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EIGHTY-THIRD ANNUAL MEETING

February 21-22, 2019

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Hattiesburg, MS**

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GENERAL SCHEDULE

MISSISSIPPI ACADEMY OF SCIENCE
 Eighty Third Annual Meeting
 February 20-22, 2018

WEDNESDAY, FEBRUARY 20, 2019

<u>TIME</u>	<u>EVENT</u>	<u>LOCATION</u>
3:00 PM to 6:00 PM	Registration	Lobby
6:30 PM to 9:00 PM	Board of Directors Meeting/Dinner	TBA

THURSDAY, FEBRUARY 21, 2019

<i>Thursday</i>	<i>Agriculture & Plant Sciences</i>	<i>Cellular, Molecular & Developmental Biology</i>	<i>Chemistry & Chemical Engineering</i>	<i>Ecology & Evolutionary Biology</i>	<i>Geology & Geography</i>	<i>Health Sciences</i>
7:30 a.m.	Registration (Lobby)					
8:00 a.m.	Oral Presentations TCC 216	Oral Presentations TCC 214	Oral Presentations Session I TCC 218 A		Oral Presentations Union C	Oral Presentation Session I Union B
9:00 a.m.		Invited Speaker TCC 214	Oral Presentations Session II – TCC 218 A Session III – TCC 218 B			Population Health Symposium I Union B
10:00 a.m.		Oral Presentations TCC 214				
11:00 a.m.		General Session	General Session			Keynote Talk Dr. Lin He, NSF TCC 218 A
12:00 p.m.	Divisional Poster Session TCC Ballrooms	Oral Presentations TCC 214	Divisional Symposium I TCC 218 A		Guest Speaker Union C	Population Health Symposium II Union B
1:00 p.m.	Awards Ceremony & Business Meeting TCC 216		Oral Presentations Session IV TCC 218 A			
2:00 p.m.						
3:00 p.m.						



MISSISSIPPI ACADEMY OF SCIENCES, EIGHTY THIRD ANNUAL MEETING

THURSDAY, FEBRUARY 21, 2019

Thursday	History & Philosophy of Science	Marine & Atmospheric Sciences	Mathematics, Computer Sciences & Statistics	Physics & Engineering	Psychology & Social Sciences	Science Education	Zoology
7:30 a.m.	Registration (Lobby)						
8:00 a.m.							
9:00 a.m.	Oral Presentations Union D	Oral Presentations TCC 226	Oral Presentations TCC 229	Oral Presentations Session I & II Union A	Oral Presentations TCC 227	Oral Presentations TCC 210	Oral Presentations TCC 228
10:00 a.m.					Panel Discussion TCC 227		
11:00 a.m.							
12:00 p.m.	General Session	General Session	General Session	General Session	General Session	General Session	General Session
1:00 p.m.			Workshop TCC 210	Oral Presentations Session III Union A	Oral Presentations TCC 227	Workshop TCC 210	Oral Presentations TCC 228
2:00 p.m.	Oral Presentations Union D	Oral Presentations & Business Meeting TCC 226					
3:00 p.m.							
	Dodgen Lecture & Presentation of Awards TCC Theatre						
4:00 p.m.	Reception & Poster Session TCC Ballrooms						
5:00 p.m.							



MISSISSIPPI ACADEMY OF SCIENCES, EIGHTY THIRD ANNUAL MEETING

Friday, February 22, 2019

Friday	Agriculture & Plant Sciences	Cellular, Molecular & Developmental Biology	Chemistry & Chemical Engineering	Ecology & Evolutionary Biology	Geology & Geography	Health Sciences
7:30 a.m.	Registration (Lobby)					

8:00 a.m.	Workshop I & II TCC 216	Oral Presentations TCC 214	Oral Presentations Session V TCC 218 A		Invited Presentation TCC 226	Oral Presentations 8:00-12:00 p.m. & 1:00-2:00 p.m. Union C	Oral Presentation Session II Union B	
9:00 a.m.		Awards Ceremony & Business Meeting TCC 214	High School Poster Session	Oral Presentations Session VI (TCC 218A) & VII (TCC 218 B)			Bouie River Field Trip	High School Poster Session TCC 3 rd Floor
10:00 a.m.		Oral Presentations TCC 214						
11:00 a.m.								

Friday	History & Philosophy of Science	Marine & Atmospheric Sciences	Mathematics, Computer Sciences & Statistics	Physics & Engineering	Psychology & Social Sciences	Science Education	Zoology
7:30 a.m.	Registration (Lobby)						
8:00 a.m.	Divisional Keynote Address TCC 228		Oral Presentations TCC 229	Invited Speaker Union A		Oral Presentations TCC 210	
9:00 a.m.				Oral Presentations Session IV & V Union A			
10:00 a.m.				Oral Presentations TCC 228			
11:00 a.m.							

12:00 p.m.	Plenary Speaker Sponsored by Millsaps and Mississippi INBRE						
1:00 p.m.	Millsaps Undergraduate Symposium (218 B) & Mississippi INBRE Graduate Symposium (218 A)						



Thad Cochran Convention Center
121 Ray Guy Way
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If Coming from the South on I-59:

Take Exit 67A
At bottom of ramp turn right onto Hwy 49 S
Look for a sign on the right showing Exit to Coliseum and 4th Street
Take the West 4th Street Exit (follow signs to Coliseum. Turn left on service road
Take right onto West 4th street
On West 4th street, take left at first traffic light onto Golden Eagle Avenue
Take 3rd left into the Visitor's parking lot

If Coming from the North on I-59:

Take Exit 67A
At bottom of ramp merge into Hwy 49 South
Look for a sign on the right showing Exit to Coliseum and 4th Street
Take the West 4th Street Exit (follow signs to Coliseum. Turn left on service road
Take right onto West 4th street
On West 4th street, take left at first traffic light onto Golden Eagle Avenue
Take 3rd left into the Visitor's parking lot

If Coming from the South on Highway 49:

Less than 1 mile after passing I-59, look for a sign on the right showing Exit to the Coliseum and 4th Street
Take the West 4th Street Exit (follow signs to Coliseum. Turn left on service road
Take right onto West 4th street
On West 4th street, take left at first traffic light onto Golden Eagle Avenue
Take 3rd left into the Visitor's parking lot

If Coming from the North on Highway 49:

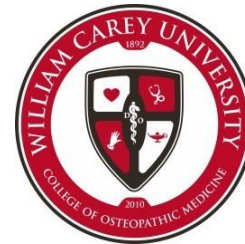
At the Hwy 49/Hardy Street Intersection, Turn left onto Hardy Street
Take an immediate right onto Service Drive
Follow Service Drive to Traffic Light
Take left onto West 4th Street
On West 4th Street, take left first traffic light onto Golden Eagle Avenue
Take third left into the visitor's parking lot

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MISSISSIPPI ACADEMY OF SCIENCES AWARD WINNERS 2019

Contribution to Science

Johnie Jenkins, PhD

USDA/ARS Research Geneticist



Dr. Johnie N. Jenkins of USDA, ARS, located at Mississippi State, MS, recently received a Presidential Rank Award as a Distinguished Senior Professional based on the impact on his research on American and International Agriculture. Known world-wide as a pioneering, visionary leader, Dr. Jenkins' innovative cotton research has made a major impact on the broad field of agricultural sciences. He has excellent leadership abilities coupled with exceptionally strong research and scientific knowledge. He has also demonstrated a clear understanding of the complex process of how to successfully apply science to solve real-world problems. He has published 542 research papers with over 200 different co-authors. His major contributions in genetics, bioinformatics, DNA markers, pest resistant germplasm, genetic breeding base diversification, and genetics of seed nutritional traits have improved

sustainability of crop production and breeding. A far-reaching legacy is Dr. Jenkins' mentoring of over 75 graduate students from 12 countries. He has mentored an entire generation of graduate students who work as cotton breeders with all the major cotton seed breeding companies in the world. One former student recently received Dow's "Innovator of the Year" Worldwide Award, and another was Global Products Manager for Dow AgroSciences Ag Division. Dr. Jenkins has been an invitational speaker for symposia sponsored by six scientific societies and for seminars at several major agricultural companies. His research has been featured in National Geographic magazine. He currently has collaborators in China, Uzbekistan, and Azerbaijan and his lab has hosted many international visiting scientists. Dr. Jenkins' long and productive research career has brought credit upon himself, his colleagues, USDA, and ARS. He epitomizes public service as a government employee. His research accomplishments and training and mentoring of young scientists will continue to impact U.S. and world production agriculture well into the second half of the 21st century.

Dr. Jenkins is in his 58th year of employment with the Agricultural Research Service (ARS), United States Dept of Agriculture (USDA) and was promoted to Senior Scientist (ST) in 2003. He is currently Director of the Crop Science Research Laboratory (CSRL), Research Leader of Genetics and Sustainable Agriculture Research, and Location Coordinator for the Mississippi State, MS, location of ARS. Scientists in the CSRL conduct research in 1) Cotton Genetics and Breeding 2) Sustainable Agriculture and 2) Corn Breeding and Genetics. Dr. Jenkins is an adjunct professor in three academic departments in two Universities. He holds memberships in five Scientific Societies.

Stature in Professional Field: Dr. Jenkins' stature has been consistently recognized with prestigious national and international honors and award. Cotton Genetics Award, from the commercial cotton breeders, **1972**; MOBAY Cotton Research Award for Outstanding Contributions to Cotton Industry, **1985**; Fellow, American Society of Agronomy, **1986**; Fellow, Crop Science Society of America, **1986**; Fellow, American Association for Advancement of Science, **1990**; ARS Outstanding Scientist of Year, **1992**; USDA Superior Service Award, **1996**; Agronomist of Year, MS Chapter, ASA **1998**; Outstanding Graduate of Crop, Soil, and Environmental Sciences, University of Arkansas, **2000**; VERDANT, Crop Genetics International Award, **2000**. USDA, ARS, Science Hall of Fame in **2007**. Presidential Rank Meritorious Senior Professional Award in **2008**; Award for Outstanding and Meritorious contributions to Resistance of Plants to Insects **2008**; Certificate of Honor from Minister of Agriculture and Water Resources for dedicated support in building a cadre of Uzbek scientists in Genomics and Bioinformatics **2012**; and the Lifetime Achievement Award, National Association of Plant Breeders **2013**.

Dudley Peeler Award Contribution to the Mississippi Academy of Sciences

David Dockery III, Ph.D. State Geologist



David T. Dockery III, Clinton, Mississippi, is a registered professional geologist and the Surface Geology Division Director for the Mississippi Department of Environmental Quality. His work has appeared in *Mississippi Geology*, *Palaios: Nature*, *Palaeontologie*, and *Compass*, among others. To say that Dr. Dockery has a passion for geology is an understatement. According to Dr. Dockery his interest in geology started when he was a mere child of five years old when he started to collect his first rocks and shells. He earned his BS degree in petroleum geology from Mississippi State University, a MS degree from the University of Mississippi and his Ph.D. from Tulane University. Dr. Dockery began working for the Mississippi Geological Survey during the summers of his undergraduate and Master's degree. After finishing his Master's degree he was appointed as Chief of the Surface Geology Division for the Mississippi Office of Geology in 1978. Dr. Dockery held that position until June 2017. In July of 2017, he was selected as the Director of MDEQ, Office of Geology and State Geologist. He has taught courses in Invertebrate Paleontology, Physical Geology, Forensic Geology, The Geology of Mississippi, and Environmental Geology. He has developed two textbooks a 685-page textbook with over 1000 figures related to the Geology of Mississippi, and a second 379 page textbook with over 800 figures on Environmental Geology. In addition to the textbooks he has also written eight additional book titles related to identifying rocks and fossils throughout Mississippi. He has named numerous new species and has had 13 species named in his honor. He is a long time member of the Mississippi Academy of Sciences dating back to the late 1980's and has not missed an annual meeting. He has served the division of geology as Chair and Vice Chair and has presented and fostered the growth of the division since 1990. He has significantly contributed to the field of Geology in our state and within our academy. His passion for Life Among the Rocks has impacted the education of all those studying within the field of Geology.

Horizon Lifetime Achievement Award

David Thompson, RPG Minerals Manager Weyerhaeuser Company



Dr. David E. Thompson, Jackson, Mississippi, is a registered professional geologist that is currently the minerals manager for Weyerhaeuser Company. He received his BS degree from Mississippi State University in Petroleum Geology. He has served as an Environmental Health Specialist for the Mississippi State Department of Health and has a Geologist for the Mississippi Department of Environmental Quality (MDEQ), Office of Geology. Before serving in his current role, he held the position of supervising geologist in the Surface Geology Division at the Mississippi Department of Environmental Quality. During his career with the MDEQ he has produced seventy-six 7.5 minute quadrangle maps at a scale of 1:24,000 and the Holly Springs Geologic Map at a scale of 1:100,000. Each of 7.5 minute quadrangle maps covers an area of 49 to 70 square miles. The maps show and name prominent natural features in detail that is useful for engineering, local recreational planning, and land management planning. His published works have appeared in *Geological Society of America*, *Society for Sedimentary Geology*, *Journal of the Mississippi Academy of Sciences*, and *Mississippi Geology*, among others. In addition, he has co-authored the *Geology of Mississippi* and *Mississippi Environmental Geology* textbooks

with Dr. David Dockery. He is also a long time member of the Academy and has been an active member in the Geology Division since the early 1990's.

2018 Dodgen Lecture

Thursday, February 21, 2019

3:30 p.m.

The LADC Marine Mammal Research Program in the Gulf of Mexico, with Recorded Sperm Whale Sounds”



Given by

Juliette Ioup, PhD

Juliette W. Ioup received a BS and MS in physics from the University of Florida and a PhD in physics from the University of Connecticut. She has been a professor of physics at Xavier University of Louisiana, a geophysicist data processor at Texaco in New Orleans, and is presently a professor of physics, geophysics, and electrical engineering at the University of New Orleans. Her research interests include geophysical, acoustic, and aerospace signal analysis and processing; deconvolution, mathematical digital filtering, spectral estimation; Fourier and wavelet transforms; neural networks; higher order correlations and spectra; underwater acoustics; modeling and simulation; and computational physics. She is a Fellow of the Acoustical Society of America and a member of ASA, SEG, AGU, IEEE, APS, AWIS, and SGS

Dr. Ioup along with her late husband Dr. George Ioup were a part of founders of the Littoral Acoustic Demonstration Center (LADC) which was formed in early 2001 to utilize Environmental Acoustic Recording Systems (EARS) buoys developed by the Naval Oceanographic Office (NAVCEANO). LADC is a consortium of scientists from universities and the U.S. Navy. The following institutions are or have been represented: initially, the University of New Orleans, the University of Southern Mississippi, and the Naval Research Laboratory-Stennis Space Center; and then the University of Louisiana at Lafayette, the Applied Research Laboratories at the University of Texas at Austin, and Oregon State University.

The long-term goal of LADC is to use advanced technology to study the anthropogenic soundscapes of the Gulf of Mexico and their impact on marine mammals. Dr. Ioup’s LADC team was the first to collect long-term acoustic data for sperm whale phonation using EARS, which has led to understanding the differences in sperm whale phonation that allow for identifying individual mammals similar to how humans recognize voices.

The early works of the LADC have paved the way for more recent advances in acoustic technologies to better understand marine mammal habitats, and the impact of natural and man-made changes in their environment. The advancements in passive acoustic data collection and processing provide relationships of regional abundance variations to long-term and short-term environmental factors, such as environmental disasters, weather conditions, natural seasonal migration, regional anthropogenic noise soundscapes due to industrial operations in an area, food supply, etc.

In 2007, LADC conducted a two-week visual and acoustic survey of marine mammal activity just 9 miles and 23 miles from the DWH spill site, giving LADC a unique pre-spill baseline dataset of marine mammal activity and anthropogenic soundscapes near the oil spill site. Earlier surveys had also been conducted at sites 50 miles from the incident site. In September 2010, LADC returned to those same survey sites to repeat underwater acoustic recordings, gathering data to support the first and possibly only comparisons of pre- and post-spill estimates of the marine mammal populations in the vicinity of the event based on their acoustic activity.

Plenary Speaker

Sponsored by Millsaps College and Mississippi INBRE

Friday, February 22, 2019
12:00 p.m.

IMPACT OF INTERACTIVE BIOMEDICAL EDUCATION AND RESEARCH TRAINING

Given by

Joseph A. Cameron, PhD
Professor and Director, REAP, Retired
Department of Biology
Jackson State University



Dr. Joseph A. Cameron held the position of Professor of Biology at Jackson State University (JSU) from 1978 to his retirement in 2018. During his remarkable tenure at Jackson State University, Dr. Cameron developed and taught many graduate and undergraduate courses as well as served as Coordinator of the Graduate Program, Acting Chair of the Department of Biology and Acting Dean of the School of Science and Technology. Perhaps his greatest contribution, however, to Jackson State University was his desire to enhance and generate an interest in science at the levels of high school, junior college, college, doctoral, and post-doctoral level. With the support of Superintendents of Education, principals, teachers, parents, UMMC, JSU, biomedical scientists and healthcare professionals, he secured funding from the Department of Education (250,000 annually for 2 years) and established a Biomedical Science Program that motivated and trained Junior High and High School students

from Jackson, Edwards, Bolton and Hinds to prepare for careers in science, mathematics and healthcare professions. In addition, he generated NIH funding and served as the Director for Training programs that allowed students to pursue the BS, MS, and progress to the Ph.D. Having mentored over 40 Masters level theses, he has served on more than 30 Ph.D. dissertations and has over 60 peer-reviewed publications. Dr. Cameron also secured funding from NIH with an annual operating budget of \$193,000 from 1986-2010. Well respected at the NIH, Dr. Cameron continues to serve as a member of Special Emphasis Panels at the National Heart, Lung and Blood Institute and the National Center for Minority Health Disparities at the National Institute of Health. He was a member of the JSU, UMMC, Tougaloo College proposal writing committee for the Jackson Heart Study and served as Director of Community Mobilization. He also served as Director for undergraduate training with the US Army (REAP) for more than two decades. As Dr. Cameron enters retirement, he is actively working on his lifetime goal to serve his community through enhancing education and training.



