet nor TBI resulted in significant changes to behaviors in the elevated plus maze. In contrast, TBI subjects spent significantly longer periods of time resting and significantly less time ambulatory in the open field test compared to sham subjects. Further, subjects who sustained a TBI and also consumed a high-fat diet spent the lowest percentage of time in the center of the open field. In addition, TBI subjects who participated in the acute restraint stress test had significantly lower plasma corticosterone levels compared to sham subjects, but plasma ACTH levels were not significantly altered by diet or TBI. In addition, QRT-PCR showed significantly lower expression of NR3C1, NR3C2, and CRHR2 in the hypothalamus of TBI subjects compared to sham subjects. These results offer evidence that TBI and high-fat diet consumption can cause HPA axis dysfunction, which can result in the presence of more anxiety-like behaviors.

O11.10

11:40 BLUNTED RESPONSIVITY TO NUTRIENTS IN ADULT FEMALE OFFSPRING OF MATERNAL VERTICAL SLEEVE GASTRECTOMY

Seth Johnson, Taylor Welch, Nandini Arivindan, Redin Spann, Bradley Welch, Bernadette Grayson

University of Mississippi Medical Center, Jackson, MS

12:00 General Session

Thursday, February 23, 2023

AFTERNOON

DIVISION POSTER SESSION

1:00-3:00 PM

Hall C

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

P11.01

IMPACT OF GENETIC KNOCKDOWN OF ACID SENSING ION CHANNEL 2A AND MATERNAL SEIZURES ON NEUROINFLAMMATION IN EMBRYONIC DAY 18.5 MOUSE OFFSPRING

Tyranny Pryor[1], Maria Jones-Muhammad[1], Akia Sherrod[1], Qingmei Shao[1], Junie Warrington[1]

[1]Department of Neurology, Program in Neuroscience, University of Mississippi Medical Center, Jackson, MS 39216

Background: Acid sensing ion channels (ASIC) play important roles in regulating homeostasis and seizure sensitivity in mice. We showed recently that pregnant mice with reduced ASIC2a, the isoform least sensitive to drops in pH, have worse seizures and impaired ability to mount an inflammatory response compared to wild-type pregnant mice subjected to seizures. While these changes in the maternal brain were observed, the effect of acute maternal seizures on the developing fetal brain is not known. Therefore, in this study, we determined whether exposure to maternal seizures coupled with reduced ASIC2a, would result in increased fetal neuroinflammation.

Methods: Timed-pregnant ASIC2a mice were subjected to seizures on gestational day (GD) 18.5 using 40mg/kg pentylenetetrazol (PTZ, i.p.). After 30 minutes of video recording, mice were euthanized, tissues were harvested, pups collected and further analysis was performed. Cytokine/chemokine concentration was measured using a multiplex bead array using fetal brain homogenates and normalized to protein concentration.

Results: Compared to ASIC2a wild-type (ASIC2a+/+) fetuses not exposed to seizures, heterozygous (ASIC2a+/-) fetuses had lower brain interleukin -1 beta ($p = 0.015$), keratinocyte chemoattractant (KC; $p=0.035$), a trend for reduced IL-3 ($p=0.081$), IL-10 ($p=0.073$), IL-13 ($p=0.076$), and MIP-1β ($p=0.055$) levels. Additionally, ASIC2a homozygous (ASIC2a-/-) fetuses had decreased Eotaxin/CCL11 ($p=0.026$), increased monocyte chemoattract protein -1 (MCP-1; $p=0.030$), and trends for reduced IL-1β ($p=0.078$) levels compared to ASIC2a+/+ fetuses that did not undergo seizures. Brain KC was increased in ASIC2a-/- fetuses ($p=0.046$) compared to ASIC2a+/- mice in the absence of seizures. Acute exposure to maternal seizures resulted in significant decreases in fetal brain IL-2 in ASIC2a+/+ ($p = 0.003$) and ASIC2a+/- ($p = 0.023$) fetuses, decreases in KC in ASIC2a+/- fetuses ($p = 0.019$), decreased MCP-1 in ASIC2a-/- fetuses ($p<0.001$), and decreased macrophage inflammatory protein-1β (MIP-1β) ($p = 0.020$) in ASIC2a+/+ fetuses.

Conclusion: Taken together, our results indicate that heterozygous expression of ASIC2a was associated with reduced levels of cytokines and chemokines in the absence of seizures. Moreover, heterozygous fetuses were less likely to respond to seizures in the same manner as wild-type mice. Overall, our findings do not support the hypothesis that seizures increase fetal brain pro-inflammatory cytokines. Fetal exposure to seizures is indirect and acute, which may explain the lack of increase in neuroinflammation in this study.

P11.02

CONTRIBUTION OF ALPHA 4/6-CONTAINING GABA-A RECEPTORS TO THE REINFORCING EFFECTS OF ALCOHOL IN RHESUS MONKEYS

Lauren Threadgill[1], Carolina Teague[1], James Cook[2], Donna Platt[1]

[1]Department of Psychiatry & Human Behavior, University of Mississippi Medical Center, Jackson, MS, [2]Department of Chemistry & Biochemistry, University of Wisconsin-Milwaukee, Milwaukee, WI

Alcohol's ability to enhance gamma-aminobutyric acid (GABA) neurotransmission via GABA-A receptors has been implicated as an important mechanism underlying the use and abuse of alcohol in humans and animals. GABA-A receptors are chloride ion channels comprised of multiple subunits, most typically two alpha subunits, two beta subunits, and either a gamma or delta subunit. GABA-A receptors containing the alpha 4 and/or alpha 6 subunits (e.g., alpha 4 and/or alpha 6 GABA-A receptors) have been suggested to be uniquely involved in the reinforcing effects of low-to-moderate doses of alcohol (i.e., doses that would be encountered by individuals just initiating a history of drinking). Using ligands selective for alpha 4/6 GABA-A receptors as pharmacological tools, we determined the extent to which selective agonists selectively modulated alcohol self-administration in rhesus monkeys trained to self-administer either an alcohol or a sucrose solution under a 10-response fixed-ratio schedule of sipper availability and limited access conditions. In alcohol-drinking monkeys, concentrations of 1-6% alcohol maintained self-administration above water levels, engendered pharmacologically-relevant blood alcohol levels ranging from 90-160 mg/dl, and produced changes in behavior typical of alcohol intoxication. In sucrose-drinking monkeys, concentrations of sucrose above 0.3% (w/v) maintained self-administration above water levels. When administered as pretreatments, the nonselective agonist bretazenil, the selective alpha 4/6/delta agonist gaboxadol and the selective alpha 6/delta agonist DK-I-56-I significantly enhanced alcohol self-administration. In contrast, the selective alpha 4/6/gamma agonist XHe-III-

74 did not reliably alter alcohol self-administration. None of the test ligands altered self-administration of sucrose. These results suggest a selective, facilitative role for alpha 6/delta GABA-A receptors in the reinforcing effects of alcohol. Development of ligands that reduce the activity of alcohol at this receptor subtype may have utility as anti-alcohol therapies. Supported by: AA029023.

P11.03

TRANSCRIPTIONAL DIFFERENCES IN HUMAN POST-MORTEM TISSUE CORRESPOND WITH IMPULSIVE BEHAVIOR IN MOOD DISORDERS

Jon Person, Eric Vallender, Craig Stockmeier

University of Mississippi Medical Center: Program in Neuroscience, Jackson, MS

Rationale: Impulsive behavior is often found in mood disorders. It is associated with worse health outcomes and may lead to death by suicide. Studies have linked several genes with impulsive behavior through GWAS. This data on impulsive behavior is not specific to mood disorders, and there is a lack of brain region transcriptomic data for impulsive behaviors.

Objectives: This study sought to measure differential gene expression in mood disorder as it correlates to severity of impulsive behavior.

Methods: Adult post-mortem brain tissue from the dorsolateral prefrontal cortex (dlPFC) and orbitofrontal cortex (OFC) of adult humans was sorted into two groups: control and mood disorder. All subjects were given an impulsivity score based on upon post-mortem questionnaires filled out after their death by next-of-kin. Bulk tissue RNA sequencing was performed on both brain areas. Differential gene expression was analyzed to see if it corresponded with increasing impulsivity scores.

Results: Bioinformatic analysis of RNA sequencing data observed differential gene expression among individuals with mood disorder corresponding with increasing impulsivity scores. Thirty-eight genes were found to be differentially expressed in the OFC, and 5 genes in the dlPFC.

Conclusion: These genes could provide insight into our understanding of impulsive behavior in mood disorders as well as potential therapeutic targets for treatments.

P11.04

ROLE OF OREXIN RECEPTORS IN THE EFFECT OF METHAMPHETAMINE ON SLEEP IN FEMALE MONKEYS SHOWING A SHORT VS NORMAL SLEEP PHENOTYPE

Daniel Borgatti, Joseph Talley, James Rowlett, Lais Berro

Department of Psychiatry and Human Behavior, Center for Innovation and Discovery in Addictions, University of Mississippi Medical Center, Jackson, MS

Rationale: Insomnia is one of the most prevalent sleep disorders in the world, affecting 10-30% of the population, with a higher prevalence among women (up to 48%). Recent studies from our laboratory also have reported a particular short sleep phenotype among adult female rhesus monkeys, present in nearly 40% of females. Importantly, sleep disruption is a notable consequence and driver of methamphetamine use, which has been steadily increasing. Importantly, the orexin (hypocretin) system has been implicated as a critical regulator of both reward and sleep-wake processes, with OX2 receptors mediating the sleep-promoting effects of orexin.

Objective: The current study investigated the role of orexin receptors in the effects of acute methamphetamine administration on actigraphy-based sleep parameters in short vs normal sleeper female rhesus monkeys.

Methods: Actigraphy data for female rhesus macaques (n=4/group) were recorded under baseline and acute test conditions, in which they received morning (10h) intramuscular injections of saline or 0.3 mg/kg methamphetamine, and evening (17h30) oral treatments with placebo, the non-selective orexin receptor antagonist suvorexant (10 mg/kg), and the OX2-selective orexin receptor antagonist MK1064 (10 mg/kg).

Results: Methamphetamine disrupted sleep in normal sleepers, but not in short sleepers. Treatment with both orexin receptor antagonists improved methamphetamine-induced sleep impairment in normal sleepers, and also promoted sleep in short sleepers under baseline conditions.

Conclusions: These findings suggest that orexin-mediated mechanisms play a role in phenotypic short sleep and in methamphetamine-induced sleep impairment in female monkeys, and that female normal sleepers are more susceptible to the sleep-disrupting effects of methamphetamine than normal sleepers.

P11.05

PIEZO1 ACTIVATION INDUCES VASOCONSTRICTION IN MIDDLE CEREBRAL ARTERIES OF F344 RATS

Jena' Mazique[1,2], Xing Fang[2], Patrice Rivers[2], Christopher Bartle[2], Jane Border[2], Imani Kirven[2], Richard Roman[2], Fan Fan[2]

[1] Program in Neuroscience, University of Mississippi Medical Center, Jackson, MS, [2] Department of Pharmacology and Toxicology, University of Mississippi Medical Center, Jackson, MS

Piezo1 is a mechanosensitive ion channel, activated by shear stress and wall distension, that plays a role in blood flow regulation. Previous studies indicated that Piezo1 activation enhances cerebral-vascular endothelial cell vasodilation by promoting calcium influx. However, whether Piezo1 is expressed in cerebral vascular smooth muscle cells (CVSMCs) and if it plays a role in cerebral myogenic reactivity have not been adequately investigated. The current study explored the role of Piezo1 in both the middle cerebral arteries (MCAs) and primary CVSMCs isolated from the MCAs of F344 rats. At a physiological perfusion pressure (120 mmHg), endothelium-intact

MCAs rapidly constricted when administered Yoda1 (30 μM), a selective activator of Piezo1, and the inner diameters (IDs) were reduced to 92.74 ± 1.42% (n = 9, 19). In endothelium-denuded MCAs, Yoda1 administration evoked a greater maximum constriction (IDs: 90.24 ± 1.37%; n = 7, 12) than in the intact MCAs. Using a collagen gel-based cell contraction assay kit, Yoda1-treated F344 CVSMCs constricted to 91.22 ± 1.36% (n = 3, 6). This constriction was linked to a greater influx of calcium (109.84 ± 8.13%, n = 3, 6), detected by a Fluo4 AM calcium indicator kit. These results suggest that Piezo1 may be involved in the regulation of cerebral blood flow in the MCA and its CVSMCs and offer insights into cerebrovascular diseases.

P11.06

PRENATAL EXPOSURE TO REDUCED UTERINE PERFUSION PRESSURES RESULTS IN RETINAL VASCULAR CHANGES IN ADULT MOUSE OFFSPRING

Zyon Davis, Maria Jones-Muhammad, Qingmei Shao, Tyranny Pryor, Junie Warrington

University of Mississippi Medical Center, Jackson, MS

Background: Studies have shown that children exposed to hypertensive disorders of pregnancy develop smaller retinal arterioles and venules during childhood. It is not clear why this happens and a time-course of changes in retinal vascular structure after exposure to hypertensive pregnancy disorders has not been done. Reduced uterine perfusion pressure (RUPP) is used to mimic the clinical hypertensive disorder of pregnancy, preeclampsia. It is not known whether RUPP-exposed offspring develop changes in retinal vascular structure during adulthood.

Objective: To determine whether prenatal exposure to RUPP leads to changes in retinal arteriole and venule caliber and pericyte coverage during adulthood.

Methods: Pregnant Smooth Muscle Actin – Green Fluorescence Protein (SMA-GFP) reporter mice underwent no, sham, or RUPP surgery on gestational day 13.5 and were allowed to deliver. At 2 and 6 months of age, eyes were collected and retinas dissected from male and female offspring and flat-mounted onto slides. Retinas were imaged using a confocal microscope and the number and diameter of arterioles and venules measured. Additionally, the number of pericytes on the surface of venules were counted and divided by the area of the venule to calculate venule pericyte density. Data are presented as Mean ± SD.

Results: At 6 months of age, there was no difference in arteriole number (5.4±0.5 in Sham vs. 5.0±1.0 in RUPP; p=0.241) or diameter (20.8±3.0 in Sham vs. 23.9±6.4 μm in RUPP; p=0.188), but a significant decrease in the number of venules (4.8±0.8 in Sham vs. 4.0±0.0 in RUPP; p=0.050) and increased venule diameter (31.0±2.0 in Sham vs. 33.9±2.6 μm in RUPP; p=0.058) in offspring from RUPP mice. Additionally, no difference in venule pericyte density (0.0014±0.0002 in Sham vs. 0.0012±0.0001 pericytes/μm in RUPP; p=0.114) was observed.

Conclusion: Our results indicate that in adult mice, prenatal exposure to RUPP affects primarily the retinal venules with no change in arterioles. Increased retinal venule number and diameter could be compensatory. Ongoing studies are geared at increasing the sample sizes and assessing whether retinal vascular changes are also evident at earlier time-points.

P11.07

PARAMETRIC OPTIMIZATION OF RESPIRATORY MEASUREMENT IN RATS USING A CUMULATIVE-DOSING PROCEDURE AND WHOLE-BODY PLETHYSMOGRAPHY

Kevin Freeman[1], Aaron Araujo[2], Loc Pham[1]

[1]Base Pair, Murrah High School; [2]Program in Neuroscience, University of Mississippi Medical Center; Jackson, MS, [3]Department of Psychiatry and Human Behavior, University of Mississippi Medical Center, Jackson, MS

Rationale: Last year more than 100,000 people died from drug-related overdoses, and most of these cases involved the administration of a mu opioid agonist. Fatalities from opioid overdose occur through opioid-mediated depression of autonomic respiratory function. Recently, novel opioids have been developed that may decrease pain without affecting respiration to the same degree as typical opioids. However, rigorous preclinical *in vivo* assessments comparing these compounds to typical opioids requires optimization of the technical procedure with prototypical opioids such as fentanyl.

Objectives: The aim of the current study was to measure respiratory responsivity of machine-delivered serial infusions of the opioid agonist, fentanyl, over varied inter-infusion intervals to determine if interval variance affected the cumulative dose-response relation for fentanyl.

Methods: Male and female Sprague-Dawley rats (4 males and 4 females) with chronic indwelling intravenous catheters were placed in sealed whole-body plethysmography chambers. Respiratory performances (breath frequency and tidal volume) were measured and recorded over the course of a sessions that varied in time according to the inter-infusion intervals. Breath frequency and tidal volume were used to calculate minute volume, and data were compiled as average performance over serial 10 and 5-minute bins.

Results: Minute volume was relatively high at the session's outset but stabilized after approximately 25 minutes. Machine-delivered serial infusions of fentanyl produced dose-dependent decreases in most respiratory parameters across all infusion intervals. The average fentanyl's durations of effect across all doses appeared to be approximately 3.5 minutes within the intervals, with the higher doses producing more robust and longer lasting effect.

Conclusions: Machine-delivered serial infusions of fentanyl renders dose-orderly effects on respiratory performances in whole-body plethysmography, thus allowing for rapid throughput for comparisons across numerous compounds. Fentanyl's relatively short duration of effect indicates that shorter inter-infusion intervals are needed to capture the cumulative effects better.

Funding: This work was supported by R01DA039167 to KBF and F31DA056209 to LP.

P11.08

INFLUENCES OF POST-FLEDGING PROTEIN SUPPLEMENTATION IN JUVENILES AND ADULTS ON SIZE OF SECONDARY SEXUAL CHARACTERISTICS AND PLUMAGE COLOR IN ZEBRA FINCHES (*Taeniopygia guttata*).

Carley Craig[1,2], Woods Young[1,2], Mary Lindley Tharp[1], Gabrielle Morris[1], Mathew Thibodeaux[1], Belinda Bagwandeen[1], Lainy Day[1,2]

[1]Department of Biology, University of Mississippi, Oxford, MS, [2]Interdisciplinary Neuroscience Minor, University of Mississippi, Oxford, MS

All vertebrates require dietary protein, especially during periods of growth, reproduction, or illness. In mammals, protein malnutrition reduces brain growth, coincident with deficits in learning and memory. Wild zebra finches consume soft or half-ripe seeds from around twenty species of grass, coordinating breeding around rainfalls that produce this protein rich resource. Captive seed-eating birds can live on a low protein, dried birdseed diet in sufficient quantities, but seed-only diets may produce subtle adverse consequences. Providing a protein rich diet for birds during the nestling period alters influences adult attractiveness, which is related to the size and color of secondary sexual traits. Whether a protein rich diet fed post-nestling period produces similar results is unclear. Thus, we tested the effects of increased dietary protein in zebra finch starting at approximately 36 days old for juveniles, and in adults over 1 year old of both sexes (n=5-7/group). All groups received a standard seed diet with the protein supplement groups receiving approximately 20 grams of boiled chicken eggs daily. We measured plumage variables at regular intervals across the 90 days on their assigned diet. To detect any color or brightness changes in sexually dimorphic regions, we gathered reflectance data for the beak, cheek patches, zebra stripes, breast patch, spotted flanks, legs, and tail using a spectrometer. The size of orange cheek patches (in males) was also recorded. We are in the early stages of gathering data. We expect that increased dietary protein will increase cheek patch size and increase red hue in cheeks and feet and overall brightness of other plumage areas. These results will be important in determining the impact of dietary protein supplied after the nestling phase, when parents stop supplying resources, and in understanding how age may alter susceptibility to low protein in a songbird. Such results will be informative for captive bird husbandry, understanding species diversity in response to low protein diets, and determining if zebra finches can model low protein impacts on mammals despite physiological differences.

P11.09

INFLUENCES OF POST-FLEDGING PROTEIN SUPPLEMENTATION IN ADULTS AND JUVENILES ON GROWTH AND REACTIVE STRESS RESPONSE IN ZEBRA FINCHES (Taeniopygia guttata)

Gabrielle Morris[1], Mary Lindley Tharp[1], Carley Craig[1,2], Woods Young[1,2], Mathew Thibodeaux[1], Belinda Bagwandeen[1], Lainy Day[1,2]

[1]Department of Biology, University of Mississippi, Oxford, MS, [2]Interdisciplinary Neuroscience Minor, University of Mississippi, Oxford, MS

All vertebrates require dietary protein, especially during periods of growth, reproduction, or illness. In mammals, protein malnutrition reduces brain growth, coincident with deficits in learning and memory. Wild zebra finches consume soft or half-ripe seeds from around twenty species of grass, coordinating breeding around rainfalls that produce this protein rich resource. Captive seed-eating birds can live on a low protein, dried bird seed diet in sufficient quantities, but seed-only diets may produce subtle adverse consequences. Providing a protein rich diet for birds during the nestling period alters growth patterns and alters stress responses. Whether a protein rich diet fed post-nestling period produces similar results is unclear. Thus, we tested the effects of increased dietary protein in zebra finches starting at approximately 36 days old for juveniles of both sexes (n=7 group). All groups received a standard seed diet with the protein supplement groups receiving approximately 4 grams of boiled chicken eggs per bird daily. We measured indicators of body growth: body mass and head-to-beak, tarsus, tail and wing lengths after 0, 15, 30, 45, and 60 days on their assigned diet. After 32 and 60 days on their assigned diet, birds' response to an acute stressor, measured by quantifying the stress hormone (corticosterone) levels in blood samples pre and post-20 minutes passive restraint in a bird bag. We are in the early stages of gathering data. We expect that increased dietary protein will increase growth rate in juveniles and will buffer the stress response. These results will be important in determining the impact of dietary protein supplied after the nestling phase, when parents stop supplying resources, and in understanding how age may alter susceptibility to low protein in a songbird. Such results will be informative for captive bird husbandry, understanding species diversity in response to low protein diets, and determining if zebra finches can model low protein impacts on mammals despite physiological differences.

and advance questions into what we know of animal ethology based primarily on human visual observation.

P11.10

NEURONAL AND BEHAVIORAL EFFECTS OF COCAINE AFTER EPISODIC SOCIAL STRESS: RELEVANCE FOR SUBSTANCE USE VULNERABILITY

Eboni Eddins, Alberto Del Arco

HESRM, School of Applied Sciences, Oxford, MS

Studies that use Intermittent (episodic) Social Defeat (ISD) in rats demonstrate that ISD increases cocaine-self administration several weeks after the end of the adverse experience and suggest that a history of social stress makes individuals more vulnerable to substance abuse in the long term. The medial prefrontal cortex (mPFC) plays a key role in regulating drug-seeking behavior. The present study investigates whether ISD enhances the response of mPFC neurons to cocaine. We also assess whether ISD increases the locomotor and reinforcing effects produced by cocaine. Male Long Evans rats (3-4 months) were trained in an operant task to discriminate between a rewarded (continuous tone) and a non-rewarded (intermittent tone) stimulus that was paired to the extension of a lever (right or left, counterbalanced). After stable performance, rats were implanted with electrode arrays in the mPFC (prelimbic area) and divided into two groups (Control, n= 4; Stress, n= 4). Then, they were exposed to ISD (or handling, Control group) once every three days for ten days (four stress episodes in total). Four weeks after the last stress episode, cocaine (or saline) injections (10 mg/kg, i.p.) were performed in control and stressed rats to evaluate PFC neuronal activity and locomotion. Then, conditioned place preference (CPP) was also assessed. The results show that cocaine injections increase locomotion in both groups. However, cocaine-induced locomotion was stronger in stressed rats compared to controls. Likewise, CPP shows that the reinforcing effects of cocaine were stronger in stressed rats compared to controls. These results support the idea that ISD increases the risk of substance abuse in the long term. Our results also show that mPFC neurons increase and decrease their activity in response to cocaine injections in both stressed and control rats. The analysis of electrophysiological data is still ongoing to determine whether cocaine produces different effects in the mPFC of stressed compared to control rats. *Supported by NIGMS-NIH P30GM122733*.

P11.11

NEURONAL AND BEHAVIORAL EFFECTS OF COCAINE AFTER EPISODIC SOCIAL STRESS: RELEVANCE FOR SUBSTANCE USE VULNERABILITY

Eboni Eddins, Alberto Del Arco

HESRM, School of Applied Sciences, Oxford, MS

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P11.12

EFFECT OF BINAURAL BEATS ON THE ATTENTION NETWORKS TASK: EFFECT ON ALERTING, ORIENTING, AND CONFLICT RESOLUTION

Erick Bourassa

Biological Sciences, Mississippi College, Clinton, MS

A binaural beat (BB) is a phenomenon that occurs when two tones of slightly different frequencies are administered to each ear separately (for example, a 500 Hz tone in the left ear and a 505 Hz tone in the right ear). The brain creates an auditory illusion that the sound actually being presented is a 502.5 Hz sound with a 'beat' that happens at 5 Hz (every 0.2 seconds, in this example). BBs are becoming popular and are purported to improve mood, decrease anxiety, increase attention, improve memory, etc., although there is very little scientific literature to support (or refute) such claims. The purpose of this study is to determine if BBs that increase theta frequency band power as measured by electroencephalography (EEG) can alter any of the attentional networks as measured by the attention networks task (ATN). Participants will perform a standard ATN while listening to a BB, a monaural beat (the

same two frequencies used in the BB but both tones are presented to both ears simultaneously), or no sound. Continuous 9-lead EEG will be recorded from the participants to measure changes in theta-, alpha-, and beta-band power across the cortex as well as measure standard event-related potentials while performing the ATN. Each participant will receive an 'alerting' score, 'orienting' score, and 'conflict resolution' score based on their performance on the ATN during the no sound, monaural beat, and BB conditions. Changes in performance on these scores will be correlated to alterations on the event-related potentials measured from the scalp. These findings will hopefully shed light on the role of theta, alpha, and beta power on the three attentional components as well as provide evidence of the effect of BB on attentional processes.

P11.3

CAN BINAURAL BEATS CAUSE WIDESPREAD CORTICAL ENTRAINMENT IN THE THETA, ALPHA, BETA, AND LOW-GAMMA FREQUENCY BAND RANGES?

Erick Bourassa[1], *Scoty Hearst*[2]

[1]*Biological Sciences, Mississippi College, Clinton, MS,* [2]*Chemistry Department, Mississippi College, Clinton, MS*

A binaural beat (BB) is a phenomenon that occurs when two tones of slightly different frequencies are administered to each ear separately (for example, a 500 Hz tone in the left ear and a 505 Hz tone in the right ear). The brain creates an auditory illusion that the sound actually being presented is a 502.5 Hz sound with a 'beat' that happens at 5 Hz (every 0.2 seconds, in this example). BBs are becoming popular and are purported to improve mood, decrease anxiety, increase attention, improve memory, etc., although there is very little scientific literature to support (or refute) such claims. The historical theory of BBs is that the 'beat' frequency (5 Hz in the above example) will cause entrainment of the brain at that frequency, meaning that the proportion of neurons firing at 5 Hz will also increase. In this way, BBs could be used to alter brain functionality as certain frequency bands are associated with different types of information processing. However, whether entrainment occurs in the brain due to BBs is questionable and the data is mixed, likely due to different base frequencies (i.e. 500 Hz) and beat frequencies (i.e. 5 Hz) being used in various research. The purpose of this study is to determine if entrainment efficiency is dependent on base- and beat-frequencies as well as to identify the BB best suited to increase theta power (4-8 Hz) in the cortex of the brain. To test this hypothesis and optimize theta-frequency entrainment, each participant will listen to four BBs for 8 minutes each, along with 5 minutes of silence before the first BB presentation and after the last BB presentation. Across the experiment, participants will be exposed to twelve BBs from a combination of three base frequencies (250, 500, and 1000 Hz) and four beat frequencies (6, 10, 25, and 40 Hz). 9-lead electroencephalography will be recorded during the task, which will be analyzed for event-related spectral perturbations (ERSPs) in the theta, alpha, beta, and low-gamma frequency bands. Relative power changes in each of these bands will be compared across the nine cortical locations.

P11.14

TEST ANXIOUS STUDENTS CAN LEARN: CAN THEY RELEARN?

Erick Bourassa

Biological Sciences, Mississippi College, Clinton, MS

Test anxiety is reported to be a common entity; however, it is currently not recognized as a distinct disorder and the neurobiological basis of it is very poorly characterized. Previous work in our lab using a Go/No-Go task has shown that students with high test anxiety (HTA) do not have two characteristic event-related potentials seen on electroencephalography (EEG): the error-related negativity (ERN, a negative deflection following the commission of an error) and the feedback-related negativity (FRN, a negative deflection following feedback to a response). Both the ERN and FRN are believed to be generated from the anterior cingulate cortex and are EEG components of the error-detection network. That finding suggested that HTA students would have a decreased ability to identify errors as well as reduced ability to alter future behavior based on feedback, both of which are critical to learning. A follow-up experiment utilized a time estimation task with both learning and recall phases with three feedback types (millisecond accurate feedback, fake feedback, or no feedback). That experiment showed that HTA students *did* have an ERN during both the learning and recall phases *and* their ERN was larger than students with low test anxious students (LTA). In the learning phase, task performance was similar between HTA and LTA students. Intriguingly, HTA students still failed to show an FRN in either phase of the task to any form of feedback, and their performance in the recall phase of the task was better than LTA, even on trials containing fake feedback. Taken together, this would suggest that the lack of FRN causes HTA to not alter their task performance when given feedback. The hypothesis of this experiment is that HTA will be unable to relearn a previously learned task when given feedback. To test this hypothesis, the same time estimation task will be utilized, except after the learning phase is complete, the target time will change without the participants knowledge; they will need to relearn the task using feedback provided (blocks will consist of "dichotomous feedback" - acceptable/unacceptable - or no feedback). It is expected that HTA will have a large ERN and undetectable FRN during both phases of the task, task performance will be similar between HTA and LTA in the first half of the task, and HTA will have decreased task performance on the second half of the task compared to LTA.

Thursday, February 23, 2023

EVENING

3:30 DODGEN LECTURE and AWARDS CEREMONY

Hall B

5:00 GENERAL POSTER SESSION

Hall C (immediately following Dodgen Event)

Friday, February 24, 2023

MORNING

Room

10:00 Welcome and Opening Remarks

10:10 Division Awards Ceremony & Business Meeting: Division Adjourns; Must be Present to Obtain Award

Physics and Engineering

Chair: Umar Iqbal

Mississippi State University

Co-Chair: Jason Griggs

University of Mississippi Medical Center

Thursday, February 23, 2023

MORNING

Room L6

8:20 Welcome and Opening Remarks

O12.01

8:30 ULTRASONIC PROPERTIES OF HUMAN SCALP

Cecille Labuda[1], *Blake Lawler*[2], *Shona Harbert*[2], *Brent Hoffmeister*[2]

[1]*University of Mississippi / National Center for Physical Acoustics, University, MS,* [2]*Rhodes College, Memphis, TN*

The goal of this study was to characterize the ultrasonic properties of human scalp. Thirty-two specimens were prepared from formalin-fixed scalp tissue from four human donors (age 35 – 65, 2 male, 2 female). Tissue specimens were mounted in acrylic frames with a 30 × 30-mm acoustic window. The specimens were scanned in a water tank with a broadband ultrasound transducer with center frequency 7.5 MHz using a motion-controlled system. The ultrasonic region of interest (ROI) was a 20 × 20-mm region with a step size of 410 μm. The signals acquired were analyzed to determine the speed of sound (SOS) and frequency slope of attenuation (FSA) at all scan locations (2500 locations per specimen). The mean ± standard deviation (SD) of the SOS and FSA over all the specimens respectively was 1536 ± 9 m/s and 1.88 ± 0.51 dB·cm-1·MHz-1. The SD within an ROI was 3 – 15 m/s for SOS and 0.15 – 0.85 dB·cm-1·MHz-1 for FSA, depending on specimen, indicating some heterogeneity in the ultrasonic properties of the tissue.

O12.02

8:50 CONNECTIONS BETWEEN ENTANGLEMENT ENTROPY AND THE HEIGHT FIELD REPRESENTATION FOR THE FREDKIN SPIN CHAIN

Joshua Moore

University of Mississippi, University, MS

The scaling of entanglement entropy with system size has been the focus of intensive, recent study. In particular, there has been significant effort to find physically plausible systems that violate the area law for entanglement entropy. The Fredkin spin chain, proposed by Salberger and Korepin in 2017, is a gapless, frustration-free spin-1/2 system with three-site interactions that violates the area law logarithmically. The height field representation for the ground state provides a simple graphical method to explore properties of the Fredkin spin chain. We present some preliminary results for the height field statistics as a way to understand the entanglement entropy.

O12.03

9:10 LIQUID GALLIUM EMBRITTLEMENT OF ALSI10MG ALLOY WITH MICRON-SIZED GRAINS PROCESSED BY LASER POWER-BED FUSION

Brandon Fisher[1], *John Misiaszek*[2]

[1]*Jackson State University, Jackson MS,* [2]*Northwestern University, Evanston, IL*

Liquid Metal Embrittlement (LME) is caused by the infiltration of a liquid phase metal between the grain boundaries in a metallic microstructure, leading to failure of components at stresses well below yielding. Gallium has been extensively used as an LME material for aluminum. Here, we study the effect of grain size and residual stresses on gallium penetration of the near-eutectic alloy AlSi10Mg (Al-10Si-0.4Mg wt%), after laser powder-bed fusion (LPBF) manufacturing for small-scale device and drug delivery applications. Observing grain boundaries furthers understanding on the size and impurities that may affect the rate of Ga infiltration, whereby larger grain sizes lead to faster embrittlement due to more substantial grain boundaries, allowing Ga to penetrate the bulk of the material at a greater rate. The mechanical property of cast and LPBF AlSi10Mg specimens, after exposure to liquid Ga, are studied via (i) monotonic stress-strain curves (drop in ductility) and (ii) static fatigue testing (delayed fracture).

O12.04

9:30 COMPARING CURRENT CONSISTENCY AND ELECTRICAL RESISTANCE OF WEARABLE PHOTOVOLTAIC CELLS PRE- AND POST-LAUNDERING AND CORROSION RESISTANCE TESTING CONDITIONS.

Amit Talukder, *Charles Freeman*

Department of Human Sciences, Mississippi State University, Starkville, MS

Wearable electronics have grown in popularity recently, particularly incorporating electronic parts into textiles.

Besides comfort and warmth, these devices have a competitive advantage over traditional textiles by offering sensing, stimulating, and adaptive functionalities. There is a desire to keep these wearables powered continuously without requiring frequent recharging or bulky energy storage to get full competency. Since solar/photovoltaic(PV) energy is abundant in nature, researchers have suggested integrating PV energy harvesting technologies into textiles to power. However, most product developers produce wearable PV cells for terrestrial applications. Research remains still limited to wearable PV cells for the marine environment. This environment is harsh and corrosive because it contains salts that act directly on the PV cell's surface. Metallic components of wearable electronics may corrode from salt from body sweat during physical activity, which is similarly applicable to seawater in marine applications. Again, launderability is a significant barrier to successfully commercializing wearable electronics. Chemical stress (detergent, surfactants), thermal stress (washing temperature), and mechanical stress (e.g., friction, abrasion) are the four primary forces that can cause damage to electronic components during laundering cycles because these wearable cells will ultimately be washed when integrated into textiles. Therefore, the purpose of this research project is to determine how wearable PV cells perform under several testing conditions, including laundering and corrosion resistance testing conditions. This project will compare the maximum current consistency and electrical resistance of commercially sourced wearable PV cells pre and post-laundering and corrosion resistance testing conditions. The following objectives will guide the research study: (1) to baseline measure the current capacity and electrical resistance (AATCC EP13) for 1W flexible wearable PV cells direct from manufacturers; (2) evaluate the corrosion aspects (ASTM B-117-19) and compare pre- and post-corrosion current capacity and electrical resistance; (3) compare current capacity and electrical resistance to baselines following five home laundering cycles (AATCC 135-2015). In the laundering testing, specimens will be prepared and laundered with detergents following home laundering standardized conditions for five cycles. In the corrosion testings, specimens will be placed in a controlled corrosive environment and tested for resistance to high-concentrate salt conditions. The temperature and relative humidity will be kept at 35ºC and 6.5pH to 7.2pH. The ratio of NaCl and ASTM D1193 Type IV water will be 1:19. Then, compressed air will be introduced and combined with the saline solution for 72 hours. Results from this study will provide researchers and product developers with valuable information on the reliability of wearable PV cells for occupational use in a marine environment. This proposed study is significant because wearable PV cells are a perfect choice for powering devices, as sunlight is omnipresent. In addition, renewable energy is always readily available. Though not as popular as land-based PV cells, marine wearable PV cells are gaining popularity these days. So, the proposed project tests wearable PV cells' performance as a power generator in a simulated marine environment. Power gained from wearable PV cells could help users living in the marine environment to be self-sustainable.