83rd Annual Mississippi Academy of Sciences Meeting

February 21-22, 2019

The University of Southern Mississippi

Thad Cochran Center

Hattiesburg, 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: Dr. Timothy J. Ward | Associate Dean of Sciences, Millsaps College

Event Coordinator: Dr. Ramon Jackson | MAS Executive Assistant

Millsaps College, Jackson, MS

This symposium, established with support from the Howard Hughes Medical Institute (HHMI), is intended to expand the scope and depth of opportunities for undergraduate student researchers to meet other student researchers and 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 symposium seeks to promote all levels of science education and is dedicated to increasing the number of people who pursue science-related careers and to broadening access to science for all. Student researchers who have shown outstanding achievement in science and engineering research may be selected by their division chairs to compete for these outstanding symposium awards.

Criteria for Selection of recipients:

1. Each division chair(s) and vice chair(s) of the 13 divisions will select the **top 20% of undergraduate student abstracts** to represent their division and present in the Millsaps/HHMI sponsored lunch award symposium, "Honoring Excellence in Science in Mississippi," on Friday February 22nd from 12:00 pm – 3:00 pm. Student's name must appear as first author in both abstract and poster.
2. After presenting in their division, the nominated students will agree to present their posters in the poster symposium following the provided lunch on Friday from 1:00 pm – 3:00 pm. Failure to physically present at their respective division the day prior will disqualify the selected presenters from competing in the symposium. First author must be present to compete and presentation by a co-author will not be accepted.
3. Award prizes will be presented immediately at the end of event 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 – 6th winners. Each selected presenter will receive a MAS certificate of achievement.



2. Mississippi INBRE Graduate Scholars Symposium

Honoring Excellence in Science in Mississippi

Symposium Chairman: Dr. Glen Shearer | Program Coordinator, Mississippi INBRE

Event Coordinator: Mrs. Jamie Lott | Events and Public Relations Coordinator

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 13 divisions will select the top **20% of graduate student abstracts** to represent their division and present their work in the Mississippi INBRE sponsored lunch award symposium, "Honoring Excellence in Science in Mississippi," on Friday, February 22nd at 10:00 am – 1:00 pm. Student's name must appear as first author in both abstract and poster.
2. After presenting in their division, the nominated students will agree to present their posters in the poster symposium on Friday from 10:00 am – 12:00 pm. Lunch will be provided from 12:00pm – 1:00pm. Failure to physically present at their respective division the day prior will disqualify the selected presenters from competing in the symposium. First author must be present to compete and presentation by a co-author will not be accepted.
3. Award prizes will be presented immediately at the end of event 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 – 6th winners. Each selected presenter will receive a MAS certificate of achievement.



83rd Annual Mississippi Academy of Sciences Meeting



Mississippi INBRE Graduate Scholars Symposium

Honoring Excellence in Research in Mississippi

Symposium Chairman: Dr. Glen Shearer | Program Coordinator of Mississippi INBRE

Event Coordinator: Mrs. Jamie Lott | Events and Public Relations Coordinator

University of Southern Mississippi, MS

Symposium Program: All posters have to be assembled by **Thursday 2/21/2019 no later than 12:00 PM** and dismantled after **after 3:00 PM on Friday 2/22/2019**. All students **must be present** on both days and lack of adherence with this schedule will result in disqualification from the competition.

Thursday

5:00-7:00

Judging of students posters will begin immediately after Dodgen Event.

Friday

12:00-1:00

Symposium Plenary Speaker and Lunch

1:00-1:20

Opening and Introduction Remarks, Dr. Glenn Shearer; Symposium Chair

1:30-1:40

President's Remarks, James Stephens; MAS President

1:40-2:25

Poster competition (Visit to Posters- if the Judges have not finished)

2:25-2:55

Presentation of Awards: Drs. Shearer and James Stephens

2:55-3:00

Closing Remarks: Dr. Glenn Shearer: Chair of the Symposium

(Times subject to change- announcements of any changes to the schedule will be made by the Symposium Chair-following the plenary speaker)

**Awardees must be present at the awards event and monetary award will not be honored for no show by the student winners at the awards ceremony*



83rd Annual Mississippi Academy of Sciences Meeting

Millsaps Undergraduate Scholars Symposium - Honoring Excellence in Science in Mississippi

**Symposium Chairman: Dr. Timothy J. Ward, Associate Dean of Sciences
Millsaps College, MS**

Dr. Ramon Jackson: MAS Executive Assistant

Symposium Program: All posters have to be assembled by **Thursday 2/21/2019 no later than 12:00 PM** and dismantled after **after 3:00 PM on Friday 2/22/2019**. All students **must be present** on both days and lack of adherence with this schedule will result in disqualification from the competition.

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Judging of students posters will begin immediately after Dodgen Event and will continue on Friday.

Friday

12:00-1:00

Symposium Plenary Speaker and Lunch

1:00-1:20

Opening and Introduction Remarks, Dr. Tim Ward; Symposium Chair

1:20-1:30

President's Remarks, James Stephens; MAS President

1:30-2:15

Poster competition (Visit to Posters- if the Judges have not finished)

2:15-2:25

Dr. Hamed Benghuzzi: MAS Executive Director

2:25-2:55

Presentation of Awards: Drs. Ward and Kenneth Butler; Past President

2:55-3:00

Closing Remarks: Dr. Tim Ward: Chair of the Symposium

(Times subject to change- announcements of any changes to the schedule will be made by the Symposium Chair-following the plenary speaker)

**Awardees must be present at the awards event and monitory award will not be honored for no show by the student winners at the awards ceremony*

DIVISIONAL SYMPOSIA AND WORKSHOPS**Thursday, February 21, 2019**

HEALTH SCIENCES**10:00 AM-12:00 PM****Room: Union B**

Population Health Symposium I**MENTAL HEALTH AND DISEASE****10:00 AM****Alexander P. Anchus, MD**

University of Mississippi Medical Center

Title: "Dementia and Alzheimer"

Dr. Anchus will discuss disease characteristics and prevalence of Dementia and Alzheimer in the population. Dr. Alexander Anchus is a neurologist at University of Mississippi Medical center (UMMC). He is affiliated with multiple hospitals in the Jackson area, including G.V. (Sonny) Montgomery Veterans Affairs Medical Center.

Dr. Anchus is Professor of School of Medicine, Neurology and holds McCarty Chair of Neurology, Department of Neurology at UMMC since 2009. He received his medical degree from Washington University School of Medicine in St. Louis. He is trained in Internal Medicine at Thomas Jefferson University and his residency training in Neurology at New York Presbyterian Hospital-Cornell University Medical College. Dr. Anchus is certified by the American Board of Psychiatry and Neurology in Neurology and Vascular Neurology. Dr. Anchus is a skillful Neurologist who diagnoses and treats disorders of the brain, spinal cord, peripheral nerves, muscles, and the involuntary nervous system that controls the heart, lungs and other organs. He is known for offering a broad range of treatment of headaches, stroke, dementia, seizures, epilepsy, multiple sclerosis, sleep disorders and neuromuscular diseases. He has been in practice for more than 20 years.

Dr. Anchus has been member of many scientific and clinical societies including, United Council for Neurologic Subspecialties (UCNS), Geriatric Neurology Examination Committee; Scientific Committee, 4th Congress of the International Society for Vascular Behavioral and Cognitive Disorders; Dementia Research Group, Alzheimer's Disease International; International Committee, International Neuropsychiatric Association; American Academy of Neurology and many others.

Dr. Anchus provides leadership and has overall responsibility for the Neurology services of the Medical Center, as well as the teaching and research programs.

11:00 AM**Ronald Klien, PhD**

Louisiana State University Health Science Center

Title: "ALS Research, Genes, and Therapeutic Options"

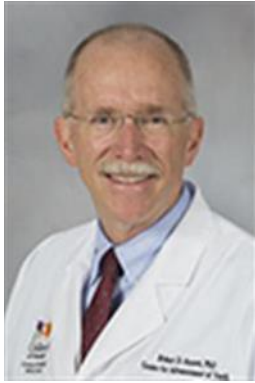
Dr. Klein is a Professor in the Department of Pharmacology, Toxicology, and Neuroscience at LSU Health.

Dr. Klein will discuss Amyotrophic Lateral Sclerosis (ALS) including neuropathology, genetic causes, and some of the new treatments being developed and tested.

Dr. Klein received his PhD from the University of Colorado Health Sciences Center. He became interested in gene transfer to the CNS as a post-doctoral associate at the University of Florida. He joined the Department of Pharmacology at LSU Health Shreveport in 2002. Dr. Klein was involved in achieving long-term gene transfer to the brain with adeno-associated-virus (AAV) vectors and the

development of several widely used animal models for neurodegenerative diseases. Current projects include pre-clinical gene therapy for ALS with upframeshift protein one (UPF1) and how traumatic brain injury (TBI) may incite neurodegenerative disease symptoms and pathology.

His research has been supported by NIH, the ALS Association, the M.J. Fox Foundation, The Society for Progressive Supranuclear Palsy, among others. Dr. Klein serves on the Board of Directors of the ALS Louisiana-Mississippi Chapter.



Robert Annett, PhD.

University of Mississippi Medical Center.

Title: “Genome Wide Association Contributions to Understanding Autism Spectrum Disorder”

Dr. Annett will discuss the GWAS contribution to a broad spectrum autism disorder, including SPARK study in Mississippi.

Dr. Annett is Professor of School of Medicine and Pediatrics at the University of Mississippi Medical Center and the Blair E. Batson Hospital for Children in Jackson MS. Dr. Annett received his PhD. from Loyola University of Chicago. He completed a clinical psychology internship at John H Stroger Hospital of Cook County. Then, his Post-doctoral Fellowship training in Pediatric Neuropsychology from University of California, San Francisco.

Dr. Annett’s areas of clinical practice include neurodevelopmental disorders and central nervous system complications from pediatric chronic illnesses. He is leading the UMMC study site for the Simons Foundation Powering Autism Research for Knowledge, or SPARK, a multi-site genetics study of Autism Spectrum Disorder. The goal is to build a registry of genetic information from individuals with autism and their families, in which the results will be important for identifying the causes of autism and informing treatment-related studies.

Dr. Annett the PI for the NIH-funded IDeA States Pediatric Clinical Trials Network in Mississippi. He is currently funded by the Health Resource and Services Administration (Early Childhood Developmental Health System: Implementation in a High Need State, and MAGNOLIA: Expanding Mississippi’s Behavioral Workforce for Children and Families) and Substance Abuse and Mental Health Services Administration (Mississippi- BeHIP).

Dr. Annett is a Fellow in the Association for Psychological Science (2014) and National Academy of Neuropsychology (2001). He is member of International Neuropsychological Society, Association for Psychological Sciences, and National Academy of Neuropsychology

PSYCHOLOGY AND SOCIAL SCIENCE

11:00 -12:00

Room: TCC 227

PANEL DISCUSSION

LET’S GET HONEST: HEALTH DISPARITIES IN UNDERSERVED COMMUNITIES AND APPROACHES TOWARDS EDUCATION

*Moderator: Frederick L. Hunter Jr.
Tougaloo College, Tougaloo, MS USA*

CELLULAR AND MOLECULAR

11:30 -3:00 PM

Room: TCC 229



TEACHING BIOINFORMATICS TO UNDERGRADUATES

INBRE Symposium: Metagenomics to Functional Microbiome

Organizer: Dr. Shahid Karim, Biological Sciences

The University of Southern Mississippi

(Shahid.Karim@usm.edu)

11:30-11:35 Introduction, Dr. Shaid Karim, University of Southern Mississippi

11:35-11:55 **MS-INBRE Basic Bioinformatics Workshop for the Beginners**

Dr. Gyan Sahukhal, University of Southern Mississippi

12:00-12:20 **Broadening Access to Bioinformatics and Functional Genomics, Phage Hunter-BSC110/111**

Dr. Dmitri Mavrodi, University of Southern Mississippi

12:20-12:40 **Magnolia Cluster**

Dr. Brian Olson, University of Southern Mississippi

12:40-1:00 **Bioinformatics Experiences For Pre-Med Biochemistry Majors And Entomology-Minded Student Researchers**

Dr. Jonas King, Mississippi State University

BREAK

1:20-1:40 **Honey Bee Genetics to Teach Undergraduates at the Bench**

Dr. Mohamed Alburaki, University of Southern Mississippi

1:40-2:00 **Bioinformatics Education and no-boundary thinking**

Dr. Bindu Nanduri, Mississippi State University

2:00-3:00 **Open Forum and Closing Remarks**

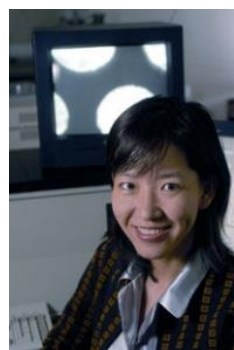
Panelist: Dr. Shyam Huda, MUW, Dr. Alex Flynt, USM, Dr. Glen Shearer, USM, Dr. Gyan Sahukhal, USM, Dr. Deepak Kumar, USM, Chandan Gurug, USM, Logan Blancett, USM

Chemistry and Chemical Engineering

12:00 -1:00 PM

Room: TCC 218A

Divisional Keynote Talk



Dr. Lin He,

Deputy Division Director in the Division of Chemistry

National Science Foundation (NSF)

Moderator: Dr. Julie Pigza

Dr. Lin He, Deputy Division Director in the Division of Chemistry at the National Science Foundation (NSF). Dr. He joined NSF in 2011. Since joining NSF, Dr. He has managed the Chemical Measurement and Imaging (CMI) program, the Chemistry Center of Innovation (CCI) program, and the data-driven discovery research program. Dr. He obtained her bachelor's degree in chemistry from Peking University in China, and her PhD from Pennsylvania State University. Before joining NSF, Dr. He was a member of faculty at North Carolina State University and an adjunct faculty member at the University of North Carolina, Chapel Hill. Her research focuses on developing novel analytical tools and exploiting their applications in the field of bioanalysis. In particular, she is interested in coupling novel properties of nanomaterials with conventional mass spectrometric imaging and biosensing techniques to monitor biomolecular interactions. Dr. He is committed to building strong partnership between government, academia and industry, and she is very committed to promoting chemical research and STEM education.

Chemistry and Chemical Engineering

1:00-2:00 PM

Room: TCC 218A

MISSISSIPPI INNOVATE PANEL: NAVIGATING PRODUCT DEVELOPMENT AND MAKING A CONVINCING SALES PITCH

Moderator: Dr. Victor Ogungbe

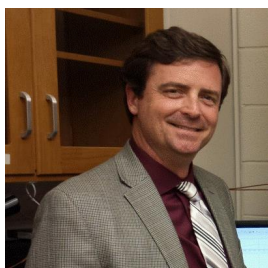
Jackson State University



Tony Jeff is the president and chief executive officer of Innovate Mississippi. Innovate Mississippi help startups and entrepreneurs connect with investors, grow their companies, and create jobs in Mississippi. Tony holds a Bachelor of Science in industrial engineering and a Master of Engineering degrees from Mississippi State University and Northwestern University, respectively. He also holds an MBA from the Kellogg School of Management at Northwestern University. Before leading Innovate Mississippi, Tony had corporate experience at Florida Power & Light, General Motors and Delphi Automotive Systems. Under his leadership, Innovate Mississippi has successfully raised more than \$172 million for startups and entrepreneurs in Mississippi.



Dr. Almesha L. Campbell currently serves as the Director for Technology Transfer and Commercialization at Jackson State University. She facilitates the development, disclosure and protection of intellectual property; develops, coordinates and conducts training on intellectual property policies and procedures, and technology transfer best practices; and facilitates the licensing and commercializing process. Dr. Campbell is the Principal Investigator for the National Science Foundation funded JSU Innovation Corps Site designed to train teams of faculty, students and business mentors how to commercialize their ideas using the lean start up methodology. She also serves as Site Lead for the NIGMS funded Southeast XLerator Network, led by XLERateHealth and the University of Kentucky, to develop a technology transfer accelerator hub for biomedical technologies in the Southeast region.



Dr. T. Keith Hollis is an Associate Professor of Chemistry at Mississippi State University. His research interest is the design and development of organometallic ligands and complexes for energy-efficiency, direct conversion of solar energy to useful forms, and more cost-effective access to medicines. Prior to joining Mississippi State University, Dr. Hollis was a member of the chemistry faculty at the University of California, Riverside and the University of Mississippi. His work has received support from the National Science Foundation, the Department of Education, ACS-Petroleum Research Fund, etc. Dr. Hollis has served on a university taskforce that evaluated invention, patenting and copyright policies, and he holds a US patent on Air-Stable, Blue light Emitting Chemical Compounds

HEALTH SCIENCES**1:00-3:00 PM****Room: Union B**

POPULATION HEALTH II**SYMPOSIUM II (1:00-2:45 PM)****POPULATION HEALTH AND DISEASE-INFANCY TO ADULTHOOD**

1:00 PM **Dr. D. Olga Mcdaniel,**
University of Mississippi Medical Center
Brief Introduction

Thomas Dobbs, MD

Director, Mississippi State Department of Health

**Title: "Population Health in Mississippi"**

Dr. Dobbs will discuss population health and disease in Mississippi. Dr. Dobbs is the former State Epidemiologist who recently has been appointed Mississippi's new State Health Officer. Dr. Dobbs is a board certified Infectious Diseases and Internal Medicine physician with extensive training in public health and epidemiology. Dr. Dobbs recently joined MSDH as the Deputy State Health Officer after two years working in Laurel as a practicing physician but also as Vice President for Quality and Chief Medical Officer of South Central Regional Medical Center. Prior to this he served four years as a District Health Officer in southern Mississippi and then four years as the State Epidemiologist with MSDH. He also has an appointment at the John D. Bower School of Population Health at UMMC, teaching Epidemiology and Health Policy.