O12.05

9:50 EFFECTS OF XANTHAN GUM ON SOIL IMPROVEMENT

Kejun Wen, Glenn Misiak

Jackson State University, Jackson, MS

Cracks on the upper surface of the geomaterials will affect the soil properties in various agricultural, geotechnical, and environmental sectors. Studies have concluded that the cracks may change the soil structures, worsen soil water quality, and affect several significant physical, chemical, and biochemical processes in the soil. The desiccation cracks expose the interior of soil slopes to climatic changes, thereby allowing further cracking to occur. The failure of geomaterials is mainly caused by the accumulation of BREAKs/cracks. In this project, non-toxic and biocompatible biopolymer, Xanthan gum, was adopted to be used as a polymeric binder for soil stabilization. The soft-gel properties of the biopolymer present a great potential application in soil cracks remediation. The unconfined compression strength (UCS) test was conducted to evaluate the mechanical behavior of the biopolymer-treated sample. The impact of different concentrations of xanthan gum solution (0.5%, 1.0%, 1.5%, 2.0%, and 3.0%) on the unconfined compression strength of treated sand was evaluated in this study. The results indicated that the unconfined compression strength increased with the increase of the concentration of the xanthan gum solution. The optimum concentration of the xanthan gum solution was determined to be 3.0% since the xanthan gum solution was too thick when the concentration further increased. The different moisture content of the treated sample was also studied, and the results showed that 15% moisture content achieved the best strength performance. When the surface spray method was adopted, the optimum xanthan gum concentration was found to be 1%. Meanwhile, the water retention test and crack observation test were conducted on biopolymer treated samples and control samples. The results showed that with the addition of biopolymers, less cracks were observed in the soil.

O12.06

10:10 e-PORTFOLIO AS A PLATFORM FOR BUILDING A NARRATIVE FOR PROFESSIONAL CAREER (V1)

Javier Gerardo Gómez[1], Umar Iqbal[2], Areejah Umar[3]

[1]Mississippi Gulf Coast Community College, [2]Mississippi State University, [3]University of Mississippi Medical Center, Jackson, MS

An e-Portfolio is used for various objectives in education, including but not limited to evaluation, digital collections, and skilled development. An e-Portfolio can also be used as a formative or summative evaluation to assess students' learning. An e-Portfolio also provides a platform to compile evidence of student learning, achievements, and reflection on their learning. More importantly, an e-Portfolio houses the communication between the learner and instructor. It is this readily accessible feedback that promotes constant ongoing learning.

This paper reviews the potential of using the e-Portfolio to document the student's reflection on learning over the years, which can act as a narrative of personal development and

achievement. This platform allows students to describe their learning process, critically assess their thinking skills over the years, and make connections between their education, background, and extracurricular activities.

This paper will present an overview of implementing e-Portfolios and the advantages of using this and pedagogical teaching and learning tool. The paper will discuss different types of e-Portfolios and tips for setting up clear expectations for developing an e-Portfolio with the Canvas LMS and Office 365—two of the most used platforms in higher education. Moreover, it will examine the critical factors of the successful implementation of e-Portfolios to build a narrative, make suggestions for enhancing student learning, and provide them with a channel to document their identities.

10:30 BREAK

O12.07

11:10 INTEGRATING HOLOGRAPHIC VISUALS WITHIN CADD/BIM SOFTWARE

Tarisha Moncrief

Mississippi Valley State University, Itta Bena, MS

Technology such as "Holograms", a topic of interest in science fiction movie critiques, has progressed from a futuristic possibility to a marketable product. HYPERVSN and HoloLens are such companies that have introduced this new age of 3D visualization. New studies by Design Engine have shown that not only is it possible to produce CAD designs but enhance them by integrating holographic visuals within them to bring the product to "life". They utilize a platform called "ZSpace" that provides a holographic projection that is not only able to be seen but manipulated with the help of a stylus to endeavor to make the experience as real as possible. This combination not only benefits the designers by producing a more appealing visual but a more advanced way to manipulate the image being seen that has not been done before. If this method is employed, then it will also directly affect a company's expenses by decreasing the amount they would need to spend on creating a mockup or prototype. Time that is also wasted when an interactive approach would greatly benefit the client so they can make adjustments, as needed, without the use of recreating the entire design from scratch. In completing this study, I believe that this will be a major advancement to not only the technology industry, but other industries given the chance. It could bring about a new era where product presentation using "Holographic Imaging" instead of being a thing of the future, could be the norm of the present.

Results: Our analyses uncovered increased densities of PNNs and CSPG-labeled glial cells in SUD, coinciding with decreased mRNA expression of the ECM protease MMP9, and increased expression for the excitatory synaptic marker VAMP2. Similar increases in PNNs were observed in monkeys with chronic alcohol self-administration.

Conclusions: Our findings suggest that PNNs are increased in SUD, possibly stabilizing contextual reward memories as suggested by preclinical studies. Our findings also point to a previously unsuspected role for CSPG expression in glial cells in SUD. Heightened levels of CSPG-labeled glia suggest enhanced CSPG biosynthesis in astrocytes in SUD. Our observations suggest that targeting PNNs to weaken contextual reward memories is a promising therapeutic approach for substance use disorders.

O12.08

11:30 SCRAP DATA ENTRIES IN THE AUTOMOTIVE INDUSTRY

Jasmine Stringer

Mississippi Valley State University, Itta Bena MS

The Automotive industry remains one of the top industries affected by scrap, causing financial losses and hardships. Scrap is an unusable material that is damaged, recycled, or discarded. Most times, a part is damaged, it is deemed unusable, or in other words, it is scrapped, which results in wasted time and money being lost. While most organizations focus on reducing scraps, scrapping parts is inevitable. Therefore, it is imperative for organizations to ensure they properly record the number of scrap parts and place them in the proper locations. This study focuses on reducing scrap for a specific automotive company located in the southeast region of the United States that was dealing with scrap data entry issues. Essentially scrap data entry is not appropriately entering the correct information into the company's inventory system to maintain an accurate count of all purchased parts. This study proposes focusing on how three strategies would improve strap data entry: (1) Training, (2) Visual Management (VM), and (3) Proper Documentation. To accomplish this research project's goal, the research proposes reviewing secondary data related to each of the three strategies to focus on how these strategies improved inventory and related issues in other companies and industries. Along with a variety of case studies involving healthcare, construction management, and manufacturing organizations, each provided different evidence as to how these methods have positively impacted the work environment. Three research questions were addressed in this study: (1) How does scrap affect cost within an automotive industry? (2) How does visual management play a role in reducing scrap? (3) Why is scrap impossible to eliminate scrap within automotive industries? Four themes emerged from the data that addressed the research questions: The financial aspect of scrap in automotive industries, the benefits of implementing essential training in the workplace, how visual management promotes employee improvement, and the importance of documentation Based on the implications of this study, implementing essential training, visual management, and proper documentation can positively affect scrap data entries in the workplace saving money and time.

12:00 General Session

Thursday, February 23, 2023

AFTERNOON

Room L6

O12.09

1:20 VALIDATION OF LARGE EDDY SIMULATION TURBULENCE MODELS ON A TRIPLE JET BUOYANT-DRIVEN FLOW

Christopher Pilmaier, Shanti Bhushan, Mohammed Elmellouki

Mississippi State University, Mississippi State, MS

The purpose of this research project is to test and validate the accuracy and predictability of large eddy simulation (LES) models on a triple jet flow domain. The flow being simulated and analyzed is complex in that it requires attention to model the effects of buoyancy forcing, heat transfer mixing effects with a low-Prandtl number, and turbulence effects; all while using planar jets. The models that have been tested include the Dynamic Smagorinksy Model (DSM), Constant Smagorinsky Model (CSM), Filtered LES (FLES) model, and the Wall Adaptive LES (WALE) model. The predictive capability of these models will be assessed and compared with publicly available DNS results.

This research is not yet completed as of submission but will be continued throughout the year and will progress to test other LES models that may be of interest. Since DNS results are computationally expensive and take a considerable amount of time to determine, this research will serve as a suggestion to other computational fluid dynamic (CFD) users to implement the correct models when attempting to simulate a similar flow type. In our research, we have determined that the FLES and CSM models predict the flow characteristics quite well, while still maintaining a respectable level of turbulent kinetic energy (TKE) when compared to the benchmark data. The DSM and WALE models have shown far less accuracy because of the caluclation for the turbulent viscosity. The process has not been fully completed, but is expected to be by the presentation time.

O12.10

1:40 SALIENT FEATURES OF RE-STRUCTURING CIRCUIT LAB FOR ELECTRICAL ENGINEERING

Umar Iqbal, Kim Ball, Mahfuzur Rahman, Fasiha Zainab

Mississippi State University, Mississippi State, MS

The basic circuit course introduces students to the essential electronic elements' functionality and operation. Topics include voltage, current, power of AC and DC circuits, passive devices and components, and active devices - namely resistors, capacitors, inductors, and operational amplifiers. Laboratory experiments provide a chance for students to learn the use of electronic instruments and construct several circuits with these electronic devices. Revising existing course material to reflect technological changes is a vital aspect of engineering education.

The local university's Electrical and Computer Engineering (ECE) department has substantially transformed the undergraduate curriculum to modernize the Electrical Engineering (EE) program, including introducing new circuits and electronics courses to enhance the effectiveness of the EE curriculum. These curriculum changes aim to provide up-to-date education to better prepare students for graduate study or entry into the industry.

This paper discusses the implementation of hands-on circuit laboratory activities that reinforce the concepts discussed in the circuits course. Students gain substantial practical experience in these labs by utilizing electrical circuits and instruments such as digital multimeters, oscilloscopes, power supplies, and function generators. The new lab experiments need to be fully aligned with the current circuits textbook. This paper will discuss the modification and implementation of new laboratory experiments for the course, the layout of the experimentation, the documentation of the testing procedures, and the operating conditions. This paper will also review the multiple feedback techniques employed to improve the course.

2:00 KEYNOTE SPEAKER

AN ENGINEER'S JOURNEY FROM AN INTERNATIONAL STUDENT TO A UNIVERSITY EXECUTIVE.

Lokesh Shivakumariah

Mississippi Valley State University, Itta Bena, MS

Dr. Lokesh Shivakumaraiah, an Electrical and Computer Engineer by training, is the Executive Director of International Relations and Assistant to the Provost at Mississippi Valley State University. He is the current Chair and founding President of the Study Mississippi Consortium and the incoming NAFSA Region VII Mississippi State Representative. He has over 14 years of professional experience in the area of international education, international recruitment, and student services at public land grant, private, and HBCU institutions. He has also served as the Clinical Assistant Professor of Electrical and Computer Engineering at Mississippi State University and helped MSU start their Engineering on the Coast program in Mississippi Gulf Coast. He had held positions of the Associate Director of the International Institute at Mississippi State University, Assistant Director of International Recruitment and Admissions at Metropolitan College of New York, and the Director of International Programs at Jackson State University. He had also served as the Program Chair for Study New York Consortium.

Thursday, February 23, 2023

EVENING

3:30 DODGEN LECTURE AND AWARDS CEREMONY

Hall B

5:00 GENERAL POSTER SESSION

Hall C (immediately following Dodgen Event)

P12.01

SURVEY ON ANTENNA FOR AMBIENT RF ENERGY HARVESTING: DESIGNS, CHALLENGES, AND APPLICATIONS

Elizabeth Moss

Hinds Community College Utica, MS

Radio frequency energy harvesting is an emerging alternative energy solution that has the potential to offer sustainable wireless energy in the near future. This process is promising and offers various environmentally friendly alternative energy sources. Ambient RF energy could be provided by commercial RF broadcasting stations such as TV, Wi-Fi, cell phones, or a radar. This technology is suitable for overcoming problems related to wireless sensor nodes located in harsh environments or inaccessible places. Radio frequency energy harvesting (RFEH) can also be utilized in Medical applications like patient monitoring. One of the vital components of radio frequency energy harvesting (RFEH) that makes this process possible is the receiving antenna. The receiving antenna's performance has a considerable impact on the power supply capability of a radio frequency energy harvesting (RFEH) system. This research provides a well-rounded review of recent advancements of receiving antennas for radio frequency energy harvesting (RFEH). The antennas discussed in this research are explained in great detail and categorized as low-profile antennas, multi-band antennas, and polarized antennas. Current design and fabrication challenges, multiple applications, open research issues of the antennas and visions for radio frequency energy harvesting (RFEH) are also discussed in this review. Therefore, the purpose of conducting this research is to provide radio frequency energy harvesting (RFEH) insight and techniques that can be applied to open the possibility of powering electronics directly or recharge secondary batteries. This overview is anticipated to lead to relevant approaches for developing an efficient radio frequency energy harvesting (RFEH) system.

P12.02

FINITE ELEMENT ANALYSIS OF AIRCRAFT WING. WORK-IN-PROGRESS (WIP)

Hatim El Bakkali

Mississippi State University, Starkville, MS

Recently, wings have been made of composite materials such as laminated composite with fiber or carbon fiber, which makes their structures complex. In their daily practice, scientists are always dealing with problems that involve complex problems. Many complicated engineering problems can now be solved with computers at an extraordinarily low cost in a truly brief time due to the large capacity of computers. Finite Element Analysis of composite materials is used to analyze structures made of composites and help the industry design the final product. Because of the characteristics of its pre-processing, finite element analysis is proposed in this work because of its accuracy and efficiency. In this study, the theoretical background and a finite element solution to a non-linear problem are presented. Non-linear problems require more effort because of their high complexity, such as non-linear material behavior, contact, and large deformations. In solid mechanics, experts grouped nonlinear problems into three types: material, geometric, and boundary nonlinearity (contact). Different loads, boundary conditions, and situations such as vibrations are applied to wings, which means a nonlinear problem and a challenge for engineers. In this study, different techniques, such as mesh refinement, are used to obtain mesh convergence. The result will be stress concentration, and maximum, and minimum stress applied. One of the difficulties will be the material properties because accurate material properties are difficult to obtain in problems involving the nonlinear material behavior of real-life structures. Loads are specific to the application. To limit the displacements, an appropriate material must be selected.

P12.03

AN AR-QR CODE APPROACH TO IMPROVE ACCESS OF CREWS TO DESIGN AND CONSTRUCTION INFORMATION ON CONSTRUCTION SITES

Mohsen Foroughi Sabzevar

University of Southern Mississippi, Hattiesburg, MS

Despite advancements in technologies and tools used to design and display building elements in the construction industry, design communication on construction sites still relies on two-dimensional documents and verbal instructions. Paper-based 2D drawings are used widely on construction sites. The main drawings (i.e., plan views), to be able to deliver design intent and related construction requirements to construction site workers, need to be supplemented by other drawings, written specifications, and informal verbal instructions given by foremen/superintendents. However, access to this information often requires multi-step processes that could be time-consuming, inefficient, and prone to error.

This study investigates how the procedures for traditionally accessing design and construction information through paper-based drawings can be improved and impact crew performance when combined with a digital environment.

P12.04

RADIOACTIVITY IN SOILS COLLECTED IN THE VICINITY OF NUCLEAR PLANT

Jarriah Hooker[1], Ca`Niya Ferguson[1], Jermiah Billa[1], Steve Adzanu[1], John Adjaye[1]

Alcorn State University

The Earth's crust is filled with many naturally occurring elements (isotopes) and among them, the Naturally Occurring Radioactive Materials (NORM) have lot of importance in radiological health perspective as they can pose some health hazards to living organisms. The concentrations of NORM isotopes are widely distributed based on the geographical

locations, soils (rocks) type, and other human activities in the vicinity. However, it is a known fact that there is limited NORM activity in soils irrespective of the geographical location. Industries' such as nuclear power plants may release trace quantities of man-made isotopes into the environment during their routine operations. Specifically, man-made isotopes such as Cs-137 possess longer half-life and may retain in the environment for a significant time of period. In this context, a pilot study is performed on soils collected in the vicinity of a Nuclear Power Plant located within few miles of Alcorn State University campus. The soils were analyzed using a solid-state detector (germanium detector) of 35% relative efficiency via the gamma spectroscopic techniques. While the NORM isotopes of Ra-226, Th-232, and K-40 were identified, trace quantities of Cs-137 and Mn-54 (both man-made) isotopes are identified in the soils. Based on this study, it is strongly recommended that routine monitoring of radioisotopes within a 5-mile, 10-mile, 20-mile, and 25-mile radius around the nuclear power plant is performed on a continuous basis. Also, it is suggested that a clear database is created and made available to residents who live within the 25 miles radius around the plant on activity levels and radiation dose levels.

P12.05

LINEAR-ATTENUATION COEFFICIENTS OF VARIOUS SHIELDING MATERIALS

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

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

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

P12.06

RAIN-AWAY APPROACH

Jacob Clanton, Austin Entremont, Taylor Maples, Gavin Shows, Tyler May

Mississippi State University, Mississippi State, MS

Distracted driving is the leading cause of vehicle accidents in the United States by a considerable margin. We intend to combat this problem by introducing our product, Rain-Away. It automatically engages the vehicle's windshield wipers when rain is detected. The problem with existing products that accomplish this task is their pricing and installation. The minimum price for one of these windshields is $1,500, and they must be professionally installed and calibrated. Instead of requiring a professional mechanic to implement, this product is installed by the customer, and its retail price is $125. It encompasses the use of an external and an internal unit for operation. The external unit is composed of an infrared sensor and a microcontroller that are powered by a solar panel that is connected to a rechargeable battery. The sensor detects the magnitude of the rainfall in real time. The data that the sensor collects is transmitted to the microcontroller. The microcontroller then determines if the rainfall is light, moderate, or heavy. Depending on the choice, a specific speed code is transmitted by Bluetooth to another microcontroller encased inside the internal unit which is powered by the car battery. The internal microcontroller receives the transmitted speed code, then sends the appropriate voltage to the windshield wiper motor through use of switching relays. Once the motor is energized, the windshield wipers will either move at a slow, moderate, or fast speed. Also, if the customer desires to use the manual function of the windshield wipers, our product can be powered off with no effect to the manual system. From this project, we hope to provide a safe and affordable option to decrease the number of distractions during the operation of the vehicle.