Dr. Dobbs graduated from Emory University and received his MD degree and his MS degree in Public Health at the University of Alabama at Birmingham. He has been active in public health research and advocacy, working globally through the Gorgas Tuberculosis Initiative in Russia and Cambodia, and in the U.S. through appointments at UMMC and the University of Florida (as regional clinical consultant with the Southeastern Regional TB Center).

**Barbara T. Alexander, PhD**
University of Mississippi Medical Center**Title: "Renal Mechanisms of Fetal Programming of Hypertension and Renal Injury in Low Birth Weight"**

Dr. Alexander is Professor of Physiology and Biophysics, and the Director of Analytical and Assay Core Facility.

Dr. Alexander will discuss the mechanisms linking low birth weight, renal injury and hypertension.

Dr. Alexander received her PhD. from University of Mississippi Medical Center in Biochemistry, then post-doctoral training in Physiology and Biophysics, University of Mississippi Medical Center, where her current research interest initiated. Her research expertise includes cardiovascular/renal physiology, particularly, developmental programming of adult health and disease, low birth weight, intrauterine growth restriction and sex differences in hypertension. She has received numerous awards for her research and teaching.



Alejandro Chade, MD
University of Mississippi Medical Center

Title: “Biotechnology and Therapeutic Targets in Cardiovascular and Renal Disease”

Dr. Alejandro Chade is Professor of Physiology and Biophysics, Medicine, Radiology, and Associate Director, Graduate Studies in Physiology at University of Mississippi Medical Center.

Dr. Chade will discuss therapeutic targets in cardiovascular and renal disease and the progression of renal injury and the outcomes of the kidney in response to treatment.

Dr. Chade received his MD from Universidad Nacional de Cuyo, Mendoza, Argentina, followed by Residency and Fellowship in Cardiology from Provincia de Mendoza, Argentina. Then he became Post-Doctoral Research Fellow followed by Research Associate position in the Department of Internal Medicine - Division of Nephrology and Hypertension at Mayo Clinic, Rochester, MN, prior to joining the Department of Physiology and Biophysics, at UMMC.

Dr. Chade’s research expertise in general includes use of imaging to study renal physiology and pathophysiology, renal microcirculation, development of novel therapeutic interventions. His studies were among the first to investigate the potential therapeutic application of cell progenitors or angiogenic cytokines to protect the kidney.

**MATHEMATICS, COMPUTER SCIENCE, STATISTICS
SCIENCE EDUCATION**

1:00 -2:30 PM

Room: TCC 210

WORKSHOP:

**PERFORMING STATISTICAL POWER, SAMPLE SIZE, CONFIDENCE INTERVAL AND EFFECT SIZE
FOR A RESEARCH STUDY**

*Jamil Ibrahim and Elgenaid Hamadain
University of Mississippi Medical Center, Jackson, MS*

DIVISIONAL SYMPOSIA AND WORKSHOPS**Friday, February 22, 2019**

AGRICULTURE**8:00 -11:30 PM****Room: TCC 216**

WORKSHOP

Organizers: Dr. Nacer Bellaloui and Dr. Te-Ming Paul Tseng

AFLATOXIN CONTAMINATION: A NATIONAL PROBLEM AND ITS MANAGEMENT BY BIOLOGICAL CONTROL

This workshop will be led by Dr. Hamed Abbas, National Biological Control Laboratory, Biological Control of Pests Research Unit, Agriculture Research Service, United States Department of Agriculture, Stoneville, MS



Dr. Hamed Abbas joined ARS in 1990 after finishing his Ph.D. in 1987 and post-doctoral work at the University of Minnesota, and he has been the lead scientist in the aflatoxin control project since 1999. The focus of Dr. Abbas' research is reduction of corn contamination with mycotoxins (especially aflatoxins and fumonisins) by studying agricultural practices, varietal resistance, fungal ecology, and biological control. He developed a sensitive, inexpensive method to identify aflatoxigenicity in *Aspergillus* isolates. Currently Dr. Abbas is cooperating with an industrial partner (Syngenta) to further develop and refine application methods for two promising aflatoxin biocontrol strains. Dr. Abbas has more than 30 years of post-graduate research experience and he has authored or co-authored 270 publications (220 refereed research journal articles, 50 review articles/book chapters) and over 200 abstracts. He has received 7 patents for his work on mycoherbicides and aflatoxin control. Dr. Abbas has been recognized worldwide as an authority on mycotoxin contamination in the

field, and in food, and for his work on mycoherbicides.

BIOLOGY AND MANAGEMENT OF RED IMPORTED FIRE ANTS

This workshop will be led by Dr. Jian Chen

National Biological Control Laboratory, Biological Control of Pests Research Unit, Agriculture Research Service, United States Department of Agriculture, Stoneville, MS



Dr. Jian Chen received his B.A. and M.S. in Entomology from Zhejiang University, Hangzhou, China and his Ph.D. in Entomology from Louisiana State University. He serves as a Research Entomologist in USDA-ARS, Biological Control of Pests Research Unit, Stoneville, Mississippi and a Lead Scientist of a project focusing on developing biologically-based control technologies for managing invasive pest ants, including fire ants and tawny crazy ants. In addition to a better understanding of the behavior, chemical ecology and physiology of the invasive ants, the ultimate goal of his research is to minimize the impact of invasive ants on human health and agriculture by solving long-standing and difficult problems in ant management, such as low stability and specificity of fire ant baits, need for repeated bait applications due to rapid re-infestation, and the environmental impact of synthetic contact insecticides used in ant control.

ECOLOGY AND EVOLUTIONAL BIOLOGY**9:00 AM-11:00 AM –Room TCC 226**

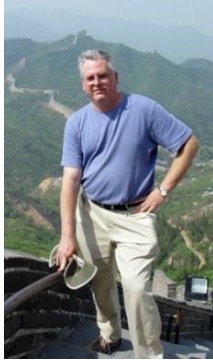
**Dr. Donald Yee**

University of Southern Mississippi

Title: "Mosquitoes of Puerto Rico: What we knew then, what we know now, and how it affects understanding of disease"

Dr. Yee was born and raised in Michigan and received his B.S. in Biological Sciences from the University of Michigan-Dearborn, his M.S. in Zoology from Texas Tech University, and his Ph.D. in Biological Sciences from Illinois State University. He then completed his post-doctoral

training at the University of Calgary before joining the faculty in the School of Biological, Environmental, and Earth Sciences at the University of Southern Mississippi. His lab focuses on the ecology of medically important mosquitoes, including their spatial and temporal patterns, interactions with native species, how nutrient stoichiometry affects their ecology and disease, larval feeding behavior, and phylogenetic relationships among species.



Dr. Brian Axsmith

University of South Alabama

Title: "Ancient Forests of the Central Gulf Coast"

Brian Axsmith is a Professor in the Biology Department at the University of South Alabama, where he teaches Ecology and Evolution, Evolutionary Biology, and the Evolution of Vascular Plants. He is also Graduate Coordinator for the department's MS program. His main research interests are the Mesozoic paleobotany of eastern North America and China, and the Neogene of the Gulf Coastal Plain. Much of his work has dealt with the evolution of conifers, but he has worked on nearly every major group of vascular plants. When not working on fossil plants, he plays bass in several local groups.

ECOLOGY AND EVOLUTIONALY BIOLOGY

Co sponsors-Agriculture, Geology, Zoology

11:30 AM-1:00 PM

Field Trip

FIELD TRIP TO BOUIE RIVER

"Miocene Plant Fossil Outcrop Along the Bouie River, Hattiesburg, Mississippi"

Organizers: Dr. Mac Alford, University of Southern Mississippi

The Field Trip

The 1.5-hours field trip to the Bouie River. An extensive outcrop of plant fossils from the Miocene was recently discovered along the Bouie River. Common fossils include baldcypress, sycamore, tree-palms, oaks, and ferns. This field trip will involve scaling down a hill to one of the outcrops along the river and looking for fossils." A sign up sheet to participate in the field trip will be provided on Thursday morning.

- We recommend all participants to have comfortable walking shoes and a bottle of drinking water.



HEALTH SCIENCES

11:00-12:00

Room: Union B

Population Health Interactive Workshop

Scientific Career Development and Innovation Development and Licensing



Speaker: Justin Thorton, PhD

Mississippi State University

Dr. Thorton will discuss his own scientific career development and challenges. He will discuss unique opportunities for research development and the establishment of collaborative links between both scientists and clinicians. He will discuss how to pick a good Mentor and what are characteristics of a good Mentor.

Dr. Thorton will discuss how to read or review a scientific journal article; how to write an abstract from reviewed article. This is an area that will benefit the Students and the Mentors in “My Brother’s Keeper” Program. The program committee for the Health Science Division could provide guidelines and designated scientists for assistance if needed.

Dr. Thorton received his PhD. in Microbiology from the University of Mississippi Medical Center. Then he took a post-doctoral research position, at St. Jude Children’s Research Hospital, where he continued his research investigating pathogenesis of *Streptococcus pneumoniae*. At present, he is Associate Professor in the Department of Biological Sciences at MSU. His research focuses on host-pathogen interaction by characterizing the mechanisms that the innate immune response uses to prevent infections.



**Bianca L. Garner, PhD., Provost and Vice President for Academic Affairs
Tougaloo College**

Dr. Garner received her PhD. in Microbiology from the University of Mississippi Medical Center.

Dr. Garner serves on numerous Task Forces at Tougaloo College, including the Honors Program and the Graduate School Task Force. She has established a great research program, where she mentors undergraduate and graduate students.

Dr. Garner will discuss her own scientific career development and the path she followed differently from our previous speaker. Dr. Garner, also will discuss role of the Office of Academic Affairs in teaching and grant development. She is the recipient of numerous grants, including the Mississippi IDEA Networks of Biomedical Research Excellence (INBRE) grant for research which provides founding resources for undergraduate students. In addition, she is the Co-PI of a National Science Foundation Scholarship grant associated with Science, Technology, Engineering and Mathematics (STEM) program.



**Jim Petell, PhD., Director, Innovation Development and Licensing
University of Mississippi Medical Center.**

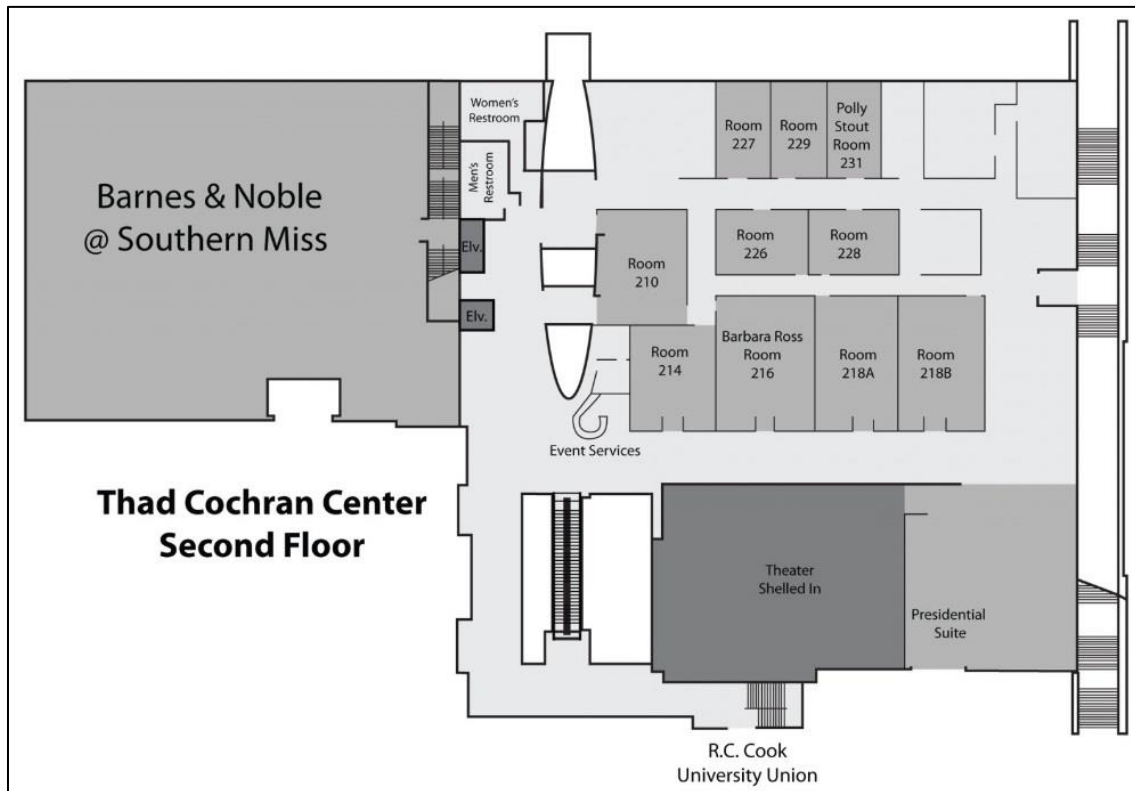
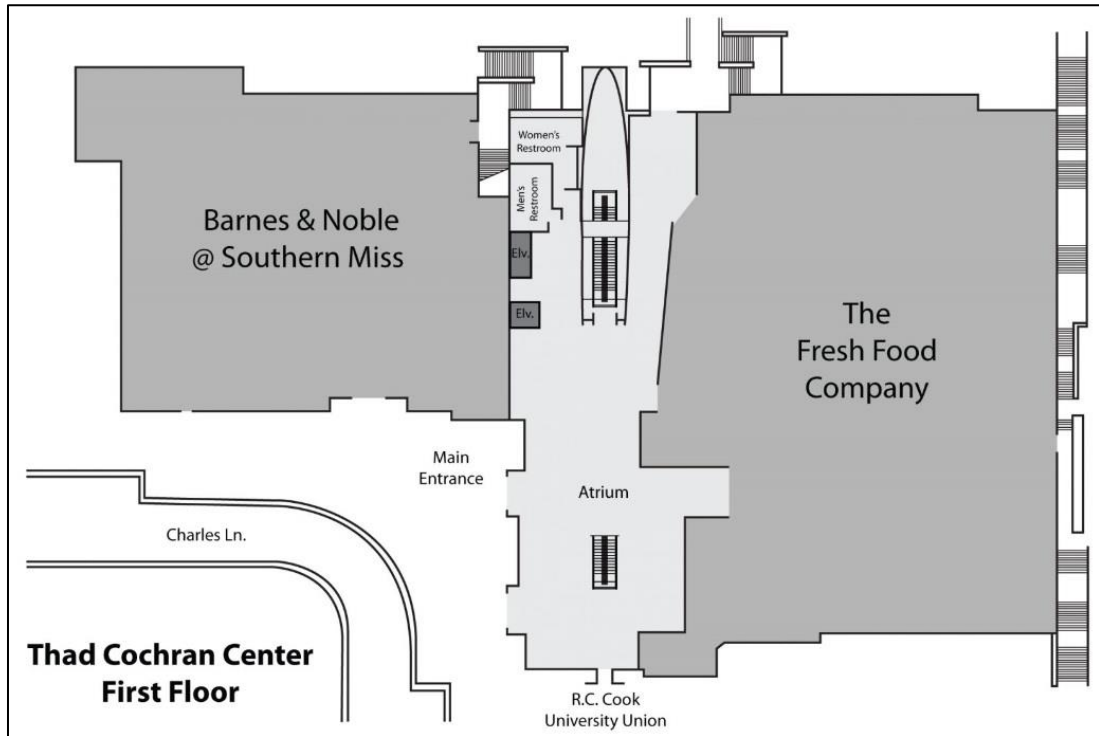
Dr. Petell will discuss Innovation Development and Licensing that provides patent and other commercialization support to researchers at UMMC and serves as a liaison for industry partners interested in commercializing the UMMC technologies.