P12.07

SMALL MODULAR REACTORS: A POTENTIAL SAFE, RELIABLE, AND CLEAN ENERGY SOURCE *Work in Progress, Undergraduate Research*

John Barch

University of Mississippi, Oxford, MS

Growth in population and modernization of lifestyles have led to a worldwide increase in energy and electricity demand. Predominant means of generating electricity, such as coal-based or natural gas-based plants, face scrutiny due to their greenhouse gas emissions. Over the last few decades, research has been dedicated to discovering and developing alternative electricity generating sources that can meet the increasing energy demand while reducing emissions such as solar, wind, hydropower, and, in particular, nuclear energy. Nuclear energy has been a source of controversy since the discovery of nuclear fission in 1938. Many argue that the safety concerns of nuclear energy, particularly in response to the 1986 Chernobyl disaster and the 2011 Fukushima accident, deem nuclear energy unsuitable for modern America. Others argue that reliability, improvements in safety from recent technological improvements, and low carbon emissions elicit an embrace of nuclear energy to help combat the increasing global energy demand. One of these technological improvements, Small Modular Nuclear Reactors, aims to address the concerns of nuclear energy with claims of enhanced safety features, along with other benefits. This work aims to evaluate the potential effectiveness of Small Modular Nuclear Reactors by analyzing the technology and design of different small modular reactors and whether the technology and design warrant an embracing of these reactors. Small Modular Nuclear Reactors are nuclear reactors which have a

power rating of less than 300 MW of electrical power; conventional nuclear power plants typically generate 1000 MW. Interest in Small Modular Nuclear Reactors when compared with traditional nuclear reactors stems from their scalability, safety features, reliability, and remote grid applications.

P12.08

DEVELOPMENT AND CHARACTERIZATION OF MICROSPHERE-BASED ACOUSTIC METAMATERIALS

Sina Rostami

University of Mississippi, Department of Physics, Oxford, MS

Metamaterials are composite systems designed to exhibit properties not found in ordinary matter. This work focuses on the design of acoustic metamaterials that simultaneously exhibit negative mass density and negative compressibility which are known as double negative metamaterials. The goal of this work is to explore higher order resonant scattering modes of spheres and look for signs of negative density and compressibility. Our approach is to use microspheres of mixed sizes which have overlaps in even and odd modes. In this work we report on the various modes and experimental approaches to observing double negative material behavior.

P12.09

BIOMECHANICAL, PHYSIOLOGICAL, AND SUBJECTIVE PERCEPTION ASSESSMENT OF PERSONAL FLOTATION DEVICES

Amit Talukder[1], Charles Freeman[1], Harish Chander[2], Reuben Burch[3], David Saucier[4]

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Commercial fishing has consistently been ranked as one of the most hazardous jobs in the United States (U.S.). This industry is known for its harsh working conditions, strenuous physical labor, unstable weather, and high fatality rates. According to the National Institute for Occupational Safety and Health (NIOSH) at the Centers for Disease Control and Prevention (CDC), 725 commercial fishing-related deaths were reported between 2000 and 2015 in the U.S, significantly higher than the national average for all occupations. Prior works provide evidence that drowning is one of the leading causes of death in this commercial fishing industry. Most of the fishermen drowned due to vessel disasters and falls overboard. A personal flotation device **(**PFD) could be a viable option to reduce casualties related to drowning. However, fishermen are not adopting these PFDs due to their prior assumptions. These assumptions include breathing problems, comfort, and obstruction during high-intensity activities. Therefore, this project's scope includes the reliability of personal flotation devices (PFDs) for commercial fishermen. This study will evaluate whether these PFDs are affecting these issues or not. This study aims to assess biomechanical, physiological measures (pulmonary and heart rate measurements), and subjective measures (comfort assessment) while wearing PFDs during a series of physical activities. Participants will perform a short repetitive task of manual material handling (MMH), including lifting, moving, pushing, and pulling, during which motion capture will be used to measure kinematics, and heart rate monitors will be used to capture continuous heart rate data. Pulmonary function tests are noninvasive tests that determine how well the lungs function. Lung volume, capacity, flow rates, and gas exchange are all measured in these tests. A portable spirometer will be used to measure lung function accurately and conveniently. This pulmonary function testing and subjective questionnaires will be collected in a resting seated position before and after the MMH task. These tasks will be performed in three testing conditions. One in controlled condition (i.e., No PFD) and two different types of PFDs will be assigned in randomized/counterbalanced order. In the pilot study of the pulmonary function test, the results showed that positive difference in the data of forced vital capacity (FVC), forced expiratory volume (FEV), and FEV/FVC ratio before and after MMH tasks. Forced vital capacity measures the total volume of air that participants forcefully into the mouthpiece following a full inhalation; forced expiratory volume measures the volume of air exhaled into the mouthpiece in the first second after a full inhalation. The findings reveal that there must be obstruction because of wearing PFDs during the task. This study will highlight the importance of understanding user requirements and needs as a prerequisite for end-user acceptance and also will provide insight into the designs of PFDs with adequate comfort, safety, and protection for commercial fishermen.

P12.10

DENTAL IMPLANT STABILITY QUOTIENT IN SIMULATED BONE OF VARYING QUALITY

Anabel Morgan[1], Megha Satpathy[2], Kartikeya Jodha[3], Firas Mourad[3], Jason Griggs[3]

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Introduction: Our goal was to create synthetic bone that mimics the range of structures found clinically in the mandible and maxilla and to verify that implants placed in the simulated bone *in vitro* have the same range of implant stability quotient (ISQ) scores as implants placed clinically. We hypothesized that implants placed in D2 bone would have the highest ISQ scores and that ISQ scores would range from below 60 to above 70.

Methods: Bone having four different levels of quality according to Lekholm and Zarb (1985) classification was simulated using custom-ordered bilayered blocks from SAWBONES USA (sawbones.com). D1 bone had a 3 mm thick cortical layer of short fiber-filled epoxy (#3401-02) and a cancellous layer of 20# cellular foam (#1522-12). D2 bone had a 2 mm cortical layer (#3401-01) and a 12.5# cancellous layer (#1522-11). D3 bone had a 1 mm cortical layer (#3401-07) and a 10# cancellous layer (#1522-210). D4 bone had no cortical layer and a 7.5# cancellous layer (#1522-09). A high-

speed handpiece (WS-75 L, W&H, Sweden) at 1000 rpm was used to create a pilot hole using consecutively wider drill bits (2.0x15 mm, 2.75x15 mm, 3.0x15 mm, 3.25x15 mm) with the latter two only penetrating the cortical layer. Commercially pure titanium dental implant bodies (3.25x15 mm parallel walled with external hex connection, 3i T3, Biomet 3i Dental, USA) (n=4) were placed into each simulated bone specimen using an Implantmed unit (SI-1015, W&H, Sweden) at 15 rpm and 30 N-cm maximum torque. A magnetic post (SmartPeg Type 1, W&H) was screwed into the coronal portion of each implant body. ISQ score was measured using a magnetic resonant frequency analysis unit (SI-SQ, W&H) from the four sides on each implant body. The mean ISQ scores were compared using repeated measures two-way ANOVA.

Results and Discussion: The data passed tests for normality (Shapiro-Wilk, $p=0.74$) and equal variance (Brown-Forsythe, $p=0.37$). ISQ scores for individual implants ranged from 1 to 72. There was no difference in ISQ based on the direction of measurement ($p=0.16$), and there was no interaction of direction and bone type ($p=0.82$). There was a highly significant difference in ISQ based on bone type ($p<0.001$). Subsequent pairwise testing with Tukey's HSD revealed that D4 bone had a significantly lower mean ISQ score (26) than all other bone types (55 for D1, 67 for D2, and 61 for D3). D2 had the highest mean ISQ score, which agrees with clinical observations, but this score was not statistically different from those of D1 and D3 bone with the current sample size (n=4).

Conclusion: The hypothesis that implants placed in D2 bone would have the highest ISQ scores was accepted. The hypothesis that ISQ scores would range from below 60 to above 70 was accepted. These types of simulated bone exhibit an acceptable range and ranking of ISQ scores to use in a future study to validate the accuracy of finite element models for predicting ISQ scores.

P12.11

IMPLEMENTATION OF BAYESIAN ANALYSIS TO REFINE THE DEFINITION OF THE PROTON CHARGE RADIUS

Jackson Koloc

Mississippi State University, Starkville, MS

The proton has been a subject of study for over a century now, and yet, so much is still not known about it. One of the more prevalent characteristics of the proton is its RMS charge radius. The PRad experiment was conducted in order to try and measure this charge radius by utilizing a windowless hydrogen gas target with a low beam background, a very low momentum-transfer range, and an environment that allows electron-proton and electron-electron scattering to be deleted simultaneously. This method allowed for a precise control of the systematic uncertainties to try and extract the most accurate measurement of the proton radius possible. Using previous data from the PRad experiment and a program that utilizes a method called Bayesian Analysis, we are trying to extract the proton radius with a smaller error range. Bayesian Analysis aims to continually learn from previous information gathered from this experiment allowing it to build upon itself and ultimately achieve a much more precise measurement. By running our data from the PRad experiment through a computer program called netmaker, which is a program that utilizes machine learning alongside Bayesian analysis, we were able to extract the charge radius of the proton with a much smaller error.

P12.13

THE LOW-VELOCITY IMPACT RESPONSE OF SOUTHERN YELLOW PINE BIO-COMPOSITES

Brock Breedlove, Maharshi Dave, Tejas Pandya

University of Mississippi Mechanical Engineering Department, Oxford, MS

Composites built from organic and biocompatible materials are known as bio-composites. Eco-friendly materials are becoming more popular as people become more conscious of the harm that synthetic, petroleum-based materials do to the environment. For a variety of reasons, including their potential to replace synthetic, petroleum-based composites at a cheaper cost with greater sustainability, interest in 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 creating new wood-based bio-composites from agricultural and plant-based materials in response to the current trends toward natural-based composites. It is imperative to study the structural properties of newly developed bio-composites to find the potential capabilities.

In this research, the low-velocity impact response of wood-based bio-composites is presented through experimental data. The materials tested were made from southern yellow pine (SYP), a commercial urea formaldehyde (UF Unibond) resin, and a polymeric methylene diphenyl isocyanate (pMDI) resin using a Dieffenbacher hot press. The specimens' impact performance was assessed in terms of their capacity to absorb energy. Three types of bio-composites were prepared with varying compositions with SYP: 4% pMDI; 5% UF Unibond; and 8% UF Unibond. These materials were impacted at an energy level of 256.3 J and impact velocity of 5 m/s using a drop weight test, and comparisons of the force and energy displacement responses as well as the state of the damaged specimens were made. The results of this study could be helpful in revealing how well plant-based materials work as substitutes for traditional materials in both structural and non-structural applications.

A drop weight impact testing machine was used to study the low-velocity impact reactions of innovative bio-composites. The following conclusions can be drawn from the data on impact response and the damage analysis. The composite created with the 4% pMDI had the greatest energy absorption among all the samples. Improved damage resistance and energy absorption characteristics were observed when pMDI samples were compressed.

Friday, February 24, 2023

MORNING

Room L6

10:00 Welcome and Opening Remarks

10:10 Division Awards Ceremony -Must be Present to Obtain Award

Divisional Business Meeting

Friday, February 24, 2023

AFTERNOON

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

Psychology and Social Sciences

Chair: Shaila Khan

Tougaloo College

Co-Chair: Mehrun Laiju

Tougaloo College

Vice-Chair: Carmen Lewis

Tougaloo College

Thursday, February 23, 2023

AFTERNOON

12:00 General Session

Thursday, February 23, 2023

AFTERNOON

Room L7

O13.01

1:00 THE IMPACT OF MATTERING AND PSYCHOLOGICAL BURNOUT ON JOB SATISFACTION WITH COLLEGE RESIDENT ASSISTANTS

Jade Burnett, Sarah Stout, Abigail Shook

Belhaven University, Jackson, MS

The purpose of this research is to study the impact of mattering and psychological burnout on job satisfaction with college resident assistants. The researchers in this study hypothesize that mattering and psychological burnout affects job satisfaction in college resident assistants. College resident assistants from schools across Mississippi will complete surveys measuring mattering and psychological burnout and how they impact job satisfaction as resident assistants. A multiple regression analysis will be used to analyze the data. The research project, including data collection, data analyses, and final preparations for presentations will be completed before the dates of this conference. A final abstract will be resubmitted for the conference.

O13.02

1:15 THE RELATIONSHIP BETWEEN PERSONALITY TYPES AND COPING MECHANISMS IN AFRICAN-AMERICAN COLLEGE STUDENTS

Cherish Smith, Shaila Khan

Tougaloo College, Jackson, MS

The purpose of the present study was to determine the correlation between personality types and coping mechanisms among African-American college students. An individual's personality type is composed of various characteristics and traits. There are various ways an individual copes with the stresses of life, and it can depend on the type of personality one possesses. One research study reported that those students with neuroticism as their personality type were most likely to utilize active coping strategies (Muhammad et al., 2019). According to Afshar et al,. (2015). some coping behaviors and personality types could prove to be risk factors in certain stressful events. Adaptive personality traits reported being positively correlated with active coping behaviors, while those same personality traits were negatively correlated with avoidance coping styles (Afshar, et al., 2015). Openness, extraversion, conscientiousness, and agreeableness had a positive relationship with problem-focused coping while they had a negative relationship with emotion-focused coping (Agbaria & Mokh, 2021).). Personality traits can and will eventually affect what types of coping styles an individual possesses and utilizes in their everyday lives to deal with stress. (Celikkaleli and Gunduz, 2019). In the present study it was hypothesized that there would be a positive correlation between personality types and coping mechanisms. It was also hypothesized that that personality types and coping mechanism will vary among gender and classification. The sample included eighty (80) undergraduate participants between the ages of 18 and 23. The participants were recruited via social media platforms, a GroupMe chat for all College students, and sending out emails, providing them a link to the questionnaire located on Microsoft Forms, an online survey creator. Each participant was given the COPE Inventory (Carver, 2013), the Big Five Inventory (John & Srivastava, 1999), and a few demographic questions, such as age, gender, classification, ethnicity etc. To test the first hypothesis, the results will be analyzed by conducting Pearson correlation coefficient. To test the gender differences among personality types and coping mechanism, T-tests will be conducted and to test whether personality types and coping mechanism vary according to classification, ANOVA tests will be conducted. After the results are being calculated, it will be presented at the oral presentation. The study is important for college students to reveal their personality traits and better able to cope with the stresses of their daily life.

O13.03

1:30 THE IMPACT OF THE TRANSITION INTO COLLEGE LIFE AND LONELINESS AMONGST STUDENTS

Dorian Gordon, Shaila Khan,

Tougaloo College, Tougaloo, MS

The purpose of the present study was to determine the impact of the transition into college life and loneliness among college students. (Worsley, Harrison, & Corcoran. 2017). examined the transition from home to college life for students and how it has affected them throughout their time at school and concluded that some students felt strongly about the fact that college life does take a toll on one's mental health. Another research study was to find possible stressors that may arise as the shift into higher education begin. The inductive thematic analysis on a focus group and one to one interviews findings include that the students weren't prepared for the amount of independence they'd possess as they went into college (Thompson, Pawson, & Evans (2021). In the present study it was hypothesized that will be a relationship between the transition into college life and loneliness. It was also hypothesized that transition into college life and loneliness would vary according to gender. The sample included eighty undergraduate participants between 18 and 24 years old. The participants were contacted through email, social media, and messaging apps, providing them a link to the questionnaire located on Microsoft Forms, an online survey creator. Each participant was given the New Student Questionnaire (Office of Institutional Research, 2002) and the Loneliness Scale (Russell, et al., 1980) and some demographical information. To test the first hypothesis a correlation –coefficient between transition into college life and loneliness questionnaire will be performed. To test if there is a gender differences between transition into college life and loneliness t tests will be calculated. After the results are being calculated, it will be presented at the oral presentation. This research is important for college students to discover potential signs of loneliness and solutions to combat the feeling. It is also helpful because it gives college students the ability to make positive changes to their transition into college life and wellbeing on campus.

O13.04

1:45 THE EFFECTS OF ACUTE HYPOXIA EXPOSURE ON COGNITIVE FUNCTION

Zakary Patrick[1, 2], John Sepko[2, 3], Paul Loprinzi[1, 2]

[1]Department of Health, Exercise Science, and Recreation Management, University of Mississippi, [2]Oxford, MS, [3]Department of Biology, University of Mississippi, University, MS

Purpose: There is conflicting literature as to the effects of varying levels of hypoxia on cognition. Recent work by Loprinzi et al. (2019) demonstrated that moderate levels of hypoxia exposure increased memory (cognitive) performance. However, research investigating severe hypoxic exposure has shown immediate cognitive impairments (Nation, 2017). To reconcile these mixed findings, the present study aimed to investigate the extent to which varying levels of hypoxia improves, decreases, or has no effect on cognition. **Methods:** Thirty-five participants were recruited using convenience sampling at the University of Mississippi and completed a within-subject experimental protocol involving two laboratory visits. The first visit was conducted for familiarizing the participant to the normobaric-hypoxia-inducing equipment, the cognitive task utilized, and the study protocol. During the second visit, participants were exposed to three different experimental conditions, Normoxia (20.5% FIO_2), Moderate Hypoxia (15.0% FIO_2), and Severe Hypoxia (10.5% FIO_2) via breathing in lower concentrations of oxygen within a gas mixture for 10 minutes and then completed a Modified Stroop cognitive assessment at the end of each condition. Each counterbalanced condition was separated by a 10-minute resting period to ensure HR and SpO_2 values returned to baseline. Overall accuracy and reaction time for each trial were recorded. With accuracy and reaction times as separate outcomes, a one-factor (Condition: Normoxia, Moderate, Severe) Bayesian repeated measures ANOVA was employed; models were computed separately for the three item types from the Stroop task, including naming, inhibition, and switch. Bayes Factors (BFs) were calculated, with BFs < .33 and > 3, respectively, indicating evidence in favor of the null and alternative models. **Results:** For accuracy of naming, inhibition, and switch trials across the conditions, BFs were .44, .11, and .22, respectively. For reaction time of naming, inhibition, and switch trials across the conditions, BFs were .09, .19, and .26, respectively. **Conclusion:** Regarding the effects of hypoxia on Stroop cognitive performance, we provide consistent evidence in favor of the null model. Future work should evaluate this topic using more severe levels of hypoxia (e.g., < 10% FIO_2), longer exposure to the respective levels of hypoxia, and consider other cognitive outcomes that may be more sensitive to the effects of hypoxia.