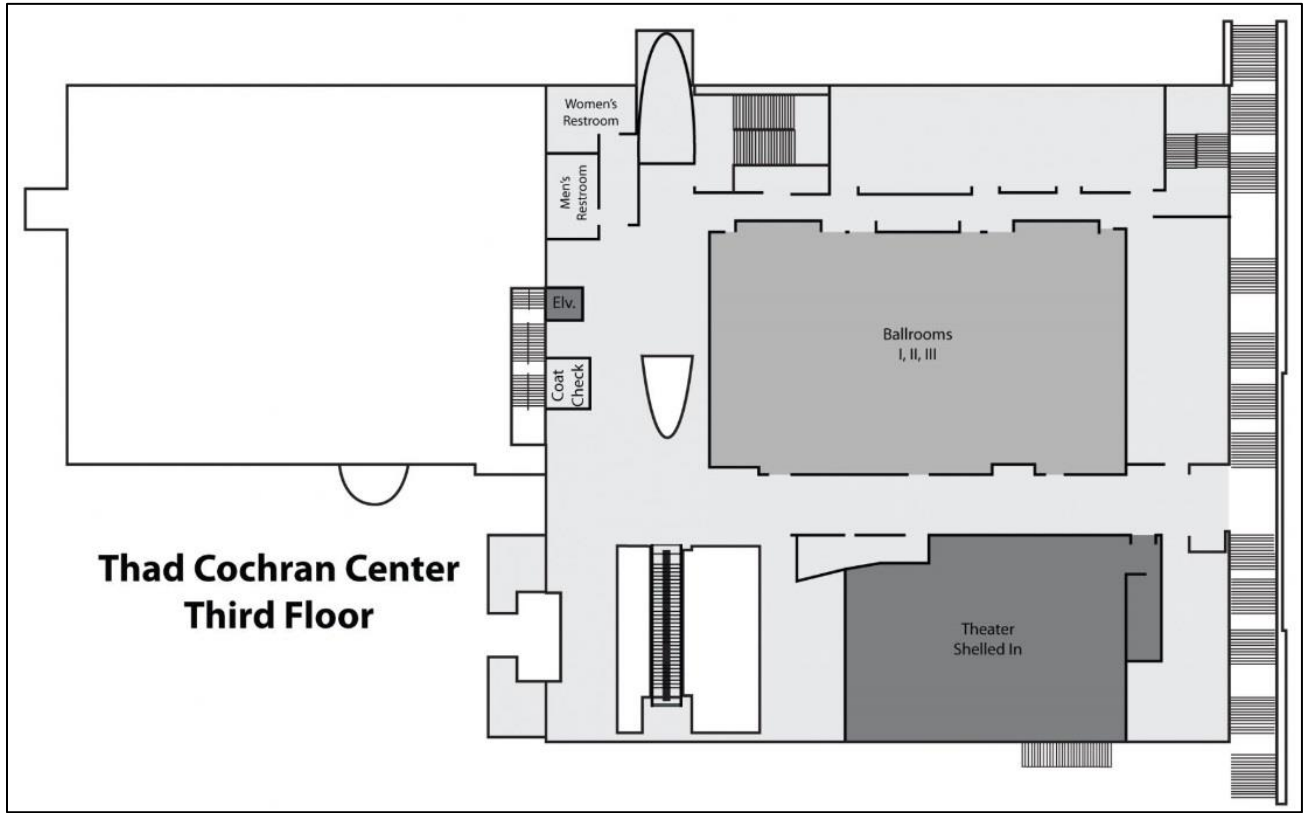
Dr. Petell received his Ph.D. in chemistry from the University of California-San Diego. He was a practicing scientist for more than 15 years before he changed his scientific career.

While working for Dow AgroSciences, he and collaborators patented several novel insecticide proteins and genes and techniques for trait modification of transgenic crops.

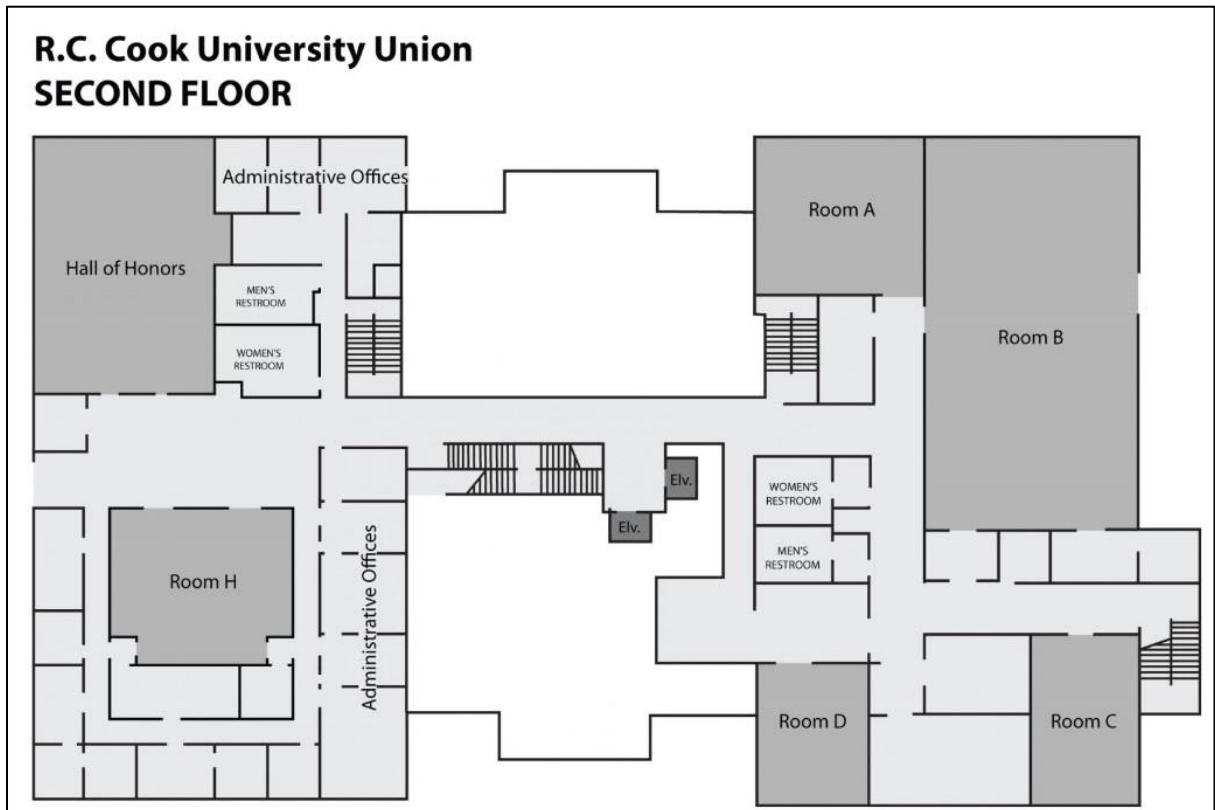
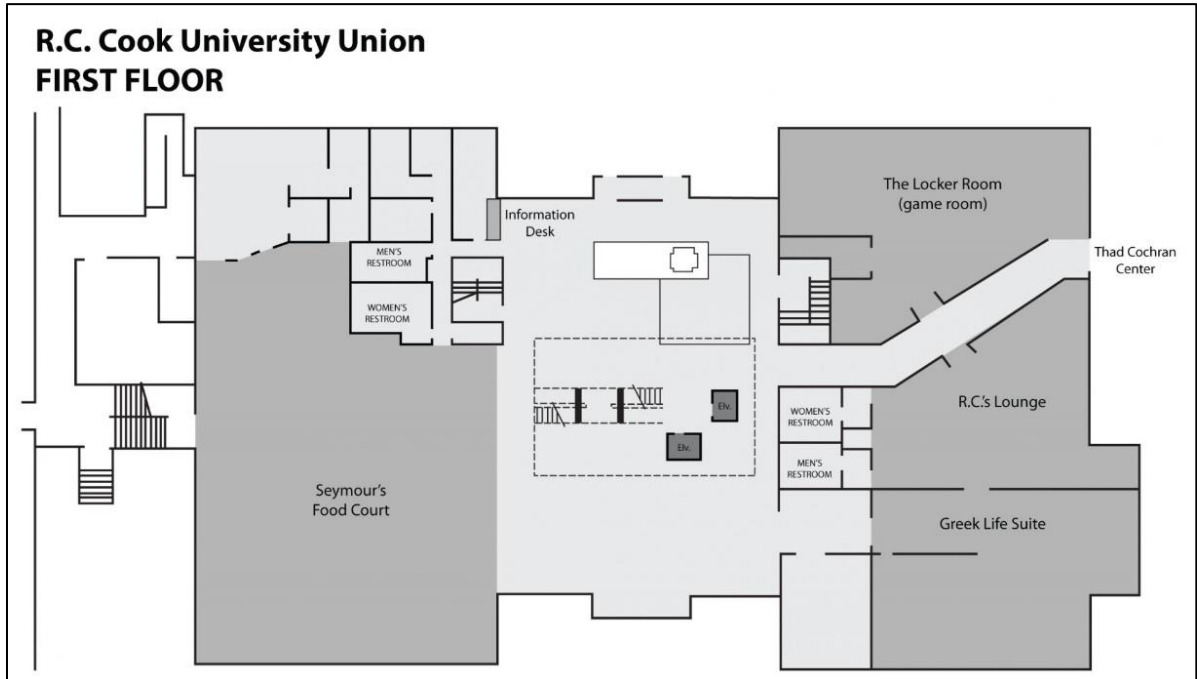
Dr. Petell has 14 U.S. patents, numerous foreign patents and co-founded two biotech companies.

Thad Cochran Center Floorplans





R.C. Cook University Union Floorplans





NOTES

Key to Abbreviations

O = Oral Presentation

P = Poster Presentation

1st number is Division

- 1** Agriculture and Plant Science
- 2** Cellular, Molecular, and Developmental Biology
- 3** Chemistry and Chemical Engineering
- 4** Ecology and Evolutionary Biology
- 5** Geology and Geography
- 6** Health Sciences
- 7** History and Philosophy of Science
- 8** Marine and Atmospheric Sciences
- 9** Mathematics, Computer Science, and Statistics
- 10** Physics and Engineering
- 11** Psychology and Social Sciences
- 12** Science Education
- 13** Zoology and Entomology

2nd number is Abstract Number within oral presentations or poster session

Eg., O3.04 = oral presentation (O) number 4 in the division of Chemistry and Chemical Engineering (3)

**Agriculture and Plant Science****Chair: Nacer Bellaloui****USDA-ARDS****Vice-Chair: Te-Ming Paul Tseng**

Mississippi State University

Thursday, February 21, 2019**MORNING****Room TCC 216****7:50 WELCOME****O1.01****8:00 ARBUSCULAR MYCORRHIZAL AND DARK SEPTATE ENDOPHYTIC FUNGAL ABUNDANCE IN BIOENERGY GRASS GIANT MISCANTHUS***Temitope Omole, Michael Felton Jr., Keerthi Mandyam, Ananda Nanjundaswamy,**Alcorn State University, Lorman, MS*

Perennial C4 grasses are part of native grasslands and provide a suite of valuable ecosystem services. Accordingly, they are often cultivated for conservation, restoration, bioenergy, etc. Cultivating perennial energy grasses like Giant Miscanthus and switchgrass are vital in achieving annual biomass production of a billion tons by 2030 for fulfilling the U.S. bioenergy vision for energy independence. Freedom@ Giant Miscanthus (FGM) is a commercial variety that is drought- and heat-tolerant with expected stand life of 20 years. Long-term and large-scale cultivation of FGM necessitates investigation of their associated microbial endophytes. C4 grasses host an abundance of root-colonizing arbuscular mycorrhizal (AMF) and dark septate endophytic (DSE) fungi. To investigate FGM stand- establishment in Mississippi, FGM was planted in 2013 at Alcorn State University's research sites in Lorman, Preston, and Mound Bayou. The overall goal of this study was to investigate seasonal changes of FGM root endophyte abundance in all three locations. Based on native grassland studies, we hypothesized that both AMF and DSE i) will be equally abundant, ii) will exhibit seasonal variation, and iii) site-specific variation will be observed due to variation in soil properties in the three sites. Six root and soil samples were collected from these sites in spring, summer and fall in 2016. Roots were stained with Trypan Blue and Sudan Red, and the magnified intersections method was used to quantify AMF and DSE abundance. Soil chemical indicators were also measured. Statistical analyses of fungal abundance, their seasonal and site-specific variation and their ecological significance will be discussed.

O1.02**8:15 BIOPROCESS KINETICS OF CORN ETHANOL IN BENCHTOP BIOREACTORS INVOLVING SIMULTANEOUS SACCHARIFICATION AND FERMENTATION (SSF) AND SEPARATE HYDROLYSIS AND FERMENTATION (SHF)***Lydia Batey, Joseph Bridges, Ananda Nanjundaswamy, Mandyam, Keerthi**Alcorn State University, Lorman, MS*

Corn Ethanol is an important portfolio of Energy Independence Security Act (ESIA) of 2007 that targets 36 billion gallons of biofuel by 2022. United States is the largest producer of corn ethanol in the world. In 2017, US produced 15 billion gallons of ethanol. Over 200 ethanol producing plants are located all across the US. Though the ethanol production from corn is standardized, there is constant

search for improving the process efficiency. The present study compared the differences between SSF and SHF of corn ethanol production in benchtop bioreactors. Bioethanol production kinetics such as ethanol productivity with glucose utilization were compared for 72 hours of fermentation process. The study also compared the expression of genes in some of the important metabolic pathways. Results from the study indicate SSF and SHF have shown different biochemical kinetics with respect to ethanol production and glucose utilization. There is a significant change in the gene expression of SSF and SHF. The presentation will deal with the biochemical relationships between SSF and SHF and how this information can be employed in improving the bioprocess efficiency of bioethanol production.

O1.03**8:30 ASSESSMENT OF THE RELATIONSHIP OF LEAF AREA INDEX (LAI), PERCENT CANOPY COVER, AND DRY BIOMASS OF SWITCHGRASS (PANICUM VIRGATUM L.) FOR EROSION PREDICTION MODELS***JyQuavis Berry, Girish Panicker, Keerthi Mandyam, Timothy Cary**U.S. Army Cold Regions Research and Engineering Laboratory,*

Soil erosion is one of the major problems world faces today. Crop residue management has been established as a valuable technology for reducing erosion. As a part of the C-factor (cover and management) research being carried out at Alcorn, different varieties of Switchgrass are thoroughly studied to prevent erosion on U.S. Army's training lands. The main objective of this research is to study the plant density effects of four highly adapted varieties of Switchgrass, Kanlow, Colony, Alamo, and BoMaster, on biomass development, leaf area index (LAI), percent canopy cover, dry biomass, carbon buildup, rate of residue decomposition, and C: N ratio. Plants were raised on a heavy soil, Memphis Silt Loam, at two plant densities without any fertilizer application; high-density planting (HDP) and low-density planting (LDP) of 10.16cm and 12.7cm between plants, respectively. LAI is the total one-sided area of leaf tissue per unit ground surface area. LAI is an important factor in plant growth assessment and dry biomass yield models. Percent canopy cover and LAI were recorded during the entire growth period. Our data indicate that Switchgrass is an excellent perennial cover for heavy soils and HDP yields high biomass than LDP. Results indicate that LAI measurements were as effective at predicting Switchgrass dry biomass yield. In addition, LAI and dry biomass measurements were strongly related with one another. The solar radiation intercepted by the leaves and transformed into chemical energy during photosynthesis is directly related to the dry biomass yield.

O1.04**8:45 IDENTIFICATION OF SECONDARY METABOLITES PRODUCED BY MACROPHOMINA PHASEOLINA AND OTHER SOYBEAN PATHOGENS, AND THEIR ROLE IN ROOT INFECTION***Vivek Khambhati**National Biological Control Laboratory, Biological Control of Pests Research Unit, Agriculture Research Service, United States Department of Agriculture, USA.*

In many growing seasons charcoal rot disease, caused by the fungus *Macrophomina phaseolina* (Tassi) Goid., is the leading causes of soybean crop yield losses in Mississippi and some neighboring states. *M. phaseolina* causes a variety of diseases, including charcoal rot, crown rot, seed rot, wilt, and many others in over 500 commercially-important plants, including soybeans, trees, vegetables and ornamentals. *M. phaseolina* primarily infects plants from the soil reservoir through the roots, although it may also be seed-borne. *M. phaseolina* has been reported to produce several secondary metabolites, including asperlin, phenomone, phomalactone, phaseolinone, phaseolinic acid, patulin, and (-)-

botryodiplodin, one or more of which may play a role in facilitating the root infection process. A previously- developed in-culture colorimetric assay for the mycotoxin (-)-botryodiplodin was used to screen *M. phaseolina* isolates and other soybean fungal pathogens for their ability to produce the toxin. Isolates of *M. phaseolina* negative for (-)-botryodiplodin production in this assay (20-25%) were cultured in potato dextrose broth medium for 7 days, then the culture medium filter-sterilized, mixed 1:1 with hydroponic medium and tested for 72 hours for root toxicity with soybean seedlings in hydroponic culture. 50% of (-)-botryodiplodin-negative isolates exhibited potent phytotoxic responses ranging from prevention of lateral root production to complete seedling death. Culture media from phytotoxic isolates are being examined further by bioassay-guided fractionation and LC/MS, GC/MS, and HP/LC analysis to identify production of secondary metabolites that may play a role in facilitating soybean root infection by *M. phaseolina* and other fungi.

O1.05

9:00 CORROSION AND TRANSPORT OF URANIUM METAL IN SOIL ENVIRONMENTS

*Qinku Zhang, Mengge Hu, Fengxiang Han
Jackson State University, MS*

Depleted uranium (DU) metal in the soils undergoes various physicochemical reactions and is transformed into oxides, hydroxides and other major or minor compounds during corrosion processes. DU may be co-precipitated as forms of uranium minerals, such as phosphates, silicates, arsenates, vanadates and oxyhydroxides or as minor components adsorbed on major soil phase components such as on the surface of Fe/Mn oxides, carbonates, organic matter and clay minerals. During the corrosion processes, DU is partitioned between aqueous phase and solid phase and further among various solid phase components like other trace elements. This process ultimately controls its transport into ground water and their bioavailability to plants and microbes. Much less information has been obtained for DU partition in soils between aqueous and solid phases and among solid phase components.

Uranium metals were buried under three soil moisture regimes for corrosion and transport studies in laboratory. Three moisture regimes include dry soil, field capacity moisture regime and saturated soil regime. SEM, XRD, FT-IR and Raman spectroscopy were used to analyze the corrosion of uranium metal, and total uranium (TU), soluble plus exchangeable uranium (EXC), uranium bound to organic matter (OM) and uranium in the residual fraction (RES) in the soil were measured. Results of analysis indicated that the corrosion of uranium in saturated soil was the fastest.

We will discuss transformation of DU throughout the corrosion, the affection of water content in the soil on its rate of corrosion as well as its transport in the soils.

O1.06

9:15 USING BIOTECHNOLOGICAL APPROACHES FOR IMPROVING SWEETPOTATO VIRAL DISEASE RESISTANCE

*Faith Iseguede, Yan Meng, Chunquan Zhang, Victor Njiti
Alcorn State University, Lorman, MS*

Sweetpotato (*Ipomoea batatas* L.), a member of Convolvulaceae family, 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. Sweet potato feathery mottle virus (SPFMV) and Sweet potato leaf curl virus (SPLCV) are two of the most prevalent sweetpotato viruses that cause devastating diseases and yield reductions in Mississippi. Two biotechnological approaches have been utilized to address the viral disease problem in this research: producing virus- tested sweetpotato seedlings and

generating novel virus resistance sweetpotato lines. To produce virus-tested sweetpotato seedlings, we use meristem-tip culture technology combined with heat treatment to provide farmers with healthy propagating materials that are free of detectable viruses. In this study, 15 lines of sweetpotato have been collected and processed for virus removal. Following laboratory treatment, field practices for virus-tested sweetpotato have been conducted since 2015. The second approach for sweetpotato viral disease management is to develop transgenic sweetpotato plants with virus resistance to these two viruses. The SPFMV and SPLCV dual resistance genetic segment was introduced into a binary vector for expression to induce gene silencing in transgenic sweet potato. Expression of transgenes has been achieved by using Agrobacterium-mediated transformation. Regenerated plants induced from transformed leaf and petioles showed the genome insertion of transgene by Polymerase Chain Reaction. Further investigation on transgenic plants regeneration and resistance to virus infection under field conditions will be discussed.

O1.07

9:30 ASSESSING HEAT AND DROUGHT TOLERANCE AMONG ROSE CULTIVARS USING PHYSIOLOGICAL AND REPRODUCTIVE PARAMETERS

*Bhupinder Singh, Daryl R. Chastain, K. Raja Reddy
Mississippi State University, Starkville, USA.*

Garden roses are prominent in landscaping and widely grown as bedding plants in Mississippi. However, hot and humid climate in Mississippi provides a challenging environment for garden roses by affecting their aesthetic and reproductive potential, and ultimately commercial values. An in vitro study was conducted to identify tolerance to drought and temperature stresses among twenty-two rose cultivars belonging to diverse genetic background. Physiological parameters such as cell membrane thermostability, total chlorophyll content, carotenoids, leaf photosynthesis, and stomatal conductance were measured under different temperature and drought treatments during flowering in comparison to optimum conditions. In addition, pollen-related reproductive parameters including pollen viability, germination (PG) and tube length (PTL) were also measured. Cumulative response index of each cultivar for the temperature (CTRI) and drought (CDRI) stresses were developed to identify cultivar variability based on responses of the measured parameters to the treatments. Among twenty-two cultivars, seven were identified as high heat and drought tolerant, ten were identified as moderately heat and drought tolerant, and five were identified as low heat and drought tolerant based on CTRI and CDRI values with an increment of standard deviation. The classification provided cultivars tolerant scoring, which would assist the state's rosarians in selecting rose cultivars suitable to their region. Further, the cultivars classified as high heat and drought tolerant could be used as parents in rose breeding programs to develop new garden and greenhouse rose genotypes with improved tolerance to heat and drought growing conditions.

O1.08

9:45 SCREENING WEEDY RICE GERMLASM FOR TOLERANCE TO VARIOUS ABIOTIC STRESSES

*Shandrea Stallworth
Mississippi State University, Starkville, MS*

Rice is the staple food for more than 3.5 billion people worldwide. Yield levels in Asia have tripled, and are expected to increase by 70% over the next 30 years due to population growth. In the US, Arkansas accounts for more than 50% of rice production. Over the last 68 years, rice production has continued to grow in Mississippi, placing it in fourth place after Arkansas, Louisiana, and California. Due to increasing rice acreage, regionally and worldwide, the need to develop abiotic stress tolerant rice has increased. Unfortunately,

current rice breeding programs lack genetic diversity, and many traits have been lost through the domestication of cultivated rice. A possible solution to this problem is to use weedy rice, a noxious weed with increased competition compared to cultivated rice, to discover genes related to cold, heat, and submergence stress. The proposed research will identify possible stress tolerant weedy rice lines and genes associated with abiotic stress tolerance. In this study, we used genome-wide associations (GWAS) to identify genes associated with abiotic stress and access the genetic diversity of the selected weedy rice population.

10:00- Break

O1.09

10:15 ALLELOPATHY IN WEEDY RICE: A RESOURCE FOR BREEDING ALLELOPATHIC RICE CULTIVARS

Brooklyn Schumaker, Shandrea Stallworth, Swati Shrestha, Te-Ming Tseng

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

Rice provides 50% of the caloric supply for 520 million people worldwide. The most significant yield constraint in rice production is weed competition. Barnyardgrass is one of the most common and difficult to control rice weeds. Barnyardgrass has been developing resistance to frequently employed chemical control methods. Allelopathy is defined as any detrimental effect by one plant on another through the production of chemical compounds that escape into the environment. Weedy rice has been shown to exhibit allelopathic traits and is of the same species as cultivated rice. Incorporation of allelopathic traits into cultivated rice lines may improve growth habits and overcome the yield loss due to weeds. The overall objective of this study is to identify the allelopathic genetic controls associated with weedy rice root structure and its ability to suppress barnyardgrass. Phenotyping weedy rice root architecture will help identify the best allelopathic root traits for possible integration into cultivated rice lines. Once known, it may be possible to incorporate weedy rice allelopathic genetic traits into cultivated rice breeding programs for barnyardgrass suppression. From this study, it is expected that weedy rice accessions will display herbicidal activity on barnyardgrass.

O1.10

10:30 DIETARY INCLUSION OF GUARPRO-71 CAN NEGATIVELY AFFECT FEED INTAKE AND BODY WEIGHT GAIN IN GROWING PIGS

M. Shamimul Hasan, Rebecca M. Humphrey, Mark A. Crenshaw, Shengfa F. Liao

Department of Animal & Dairy Sciences, Mississippi State University, Starkville, MS

This study was conducted to evaluate the effects of dietary GuarPro F-71 inclusion on growth performance and nutrient metabolism of growing pigs. Sixty barrows (31.9±1.84 kg BW) were randomly allotted to 5 treatments with 4 pens/treatment and 3 pigs/pen. Diet 1 was a corn-and-soybean-meal based diet with nutrient composition following NRC (2012) recommendations. GuarPro-71 was used to replace 25%, 50%, 75%, and 100% of soybean meal (on equivalent CP basis) in Diet 1 to generate Diets 2, 3, 4, and 5, respectively. Crystalline amino acids were used to balance the essential amino acid concentrations across the 5 diets. Dietary inclusion of GuarPro-71 reduced ADFI ($P < 0.01$), whereas no clinical signs of unhealthiness of pigs were observed. The magnitude of ADFI reduction showed linear but also quadratic relationships ($P < 0.05$) with the GuarPro-71 inclusion rate. The blood plasma concentrations of six metabolites (urea nitrogen, albumin, glucose, total protein, cholesterol, and triglycerides) were not affected ($P > 0.30$), indicating that the pigs' metabolic utilization of nutrients was not compromised. The cubic effect ($P < 0.05$) of dietary

GuarPro-71 inclusion on the G:F suggests that the level of soybean meal replacement up to 75% by GuarPro-71 did not negatively affect feed efficiency in pigs. In short, the feed intake reduction due to the dietary GuarPro-71 inclusion should be, if not solely, responsible for the ADG and final BW reduction. Overall, this study suggests that the dietary inclusion of GuarPro-71 can negatively affect ADFI and ADG in growing pigs. The reason for the ADFI reduction warrants further investigation.

O1.11

10:45 SEASONAL INFLUENCE ON SELENIUM REMOVAL EFFICIENCY IN SIMULATED CONSTRUCTED WETLANDS

Michael Natrass, Jesse I. Morrison, and Brian S. Baldwin

Mississippi State University, Starkville, MS

Constructed wetlands are a popular passive treatment option for runoff impacted by a broad range of elements, including selenium (Se). However, the efficiency of these systems is dependent on environmental conditions. The objective of this research is to assess seasonal influence on the efficiency and stability of constructed wetlands planted to cattail (*Typha angustifolia* L.) or duckweed (*Lemna minor* L.) receiving selenate-impacted runoff over four weekly flood-discharge cycles. Simulated constructed wetland microcosms (110-L containers) planted to either cattail (three plants), duckweed (250 g fresh), or unplanted (control) were flooded with 30 L of fresh runoff at zero, 1x, or 2x Se concentrations. After six days, microcosms were discharged for 24 hours completing one flood-discharge cycle. This was repeated three times and replicated in the spring, summer, and fall of 2018. Aqueous and ambient temperatures were recorded using Watchdog Data Loggers (Model 425). During each flood-discharge cycle, aqueous, plant, and soil samples were analyzed for total Se concentration. Data were analyzed with PROC GLM at $\alpha = 0.05$ (SAS v.9.4). Overall, planted microcosms removed 50% of the applied selenium compared to 42% in unplanted controls ($p < 0.0001$). Selenium removal efficiency and mean temperature was greater in the summer (70%, 30°C) compared to the spring (39% 20°C) and fall (37%, 16°C). Results indicate a strong positive correlation between Se removal efficiency and seasonal temperature. In this study, simulated constructed wetlands planted to cattail or duckweed improved the water quality of selenate-impacted runoff over four weekly flood-discharge intervals, but Se removal efficiency varied by season.

O1.12

11:00 RECOGNITION OF BRUISED APPLES USING A 3-D IMAGING AND FEATURE EXTRACTION ALGORITHM

Cyril Khokhar

Alcorn State University, Lorman, MS

We propose an algorithm for identifying bruised apples based on 3D shape information obtained by a 3D infrared imaging system. The algorithm aims at classifying apples into two classes: bruised apples and un-bruised apples. We introduce a vertex-based mesh local binary pattern operator to extract binary patterns from 3D meshes. For classification, we apply a support vector machine (SVM) classifier to train the feature vectors generated from the histograms of feature codes. We investigated the optimized parameters of the proposed algorithm to achieve the highest identification accuracy. The comparison of the proposed algorithm with other algorithms has been conducted. Experimental results show that the proposed algorithm achieved better performance for bruised apple identification than traditional algorithms.

O1.13

11:15 YEAST GENE TRANSCRIPTOMICS IN POPLAR CELLULOSIC ETHANOL PRODUCTION IN BENCH-TOP FERMENTER

Joseph Bridges Ananda Nanjundaswamy, Lydia Batey, Keerthi

Mandyam

Alcorn State University, Lorman, MS

The United States is the world's largest producer of corn ethanol and produced 15.8 billion gallons in 2017 reaching the mandated target outlined in the Energy Independence and Security Act (EISA). According to EISA's Renewable Fuel Standard, the target cellulosic ethanol production for 2018 was 7 billion gallons and 16 billion gallons by 2022. However, the cellulosic ethanol production for 2018 is around 15 million gallons which is far from the target. Unlike corn ethanol production, several critical challenges like enzyme cost, biomass pretreatment, conversion efficiency, presence of inhibitors etc. have hindered efficient cellulosic ethanol production. Understanding yeast transcriptomic signatures during cellulosic ethanol fermentation of different types of biomass like corn stover, miscanthus, switchgrass, and poplar may provide insights into calibrating the process. Accordingly, the goal of this study was to evaluate and compare the yeast gene regulation at 24h, 48h and 72h of yeast inoculation for poplar bioethanol production in three 7L bench-top bioreactors. Mild acid-pretreated poplar feedstock was used for separate hydrolysis and fermentation using yeast, *Saccharomyces cerevisiae* under high solids medium. Saccharification at 48 hours resulted in 8g/l of glucose and 1.87g/l of xylose. Fermentation with yeast resulted in 4.04g/l of ethanol at 24h and thereafter the ethanol production slightly reduced. The overall enzyme and fermentation kinetics along with the regulation of select yeast genes involved in fermentation will be presented. Further, the impact of mass transfer factors such as aeration and temperature on the behavior of yeast will be discussed.

O1.14

11:30

ROOT SYSTEMS ARCHITECTURE AND GENES

ASSOCIATED WITH ALLELOPATHY IN WEEDY RICE

Auriana Tucker¹, Brooklyn Schumaker¹, Swati Shrestha¹, Shandrea Stallworth¹, Nilda Burgos², Te-Ming Tseng¹

¹Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS, and ²Crop, Soil and Environmental Sciences Department, University of Arkansas, Fayetteville,

The unique hardiness of weedy rice species allows them to thrive in dynamic and stressful environments. Weedy rice thrives because it has retained traits such as the potential to grow taller, produce more tillers, and consume more nutrients. These findings collectively suggest that weedy rice is an untapped source of novel genes for competitive traits that can be used in rice breeding programs, since they are of the same species as rice. One such trait is allelopathy, a process where the secondary metabolites produced by one plant species suppresses growth and development of neighboring species. Our preliminary study with a small subset of weedy rice accessions (10 accessions) identified 2 accessions able to suppress barnyardgrass weed seedlings by causing more than 50% height reduction, and of these, one weedy rice accession caused greater than 75% height reduction. Weed management is often considered a leading factor limiting rice productivity, and among the weeds, barnyardgrass is most damaging to rice causing up to 70% loss in rice grain yield. Allelopathy can therefore be bred into rice and act as a natural and sustainable weed control strategy. However, the extent to which weedy rice varieties exhibit superior competitive traits such as allelopathy is unknown, as are the genetic pathways potentially associated with allelopathy. Thus, there is a critical need to identify the specific allelopathic weedy rice accessions and the precise mechanisms through which these varieties are allelopathic. The goal of this study is to identify root system architectural changes associated with allelopathic phenotypes; and use genome-wide association study to map root system architectural traits

associated with allelopathy in weedy rice. As wild relative is often explored by plant breeders for crop improvement program, 54 weedy rice accessions- weedy relatives of cultivated rice were evaluated for their interference or weed suppressive potential against barnyardgrass and Amazon sprangletop. Accession B2 (61%) had higher interference potential against barnyardgrass and accession B81 (52%) had greatest interference potential against Amazon sprangletop. Accession B81 had more than 50% inhibition on the growth of both barnyardgrass and Amazon sprangletop, two major weeds of rice. Nei's genetic diversity among weedy rice (0.45) was found to be higher than cultivated rice (0.24) but less than allelopathic rice (0.56). Accession B2, which had high weed suppressive potential was found to be genetically distinct than other weedy rice accessions. This information will be helpful for marker assisted breeding in the future. This knowledge will also be vital in further understanding the physiological mechanisms associated with allelopathy in weedy rice, and thereby utilize such knowledge in rice/crop improvement.

12:00 -1:00

General Sessions

Thursday, February 21, 2019

AFTERNOON

Poster Presentation (TCC Ballrooms 3rd floor)

P1.01

AFLATOXIN CONTAMINATION: A NATIONAL PROBLEM AND ITS MANAGEMENT BY BIOLOGICAL CONTROL

Hamed K. Abbas

National Biological Control Laboratory, Biological Control of Pests Research Unit, Agriculture Research Service, United States Department of Agriculture, Stoneville, MS, USA.

Aflatoxins, which are produced by numerous species of *Aspergillus*, are highly toxic substances that contaminate corn, peanut, cottonseed and other crops. Aflatoxin contamination threatens the health of people around the world, as well as pets, fish, livestock, birds and other animals by causing acute and chronic liver injury and liver cancer. Aflatoxin is a chronic problem in the southern US, where estimated annual economic losses due to aflatoxin contamination range up to more than \$200 million for corn alone and \$500 million for all crops combined. US Food and Drug Administration (FDA) regulations prohibit the sale of corn or any other grain that contains more than 20 parts per billion of aflatoxin for direct human consumption. Little progress has been made in developing methods for eradicating aflatoxin contamination. Thus far, the most promising eradication method has been biological control with non-toxigenic *A. flavus* strains. Some *Aspergillus* strains that do not produce aflatoxins are being used as biological control agents to reduce contamination of crops like corn. Recent research on delivery methods for the most effective biocontrol strains have focused on starch-based bioplastic, which has ideal properties for promoting growth of fungus and helping it become established in the field. Bioplastic can be used to deliver biocontrol strains in numerous forms, including seed coatings, sprayable liquids and granules for soil application. Bioplastic-based formulations are more effective and easily stored than previously used liquid or grain-based formulations.

P1.02

BIOLOGY AND MANAGEMENT OF RED IMPORTED FIRE ANTS

Jian Chen, Margaret L. Allen, Yuzhe Du, Michael J. Grodowitz

National Biological Control Laboratory, Biological Control of Pests Research Unit, Agriculture Research Service, United States Department of Agriculture, Stoneville, MS

The red imported fire ant, *Solenopsis invicta*, is one of the most successful invasive fire ants in the world and is regarded as one of World's worst invasive alien species. Native to South America, red imported fire ants were introduced into the United States in the 1930's and have now invaded many other countries and regions, including Australia, New Zealand, China, Taiwan, Hong Kong, Macau, among others. This species causes manifold problems posing a significant threat to public health, a danger to livestock and pets and also significantly reduces biodiversity through preying on and competing with other organisms. Control of red imported fire ants has been proven difficult and management still heavily depends on the use of synthetic insecticides. Due to an ever-increasing public concern for the negative impact of synthetic insecticides, new environmentally friendly products and methods are needed to reduce the use of and lessen our dependence on synthetic insecticides for fire ant management. Scientists in the National Biological Control Laboratory, Biological Control of Pests Research Unit, Agriculture Research Service, United States Department of Agriculture, Stoneville, Mississippi are studying the biology of the red imported fire ants in an effort to develop new and safer control products and methods. In this workshop, in addition to the ant biology, research endeavors will be described, and recent accomplishments

P1.03

EFFECTS OF PROJECTED DAY/NIGHT TEMPERATURES ON CARBON ASSIMILATION AND PHOTOSYSTEM OF TWO RICE CULTIVARS

Bhupinder Singh, Daryl R. Chastain, Edilberto D. Redoña, K. Raja Reddy

Mississippi State University, MS

Global temperatures are projected to increase by 0.3 to 0.6 °C per decade over next century. While an increase in night-time air temperatures (T_N) of 20% and 40% were projected by 2100 in the US, which could reduce rice yields through impairing biochemical and physiological processes. This study quantified the effects of projected day/night temperatures on carbon assimilation and photosystem response mechanisms in two genetically diverse rice (*Oryza sativa*) cultivars during reproductive growth. At flowering, nine different day/night temperature treatments (TTs) were imposed on two rice cultivars, IR6 and rex, grown in PVC pots filled with a mix of 3:1 sand and soil. During the experiment, photosynthetic and carbon dioxide (CO_2) response measurements made and quantified as function of changes in day/night temperature treatments. In addition, net photosynthesis (A_N), gross photosynthesis (A_G), dark respiration (R_D), maximum quantum yield (Fv/Fm), pigment content, and cell membrane thermostability (CMT) were determined. The maximum rate of electron transport (J_{max}) and maximum carboxylation rate allowed by Rubisco (V_{cmax}), estimated from the response functions, decreased with increasing T_N and that led to decline in A_N . A significant decline in A_N , R_D , and A_G was observed with increasing T_N under control and supra-optimal TTs. Cultivar Rex exhibited significantly higher R_D and pigment contents, but lower J_{max} than cultivar IR6 across TTs. The information on genetic, biochemical and physiological processes between the diverse cultivars under projected temperature treatments from this study could aid in breeding tools to enhance tolerance in the US rice cultivars for future climatic condition.