O13.05

2:00 INVESTIGATING ATTACHMENT STYLES RELATIONSHIP WITH LEVELS OF INTIMACY AND SELF-ESTEEM

Kingston Harness, Shaila Khan

Tougaloo College, Tougaloo, Jackson, MS

The purpose of this study was to investigate whether adult attachment styles has a relationship with self- esteem and levels of intimacy. Swami et al (2012) conducted a study to examine the ratings of physical attractiveness of self, former partners, and current partners. Some key findings from this study were that, in general, former partner ratings were higher than self- ratings. Current partners were rated higher than former partners. It was also found that former partners' ratings were lower if they were to blame for the relationship's termination but higher levels of self- esteem lead to rating former partners higher (Swami et al., 2012), He X (2022) conducted a study to better understand the relationship between self-esteem, interpersonal trust, and social anxiety of college students. A very important finding from this study was that self-esteem does not vary significantly according to gender. It was also found that males' levels of social anxiety are significantly lower than females. This is important because social anxiety has a negative correlation on self -esteem and self -esteem is significantly correlated to interpersonal trust (He 2022). Sakthivel (2022) did a research to find out if there were a significant difference between self- esteem among

adolescent male and females. It was concluded that self-esteem differs significantly amongst adolescent male and females with males having higher levels of self- esteem. In the present study it was hypothesized that there will be a positive correlation between adult attachment, self-esteem and levels of intimacy. It was also hypothesized that adult attachment, self- esteem and levels of intimacy will vary among gender and classification. The Adult Attachment Questionnaire (AAQ) (Simpson et al 1992), the Rosenberg's Self Esteem Scale (Rosenberg 1965) and the Sternberg's Triangular Love Scale (Sternberg, 1997) was distributed among eighty (80) undergraduate participants between the ages of 18 and 24. Participants were contacted through social media and messaging apps, giving participants a link to the questionnaire on microsoft forms. To test the first hypothesis a Pearson correlation co-efficient will be conducted on adult attachment, self -esteem and levels of intimacy. To test if there is a gender differences among adult attachment, self-esteem and levels of intimacy t tests will be conducted. To test if adult attachment, self- esteem and levels of intimacy vary according to classification ANOVA tests will be conducted. After the results are being calculated, it will be presented at the oral presentation. This research is important for college students to discover their attachment styles, self-esteem and levels of intimacy. It is also helpful because it gives college students the ability to maintain a healthy level of intimacy

O13.06

2:15 THE UNKNOWN PERCEPTION OF ASD ON A HBCU CAMPUS

Niya Ellis, Diane Groat

Jackson State University

A neurological and developmental disorder known as autism spectrum disorder (ASD) affect show people learn, behave, communicate and interact with others. Autism is considered a developmental disorder because symptoms typically begin in the first two years of life. ASD can be diagnosed in people of any age, gender, race, ethnicity, or economic status. The proposed study will use an experimental design to explore the attitudes and stereotypes about ASD in an HBCU population. It is hypothesized that participants who hold stereotypical attitudes and beliefs about ASD will report different responses to the experimental stimulus than the control stimulus used in the study

P13.07

2:30 WERE THERE LESSONS TO BE LEARNED FROM THE 2005 EARTHQUAKE VICTIMS IN PAKISTAN FOR THE 2022 FLOOD?

Abida Ijaz[1], Ameena Rauf[2]

[1]Institute of Communication Studies, University of Punjab, Lahore, Pakistan, [2]Arkansas State University, Jonesboro, AR

Natural disasters in the world are destructive, affecting human lives, country's infrastructure, and causing significant human pain. Among these natural disasters in the world is an earthquake. Earthquakes can lead to human psychological suffering, life-style destruction, loss of life, and destruction of country's infrastructure. The objectives of this research were to study the role of two major Pakistani national newspapers (The News and Daily Jang) in covering the news and conveying information about the earthquake to allow the public agencies and private sector to effectively rescue the victims. To achieve this objective, this current research was conducted using the quantitative analysis method. Categories covered by these two newspapers during this study were: casualty, injury, physical relief, psychological relief, infrastructure, and financial relief were used. The results showed that during the study period, October 9, 2005, to January 9, 2006, The News newspaper did more coverage than "The Daily Jang" in some categories and the Daily Jang did more coverage than The News in other categories, depending on the period of coverage. The same trend of total categories was also observed between The News and The Daily Jang for the total number of categories. For example, in the period from October 9 to October 15, 2005, The News did more coverage than the Daily Jang in the following categories: casualty (16.07%), physical relief (23.21%, financial relief (26.79%), and others (28.57%). However, the Daily Jang did more coverage than the Daily in the following categories: injury (14.63%), infrastructure (17.07%), and psychological relief (4.88%). In spite of the higher coverage of the Daily Jang of the grand total number of the categories (883) vs. The News (853), either newspaper did better coverage in some categories than the other during the period of coverage. The higher news coverage by either The News or The Daily Jang in some categories than others during the entire period of study (October 2005 to January 2006) could be explained by the influence of the language used (English or Urdu), individual skills, individual access to the scene, distance from the epicenter of the earthquake, and the individual emotional and psychological status during the coverage, and the social and economic status of the communities concerned with the earthquake. It can be concluded that although the newspapers reporting was essential to rescue the victims and minimize human suffering during the earthquake, an effective concrete physical and emotional approach was not present to allow the public and private agencies to rescue the victims. Were there lessons to be learned from this earthquake at the time and used for the flood that hit Pakistan in 2022? These lessons will be discussed in this presentation.

O13.08

2:45 IMPORTANCE OF SOCIAL EQUITY IN DISASTER MANAGEMENT

Kessler Pope, Ninoshka Munoz, Jamaya Redd, Shaila Khan,

Tougaloo College, Tougaloo, Jackson, MS

Management of a disaster and its impact on a community are influenced to a great extent by the physical and social vulnerability of its members. Planning and execution of management practices during all phases of a disaster event including preparedness, response, recovery and mitigation efforts are largely dependent on the social vulnerability of a community and its members. Contributing factors of this vulnerability are inequalities in socio-economic status including education level, physical disability, racial and language minority status, housing, physical environment of the neighborhood, and more. Previous researchers as well as disadvantaged community members believe that access to planning and mitigation efforts of the disaster management agencies are not uniformly available across all communities

partly because of existing social inequalities.

This qualitative study focused on two objectives. First, the study evaluated the current knowledge on assessment of social vulnerability from the perspective of planning and management of disasters. In this research a thorough literature review was prepared and with a concise summary report. Second, leaders and managers of two socially disadvantaged communities of predominantly African American members from Mississippi were interviewed. Topics of the interviews with community leaders accentuated the perception of its members about the existing disaster management practices adopted by the state and local agencies. Interview topic of the disaster management agencies focused on their self-evaluation of the adequateness and readiness of these agencies in dealing with socially disadvantaged communities. Any suggestion for improvement of practices will be sought as well. Knowledge on the importance of social vulnerability and improper equity even in the practice of well-planned disaster management efforts will be presented. A summary of the observations from literature and views held by community members and management agency leaders will be presented.

O13.09

3:00 THE EFFECTIVE RELATIONSHIP BETWEEN BINGE-WATCHING ON COLLEGE STUDENTS' EMOTIONAL INTELLIGENCE

Kelsea Spann[1], *Shaila Khan*[1],

Tougaloo College, Jackson MS

The purpose of the present study was to determine the impact of Binge-Watching Engagement and Symptoms (BWES) and Emotional Intelligence (EI) among College students. Consumer viewing habits have changed as a result of video streaming websites such as Netflix and Amazon Video. On-demand content is more convenient for viewers, and they can enjoy it at their convenience. As a result, viewers consume multiple episodes of TV shows in a compressed time frame - a phenomenon known as binge-watching. College students can benefit from binge-watching in several ways (Panda, & Pandey 2017), In the last few years, the way television series are viewed has changed dramatically, and binge-watching has become a popular viewing pattern. Early studies defined binge-watching as a potentially addictive behavior that shows characteristics similar to other behavioral addictions, such as loss of control and a sense of anticipation. Binge-watchers experienced more negative emotions such as dependency and loss of control, while fewer binge-watchers experienced more positive emotions (Anozie, 2019). Among a total of seven motivations identified in the literature, only the entertainment motivation is a significant predictor of binge-watching for those with a low level of binge-watching, while both passing time and entertainment were found to be significant predictors for those with a high level of binge-watching (Sung, Kang, & Lee, 2018). In the present study it was hypothesized there will a relationship between the BWES and EI. It was also hypothesized that BWES and EI would vary according to gender and classification. The sample included eighty (80) males and females, undergraduate participants between 18 and 24 years old. The participants were contacted through email, providing them a link to the questionnaire located on Microsoft Forms, an online survey creator. Each participant was given the EI Test (Salazar, 2017), The BWES Questionnaire (Flayelle et al, 2019), and some demographic questions. To test the first hypothesis a Pearson correlation coefficient will be conducted between BWES and EI. To test whether there is a gender differences among BWES and EI t tests will be performed. To see whether BWES and EI vary according to classification ANOVA will be performed. After the results are being calculated, it will be presented at the oral presentation. This research is important for College students to discover their emotional intelligence and binge-watching engagement and symptoms to help them manage their intake and make better future plans.

3:15 Divisional Business Meeting

Thursday, February 23, 2023

EVENING

3:30 DODGEN LECTURE and AWARDS CEREMONY
Hall B

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

P13.01

ADDRESSING MENTAL HEALTH WITHIN BLACK, INDIGENOUS, AND PEOPLE OF COLOR (BIPOC) IN HIGHER EDUCATION

Anou Vang[1], *Allyson McGowan*[2], *Kaliyah Vernon*[3], *Christian Vargas*[4]

[1]*California State University, Fresno - Department of Biology,* [2]*Tougaloo College - Department of Biology,* [3]*California State University, Sacramento - Department of Ethnic Studies,* [4]*University of California, Merced - Department of Public Health*

Our mental health affects how we feel, think, behave, and interact with others as well as how we handle stress and make decisions. Emotions, psychological health, and social wellbeing all contribute to mental health, which is crucial at every stage of life development. The BIPOC group, which deals with multiple challenges every day, is at danger of developing stress. Even though their social and emotional welfare is negatively impacted by these high levels of stress, BIPOC people are less likely than their White counterparts to seek treatment for mental health problems. In order to help this group overcome the problem, it is crucial to ensure that they receive the attention and resources they require. Our team performed a comprehensive literature review to determine multiple factors associated with negative mental health outcomes among the BIPOC community in higher education and solutions to help alleviate these outcomes.

P13.02

SEX DIFFERENCES IN THE EFFECTS OF ALCOHOL SELF-ADMINISTRATION ON ACTIGRAPHY-BASED SLEEP MEASURES

Tomyah Smith[1], Donna Platt[2], Jaren Reeves-Darby[2], Jordan Hastings[2]

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

Alcohol can cause sleep disruptions, and sleep disruptions can increase relapse risk in individuals with Alcohol Use Disorder (AUD). Rates of AUD are rising in women, but knowledge gaps exist regarding gender, alcohol use and sleep. This experiment used actigraphy-based sleep measures and alcohol self-administration in rats to study the relationship between alcohol dose, sleep disruption and sex. Wistar rats (4 male, 3 female) were surgically-implanted with E-mitter transponders then trained to orally self-administer alcohol under a fixed-ratio schedule of alcohol delivery using a step-wise sucrose fading procedure. For each rat, on the final stable day at each step, actigrams were generated and used to determine inactivity (i.e., <10% of the maximum activity count), in 5 min epochs during the post-dark phase (first 5h after self-administration), the light phase (12h), and the pre-dark phase (6h before next drinking session). In males but not females, alcohol selectively affected activity during the light/inactive phase. In this phase, alcohol increased activity (i.e., significant percent change in area-under-the-curve), compared to sucrose alone. This increase was not alcohol dose-related. In males in this phase, alcohol specifically decreased the time spent inactive and shortened the longest bout of inactivity. Again, significant effects appeared to reflect length of exposure (i.e., significant effects emerged during the later steps of the sucrose fade). The results indicate that males may be uniquely sensitive to the sleep disrupting effects of alcohol. Our results reinforce the need for addressing alcohol-induced sleep problems as an aspect of AUD treatment, especially in male patients.

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P13.03

PERCEPTIONS OF COVID-19 VACCINATIONS AND HEALTH BEHAVIORS AMONG MISSISSIPPI YOUTH

Caroline Doherty[1]

[1]*University of Mississippi Medical Center, Jackson, MS*

Mississippi consistently ranks as one of the least healthy states in the United States. With some of the nation's worst birth outcomes, highest rates of chronic diseases, and preventable mortality, Mississippians' health status is poor. Poor health begins early - MS youth engage in significantly riskier health behaviors, including higher levels of tobacco use and risky sexual behaviors, and are significantly less likely to regularly report eating healthy food, exercising, and wearing a seat belt.[1] These poor health behaviors have been highlighted by the COVID-19 pandemic, especially regarding vaccination. Currently Mississippi COVID-19 vaccination rates are well below the national average for adult and pediatric immunizations. According to the Mississippi Department of Health, only 7% of children aged 5-11 and 37% aged 12-17 are fully vaccinated. The vaccination rate for adults is 57%.[2] Research is needed to identify facilitators and barriers to COVID-19 vaccination from youth themselves to better understand how to address mistrust and miscommunication regarding COVID-19.

In this study, students involved in Project SCORE, a NIH-funded study that addresses youth behaviors through a public health education program and mentored research experience to increase science engagement, were surveyed about their perceptions and knowledge regarding COVID-19 protective behaviors and vaccinations. Since Project SCORE participants come from diverse communities and are interested in science, they provide unique insights into barriers to COVID-19 vaccination among Mississippi youth. 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 promote future vaccination efforts.

P13.04

WERE THERE LESSONS TO BE LEARNED FROM THE 2005 EARTHQUAKE VICTIMS IN PAKISTAN FOR THE 2022 FLOOD?

Ameena Rauf[1], Zarqa Shaheen[2]

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Natural disasters in the world are destructive, affecting human lives, country's infrastructure, and causing significant human pain. Among these natural disasters in the world is an earthquake. Earthquakes can lead to human psychological suffering, life-style destruction, loss of life, and destruction of country's infrastructure. The objectives of this research were to study the role of two major Pakistani national newspapers (The News and Daily Jang) in covering the news and conveying information about the earthquake to allow the public agencies and private sector to effectively rescue the victims. To achieve this objective, this current research was conducted using the quantitative analysis method. Categories covered by these two newspapers during this study were: casualty, injury, physical relief, psychological relief, infrastructure, and financial relief were used. The results showed that during the study period, October 9, 2005, to January 9, 2006, The News newspaper did more coverage than "The Daily Jang" in some categories and the Daily Jang did more coverage than The News in other categories, depending on the period of coverage. The same trend of total categories was also observed between The News and The Daily Jang for the total number of categories. For example, in the period from October 9 to October 15, 2005, The News did more coverage than the Daily Jang in the following categories: casualty (16.07%), physical relief (23.21%, financial relief (26.79%),

and others (28.57%). However, the Daily Jang did more coverage than the Daily in the following categories: injury (14.63%), infrastructure (17.07%), and psychological relief (4.88%). In spite of the higher coverage of the Daily Jang of the grand total number of the categories (883) vs. The News (853), either newspaper did better coverage in some categories than the other during the period of coverage. The higher news coverage by either The News or The Daily Jang in some categories than others during the entire period of study (October 2005 to January 2006) could be explained by the influence of the language used (English or Urdu), individual skills, individual access to the scene, distance from the epicenter of the earthquake, and the individual emotional and psychological status during the coverage, and the social and economic status of the communities concerned with the earthquake. It can be concluded that although the newspapers reporting was essential to rescue the victims and minimize human suffering during the earthquake, an effective concrete physical and emotional approach was not present to allow the public and private agencies to rescue the victims. Were there lessons to be learned from this earthquake at the time and used for the flood that hit Pakistan in 2022? These lessons will be discussed in this presentation.

P13.05

THE IMPACT OF COVID-19 ON HBCU'S UNDERGRADUATE STUDENT'S EFFECTIVE FORMS OF COPING

Shane Weld[1], *Diane Groat*

[1]*Jackson State University, Jackson, MS*

The concept of coping and the mechanisms involved are complex in nature and measured differently by many researchers. Most theorists attempt to qualify and quantify coping focusing on the behaviors of individuals when introduced to a stressor. The proposed study observed the relationship between variables associated with the coping styles of undergraduates at an HBCU during the COVID-19 pandemic. For this study, the researchers mirror the definition of coping to Folkman's and Lazarus' theory of coping model. Coping is defined as the cognitive and behavioral tendencies of an individual to tolerate and decrease internal conflicts with external stimuli. To examine this topic, we plan to utilize Pearson's correlation to measure the significant interactions between coping styles during the pandemic and perceived academic stress. The brief cope scale is the measurement used in this study. The data obtained in this study has a sample size of 84 providing an ample number of participants. It is the researchers' hypothesis that participants will display decreased usage of healthy coping styles during the height of the pandemic.