P1.04

SYSTEMIC ACQUIRED RESISTANCE FUNCTIONS IN SOYBEAN AGAINST THE SOYBEAN APHID

Vincent Klink, Hallie Troell, Keshav Sharma, Anna Autrey, Brandon Barton

Mississippi State University, MS

The soybean aphid (genus) is a major pathogen of soybean (*Glycine max*) shoots. Systemic acquired resistance (SAR) is an important aspect of plant defense to pathogen infection. SAR transmits a defense signal from one part of the plant (like a root) to another (like

the shoot). A number of genes have been identified to function in soybean, but against root pathogens as a part of SAR. These genes tested here include *Enhanced Disease Susceptibility1 (EDS1)*, *Non-expressor of PR1 (NPR1)* and *TGA2*. Transgenic roots engineered to experimentally induce gene expression of *EDS1*, *NPR1* and *TGA2* have increased levels of transcript abundance as confirmed by quantitative polymerase chain reaction (qPCR). In contrast, shoots of these transgenic plants engineered in their roots to decrease *EDS1*, *NPR1* and *TGA2* expression have been made showing decreased gene expression as revealed by qPCR. Soybean aphid numbers have been counted, enumerated and presented graphically. Shoots of these transgenic plants also show a decrease in the number of soybean aphids as compared to transgenic controls not expressing the SAR genes. Shoots of these transgenic plants, when infected by soybean aphids, show higher levels of infection as compared to the control. The results demonstrate SAR genes function in soybean as an effective defense strategy against the soybean aphid. Knowledge of this defense strategy should have important, broad applicability to agricultural control strategies directed against the soybean aphid and possibly other pathogens.

P1.05

THE AMINO ACID CONTENTS OF GUARPRO F-81, A POTENTIAL FEEDSTUFF FOR LIVESTOCK PRODUCTION IN THE UNITED STATES

Rebecca M. Humphrey, Alexandra G. McCafferty, M. Shamimul Hasan, Shengfa F. Liao

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

High feed cost is a major economic concern for livestock production in the US, and producers have been searching for alternative feedstuffs to reduce feed cost. Guar meal is an inexpensive by-product from guar gum industry. Although said to be unpalatable in the past, a new guar meal product, GuarPro F-81, possesses promise as an alternative feedstuff due to its high protein content. To evaluate its amino acid contents, samples were randomly collected from India, mixed and aliquoted to multiple sub-samples (20~200 g/sub-sample) for laboratory analyses. Results showed that GuarPro F-81 contained (as-fed basis, \pm SD, n=2~7) 97.1 \pm 1.92% dry matter, 57.9 \pm 1.29% crude protein, 7.17 \pm 0.38% crude fat, 3.24 \pm 1.06% crude fiber, 4,440 \pm 622 kcal/kg gross energy, and 5.40 \pm 0.43% ash. The amino acid contents (as-fed basis, \pm SD, n=3) were 2.30 \pm 0.102% lysine, 0.61 \pm 0.032% methionine, 0.68 \pm 0.029% cysteine, 1.57 \pm 0.009% threonine, 0.80 \pm 0.048% tryptophan, 7.43 \pm 0.149% arginine, 3.10 \pm 0.064% leucine, 1.70 \pm 0.095% isoleucine, 1.99 \pm 0.073% valine, 1.42 \pm 0.075% histidine, 2.14 \pm 0.030% phenylalanine, 1.53 \pm 0.352% tyrosine, 2.79 \pm 0.027% glycine, 2.40 \pm 0.190% serine, 1.85 \pm 0.108% proline, 2.04 \pm 0.015% alanine, 11.14 \pm 0.268% glutamate, and 5.53 \pm 0.096% aspartate. While the contents of alanine, cysteine, tyrosine, methionine, valine, phenylalanine, leucine, threonine, isoleucine, lysine, and proline were approximately 0.9 to 27% less than that in soybean meal, the contents of serine, aspartate, histidine, tryptophan, glutamate, glycine, and arginine were approximately 1.8 to 115% higher than those in soybean meal, and so was the crude protein content which was approximately 21.3% higher. While the crude fiber content was approximately 17% less, the crude fat and gross energy contents were approximately 372% and 4% higher than that in soybean meal, respectively.

P1.06

THE IMPACT OF SOIL AMENDMENTS ON SOIL HEALTH AND CROP PRODUCTION

Lee Jones, Kibet Leonard, Girish Panicker, Jacqueline McComb

Alcorn State University, MS

There is a global concern about the overall decline in soil productivity and environmental quality such as decline in soil fertility, soil organic carbon, and water quality. The decline in

environmental quality has led to a degradation of the environment as well as increased the cost of agricultural production. Hence, the objectives of this experiment are: 1) To assess the impact of poultry litter, compost manure and urea fertilizer on crop yields under horticultural based alley cropping system; 2) To assess the effect of poultry litter, compost manures and urea fertilizer on soil health under horticultural based alley cropping system. The study area is located in Alcorn State University, Lorman, MS (31°53'44.8"N 91°09'14.4"W) and the soil is classified Memphis silt loams. The plots measure 10x15 ft. and are separated by alleys of 10 ft. in length. The experiment has three treatments compost manure, poultry litter, urea fertilizer, and unamended control under randomized complete blocks design. Treatments were surface applied and incorporated by raking at a rate of 140lbs N/acre. Early round Dutch Cabbage (*Brassica oleracea*) seedlings were raised in the green house for 7 weeks and transplanted at a spacing of 2 ft. between plants and 3 ft. between the rows. Baseline soil samples were collected, processed and analyzed for soil active carbon, EC, PH and nutrients. Cabbage yields will be determined at the end of growing season and also soil samples will be collected and analyzed for soil health parameters.

P1.07

EFFECT OF COVER CROPS AND FERTILITY PRACTICES ON SOIL CARBON SUBSTRATE QUALITY AS INDICATED BY REACTION WITH PERMANGANATE SOLUTION

Sapana Pokhrel, Shankar G. Shanmugam, Mark Shankle, William Kingery

Mississippi State University, MS

Soil health generally refers to multiple soil functions and draws particular emphasis on soil biology. Overall, management practices that promote soil health will also generally improve the activity and biodiversity of the soil microbiome. The agricultural management regime, such as cover crops, tillage, and fertilizer application is a key determinant of microbial community structure in soil. Changes in small but relatively labile fractions of soil organic matter can provide an early indication response of the soil microbiome to management practices. Soil health practices which included five fall cover crops (native vegetation, mustard plus cereal rye, cereal rye, wheat, and vetch) were planted in whole plots and split into three separate fertility-practice sub-plots (no fertilizer control, mineral fertilizer based on MSU soil test recommendations, and poultry litter based on nutrient analysis and crop requirement). Soybeans were no-till planted into cover crop residue at different planting dates (May and June). Soil carbon substrate quality was assessed with a dilute, slightly alkaline $KMnO_4$ solution which reacts with the most readily oxidizable (biologically active) forms of soil carbon, converting Mn(VII) to Mn(II), and proportionally lowering absorbance of 550 nm light. For each soybean planting date, differences in oxidizable soil carbon were measured among the cover crop-fertility practice combinations.

P1.08

TEMPERATURE EFFECTS ON *Brassica carinata* GROWTH AND DEVELOPMENT

Leelawattie Persaud, K. Raja Reddy, Bisoondat Macoon, Ramdeo Seapaul, Hunt Walne

Mississippi State University, MS

Brassica carinata (BC), Ethiopian mustard, is a potential alternate non-edible biofuel feedstock crop for the US Southeast because of its relatively high concentration of erucic acid. Information on how this crop responds to temperature is prerequisite in developing models to determine potential areas and planting date options for its growth and development. Crops planted during fall or early spring will be subjected variable temperatures during early-season. In addition, temperature effects on BC root system is also not

available. The objective of this study was to study BC above- and belowground growth and developmental responses to a wide range of temperatures, 18/10, 23/15, 28/20, 33/25, and 38/30°C under optimum water and nutrient conditions for plants grown in sunlit plant growth chambers. Both above- and below-ground growth and developmental parameters were recorded three weeks after sowing and two weeks after temperature treatment. The cardinal temperatures varied among the processes. The minimum, optimum and maximum temperatures for most growth processes were 15, 27.5, and 40 °C while leaf developmental rates increased from 13.4°C base temperature to 30°C and declined at higher temperatures. The temperature-dependent above- and belowground growth and developmental responses of BC will be useful in assisting management and in developing models for on-farm and research and policy decisions.

P1.09

EFFECTIVE ANTHRAQUINONE DERIVATIVE CONTENT APPLIED ON SOYBEAN LEAF TO REPEL DEER

Ziming Yue

Mississippi State University, Starkville, MS

Deer browsing of row crops such as soybean is a perceived problem in the US. This costs farmers more than \$4.5 billion each year. Damages caused by deer have been reported in corn and soybean. Currently, the only effective and widely used techniques to control deer in row crops are establishment of fences and application of repellents. In general, fencing is expensive and labor intensive to install. Effectiveness of repellents depends on numerous factors: rainfall may dissolve repellents, thus requiring reapplication, while some deer will ignore the odor and feed on repellents when extremely hungry. The current deer repellent include Liquid Fence, Hinder etc. their active ingredients include putrescent egg, ammonium fatty acids, capsaicin etc. Our previous work reported that sicklepod extract can be an effective deer repellent with the active ingredients of anthraquinone derivatives and their glycosides. The 9, 10-anthraquinone was first reported as a bird repellent in 1940s. So far this compound as an animal repellent has expanded to include anthraquinone derivatives and their glycosides; the object animal has expanded to include much more birds like geese, blackbirds and rodents such as prairie dog, common vole, ground squirrels. It is well known sicklepod seed contain up to 1% anthraquinone derivatives, where emodin and chrysophanol were dominant. Our previous captive deer experiments showed sicklepod seed extract was able to repel deer by reducing browsing from 95% to 20%. This paper tries to find a measurable index to repel deer from browsing soybean in the wild.

P1.10

NO-TILL ORGANIC PRODUCTION OF MELON (*Cucumis melo* L.) ON A HEAVY SOIL AND ITS EFFECT ON BIOMASS, YIELD, AND SOIL PHYSICO-CHEMICAL CHANGES

Andrew Frye, Girish Panicker, Kibet Leonard, and Ananda Nanjundaswamy

Alcorn State University, MS, USA.

Soil erosion remains as a major universal problem to agricultural productivity. Soil degradation and environmental problem are some of the greatest challenges the world faces today. No-till and organic crop productions are recommended as solutions to protect the mother earth. As a part of the conservation research being carried out by Alcorn State University on horticultural crops for erosion prediction, nutrient management, and conservation planning, over one hundred varieties of Melons (*Cucumis melo* L.) from around the globe have been analyzed for their quality and adaptability. One of the highly adapted and high yielding varieties, Pride of Wisconsin, was raised on Memphis silt loam soil (Typic Hapludalf, silty, mixed,

thermic) in a randomized complete block design in southwest region of Mississippi. This no-till crop received nutrients from four treatments of composted organic manures (cow-C; poultry-P; cow, poultry-C+P, and control) which were buried in soil at 20cm to 25cm deep. The parameters evaluated were leaf area index (LAI), percent canopy cover, stem diameter, dry biomass, TSS, soil moisture, compaction, pH, temperature, EC, organic matter, bulk density, micro and macronutrients, water infiltration, porosity, and yield. Poultry manure was significantly high for T.S.S., stem diameter, biomass, and yield. Since this is the data collected during and after the 1st crop season and the source of nutrients were buried in soil, there was no significant difference in EC, pH, O.M., CEC, macro and micro elements, and soil physical changes.

PI.11

EFFECTS OF ELEVATED ATMOSPHERIC CARBON DIOXIDE AND TEMPERATURE ON SEED PROTEIN, OIL, FATTY ACIDS, AND ¹⁵N AND ¹³C ISOTOPE DYNAMICS IN SOYBEAN GENOTYPES UNDER CONTROLLED ENVIRONMENTS

Nacer Bellaloui¹, Hamed K. Abbas², Alemu Mengistu³

¹Crop Genetics Research Unit, USDA-ARS, Stoneville, MS, ²Crop Genetics Research Unit, USDA-ARS, Jackson, TN, and ³National Biological Control Laboratory, Biological Control of Pests Research Unit, USDA-ARS, Stoneville, MS, USA.

Information on the effects of elevated CO₂ and temperature on seed nutrition is very limited. The objective of this study was to evaluate the effects of elevated atmospheric CO₂ and temperature changes on seed composition (protein, oil, and fatty acids) in two soybean cultivars under controlled environments. The treatments were ambient CO₂ concentrations (360 μmol mol⁻¹) and elevated CO₂ concentration (700 μmol mol⁻¹) as well as normal temperature (26/16°C) and elevated temperature (45/35°C). Soybean plants were grown under greenhouse conditions. Elevated temperature or a combination of elevated temperature and elevated CO₂ resulted in a decrease in soybean seed protein and linolenic acid concentrations and increase in oil and oleic acid. Natural abundance of ¹⁵N and ¹³C isotopes was altered only under high temperature, regardless of CO₂ concentration, indicating changes occurred in nitrogen and carbon metabolism. The increase in oil and oleic acid and decrease in linolenic acid are desirable, as high oleic acid and low linolenic acid contribute to the stability and longer shelf-life of oil. This study showed that seed composition can be affected by elevated temperature alone or elevated CO₂ and temperature. This information is beneficial for selecting variety traits that are related to seed production, seed quality, and food security. Also, it added knowledge of the effect of climate change on seed quality.

PI.12

INVESTIGATING THE EFFECTS OF APPLICATION OF VARIOUS MINERALS WITH DIFFERENT CATIONS (POSITIVE IONS) AND ANIONS (NEGATIVE IONS) ON THE ABSORPTION OF MINERALS IN THE SOYBEAN PLANTS V₃ STAGE LEAVES

Mardarius Mann, M.B. Goli, Manju Pande

Mississippi Valley State University, Itta Bena, MS

Since 1970 there has been minimal reports that have focused on the effects of molecular Iodine (I₂) and Iodide anion KI, on few plants. KI in a small amount (0.5-1 ppm) has been found to be helpful in the growth of few plants. In our present study, we have expanded this information to study the effects of positive and negative ions on V₃ stage of soybean plants. Soil applications included the following treatments: Potassium Nitrate (KNO₃), Potassium Iodide (KI), Potassium Chloride (KCl), Sodium Chloride (NaCl), Calcium Nitrate Ca(NO₃)₂ and Magnesium Nitrate Mg(NO₃)₂. The plants were grown in the greenhouse. After the chemical applications, the plants were allowed to grow for a week. Then, the leaves were picked and were dried, and analyzed for

5 macro(K, N, P, Mg & S) and several micro minerals (for example, B, Cu, Fe, Mn, Zn, Na). In the *data* set the control plants are included. Looking at the Statistical Analysis (SAS) results, the following observations are evident. KI treatment increased the following minerals in: K by 31.9%, Mg by 8.0, P by 60.8, S by 38.7%, respectively. Similarly, minerals increased; B by 53.6%, Cu by 36.3% and Zn by 10.8%, respectively. Mn decreased by 34.9%. KI treatment demonstrated no effect on Fe in the leaves. Embedded within our results we also denoted that Ca(NO₃)₂ highly increased the amount of Ca by 20%, K by 11.7%, Mg by 10.2%, Cu by 14.3%, & Mn by 21.8%.

PI.13

EFFECTS OF MELATONIN ON STOMATAL CONDUCTANCE IN SOYBEAN PLANTS UNDER WATER STRESSED CONDITIONS

Jasmine Whitehead, Manju Pande

Mississippi Valley State University, Itta Bena, MS

Melatonin plays an important role in maintaining the circadian rhythm of night and day in human and other animals. Melatonin was first discovered in plants in 1995, which helps plants in maintaining their ability to respond to photoperiod. Later studies reported its role as an antioxidant, especially in plants under various kinds of stress. In present study, we investigated the effect of melatonin treatment on seed germination and stomatal conductance in soybean plants. The experiment was divided into groups as follows; control, Foliar-50um(L), Foliar -100um(M), and Foliar-200um(H), the next 2 groups consisted of seeds primed with low and high concentration, all plants were grown under water stressed conditions, irrigated once a week. Plants were treated with melatonin for three weeks once a week. Number of seeds germinated and stomatal conductance using a leaf porometer was measured for three weeks once/week. The maximum number of seeds germinated in seeds primed with 50um melatonin. In stomatal conductance of primed group, the control was the highest in week 1, whereas by week 3, there was no significant difference between the groups. In foliar treatment, week 1 has the highest stomatal conductance in 200um (H) treated group, however, by week 3, both 100um (1,922 m²/s mol⁻¹) and 200um (1,956 m²/s mol⁻¹) stomatal readings were higher when compared to Control (1,433 m²/s mol⁻¹). We can conclude that melatonin treated plants offers protective measurements in terms of stomatal opening and might induce germination rate, however, we need further studies to confirm.

PI.14

INFLUENCE OF LEAD (Pb) ON GERMINATION AND EARLY SEEDLING DEVELOPMENT OF POTENTIAL SPECIES FOR PHYTOEXTRACTION OF LEAD-CONTAMINATED SOILS

Vernaldo Wilson, Jessica McKenzie, Jennifer Laifa, Maria Begonia, Gregorio Begonia

Jackson State University, Jackson, MS

Phytoextraction has been used in recent years as a cost-effective and environmentally benign alternative to expensive, engineering-based technology for the clean-up of Pb-lead contaminated soils. One of the requisites for successful phytoextraction is the selection of suitable plant species that can successfully establish, tolerate, and effectively absorb and translocate Pb into the above-ground parts (shoots). The experiment was conducted as an integral part of our continuing efforts to search for phytoextraction species that can be used in our crop rotation schemes. Seeds of pea (*Pisum sativum*) and wheat (*Triticum aestivum*) were sown in petri dishes lined with filter paper and moistened with various Pb concentrations. Germination and early growth responses were assessed at 7 days after initiation. Results revealed that Pb had no deleterious effects on germination indices of pea. Tolerance index (TI) of both shoots and hypocotyl root axis were slightly reduced only at the highest Pb treatment (100 ppm Pb). In contrast, Pb inhibited the germination of

wheat especially at 50 to 100 ppm Pb. Pb treatments significantly reduced the TI of both wheat shoots and roots, even at 25 ppm Pb. Due to their differential responses to Pb treatments in vitro, only the pea variety will be grown in Pb-contaminated soils to further assess its suitability as a phytoextraction species. Another wheat *variety* will be sought and evaluated in vitro.

PI.15

AN INVESTIGATION OF THE INHIBITORY EFFECTS OF *Brassica Oleracea* on *Tagetes Minuta*

Vernaldo Wilson, Niani Bailey, Jacuerria Tucker, Sarah Jones, Jennifer Laifa, Gloria Miller, Maria Begonia, Gregorio Begonia
Jackson State University, Jackson, MS

Weeds are plants with rapid growth rates and outcompete cultivated plants from arable lands. Therefore, there is always a need to control the weeds. The ways of weed control include physical and chemical means. Crop rotation is one effective physical means used, but is time consuming. Hoeing is another physical means, but can cause erosion. Herbicides are chemicals that can be released to the water, harming the organisms in those waters. This study was conducted to investigate the effectiveness of *B. oleracea* stems and roots to control *T. minuta*, which is one of our gardens' problematic weeds. Various amounts of *B. oleracea* stems and roots of 0, 25, 50, 60, 70, 80, 100, 150, 200 and 250 g were incorporated in 500 g of soil. Five seeds of *T. minuta* were planted in each plant pot. Results showed that from 150 to 250 g of *B. oleracea* stems incorporated in 500 g of soil completely inhibited the germination of *T. minuta*. All the germinated seeds in pots with 180 g of *B. oleracea* stems did not survive after a week. Roots of *B. oleracea* were ineffective in controlling *T. minuta* as the seeds continued to germinate throughout the study period. In conclusion, the stems of *B. oleracea* were effective in inhibiting the growth of *T. minuta* while the roots of *B. oleracea* were not.

PI.16

INHIBITORY EFFECTS OF TURNIP (*Brassica Rapa*) ON THE GROWTH OF *Bidens Pilosa*

Niani Bailey, Vernaldo Wilson, Jacuerria Tucker, Jennifer Laifa, Gloria Miller, Maria Begonia, Gregorio Begonia
Jackson State University, Jackson, MS

Allelopathy or biofumigation is an environmentally friendly alternative technique to the use of herbicides in agriculture. The effects of turnip (*Brassica rapa*) were investigated for controlling the weed known as blackjack (*Bidens pilosa*). Blackjack is a common weed in many parts of the world known for invading the area where maize is grown. In the present study turnip was separated into roots and leaves, macerated separately and incorporated into the soil at various rates. The control was not treated. The growth inhibitory effects of the turnip were measured as the differences in emergence percentages, seedling lengths and biomass. The weeds were harvested after three weeks. The data were statistically analyzed to determine any significant differences between the plants at $p \geq 0.05$. Plants from pots containing incorporated turnip leaves had higher emergence percentages, seedling lengths, and mass compared to those treated with roots. The control plants, however, had higher percentage emergence, greater lengths and mass than any of the treated pots. Both treatments containing turnip leaves or roots resulted in reduced emergence percentages, lengths and biomass of *B. pilosa*. In conclusion, turnip had inhibitory effects on the growth of blackjack, and the magnitude of inhibition were greater in treatments wherein the soil was incorporated with turnip roots than with above-ground biomass.

PI.17

COMPARATIVE STUDY OF PHYSICAL AND CHEMICAL PROPERTIES OF DIFFERENT SOIL TYPES

Brittney Cary and Manju Pande

Mississippi Valley State University, Itta Bena, MS

Soils protect plants from erosions and other physical, biological and chemistry activities. The roots of a plant receive vital nutrients and water from the soil to help grow the plants. In our present study, the physical and chemical properties of different soil types were tested. 5 separate samples were collected: sand, clay, humus, and soil from soybean field (A) and rice field (B) (Moorehead, MS). We conducted four separate experiments to determine the particle size to establish different level of rock, sand and humus in the soils collected from the field. Our second and third experiment involved the determination of the water holding capacity (water potential) and erosion level of each soil. In the fourth experimentation, soil pH and the level of nitrogen (N), potassium (K) and phosphorus (P) content present in each soil was examined. While conducting these experiments, it was sought to differentiate which soil sample has the best qualities in the categories of: water holding capacity, capillary action in soil, the pH level, ion exchange capacity, analysis of free ion, and the sufficient level of nitrogen, phosphorus, and potassium. The soil obtained from the soil A and Humus had 6.5 pH, which is slightly acidic in which most crops thrive. The results from NPK values, N was deficient from all soil; P was in surplus in clay, humus and soil A; K was at adequate level in soil A. Overall our result indicates soil A had the best nutrient level.

PI.18

AN INVESTIGATION ON THE EFFECTS OF COPPER ON *Chenopodium Album*

Jacuerria Tucker, Vernaldo Wilson, Niani Bailey, Jessica McKenzie, Jennifer Laifa, Gloria Miller, Maria Begonia, Gregorio Begonia
Jackson State University, Jackson, MS

Copper is an essential metal that is needed by humans, animals and plants. This metal is an irritant to humans. The gastrointestinal effects of copper in humans include nausea, anorexia, and diarrhea. Excess copper in plants cause chlorosis, stunted growth, and denaturing of macromolecules. Wild plants are crucial in providing food source for humans. But at times, the wild plants can grow in contaminated soils. *Chenopodium album* is a wild leafy vegetable that is consumed in some parts of the world. It is rich in proteins, carotenoids, and vitamin C. The hypothesis of the study was that *C. album*, would uptake and accumulates copper in the harvestable parts. The shoot heights, root lengths, shoot and root biomass, and the concentration of copper were measured from *C. album* growing from soils contaminated with different concentrations of copper. Results showed that the shoot heights of *C. album* decreased with increasing concentrations of copper in copper-contaminated soils. The root lengths decreased with increasing copper concentration in the soil. Results also revealed that the harvestable parts of *C. album* have accumulated 160.074 mg/kg copper. The maximum accumulated copper was observed from the roots of plants growing at 100 ppm of copper with a concentration of 2175.833 mg/kg. In conclusion, *Chenopodium album* grown on copper contaminated soil can tolerate and accumulate copper in its harvestable parts.

PI.19

EFFECT OF MELATONIN APPLICATION ON GROWTH AND CHLOROPHYLL IN SOYBEAN PLANTS

Jamelia Whitehall and Manju Pande

Mississippi Valley State University, Itta Bena, MS

Melatonin (N-acetyl-5-methoxytryptamine) is a hormone that helps regulate mood, body temperature, and maintain circadian rhythm also known as your sleep/wake cycle. In plants circadian regulation, besides regulating daily and/or seasonal responses is also shown to increase photosynthesis, seed yield in crops and induce biotic/abiotic stress responses. The present study was initiated to

investigate the effect of applied melatonin on plant growth and on chlorophyll content in soybean plants under water stress. Soybean plants and seeds were treated with melatonin as follows; control, Foliar-50um (L), Foliar-100um (M), Foliar -200um (H), primed control, primed (50um) and primed (100um). For the foliar treatment, melatonin was applied once every three weeks, for seed priming, the seeds were soaked for 6 hrs in the solution. The experiment was carried on the campus greenhouse while monitoring the temperature, light and moisture level every 2 days. The plant height was measured over four week time to record the growth and chlorophyll content was recorded by chlorophyll meter. The average plant height in control and plants treated with 50um and 100um did not show any significant difference, however, plants treated with 200um foliar (16.6 cm) showed an increase as compared to control (14.08cm). Chlorophyll content in control decreased from week one (28.08) to week three (15.94) while chlorophyll remained at the same level at week three in treated 50um (28.34) and 100um (24.62) treated plants. Our results indicated that chlorophyll is likely protected by melatonin in water stressed conditions.

P1.20

ASSESSING OSMOTIC STRESS TOLERANCE IN MAIZE VIA IN VITRO SEED GERMINATION

Anna Beth Gaudin, Hunt Walne, K. Raja Reddy
Mississippi State University, Starkville, MS

Seed germination, controlled by both genetics and the environment, is an important process in the life cycle of corn (*Zea mays* L.). Drought is the major environmental factor influencing both germination percentage and rate. An experiment was conducted to evaluate *in vitro* seed germination responses of nine commercially available corn hybrids using polyethylene glycol (PEG 8000) to determine the impact of osmotic stress on the germination properties. These nine hybrids are common to dry land production systems in Mississippi and the US Mid-south region. Time series data for seed germination was generated at various osmotic potentials from 0 to -1.2MPa, at -0.3 MPa intervals while the seeds incubated at 25°C. Maximum seed germination, time to 50% germination, and seed germination rate were derived by using appropriate regression analysis. Then, maximum osmotic potentials when seed germination rate and germination were zero were derived by fitting linear and quadratic regression models of seed germination parameters as a function of osmotic potential. Maximum seed germination and seed germination rate decreased with decreasing the osmotic potential for all corn hybrids. A cumulative drought response index (CDRI) developed by summing individual response indices of each parameter for each hybrid was used to classify corn hybrids into different drought-tolerant groups: drought tolerant, moderately drought tolerant, and drought sensitive. The identified tolerance among hybrids could help producers select the best hybrids suited for suboptimal water conditions. The functional Variation in response among hybrids could indicate the possibility of improving stress tolerance through selection and breeding programs.

P1.21

FROM GROW BLOCK TO SPENT: UNDERSTANDING NUTRITIONAL COMPOSITIONAL CHANGES ASSOCIATED WITH INDOOR CULTIVATION OF SHIITAKE MUSHROOMS

George Frye Jr., Anna Kazarina, Mandyam Keerthi, Ananda Nanjundaswamy

Alcorn State University, Lorman, MS

Mushrooms are popular in the U.S. with annual per capita consumption of 3lb of fresh mushrooms. Mushroom sales reached a second all-time high in 2017 with \$1.2 billion. Specialty mushroom sales in 2017 increased by 4% from 2016, accounting for \$96 million of which shiitake (*Lentinus edodes*) contributed to \$40 million. Shiitake cultivation on indoor grow blocks is an established

concept using substrate mix of sawdust/wood chips, grain and bran. Mushroom cultivation including specialty mushroom cultivation is not prevalent in Mississippi despite the abundant availability of forest products like sawdust/wood chips. One of the goals of the Alcorn State Agricultural Experiment Station is to develop combination of substrate mixes for enhanced and inexpensive shiitake production. To develop new mixes, it is essential to understand the nutritional composition of the commonly used sawdust:grain substrate. Accordingly, the objective of this study was to conduct comprehensive nutrition analysis from unsterilized substrate mix to the spent block. Samples of unsterilized block, sterilized block, 7-10d, 35d, 60d and 90d-old block, spent block and, fresh and dried shiitake were randomly collected from a shiitake co-op in New Hebron, MS in 2016-2017. They were tested for percent protein, fat, fiber, ash, amino acids, and fatty acids. Eritadenine, an important antioxidant was also quantified in mushrooms. The data from fresh and dried shiitake were compared with that from the USDA Nutrient Database. The quantitative changes of nutrients in the different stages will be discussed from the point of view of potential replacement of grain with inexpensive alternatives.

O1.22

BACILLUS SUBTILIS ASSISTED BIOPROCESS MODIFICATION OF SWEET POTATO-SOYMEAL UNDER SOLID STATE FERMENTATION (SSF)

Kaelin Travis, Angela Jackson, Ananda Nanjundaswamy, Keerthi Mandyam, VictorNjiti

Alcorn State University, Lorman, MS

Bacillus subtilis is an important generally regarded as safe (GRAS) bacteria which is used in several animal feeds as probiotic supplement. Probiotic supplements primarily aimed at improving the gut health of the animal including improving the immune health. *B. subtilis* is used as an important industrial microorganism in preparation soy-based products such as natto. *B. subtilis* is known to produce large quantities of proteins in short duration. Sweet Potato is an important crop of Southern United States and has not been used extensively in developing fermented products. The present study used mixture of sweet potato and soymeal (85:15) as a growth medium to ferment *B. subtilis* on solid state fermentation. The fermented product was evaluated for biochemical composition of such as protein, fat, amino acid and fatty acid. It is interesting to note that fermented product showed about 400% increase in protein level followed by 30% increase in crude fat level. Generally crude fiber, NDF and ADF reduced in fermented samples. The presentation discusses the fermentation process and nutritional profile and how value-added sweet potato products can be prepared for use in animal feed industry.

2:00pm Division Award Ceremony

2:30pm Business Meeting

Thursday, February 21, 2019

EVENING

3:30 Dodgen Lecture and Awards Ceremony TCC Theatre

General Poster Session

Immediately Following Dodgen Lecture

TCC Ballrooms 3rd floor



Friday, February 22, 2019

MORNING

Room TCC 216

9:00-11:30 WORKSHOPS

(see highlights in Divisional Symposia and Workshops Section of the Journal)

AFLATOXIN CONTAMINATION: A NATIONAL PROBLEM AND ITS MANAGEMENT BY BIOLOGICAL CONTROL

This workshop will be led by Dr. Hamed Abbas, USDA-ARS, Stoneville, MS

Aflatoxins, which are produced by numerous species of *Aspergillus*, are highly toxic substances that contaminate corn, peanut, cottonseed and other crops. Aflatoxin contamination threatens the health of people around the world, as well as pets, fish, livestock, birds and other animals by causing acute and chronic liver injury and liver cancer. Aflatoxin is a chronic problem in the southern US, where estimated annual economic losses due to aflatoxin contamination range up to more than \$200 million for corn alone and \$500 million for all crops combined. US Food and Drug Administration (FDA) regulations prohibit the sale of corn or any other grain that contains more than 20 parts per billion of aflatoxin for direct human consumption. Little progress has been made in developing methods for eradicating aflatoxin contamination. Thus far, the most promising eradication method has been biological control with non-toxigenic *A. flavus* strains. Some *Aspergillus* strains that do not produce aflatoxins are being used as biological control agents to reduce contamination of crops like corn. Recent research on delivery methods for the most effective biocontrol strains have focused on starch-based bioplastic, which has ideal properties for promoting growth of fungus and helping it become established in the field. Bioplastic can be used to deliver biocontrol strains in numerous forms, including seed coatings, sprayable liquids and granules for soil application. Bioplastic-based formulations are more effective and easily stored than previously used liquid or grain-based formulations.

BIOLOGY AND MANAGEMENT OF RED IMPORTED FIRE ANTS

This workshop will be led by Drs. Dr. Jian Chen, Dr. Margaret L. Allen, Dr. Yuzhe Du, Dr. Michael J. Grodowitz, USDA-ARS, Stoneville, MS

The red imported fire ant, *Solenopsis invicta*, is one of the most successful invasive ants in the world and is regarded as one of World's worst invasive alien species. Native to South America, red imported fire ants were introduced into the United States in the 1930's and have now invaded many other countries and regions, including Australia, New Zealand, China, Taiwan, Hong Kong, Macau, among others. This species causes manifold problems posing a significant threat to public health, a danger to livestock and pets and also significantly reduces biodiversity through preying on and competing with other organisms. Control of red imported fire ants has been proven difficult and management still heavily depends on the use of synthetic insecticides. Due to an ever-increasing public concern for the negative impact of synthetic insecticides, new environmentally friendly products and methods are needed to reduce the use of and lessen our dependence on synthetic insecticides for fire ant management. Scientists in the National Biological Control Laboratory, Biological Control of Pests Research Unit, Agriculture Research Service, United States Department of Agriculture,

Stoneville, Mississippi are studying the biology of the red imported fire ants in an effort to develop new and safer control products and methods. In this workshop, in addition to the ant biology, research endeavors will be described, and recent accomplishments presented.

Friday, February 22, 2019

AFTERNOON

12:00-1:00 Plenary Speaker

1:00-3:00 Mississippi INBRE/ Millsaps HHMI Symposia

CELLULAR, MOLECULAR AND DEVELOPMENTAL BIOLOGY

Co-Chair: James A. Stewart, Jr.

University of Mississippi

Co-Chair: Donna Gordon.