P13.06

THE EFFECTS OF ACUTE EXERCISE ON MEMORY: STATE-DEPENDENT LEARNING

Lauren Fuglaar,[1] *Rylie Mangold*,[1] *Melissa Moffett*[1], *Sierra Pett*[1]*y*, *Paul Loprinzi*

[1]*University of Mississippi, University, MS*

Purpose: The Encoding Specificity Paradigm states that memory recall will be enhanced when contextual factors (e.g., same environment, mental state, etc.) are congruent between memory encoding and memory retrieval (i.e., state-dependent learning). However, minimal research has evaluated this paradigm in the exercise domain. Therefore, the purpose of this study was to evaluate the effects of acute exercise intensity on memory while considering these state-dependent contextual effects. **Methods:** Thirty-nine university students completed a within-subject experiment involving seven laboratory visits. During each laboratory visit, participants encoded a list of 15 words and were subsequently asked to recall as many of these words as possible. The encoding and retrieval phases were matched or mismatched by occurring at rest or during a 3-minute bout of acute exercise, either at moderate- or vigorous-intensity exercise. The seven conditions included: (1) encoding and retrieval at rest (R-R), (2) encoding at rest and retrieval during moderate exercise (R-E Mod), (3) encoding at rest and retrieval during vigorous exercise (R-E Vig), (4) encoding during moderate exercise and retrieval at rest (E-R Mod), (5) encoding during vigorous exercise and retrieval at rest (E-R Vig), (6) encoding and retrieval during moderate exercise (E-E Mod), and (7) encoding and retrieval during vigorous exercise (E-E Vig). With the number of words correctly recalled as the outcome, a 2 (Encoding: rest v exercise) × 2 (Retrieval: rest v exercise) repeated-measures ANOVA was employed to evaluate the potential state-dependent effects of exercise on memory; models were computed separately for moderate- and vigorous-intensity exercise. **Results:** For moderate-intensity exercise, there was no main effect for Encoding, p = .90, Retrieval, p = .24, or an Encoding × Retrieval interaction, p = .13. For vigorous-intensity exercise, there was no main effect for Encoding, p = .11, and no Encoding × Retrieval interaction, p = .54, but there was a main effect for Retrieval, p = .03. A Bonferroni post-hoc test demonstrated that memory recall was greater when memory retrieval occurred during vigorous-intensity exercise when compared to rest, M_{diff} = .54, p = .03, d = .21. **Conclusion:** We did not observe evidence that the effects of acute exercise on memory is state-dependent, but did demonstrate that memory recall is greater when memory retrieval occurs during vigorous-intensity exercise. These findings have important implications for the strategic placement of exercise during the phases of memory to optimize memory performance.

P13.07

SOCIAL VULNERABILITY INDEX (SVI) AND FOOD INSECURITY CORRELATION ANALYSIS IN MISSISSIPPIAN CHILDREN

John Williams[1], *Lora Martin*[2], *Cameron Sanders*[2], *Kayla Patterson*[2], *Gurbaksh Singh*[2], *Maygan Martin*[2], *Lisa Haynie*[3], *Brian Kirmse*[4], *Kengo Inagaki*[5], *Charlotte V. Hobbs*[2]

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Background: Social Vulnerability Index (SVI) is a score

designed by the Centers for Disease Control and Prevention and the Agency for Toxic Substances and Disease Registry to quantify the potential negative effects on communities caused by external stresses on human health. SVI uses 15 census variables and is being increasingly used in health-care research. Despite the expanding use of SVI as an estimate of social vulnerability, some have questioned its validity. Food insecurity is a well-recognized social issue that can disproportionately affect vulnerable populations. Mississippi has a food insecurity rate of 15.3%, which is higher than the national average of 10.5%. As of now, the relationship between food insecurity and SVI use requires further study. We aimed to assess the prevalence of food insecurity in our population and to examine the direct correlation to SVI.

Methods: A secondary analysis was completed on data collected through the Department of Pediatrics, Division of Infectious Diseases at the University of Mississippi Medical Center. Food security status was determined by using the USDA 6-Question survey. Scores were categorized into "High/ Marginal Food Security", "Low Food Security", and "Very Low Food Security"; households were considered food insecure if they fell into the "Low" or "Very Low" categories. Descriptive statistics were used to describe our sample. Spearman's rank order correlation was used to examine the direct correlation between food insecurity and SVI. Households within our population reported a food insecurity rate of 16.3%, which is above both the aforementioned state and national average.

Results: Almost 70% of our population resided in a high or moderate-to-high SVI. A Spearman's Ranked Order Correlation did not reveal a statistically significant correlation between SVI and food security (rho=0.1440, p=0.186).

Conclusions: These results suggest that more detailed study is necessary to understand the relationship between SVI and food insecurity and researchers should approach the use of SVI in health-related research with caution. Future directions include exploring food insecurity amongst households in specific SVI categories, as well as exploring food insecurity and SVI subscores.

P13.08

THE EFFECT OF TEXT MANIPULATION ON READING COMPREHENSION OF CHILDREN WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER (ADHD) USING THE BIONIC READING METHOD

Shelley Bentz[1], *Lin-Miao L. Agler*, *Taylor Thigpen*
[1] *University of Southern Mississippi, Hattiesburg, MS*

Empirical evidence has indicated that children with Attention-Deficit/Hyperactivity Disorder (ADHD) have a more difficult time with reading comprehension and that text manipulation could affect their comprehension level (Stern & Shalev, 2012). Bionic Reading (BR) is an innovative method of reading that manipulates text presentation by guiding the readers' eyes to specific focal points of the presented text. By highlighting the first few letters of each word in bold, this guides the reader's attention and allows the reading information to be transmitted to the brain more quickly, according to the creator of the BR method (Casutt, 2022). Manipulating text in this way encourages attentional concentration on the bolded letters, which increases text processing and facilitates comprehension, and this method of reading is reportedly being used more and more to aid children's reading comprehension (Casutt, 2022), especially children who may have more difficulty in reading due to attention-related issues (McClain et al., 2021). Reading is a basic human skill we learn very early in our lives, and a skill we use every day. However, it is estimated that 10-20% of individuals have a problem with reading (Capin et al., 2022). As Casutt (2022) stated, this method of reading not only helps those who have basic difficulty with reading but also those individuals who have disorders that make reading more challenging (McClain et al., 2021). Although the BR method has not been studied in children with ADHD, one might speculate that it could catch the attention of children with ADHD better and potentially help them to better comprehend what they read. The purpose of the present study is to investigate the role of the BR method on reading comprehension among students with ADHD. One hundred 5th grade participants with ADHD will be recruited and split into two groups of equal size for this study. One group will read 4th-5th grade level texts printed using the BR method while the other group will read the same texts in the standard print style without any letters highlighted in each word. Participants' reading comprehension will be tested by multiple-choice questions based on the texts they read using the BR presentation method and the traditional print format accordingly. Data collection will begin in January of 2023 at several elementary schools in the southeastern area of the United States. Reading comprehension performance will be compared between the two groups to determine if BR has a positive effect on the reading ability of children with ADHD.

P13.09

THE IMPACT OF MATTERING AND PSYCHOLOGICAL BURNOUT ON JOB SATISFACTION WITH COLLEGE RESIDENT ASSISTANTS

Abigail Shook[1], *Jade Burnett*, *Sarah Stout*,
[1] *Belhaven University, Jackson, MS*

The purpose of this research is to study the impact of mattering and psychological burnout on job satisfaction with college resident assistants. The researchers in this study hypothesize that mattering and psychological burnout affects job satisfaction in college resident assistants. College resident assistants from schools across Mississippi will complete surveys measuring mattering and psychological burnout and how they impact job satisfaction as resident assistants. A multiple regression analysis will be used to analyze the data. The research project, including data collection, data analyses, and final preparations for presentations will be completed before the dates of this conference. A final abstract will be resubmitted for the conference.

P13.10

THE IMPACT OF METACOGNITION ON ACADEMIC PERFORMANCE AMONG STUDENTS IN THE UNITED STATES

Martha M. Tchounwou, Ebele Okoye, and Faith Iseguele
College of Science, Engineering and Technology, Jackson State University MS

Although metacognition requires conscious action, not all processes that are needed to perform a metacognitive task must always be conscious. However, the acquiring of knowledge knowingly through metacognition must be done intentionally. A number of researchers have supported the proposition that metacognitive awareness is involved in problem solving, and may be related to the general intelligence of the student, and that individuals with higher metacognitive awareness have a better problem-solving strategy. They also perform significantly better on training and transfer tasks compared to those with lower levels of metacognitive awareness. This study looks at the impact if metacognition among students in the U.S.A. based on studies conducted at the University of Wisconsin, and Midwestern State University, using the variable of belief, self-efficacy, task-value and self-regulation. The method used to annualize the results from the 255 participants in this study, was a sub-scale that was adopted from Motivated Strategies for Learning MSLQ to measure students' metacognitive self-regulation. This sub-scale contained a total of 12 items out of the 44-item instrument using the 7-point Likert scale. Results obtained from the study revealed a significant positive correlation between metacognitive awareness, and college freshmen students' academic performance. This implies that students with a higher degree of metacognitive awareness tend to also succeed academically when compared to those with a lesser degree of metacognitive awareness.

Science Education

Chair: Seung-Renee Clary

Mississippi State University

Co-Chair: Lydia Lytal

Blue Mountain College

Thursday, February 23, 2023

MORNING

Room

8:15 Welcome

O14.01

8:30 MICROBIOLOGY STUDENTS' KNOWLEDGE OF MONKEYPOX

Johnny Mattox

Blue Mountain Christian University, Blue Mountain, MS

An important topic covered in the fall section of General Microbiology at Blue Mountain Christian University is the study of emerging diseases, those diseases that are new or exhibiting an increase in occurrence. Students in the class were given a survey to determine their knowledge of monkeypox, an emerging disease presently on the increase. Of the nineteen students surveyed, all knew that monkeypox is an infectious viral infection. 89.5% of the students surveyed knew that this disease can occur in humans and other animals. All students knew that the symptoms of monkeypox include fever, swollen lymph nodes, and a rash. 63% knew that the incubation period is from 5-21 days and 58% knew that the duration of the symptoms is 1-2 weeks. Only 21% knew that there is a vaccination for monkeypox and 68% of the students surveyed knew that there are presently two clades of the disease in circulation. 95% of the students knew that the proper techniques for preventing spread of the disease include frequent hand washing, avoidance of infected individuals, and possibly taking the smallpox vaccination. 95% of the surveyed student also knew that treatment for the disease is supportive, administration of antivirals, and taking vaccinia immune globulin.

O14.02

8:30 3D PRINTED MODELS OF THE MITOCHONDRIAL ELECTRON TRANSPORT CHAIN AND ATP SYNTHASE

Andres Becerril-Nieves, Christopher Jurgenson

Delta State University, Cleveland, MS

Models of the electron transport chain and ATP synthase were 3D printed using polylactic (PLA) on polyvinyl alcohol (PVA) supports. The models printed were NADH dehydrogenase (4UQ8), succinate dehydrogenase (1ZOY), cytochrome bc1 complex (1NTZ), cytochrome oxidase (1OCC), and ATP synthase (5ARE) using a Raise3D E2 printer. The time to print each model ranged from approximately 24-96 hours. The models were printed to scale to show their relative sizes. The scale was determined by measuring the longest axis for the NADH dehydrogenase

structure in coot (reference) and converting it to a length in inches for the printed model. The NADH dehydrogenase model was scaled to be 10 inches, with a 280 Å long axis giving a conversion factor of 0.0357 in/ Å. It was chosen since it is the largest of the five structures, which ensures that all models would fit within the parameters of the 3D printer. Each model was scaled similarly. The purpose of the project is to make a 3D model of the key components of the ETC for teaching in biochemistry, cell biology, microbiology, and physiology courses.

O14.03

8:50 USING 3D PRINTING TO MAKE MODELS FOR VISUALIZATION OF PROTEIN STRUCTURE

Christopher Jurgenson

Delta State University, Cleveland, MS

Structures of 10 proteins from the Protein Data Bank were 3D printed as part of an undergraduate biochemistry teaching laboratory. All structures were successfully printed in either a space filling surface representation or a cartoon representation that traces the Cα carbon atoms of each amino acid residue. All structures were printed using poly(lactic acid) (PLA) with water dissolvable poly(vinyl alcohol) (PVA) supports. The cost of making the models ranged from $11.02 to $24.48, and the total print time of each model ranged from approximately 42 to 103 h. PDB files were downloaded from RCSB.org (accessed 2022-04-20) into PyMol to be converted into .stl files. The .stl files were sliced using Ideamaker and printed on a Raise3D E2 printer. Quaternary structures were printed using a surface representation, but monomers were printed using a cartoon representation of the Cα skeleton. Monomers were checked using the modeling program Crystallographic Object-Oriented Toolkit (coot) to fix any gaps in the structure due to incomplete X-ray crystal models. This project was used to teach concepts such as protein structure, protein function, and computer graphics in an undergraduate biochemistry course.

O14.04

9:10 ACTIVE LEARNING STRATEGIES FOR ASYNCHRONOUS ONLINE GEOSCIENCE COURSES

Christa Haney

Mississippi State University, Mississippi State, MS

Active learning strategies are rewarding for students but can be challenging for teachers to employ, particularly in large, asynchronous, online courses. Examples of various active learning strategies used to enhance student interest and engagement will be presented. Courses include an undergraduate Water Resources course as well as graduate-level Environmental Science and Research Methods courses, delivered asynchronously in an online modality. Examples of active learning strategies include: (1) a 3-stage group activity which includes a presentation, TAG feedback (T = tell them something they did well, A = ask them a provocative question, G = give constructive feedback) and student discussion; (2) meaningful class discussions via the Discussion Board feature in Canvas along with a faculty summary of salient points and a synopsis of the discussion; (3) local research using data and government web resources (water quality reports, USGS, EPA websites, quizzes for water usage, ecological footprint etc.) where students evaluate local environmental quality and their overall impact; (4) student debates on critical environmental topics such as fracking, expansion of nuclear power, expansion of renewable energy etc.; (5) peer review of research methods for a capstone project where a peer student offers feedback on another student's data, hypothesis, statistical analysis etc. Advantages of these active learning strategies include positive student experiences (course evaluations) and increased student engagement because students have a deeper connection with the material (Bonwell and Eison, 1991). The active learning group activities improved student collaboration skills and students were satisfied that their grade was not dependent on others' performance. Students also reported learning more about their local water issues and environment because of these embedded local research activities (course evaluations) and reported higher satisfaction in their constructed learning experience because they were able to research the local topics that mattered to them. In general, student feedback is largely positive with average grades similar to, or slightly higher, than in previous semesters.

Disadvantages include the additional time required to set up these active learning initiatives including BREAKing students into groups, drafting detailed instructions, creating the online infrastructure for the group exercise, debate etc. Additional challenges include students' ability to follow directions and their technological limitations. While the setup for this active learning exercise required more work on the front end, grading on the back end required less time so that the instructor's overall time commitment was comparable. The added benefits of active learning, student interaction, and critical thinking through active learning strategies make these learning activities worthwhile.

References: Bonwell and Eison (1991)
https://files.eric.ed.gov/fulltext/ED336049.pdf

O14.05

9:50 A COMPARATIVE STUDY OF STUDENT PERFORMANCE IN A STEM COURSE TAUGHT IN-PERSON AND ONLINE

Abu Khan

Jackson State University, Jackson, MS

A recent comparative study of overall student performance in a traditional STEM course between two methods of teaching (in-person and online) reported that no significant difference was found (Khan, 2022) for an introductory calculus based physics course. Data used for this analysis included performance data from online teaching method from Spring semester of 2020. This course is a second-year level course that is usually taken by students majoring in engineering, computer sciences, physics and mathematics. A closer look at the background training of students reveal that who took this course during Spring and Summer semesters of 2020 had at least one year of in-person learning in college level courses (including basic math courses). These students should have been treated differently from those who did not have any in-person learning experiences in college level courses.

Traditionally, students of this course frequently encounter various challenges including (a) insufficient mathematical background, (b) inability to follow textbook mainly because the concepts are presented there with an assumption that students are able to recall the fundamental background mathematics right away, (c) inefficient extraction of information from the statements of problems and inability to formulate a proper strategy for solution as demanded by most physics problems (commonly asked in tests and exams for student evaluation), and (d) inefficiency in applying appropriate mathematical steps to carry out the adopted strategy for solution. Students who had at least one-year of in-person learning college level math and science courses will inevitably experience less difficulty on these challenges. Thus, Spring and Summer 2020 student data should not be included in the performance data set for online learning. The present study excludes data for Spring and Summer of 2020 (taught online) from the online as well as in-person data and includes new data from additional semesters that were not included (in online) in the previous study. Overall student performances (percentage of overall grade) of 862 students (Mean = 72.95, SD = 25.62) who took the course in-person from the same instructor from 2007 to 2019 were compared to those of 125 students (Mean = 69.27, SD = 19.96) who took the same course online since the Fall semester of 2020. Results from a comparison of means using independent sample t-test showed that overall performances of students taking online course is statistically significantly lower than those who took this course in-person ($t = 1.85$, $df = 985$, $p = 0.033$ one-sided). This difference was found even though corrective measures were adopted to reduce the limitations commonly faced in online teaching. It may worthwhile to mention that these difficulties encountered by students (especially with math background) in recent days has been observed to increase as more and more students who did not have in-person training in basic science and math courses in high schools and middle schools are taking this course.

O14.06

10:10 THE MISSISSIPPI BASE PAIR CONSORTIUM (MBPC) – TAKING A STEMM RESEARCH MENTORSHIP MODEL STATEWIDE.

Rob Rockhold[1], Kendrick Buford[2], Julie Cwikla[2], Alex Flynt[2], Ramzi Kafoury[3], Stephen Stray[1], Sydney Murphy[1]

[1]University of Mississippi Medical Center, Jackson, MS, [2]University of Southern Mississippi, Hattiesburg, MS, [3]Jackson State University, Jackson, MS

Cultivating interest in science research through individual mentorship is fundamental to ensure a competent, vigorous, and diverse future work force in science, technology, engineering, mathematics, and medicine (STEMM). Base Pair is one model in which partnership between a high school and a Mississippi Institution of Higher Learning (IHL), the University of Mississippi Medical Center (UMMC), has demonstrated positive outcomes in improving science identity and STEMM career progression in precollege students, particularly of disadvantaged and underserved populations. Supported by funding from the Phil Hardin Foundation, the MBPC has embarked on expansion of this model to five additional university campuses, Delta State University, Jackson State University, Mississippi State University, the University of Mississippi, and the University of Southern Mississippi. While incorporating recognition that Mississippi universities have existing science outreach programs and high schools have unique constraints governing off-campus student activities, the MBPC seeks to replicate core elements of Base Pair for 11th and 12th grade high school students, including providing academic credit for such participation; introduce a novel element, the MBPC After-School/Summer Science Camps for 9th and 10th grade students, that will facilitate recruitment into and preparation for research mentorship; and support high school teachers with advanced laboratory-focused learning kits to enhance inquiry-based science education in Mississippi public schools with research grade laboratory equipment. The high school partners for each IHL campus, the manner in which academic credit is awarded (dual-enrollment or use of a Mississippi Department of Education-sanctioned course, *Biomedical Research*), and progress in developing science camps and learning kits will be detailed. In the state with the highest incidence of potentially correctable health problems, improving STEMM literacy through individual mentorship is an explicit objective of the MBPC, and one that can be expected to exert a major positive impact on the health of our citizens. Supported by a generous award from the Phil Hardin Foundation.

O14.07

10:30 THE MODELS THAT SUCCESSFULLY RECRUIT AND RETAIN UNDERREPRESENTED MINORITIES IN THE STEM FIELD

Jinghe Mao, Manliang Feng, Santanu Banerjee John Barringer, Pradip Biswas, Ra'Chaud Brown, Caixia Chen, Sharron Streeter

Tougaloo College, Tougaloo, MS

The lack of Underrepresented Minorities within the STEM pipeline is well documented. This dearth of talent is linked to poor preparation for science and mathematics and limited exposure to STEM careers. Building these pipelines requires that undergraduates be engaged early and often to achieve success. Our project aims to utilize a multilayered approach to broaden opportunities for our students to succeed in STEM majors.

In this presentation, we will provide a three-year summary of building a bound STEM learning community that started from pre-college and continued through their senior year using holistic strategies. We integrated a summer science/engineering program (SSEP), summer research internship and symposium, journal club, seminar series for professional development/career exposure, and peer mentoring.

There were a total of 46 students in 3 cohorts, the STEM retention rate is 91% (first-year), 69% (third-year), and the 4-year STEM graduation rate is 100%. In addition, 80% of graduates went to graduate or professional schools. In conclusion, our data suggested that the holistic intervention strategies help us to create a model that successfully recruits and retains underrepresented minorities in the STEM Field.

10:50 Science Education Divisional Business Meeting

O14.08

11:10 BRINGING GEN Z TO THE SEA: EXAMINING THE IMPACTS OF PROFESSIONAL DEVELOPMENT ON STEM TEACHERS' KNOWLEDGE AND AWARENESS OF BLUE ECONOMY CAREER PATHWAYS

Patrick Kirby, Hannah McDuffie, Julie Cwikla, Tara Skelton

University of Southern Mississippi, Hattiesburg, MS

GenSea is a collaborative effort to introduce Mississippi's high school students and educators to the vast career opportunities along the coastal Mississippi corridor, led by the University of Southern Mississippi's Center for STEM Education and School of Ocean Science and Engineering. GenSea aims to contribute to the economic development of the state of Mississippi by carefully cultivating well-prepared young adults and serving the blue economy industries on the Mississippi Gulf Coast. Thus, creating lucrative pathways to retain our home-grown coastal talent. Due to outmigration of young, educated college graduates, Mississippi is experiencing a net loss of "homegrown" talent commonly referred to as brain drain. Mississippi has experienced the sharpest decrease in college educated Millennials in the United States over the past decade. In June 2022, a select group of 20 STEM educators from around Mississippi attended a 3-day professional development event hosted by GenSea; they toured technical training sites and interacted with STEM professionals in authentic environments to learn about job opportunities in marine science, ocean engineering, and hydrography. This inquiry is a work-in-progress aiming to examine the impacts of professional development on teachers' awareness and knowledge of career pathways, as well as their plans to incorporate STEM blue economy career opportunities into their lessons. Following a mixed method approach and guided by Desimone's (2009) conceptual framework, teaching sampling occurred over the 3-day development event. Pre-post surveys were taken before and after each day of training in addition to a general pre-post survey pertaining to the event as a whole. Preliminary results of paired student's t-tests and measures of effect size from year 1of a 2-year study indicate exposure to blue economy careers significantly increased teachers' awareness ($n=19$, $p<.001$, $SD=.602$) and knowledge of career pathways ($n=19$, $p<.001$, $SD=.905$) into STEM. Preliminary coding revealed teachers' strategies for incorporation to their lessons. STEM skills are vital to nearly every sector of the modern, global economy, thus collaborative, targeted workforce development programs are needed to identify and grow local talent and illuminate industry bridges to help plug the drain.

O14.09

11:30 AGRICULTURAL APPLICATIONS & LITERACY STRATEGIES: A WINNING COMBINATION FOR ENGAGING MISSISSIPPI STUDENTS IN SCIENTIFIC CONTENT

Renee M. Clary[1], Stephanie M. Lemley[2]

[1]Geosciences, Mississippi State University, Mississippi State, MS, [2]Curriculum, Instruction, & Special Education, Mississippi State University, Mississippi State, MS

Since agriculture is the state's top industry, some Mississippi students have exposure or interaction with livestock and crops, though many lack an understanding of where their food comes from or how it is produced. The Agricultural Science Professional Development (PD) ACRE project brought secondary science and agriculture science teachers together for a 10-day summer institute and 2 professional development days to increase teachers' agricultural science content, develop leadership strategies to disseminate this content to their peers, and introduce teachers to strategies that can be used in the classroom to develop their students' literacy skills. For two ACRE program years, teachers ($N=20$) in two cohorts were introduced to meat and dairy science as well as plant science and acquired supplies to implement the agricultural content in their own science classrooms. ACRE teachers utilized desktop greenhouses, hydroponics, soil and water investigations, and fetal pig dissection kits with their students, using agriculture to introduce and expand scientific concepts. Teachers discovered ACRE literacy strategies for speaking, writing, reading, and developing listening skills for agricultural science were also useful. ACRE teachers reported that ABC brainstorming charts, Carousel, and magnet summaries were beneficial tools for their students to learn scientific vocabulary, engage the classroom in pre- and post-unit discussion, and help students organize scientific content. ACRE teachers affirmed that both agricultural science and literacy strategies have value in Mississippi's grade 6-12 science classrooms.

12:00 General Session

Thursday, February 23, 2023
AFTERNOON

1:00-3:00

TEACHING ECELLENCE WORKSHOP

Optimizing STEM Instruction in Higher Education

Renee M. Clary, Lydia Lytal, Athena Owen Nagel, Christa Haney, Sarah Lalk

Are you interested in a professorship or teaching career in higher education? Successful, effective instruction requires pedagogical tools in addition to in-depth STEM content knowledge. Join us as we showcase active-learning strategies to engage students in both traditional and online classrooms. Science Literacy and Community Engaged Learning will be included.

Thursday, February 23, 2023
EVENING

3:30 DODGEN LECTURE and AWARDS CEREMONY
Hall B

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

Friday, February 24, 2023
MORNING
Room D12

8:45 Welcome

O14.10

9:00 THE IMPACT OF COVID-19 ON FACULTY TECHNOLOGICAL KNOWLEDGE DEVELOPMENT AT AN ACADEMIC MEDICAL CENTER

Xiaoshan Gordy, Driscoll DeVaul, Mary Morton, Kristen Callahan, Angela Burrell, Travis Schmitz, Britney Reulet

University of Mississippi Medical Center, Jackson MS

The COVID-19 pandemic impacted the learning environments of 1.3 billion students worldwide, particularly as many traditional, in-person classes moved to virtual learning. This mixed-methods study surveyed and interviewed faculty within a US academic medical center to determine whether the pandemic stimulated technological knowledge growth. While the study collected both quantitative and qualitative data, priority was given to qualitative interview data to control for a small sample size and to gather in-depth insights. Data collection began approximately 18 months after the onset of the pandemic that occurred in spring 2020. Qualitative results garnered five major themes: collective decision-making and individual autonomy, flexible learning in the new normal, challenges with student engagement in the long-distance relationship, faculty well-being in the age of COVID-19, and opportunities evolved from challenges. Quantitative results indicated that significant differences existed between faculty self-rated competency levels of performing technology-related tasks in the pre-pandemic period and in the current period, suggesting technology knowledge gains from the forced transition to online teaching. Future research is needed to survey a broader audience and to determine whether faculty will continue to utilize technological resources learned during this pandemic to supplement in-person teaching as well as to establish a future contingency plan.

O14.11

9:20 EFFECT OF TRAINING LEVEL AND DEMOGRAPHICS ON QUALITY OF CITIZEN SCIENCE COLLECTED LITTER DATA

Jessi James[1], Mandy Sartain[1, 2], Eric Sparks[1, 2]

[1]Mississippi State University Coastal Research & Extension Center, Biloxi, MS, [2]Mississippi-Alabama Sea Grant Consortium

Citizen, community, or backyard science (hereinafter referred to as citizen science) has evolved from just a means to connect local communities to scientific research, to be actively used in a wide range of research efforts. There are many benefits to citizen science, but several perceived limitations. One limitation is citizen science data is often viewed as inferior or unusable by the broader science community. This stigma associated with citizen science data can often be attributed to a lack of data validation by trained professionals across user groups. Some of the main hindrances to the usability of citizen science data is the inherently different levels of background

knowledge paired with training levels across participants. To increase the usability of data collected by citizen scientists, validity and confidence in the data must be established within the scientific community. To accomplish this usability, this study will evaluate the accuracy of two different marine debris data collection protocols by citizen scientists and the influence of individual characteristics, such as age, gender, educational background, socioeconomic status, and training level on the reliability and accuracy of collected data.

O14.12

9:40 CLIMATE CHANGE AND SEVERE WEATHER: BOOKS, MOVIES, GAMES, AND OTHER RESOURCES FOR SCHOOL AND PUBLIC LIBRARIES

Oliver Kuttner[1], *Joyce Shaw*[1]

Gunter Library at the Gulf Coast Research Laboratory (GCRL) created a reading list of children's and young adult books about climate change and other severe weather topics to support a program at the GCRL Marine Education Center about impacts of climate change on communities. The list was broadened to include movies, games, and other resources to support STEM programs in schools and public libraries. This list provides factual and current information about climate change and global weather topics. Entries for each resource include a brief description of the resource, age appropriateness, and awards and honors with weblinks if applicable. Fictional stories and science fiction are included when the science presented is fact based.

O14.13

10:00 DEVELOPMENT AND PILOT STUDY OF AN ON-LINE GENERAL CHEMISTRY COURSE FOR MISSISSIPPI HIGH SCHOOL AND UNDERGRADUATE CLASSES

Brian Burnes

Mississippi University for Women, Columbus, MS

The Coronavirus Aid, Relief, and Economic Security Act, also known as the CARES Act, is a $2.2 trillion economic stimulus bill passed by the 116th U.S. Congress and signed into law by President Donald Trump on March 27, 2020, in response to the economic fallout of the COVID disease. In early 2021, the Mississippi State University Research and Curriculum Unit used CARES funds to implement the CARES Online High School Course Project. The CARES courses were designed by award-winning teachers in Mississippi and are freely available online courses covering almost the entire high school curriculum. The details of the 2-semester General Chemistry course are shown with demonstrations of activities and suggestions for how the course can be used int any high school or undergraduate class in Mississippi.

11:30 The Mississippi Base Pair Consortium (MBPC): Current Status and Future Plans

The MBPC has been established to promote inclusivity in research mentorship programs for pre-baccalaureate students, using a successful model – the Base Pair program between the University of Mississippi Medical Center (UMMC) and the Jackson Public School District – and expanding access to universities across Mississippi. Supported by the Phil Hardin Foundation of Mississippi, six research-intensive Mississippi universities (Delta State University, Jackson State University, Mississippi State University, the University of Mississippi, UMMC, and the University of Southern Mississippi) have begun sharing concepts of and infrastructures for campus-specific mentorship activities, along with outcomes for student recruitment and career advancement. The present session will provide an opportunity for key campus representatives to present the status of MBPC efforts on each campus, including collaborative arrangements with local high schools, the recruitment of students for upcoming mentorship activities, faculty who will participate as mentors, and plans for summer and after-school student engagement activities. As MBPC member campuses have initiated activities, a diversity of approaches, based on campus-specific research infrastructures, local school collaborations, and institutional resources, has become evident. This session will seek to document these differences and implement adaptation of what was a single model to the variety of unique institutional needs and capabilities. The presentation will share presentation space with the poster session for university-mentored high school student research outcomes. Funded by a generous donation from the Phil Hardin Foundation (https://www.philhardin.org).

Index of Authors

AGRICULTURE AND PLANT SCIENCE

CELLULAR, MOLECULAR AND DEVELOPMENTAL BIOLOGY

Howell, George
Huang, Faqing
Ibrahim, Mohamed
Janie, Azzam
Janorkar, Amol
Jarreau, Mallory
Jenkins, Brenita
Johnson, Keara
Kaplan, Barbara
Karim, Shahid
Kaur, Amandeep
Keller, Lance
Kennedy, Dan
Kennon, Amber
Kessl, Jacques
Khanal, Sweta
Krishnan, Natraj
Li, Jiaxu
Little, Ireland
Love, Karen
Lovell, Kevin
Lowe, Michael-Ryan
Lowe, Micheal Ryan
Margaret, Anne
Marquart, Mary
Martin, Drew
Mavrodi, Dmitri
Mbemi, Ariane
McClinton, Leslie
McDaniel, Larry
Miller, Wes
Moffett, Mallory
Moore, Nyosha
Murin, Landon
Nazneen, Farzana
Ndebele, Kenneth
Neupane, Biswas
Nicaise, Ashleigh
Noubissi, Felicite
Odunuga, Odutaya
Ogle, Brenda
Ogungbe, Victor
Owolabi, Iyanuoluwani
Pasco, David
Pattabiram, Mahesh
Paul B., Odubanjo
Perkins, Eddie
Peter, Jacob
Pradham, Prabhakar
Qiu, Yongjian
Reagan, Jerry
Reinemann, Dana
Riley, Johnathan
Robbins, Austin
Roper, Courtney
Roy, Debarshi
Sahukhal, Gyan
Sarkar, Sanjay
Seiler, Henry
Sengupta, Bidisha
Shridhar, Viji
Simington, Laken
Singh, Shivendra
Snoddy, Caleb
Sohal, Sukhbir
Spiegelman, Vladimir
Stephen, Miller
Stewart, Jr, James
Stray, Stephen,
Stokes, Sean
Sturgis, Trell
Tchounwou, Paul B.
Tchounwou, Paul
Thompson, Elizabeth
Thompson, Courtney
Thornton, Justin
Traigle, Kassidy
Travis, Kaelin
Tullos, Ethan
Oluwatoyin, V.
Vidal, Jorge
Vidal, Ana
Xi, Jing
Xu, Hao
Yedjou, Clement
Zamadar, Matibur

CHEMISTRY AND CHEMICAL ENGINEERING

Abbood, Ibraheem
Adeyinka, Olawale
Adjaye, John
Adzanu, Steve
Ahmet, Alam
Ajayi, Oluwatomi
Alamgir, Md.
Amin, Ruhul
Arslan, Zikri
Atkins, Michael
Bai, Fengwei
Bailey, Ashley
Barnes, Arlencia
Bentley, Joseph
Billa, Benjamin
Blanton, Alicia
Bounds, Christopher
Bravenec, Ardith
Brown, Kristen
Bruni, Christopher
Celik, Ahmet
Cevallos, Alison
Chambliss, Claudia
Chandra, Subrata
Chandra, Paresh
Chastang, Breana
Cheah, Pohlee
Cooper, Regan
Cowan, Angel
Crown, Olamide
Das, Prasanta
Dasari, Shaloam
Dean, Caleb
Delcamp, Jared
Donahue, Matthew
Donahue, Matthew
Donahue, Matthew
Donahue, Matthew
Douglas, Rhaman
Egboluche, Tochukwu
Egboluche, Tochukwu
Fatima, Saman
Feng, Manliang
Fronczek, Frank R.
Gao, Ye
Gao, Ye
Gao, Ye
Gibert, Yann
Gramm, Joshua
Griesbeck, Axel
Hamilton, Heather
Hamme, Ashton
Hammer, Nathan
Han, Fengxiang
Han, Fengxiang
Harris, Alexandria
Hart, Christian
Hart, Christian
Hayek, Sarah
Hearst, Scoty
Hearst, Scoty
Hearst, Scoty
Hearst, Scoty
Hearst, Scoty
Hearst, Scoty
Hearst, Scoty
Hill, Glake
Hinton, Haley
Holmes, Madeline
Hood, Kaylee
Hossain, Alamgir
Huberty, Wayne
Hussey, Charles
Islam, M.
Islam, Saiful M.
Ivey, Ryan
Jean, Billie
Julie, Brashears
Kanatzidis, Mercouri
Kanchanapally, Rajashekhar
Kanchanapally, Rajashekhar
Kapusta, Karina
Kapusta, Karina
Kapusta, Karina
Katz, Blake
Kaur, Gurjit
Kessl, Jacques
Kessl, Jacques
Kessl, Jacques
Kolodziejczyk, Wojciech
Kolodziejczyk, Wojciech
Kramer, Wolfgang
Kramer, Wolfgang
Kundu, Sanchita
Kundu, Sanchita
Leise, Aiden
Lewis, Hannah
Li, Dien
Lofton, Madison
Ma, Youhua
Madison, Kimberly
Magers, David
Magers, David
Magers, David
Magers, David
Magers, David
Magers, David
Magers, David
Magers, David
Martin, Jasmine
Martin, Angelle
Masterson, Douglas
Mattke, Hannah
McCormick, Caitlin
McGuffee, Reagan
Md. Alamgir, Powell
Metibemu, Damilohun
Mhahabubur, Md
Mishoe, Victor

Molitor, Sabrina
Monroe, Dave
Mugon, Gavisha
Nie, Jing
Nie, Jing
Ogungbe, Ifedayo Victor
Olafuyi, Olanrewaju
Olshansky, Lisa
Ovchynnykova, Olha
Owens, Thomas
Panella, Rosemary
Parsons, Tristan
Patibandla, Shamily
Patterson, Jack
Pigza, Julie
Pigza, Julie
Pitre, Samuel
Plunkett, Aaron
Powell, Douglas
Powell, Douglas
Pramanik, Avijit
Pramanik, Avijit
Zheng, Jinju
Qu, Jing
Quintero, Michael
Rathnamalala, Chathuranga
Ray, Paresh
Razinoubakht, Donya
Rhaman, Md. Mhahabubur
Robinson, Micah
Robiul, MD
Rocray, Rachel
Saiful, Roy
Saloni, Julia
Saloni, Julia
Schuler, Whitney
Selby, Trent
Selby, Trent
Shakouri, Mohsen
Sinha, Sudarson
Sisson, Lillian
Sledge, Taylor
Smithhart, Charles
Somarathne, Radha
Steen, Bailey
Stewart, Megan
Stokes, Claire
Subrata Chandra, Celik
Suffern, Sharon
Sukhyy, Kostyantyn
Sullivan, Emily
Tanner, Eden
Taylor-Pashow, Kathryn
Thomas, Kamryn
Ward, Christine
Ward, Timothy
Yadav, Rahul
Zetterholm, David
Zhang, Huimin
Zhang, Shizhe
Zhao, Yongfeng
Zhu, Xianchun
Zimmer, Anne

ECOLOGY AND EVOLUTIONARY BIOLOGY

VanderSchaaf , Curtis
Baach , Elizabeth
Akers , Jaden
Ichu, Ichu, Godwill
Adjaye , Daniela
Dolan , Lacy
Simpson , Shawn
Yun , YaeEun
Ibrahim , Naira
Allison , Patrick
Zee , Peter
Mohaghegh Motlagh , Seyedehparisa
Holman , Lora
Pickich , Emily
Pinter , Hannah
Pinter , Hannah
Pinter , Hannah
Weeks , Mary Margaret
Himes , Austin
Siegert , Courtney
Brooks , John
Spear , Stephen
Sévêque , Anthony
McKinley , William
Baghai-Riding , Nina
Han , Fengxiang
Lieb , David
Zee , Peter
Arantes , Isis
Allison, Jr. , Patrick
Baggett , George
Baghai-Riding , Nina
Nichols , Matthew
Tramel , Katelyn
Polinko , Adam
Kruckeberg , Will
Spear , Stephen
Brooks , John
Evans , Kristine
Katembe , William
Loughman , Zachary
Garrick , Ryan
Garrick , Ryan
Darnall , Charles
McClure , Jonathan
Laventure , Zaida
Glass , Taylor
Granger , Joshua
Naylor , Ashlyn
Challender , Dan
Hileman , Eric
Strickland , Bronson
Baghai-Riding , Nina
Koehler , Catherine
Smithhart , Charles
Wolfram , Shelby
Polinko , Adam
Kruckeberg , Will
Spear , Stephen
Brooks , John
Evans , Kristine
Katembe , William
Loughman , Zachary
Garrick , Ryan
Garrick , Ryan
Darnall , Charles
McClure , Jonathan
Laventure , Zaida
Glass , Taylor
Baghai-Riding , Nina
Koehler , Catherine
Smithhart , Charles
Wolfram , Shelby
Reza , AHM Ali
Granger , Joshua
Naylor , Ashlyn
Challender , Dan
Hileman , Eric
Strickland , Bronson
Granger , Joshua
Morin , Dana
Morin , Dana
Morin , Dana
Poudel , Krishna

GEOLOGY AND GEOGRAPHY

Ageli, Mariam
Ali, S M Asger
Ambinakudige, Shrinidhi
Babineaux Claire
Begum Ruma, Amena
Brink, Alyson
Cartwright ,John
Cummings, Sabrina
Dash, Padmanava
Davidson,Gregg
Deans,Jeremy
Dixon, Mark
Falcetto, Andrea
Fradella, Seth
Goita, Esther
Gratzer, Michael
Hotton, Carol
Dockery III, David
Kennedy,Sydney
Kerr, Jackie
Kwak, Kyungwon
Leard, Jonathan
Locke, Martin
O'Reilly, Andrew
Parrish, Paul
Puckett, Mark
Reginelli, Anna
Riding, Nina
Rigby, J.R.
Schmitz, Darrel
Sherman-Morris, Kathy
Starnes, James
Sweeney, Mark
Taylor, Benjamin
Trochesset,, Ginger
Tucker, Emma
Wren, Daniel

HEALTH SCIENCES

Abdull-Haqq, Deja

Adjaye, John

Adzanu, Steve
Amaral, Lorena
Anderson, Delaney
Anderson-Lewis, Charkarra
Aras, Sermin
Arguello, Irene
Atkins, Michael
Bain, Jennifer
Bates, John
Ben, Mitchell
Benghuzzi, Ham
Bhanat, Eldrin
Bhanat, Namrata
Bhesania, Natalie
Billa, Jermiah
Bishop, Phyllis
Bradshaw, Jessica
Buck, Byron
Burks, Sydney
Butler, Kenneth
Cameron, Jr., Joseph A.
Carter, Fremeckia
Carver, Fremeckia
Chatterjee, Abhirup
Chris, McDaniel
Claudio, Pier Paolo
Coleman, Melissa
Cooper, Adrianna
Cooper, Olive
Cornelius, Denise
Covington, Richard
Daley, Courtney
Daley-Bauer, Lisa
Davis, Justin
Dawoud, Yousef
Dhaliwal, Neha
DiBlasio, Patty
Durr, Emily
Dyess, Garrett
Evans, Kymberlee
Fan, Lir-Wan
Farkas, Amy
Fatemi, Ali
Florez, Edward
Gallagher, Joshua
Gao, Ye
Garcia, Rikki
Gibson, Susan
Glover, Sarah
Goli, Jagruti
Gore, Isaiah
Graybeal, Austin
Green, Emily
Greene, Eryka
Greer, Tammy
Gregg, Parker
Hamil, Gary
Handy, Shawnell
Hatcher, LaQuita
Henderson, Jada
Henry, Mahali
Herron, Makenzie
Holbrook, Shantoni
Holmes, Brandon
Hoover, Skyler
Hopkins, Patrick
Howard, Candace
Howell, Katie
Huye, Holly
Ibrahim, Tarek
Jaynes, Lance
John, Sinha
Johnson, Marcus
Johnson, Seth
Joiner, KriShunda
Keller, Lance
Kierner, Cynthia
Kota, Sai
Kumar, Animesh
Kutcher, Mathew
Laird, Hannah
Lamara, Babbette
Lampkin, Edna
Lampkin, Taylor
Lawson, Frances
Lee, Jonathan
Lee, Nathaniel
Lemacks, Jennifer
Lewis, Joshua
Lindsey, Joseph
Lirette, Seth
Logan, Krystal
Logan, Sedonia
Lowe, Michael-Ryan
Madson, Michael
Marshalll, Tyriney
Mbemi, Ariane
McCann, Breunna
McCray, Morgan
McDaniel, Brandon
McDaniel, D. Olga
McDaniel, Larry
McDonald, Micaiah
McKnight, Chadrick
McMillian, Tiarra
McNealy, Derrick
Mestayer III, Richard
Miles, David
Miller, Wes
Mingo, Samuel
Mitra, Amal
Morrisey, Lucas
Nason, Lora
Nehete, Priyanka
Nielson, Tanner
Nowicki, Michael
Obert, Baylor
Ojeda, Norma
O'Neal, Jonathan
Owings, Anna
Pacurari, Maricica
Park, Casey
Parmar, Rinkuben
Patibandla, Shamily
Pauliah, Mohan
Payton, Jalen
Pendleton, Sabrina
Pham, Amy
Pittman, Leanna
Poe, Kenyatta
Porter, Ben
Pramanik, Avijit
Pride, Yilianys
Quach, Valerie
Rajguru, Tapan
Ray, Paresh Chandra
Robinson, Genetra
Robinson, Tanya
Roda, Manohar
Ruppa-Kasani, Vinod
Sekhar, Sudarson
Senitko, Michael
Sharma, Poonam
Shoulders, Felecia
Sitta, Juliana
Smith, Jessie
Smyly, Aubrey
Stork, Jon-Michael
Storrs, Judd
Stray, Stephen
Tandon, Ritesh
Taylor, Emily
Taylor, Kaitlyn
Thomas, Toms
Thompson, Abby
Thompson, Courtney
Thompson, Renedra
Tucci, Michelle
Turbeville, Emily
Turner, Ty
Valluri, Jagan
Varner, William
Varney, Elliot
Wallace, Kedra
Wang, Niping
Wansley, Nyla
Washington, Kalani
Weeks, Mary Margaret
Whatley, Caleb
White, Latimoris
Wichman, Thomas
Williams, Amaje
Williams, Haley
Williams, Jan
Willis, Ozzie
Wilson, Zachary
Wright, Kendra
Wright-Sexton, Laura
Young, Britney
Young, Jaslyn
Young, Rollin
Yu, Christian

HISTORY AND PHILOSOPHY OF SCIENCE

Angelou, Eleni
Batuhan, A.
Bennett, Nicholas
Bickle, John
Bruton, Samuel
Butler, Kenneth
Cox, Emma
Gregg, Parker
Hamil, Lamar
Hollahan, Kevin
Hosseini, Mohammad
Ifland, Jared
Johnson, Gregory
Macchione, Alicia
Smithka, Paula
Waltzer, Robert

MARINE AND ATMOSPHERIC SCIENCES

Alsarari , Mohammed
Black , Oscar
Chigbu , Paulinus
Craze , Amelia
Crisler , Marshand
Davis , Demontavious
Fadavi , Mehri
Fageir , Siddig
Frith , Makenzie
Garrett , Kelvin
Hirse , Gloria
Hudson , Kayla
Hundley , Jordan
Hystad , Perry
Jones , Erin
Leszczynski , Jerzy
Lu , Duanjun
Maxie , Latrice
Merem , Edmund
Nwagboso , Emmanuel
Offiah , Jude
Olagbegi , Duro
Ozuah , Zimuzo
Parks , Kendall
Pettigrew , Mia
Reddy , Remata
Remata , Reddy
Roper , Courtney
Shahroudi , Narges
Shih , HuiRu
Sidwell , Allie
Simonich , Staci
Smith , Samuel
Tonia Aminone , Voke
Trine , Lisandra
Tuluri , Francis
Twumasi , Yaw
Victoria , Shayla
Walters , Wilbur
Wesley , Joan
White , Loren
Zino , Samson

MATHEMATICS, COMPUTER SCIENCE AND STATISTICS

Abu Bakr , Bilal
Anamoni , Suresh
Beltran-Sanchez , Hiram
Burch , Megan
Caixia , Chen
Chen , Caixia
Chen , Zhiqian
Clement , Michael
Couture , Reed
Crager , Robert
Dangal , Thir
Daramoni , Anil
Daramoni , Prashanth
Fan , Lir-Wan
Gebrhana , Solomon
Genovese , Melissa
Haque , Sardar
Hickman , Tyler
Hu , Qingwen
Ibrahim , Hidaya
Ibrahim , Ibrahim J.
Ibrahim , Jamil
Ibrahim , Saja
Ibrahim , Waseem
Jackson , David
Jackson , D'Munntearriou
Jackson , D'Munntearrious
Khatri Ghimire , Balaram
Lamichhane , Anup
Lee , Sarah
Little , Matthew
Mack , LawrenceG.
Matthews-Harris , Tizon
Meadows , Andrew
Meadows , Andrew
Mondragon , Tomas
Ojeda , Norma
Patel , Reena
Patton , Bradford
Pirim , Harun
Randle , Brandon
Rop , David
Sanders , Austin
Santiago-Lugo , Abdias
Serrano , Alitzel
Shapi , Roseline
Shrestha , Niva
VanderSchaaf , Curtis
Wafer , Caleb
Wang , Haifeng
Wang , Yibin
White , Barry
Yan , Yonghua
Yu , Lixin
Zhang , Ping
Zheng , Yufeng

NEUROSCIENCE

Abbott , Madelyn
Araji , Sarah
Bagwandeen, Belinda
Banga , Aastha
Barber , Chloe
Belinda , Blair
Belk , Sheila
Berro , Lais
Bollavarapu , Ratna
Border , Jane
Bourassa , Erick
Breaux , Renee
Brunet , Nicolas
Burke , Stephen
Burton , Madison
Castle , Ashton
Chander , Harish
Chong , Sarah
Cooper , Jonita
Crumpler , Reece
Day , Lainy
Dearman , Chyna-Rae
Del-Arco , Alberto
Devenny , Dylan
Dixon , Laura
Doyle , William
Estelle , Zadrozny
Fan , Bryan
Fan , Fan
Fang , Xing
Freeman , Kevin
Garett , Ethan
Garris , Zachery
Gisabella , Barbara
Grayson , Bernadette
Greene , Jhanel
Griffin , Ashley
Harris , Kwamie
Hartley , Joshua
Hearst , Scoty
Hembree , Heather
Higdon , Carolyn
Hillhouse , Lakynn
Hopper , Jonathan
Howell , John
Hulitt , Alicia
Huskinson , Sally
Ikuta , Tossi
Jagdale , Sunny
Jones , Adam
Jones , Carolyn
Jones-Muhammad , Maria
Kornisch , Myriam
Krum , David
Lacy , Rita
Lee , Jonathan
Lee , Nathaniel
Lim , Miranda
Lin , Shuying
Lopez , Mariper
Lowe , Rebecca
Macknik , Stephen
Martinez , Alfonso
Martinez-Conde , Susana
Matkins , Hunter
May , Paul
McDonald , Tia
McFatridge , Emily
McMillan , Jakota
McMillian , Jakota
Mohead , Arma'Rosa
Molsbarger , Daniel
Morphis , Emily
Morris , Malachi
O'Donovan , Sinead
Pantazopoulos , Harry
Pareek , Tanya
Park , Hyejin
Patel , Khushboo
Patrick , Victoria
Perkins , Eddie
Person , Jon
Pettus , Maggie
Pharm , Loc
Platt , Donna
Quach , Valerie
Reeves-Darby , Jaren
Rexrode , Lindsay
Rexrode , Lindsey
Rivers , Patrice
Robertson , Mallory
Roman , Richard
Rooks , Haley

Rowlett , James
Shao , Qingmei
Silu , Lee
Stancil , Kennedi
Stockmeier , Craig
Strong , Luke
Tall , Andrea
Talley , Joseph
Tennin , Matthew
Thomas , Kirby
Thornton , Derrick
Tien , Lu-Tai
Ungo , Ricardo
Valeri , Jake
Venkatakrishnan , Ashwin
W , Jonathan
Wallace , Kedra
Warren , Susan
Warrington , Junie
West , Laura
White , Elizabeth
Yarlagadda , Siri
Yimer , Wondwosen
Young , Caleb
Zamarripa , Austin
Zhang , Huawei

PHYSICS AND ENGINEERING

Ables , Patrick
Barnes , Jared
Betts , Logan
Chumley , Scott
Corey , Kennedy
Das , Priyanka
Duan , Yuanyuan
Ford , Richterica
Gautrau , Sidney
Giri , Rekam
Griggs , Jason
Hill , Nathan
Horng , Jao-Jia
Hossain , Mehjabeen
Hughes , Alexis
Ifqir , Loubna
Kalluri , Lohitha
Marapareddy , Ramakalavathi
Misiak , Glenn
Mobley , Joel
Nimma , Divya
Nunna , Krishna Chaitanya
Pradhan , Nihar
Prather , Wayne
Priddy , Lauren
Priddy , Matthew
Ramineni , Saikrishna
Reese , Tyler
Smith , Adam
Spain , Charles
Wen , Kejun
Werfel , Thomas
Winstead , Chris
Yachareni , Krishnakanth
Yang , Shan
Yuan , Pao-Chiang

PSYCHOLOGY AND SOCIAL SCIENCES

Aras , Sermin
Banks , Pamela
Berro , Lais
Boateng , Francis
Bradley , Asha
Brook , Mary Beth
Cafer , Anne
Charles , Nora
Conway , Dakota
Crosby , Genuice
Davis , Melvin
Dozier , Mary
Franklin , Khadeejah
Goodwin , Pierrerasha
Goudy , Benjamin
Green , Amia
Greer , Tammy
Griffith , Christy
Groat , Diane
Henderson , Octavious
Hill , Nakiyah
Kelly , Justin
Khan , Shaila
Lawrence , Sarah
Lemacks , Jennifer
Lewis , Carmen
Madson , Michael
McBride , Joseph
Miller , Cordarius
Montgomery , Zannie
Myers , Qua'Meron
Nelson , Tyler
O'Dell , Chloe
Panchagnula , Sainath
Paul , MacKenzie
Payne , Amaraha
Pyles , Karly
Reinemann , Dana
Richard , Brianna
Rowlett , James
Saroj , Sree
Saval , Alexa
Sherrod , Akia
Sumrall , Savannah
Talley , Joseph
Tchounwou , Martha
Thompson , Xhana
Turner , Keiosha
Williams , Bryman

SCIENCE EDUCATION

Brown , Martha
Burger , Leslie
Hoffman , Vanessa
James , Jessi
Kastler , Jessica
Khan , Abu
Kulkarni , Sumeet
Le , Megan
Lytal , Lydia
Mattox , Johnny
Sartain , Mandy
Shaw , Joyce
Sparks , Eric

ZOOLOGY AND ENTOMOLOGY

Acholonu,Alex	Isbilir, Sena	Oyugi, Daniel
Adebayo, Andrela	Jenkins, Johnie	Ravola, Martha
Adeyemi, Oluwatosin	Kostyleva Elena	Ray, Rajarshii
Ahn, Seung-Joon	Krishnan, Natraj	Roy, Debarshi
Catchot,Beverly	Laifa, Jennifer	Sagili, Ramesh
Chakrabarti, Priyadarshini	Mukherjee, Annyasha	Saha, Sukumar
Chance, Anderson	Musser, Fred	Turner, Taina
Hayes, Kierra	Orji, Precious	Wynn, Courtney

Thomas Scientific