Mississippi State University

Thursday, February 21, 2019

MORNING

Room TCC 214

8:00 WELCOME

02.01

8:15 THE ANTIMICROBIAL ACTIVITY AND CELLULAR PATHWAYS TARGETED BY ANTIMICROBIAL PLANT-DERIVED ALDEHYDES, ALDEHYDE-BASED POLYMER NETWORKS (PANDAS) AND NATURAL INHIBITORS IN PSEUDOMONAS AERUGINOSA

Yetunde Z Adewunmi, Dahlia Amato, Douglas Amato, Sanchirmaa Namjilsuren, Sarah Jamison, Olga Mavrodi, Derek Patton, Dmitri Mavrodi

University of Southern Mississippi, Hattiesburg, MS, USA

Background: Plant antimicrobials kill microorganisms with the low propensity to trigger resistance. However, knowledge gaps about their cell targets and instability precludes their widespread application. Here, we incorporated phytoaldehydes into antimicrobial polymers called PANDAs. We then used the opportunistic pathogen *Pseudomonas aeruginosa* PAO1 as a model to determine the efficacy of PANDAs, and identify cellular pathways targeted by methoxybenzaldehyde (a key component of PANDAs). We also tested the ability of methoxybenzaldehyde to interact with epigallocatechin gallate (EGCG) and furaneol in altering the production of virulence factors and the biofilms in PAO1. **Methods:** We subjected PAO1 to transposon mutagenesis and screened mutants for hypersensitivity to methoxybenzaldehyde. Genome regions flanking the transposon insertion sites were identified by DNA sequencing. The interactions between methoxybenzaldehyde and EGCG or furaneol were characterized using checkerboard method. The effect of EGCG and furaneol on biofilms was determined by crystal violet biofilm assay. The impact of furaneol on quorum-sensing-dependent virulence traits was determined by quantifying pyocyanin and surface motility in PAO1.

Results: Forty-six mutants with mutations in genes encoding efflux pumps, porins, and molybdenum cofactor biosynthesis complex were hypersensitive to methoxybenzaldehyde. EGCG and methoxybenzaldehyde interacted synergistically (Σ FIC = 0.5) in suppressing the growth and biofilm formation in PAO1. Furanol significantly reduced biofilms, surface motility, and the amount of pyocyanin. Conclusions: Cellular pathways affected by methoxybenzaldehyde could be exploited as potential targets for other antimicrobials. EGCG potentiated the activity of methoxybenzaldehyde, while furaneol inhibited quorum-sensing-dependent traits in PAO1. Hence, they are promising candidates for incorporation into phytoaldehyde-based PANDAs to improve their efficacy.

O2.02

8:30 DIFFERENTIAL RELEASE OF MAST CELL MEDIATORS VIA VAMP HOMOLOGS

Pratikshya Adhikari, Hao Xu

The University of Southern Mississippi, Hattiesburg, MS, USA

Accumulating evidence in the field of mast cell biology has suggested the existence of different degranulation pathways, which are responsible for the regulated release of different pools of mast cell mediators. In this study, we exploited RNAi to transiently knockdown the transcription of the four exocytic R-SNAREs (soluble N-ethyl-maleimide sensitive factor attachment protein receptors) VAMP2, VAMP3, VAMP7, and VAMP8 respectively. We then investigated the exocytosis of four pre-formed mediators, β -hexosaminidase, histamine, serotonin and TNF- α using cell-based secretion assays. We demonstrated that knocking down of VAMP8 inhibited IgE/antigen-induced release of β -hexosaminidase, histamine, serotonin but not TNF- α , which is in line with previously published studies. Inhibition of VAMP7 expression on other hand inhibits the release of histamine but not serotonin or TNF- α . Intriguingly, VAMP3 seems to play an unexpected role in the release of histamine instead of TNF- α . VAMP2, a close homolog of VAMP3 seems to play a similar function as VAMP3 in mediator release. These observations set the stage to delineate the differential regulation of different degranulation pathways in activated mast cells. Understanding different regulatory mechanisms employed in mast cell degranulation will reveal potential unique molecular targets for therapeutic purposes.

O2.03

8:45 A COMPARISON OF ANTIFUNGAL AGENTS ON THE MORPHOLOGY OF SWITCHING IN *CANDIDA ALBICANS*

Aaron W. Albee, Donna M. Gordon

Mississippi State University, Mississippi State, MS, USA

Candida albicans is a polymorphic fungal pathogen growing in its medical relevance due to the increase in isolates with resistance to current antifungals. This resistance makes the call for new antifungal treatments a priority. To this end, our research has focused on occidiofungin, a compound extracted from *Burkholderia contaminans* MS14 with antifungal properties. Previous work has shown that occidiofungin inhibits filament development likely through its impact on actin organization. To characterize these effects on hyphae formation, the morphology induced by occidiofungin exposure was compared to that of two well characterized antifungal agents: caspofungin and fluconazole. Given the different biological targets for each of these antifungals, we hypothesize that at sub-lethal doses, each compound will result in different morphological responses when added during developmental switching. To ensure an accurate comparison, resazurin-based microdilution MIC assays were carried out to identify the MIC and sub-MIC doses. Data collected from cells

exposed to a range of antifungal concentrations showed varied cell morphologies that differed between compounds. As reported previously, fluconazole had no obvious impact on hyphae formation at all concentrations used. Caspofungin had the opposite effect with higher doses resulting in complete inhibition of hyphae formation. Occidiofungin exposure resulted in the accumulation of dose-dependent abnormalities including multiple hyphae growths and incorrectly polarized cells. Therefore, each of the antifungal compounds had variations in cell morphologies that confirm their different mechanisms of action. Future studies include identifying the molecular defects associated with occidiofungin induced morphological abnormalities to further the compounds potential as an antifungal agent.

O2.04

9:00 NADPH-GENERATING ENZYMES ARE INVOLVED IN RESPONSE TO SALT AND DEHYDRATION STRESS IN RICE PLANTS

Muteb Dahamq Alrifdi, Jiaxu Li

Mississippi State University, Mississippi State, MS, USA

Abiotic stresses are the major environmental factors that limit the productivity of crop. The production of reactive oxygen species (ROS) in stressed plants is a common feature for a number of abiotic stresses. Reduced form of the coenzyme nicotinamide adenine dinucleotide phosphate (NADPH) is an essential reducing reagent for the plant antioxidant system, which is important to ROS scavenging. NADPH is produced mainly by the two enzymes glucose-6-phosphate dehydrogenase, 6-phosphogluconate dehydrogenase in the oxidative pentose phosphate pathway. In this work, the effects of salt and dehydration stress on NADPH-generating enzymes in rice plants were examined. Enzyme activities of glucose-6-phosphate dehydrogenase in both leaves and roots of rice plants were significantly increased in response to salt and dehydration stress. Further, the enzymatic activity of phosphoenolpyruvate carboxylase in leaves of rice plants was affected by dehydration stress. Phosphoenolpyruvate carboxylase in cooperation with malate dehydrogenase and NADP-malic enzyme can produce NADPH. These results suggest the involvement of NADPH-generating enzymes in plant abiotic stress responses. The increased demands of NADPH in plants under abiotic stress can be furnished by enhanced activities of NADPH-producing enzymes.

O2.05

9:15 MECHANOTRANSDUCTION OF VASCULAR CALCIFICATION THROUGH CANONICAL WNT OSTEOGENIC PROMOTION

John Tyson, C. LaShan Simpson

Mississippi State University, Mississippi State, MS, USA

Vascular calcification is a debilitating pathology that wears away the elastance and compliance of arterial tissues. Comorbid with metabolic and vascular diseases such as obesity and hypertension respectively, calcification is attributed to the layering of mineralized plaques of hydroxyapatite anabolized by vascular smooth muscle cells (VSMCs) differentiated into osteoblast-like cells. This differentiation is promoted by the canonical WNT signaling cascade through expression of osteogenic promoters RUNX2 and bone morphogenetic protein 2 (BMP2). It has been shown, especially in bone remodeling, that WNT contributes to structural systems across the body. The propensity of WNT to respond to the structural needs of the body speaks to the potential cross-talk between it, integrins, cadherins, and BMPs, suggesting that mechanical force such as blood pressure play a crucial part in arterial remodeling. As healthy matrix becomes calcified, the shift from a soft to a stiff matrix induces VSMC differentiation that is then further promoted through mechanical strain. It is the purpose of this study to verify the

interactions between mechanical strain and the bone-like matrix produced by calcification. Through the utilization of the Flexcell® FX-4000T, mechanical stimulation to a 2D monolayer culture can be programmed to replicate strain at specified levels. Calcification will be induced in selected cultures, and expression of osteogenic markers and matrix proteins will be verified. Understanding the relationship between mechanical stimuli and the canonical WNT cascade will illuminate potential therapeutic targets.

O2.06**9:30 EXTRACELLULAR MATRIX COMPONENTS ISOLATED FROM DIABETIC MICE ALTERS CARDIAC FIBROBLAST FUNCTION THROUGH THE AGE/RAGE SIGNALING CASCADE**

Stephanie Burr, James A Stewart, Jr.

University of Mississippi, University, MS, USA

Roughly 30 million Americans suffer from diabetes and these individuals are at an increased risk of developing cardiovascular complications. A common complication is heart failure which occurs due to the stiffening of the left ventricle brought on by cardiac fibroblast “activation” that results in the remodeling the extracellular matrix (ECM). Fibroblast “activation” can be triggered by the AGE/RAGE signaling cascade. Advanced Glycated End products (AGEs) are produced and accumulate in the ECM overtime, but under hyperglycemic conditions this process is accelerated. We aim to investigate how the presence of AGEs in the either diabetic or non-diabetic ECM can affect fibroblast ECM remodeling as well as determine the role of AGE/RAGE signaling during this process. In order to assess this question diabetic and non-diabetic fibroblasts were embedded in 3D matrices composed of collagen isolated from either diabetic or non-diabetic mice. Non-diabetic fibroblasts displayed similar matrix contraction and α -SMA expression to diabetic fibroblasts when embedded in diabetic collagen. In addition, increasing the AGE/RAGE cascade leads to increase gel contraction indicating increase in fibroblast “activation”. These results indicate 1) the ECM from diabetic and non-diabetic mice differ from one another, 2) diabetic ECM can impact fibroblast function and shift them towards an “active” state, and 3) that fibroblasts can modify the ECM through activation of the AGE/RAGE signaling cascade. These results suggest the importance of understanding the impact diabetes has on the ECM and fibroblast function.

9:45 BREAK**Invited Speaker****10:00 UNIVERSITY OF MISSISSIPPI FLAGSHIP CONSTELLATION ON BRAIN HEALTH & WELLNESS**

Dr. Kristine L. Willett

University of Mississippi Flagship Constellation on Brain Health & Wellness, University of Mississippi, University, MS, USA

The human brain is both mysterious and wonderfully complex. It is also the core of many health issues. The University of Mississippi is bringing together an academically diverse team to realize a fuller understanding behind brain function as a result of injury, addiction, and disease. The engagement in population-based research, clinical care, education, and basic research will assist with the development of technologies and evidence-based practices to bolster prevention of and recovery from brain impairment. Kristine L. Willett, Ph.D., is chair of the Department of BioMolecular Sciences in the School of Pharmacy at the University of Mississippi. A professor of pharmacology and environmental toxicology, she has taught at the university for the past 17 years. Her lab studies the developmental, reproductive, and multigenerational impacts of benzo[a]pyrene

exposure using fish models. She also studies nanosilver mechanisms of toxicity and the consequences of the Deepwater Horizon oil spill on oysters. New work in her lab uses zebrafish to investigate drug-resistant epilepsy, including the efficacy versus toxicity of cannabidiol and +9-tetrahydrocannabinol.

O2.07**10:30 HEAD AND NECK SQUAMOUS CELL CARCINOMA CELLS AND CANCER STEM CELLS PRE-TREATED WITH BENZYL ISOTHIOCYANATE BECOME SENSITIZED TO THE EFFECTS OF CHEMO-RADIATION**

Linda Eastham¹, Claus Yang², Premalatha Balachandran¹, David Pasco¹, Pier Paolo Claudio¹

¹University of Mississippi, University, MS, USA

²University of Mississippi Medical Center Cancer Institute, Jackson, MS, USA

Approximately 90% of head and neck cancers are squamous cell carcinoma (HNSCC). Current treatments for advanced stage HNSCC primarily involve a combination of surgery with post-operative chemoradiotherapy (CRT) using a platinum-based chemotherapeutic agent. Unfortunately, the prognosis of HNSCC patients remains low in large part for the presence of chemo- and radiation-resistant cancer stem cells (CSCs) that contribute to treatment resistance. Isothiocyanates (ITC's) are phytochemicals found in cruciferous vegetables. Benzyl isothiocyanate (BITC), a bioactive derivative of ITC, has been shown to inhibit the growth of various cancer cell lines through several mechanisms. We demonstrated that in HNSCC cell lines, pre-treatment with the sulphur-containing phytochemical BITC prior to exposure to radiation and cisplatin, significantly sensitized HNSCC cells and CSCs to these treatments by enhancing programmed cell death through a mechanism involving increased ROS production. The increase in ROS and decrease in cell viability, seen in our experiments 24-hours following BITC treatment, were attenuated with a pre-treatment of the antioxidant, glutathione (GSH). The results from this data demonstrates that increased levels of ROS play an important role in the mechanism by which BITC induces cell death in HNSCC cells and CSCs. The anti-cancer effects of BITC on HNSCC cancer cells, along with its ability to significantly enhance the effects of chemo- and radiotherapy is of great importance. These results suggest that the use of BITC holds promise in the clinical setting as a potential adjuvant treatment to significantly enhance the effects of chemo- and radiation-therapy in patients with HNSCC.

O2.08**10:45 A FUNCTIONAL ANALYSIS OF MATRIX METALLOPROTEINASES AS THERAPEUTIC TARGETS IN NEURODEGENERATIVE DISEASES**

Scoty Hearst

Tougaloo College, Tougaloo, MS, USA

Matrix metalloproteinases (MMPs) are present in many cells of the central nervous system (CNS). MMPs are endopeptidases that once activated participate in the regulation of diverse physiological and pathological processes. Recently MMPs have gained much attention as therapeutic targets in neurodegenerative disorders due to up-regulation of MMPs observed in a variety of CNS disorders. MMPs are strictly regulated endopeptidases and in humans 28 different MMPs are regulated by four different types of tissue inhibitors of metalloproteinases (TIMPs). The exact mechanisms of MMPs in neurodegeneration are poorly understood and further complicated by the large number of MMPs and TIMPs expressed by humans and other vertebrates. We propose to leverage both *in vitro* and *in vivo*

techniques to gain a functional understanding of the role of MMPs in neurodegenerative diseases and as a therapeutic target. Our hypothesis is that MMPs will be therapeutic targets in the progression of neurodegenerative diseases. The long-term goal of this project is to reveal the distinctive roles of MMPs in neurodegenerative diseases and to further develop selective MMP inhibitors or modulators as possible therapeutics for neurodegenerative disorders.

O2.09**11:00 TARGETING LIPID METABOLIC PATHWAYS IN OVARIAN CANCER CELLS**

Debarshi Roy, Viji Shridhar

Alcorn State University, Lorman, MS, USA

Treatment of ovarian cancer (OVCA) is challenged by chemoresistance, tumor recurrence and a poor survival rate. Cancer cells reprogram their metabolic machineries to become highly aggressive, metastatic and chemoresistant. Metabolic alterations are now considered as one of the most important hallmarks of cancer and these changes are now being increasingly recognized as promising therapeutic targets. The current study describes the impact of altered lipid metabolic pathways in the OVCA. We found that HSulf-1 (endosulfatase), a putative tumor suppressor inhibits heparan sulfate binding growth factor signaling and regulates interplay between autophagy and lipogenesis. HSulf-1 knockdown in OV202 cell line (OVCA cell line) modulates lipid metabolic pathway, increases cell proliferation rate as well as produced *in vivo* tumor growth in athymic nude mice. Altered lipid metabolic pathway is manifested by aggregation of cytoplasmic lipid droplets (LDs), overexpression of fatty acid metabolizing enzymes and reduced autophagic flux. Biogenesis of LDs in HSulf-1 depleted cells was associated with increased activity of cPLA2 (S505). Pharmacologic inhibition of cPLA2 activity in HSulf-1 depleted cells reduced accumulation of LDs, triggered autophagy, sensitized chemotherapeutic effect and reduced xenograft tumor growth *in vivo*. Our data shows an inverse association between lipogenesis and autophagy and indicates the therapeutic advantage of targeting this association in OVCA.

O2.10**11:15 ATTENUATED INTERFERON- γ RESPONSE IN MOUSE EMBRYONIC STEM CELLS AND ITS UNDERLYING MOLECULAR MECHANISM**

Bohan Chen, Yan-Lin Guo

University of Southern Mississippi, Hattiesburg, MS, USA

Our recent studies have demonstrated that embryonic stem cells (ESCs) are deficient in innate antiviral responses. In particular, they are deficient in expressing type I interferons (IFN α and IFN β) and have attenuated response to these cytokines. However, ESC-differentiated fibroblast cells (ESC-FBs) have the gained ability to express and respond to IFN α and IFN β . In this study, we extended our investigation to the response of ESCs and ESC-FBs to IFN γ , a type II IFN that is a cytokine highly expressed under inflammatory conditions and toxic to somatic tissue cells. We first determined the effects of IFN γ on cell viability and inflammatory gene induction in ESCs and ESC-FBs. Our results suggested that ESCs were not susceptible to the cytotoxic effects of IFN γ and have reduced expression of IFN γ induced genes as compared to ESC-FBs. To determine the molecular basis underlying these observations, we analyzed the activation of STAT1, the transcription factor that mediates the effect of IFN γ , and demonstrated that STAT1 can be activated in ESC-FBs by IFN γ , but not in ESCs. Furthermore, the expression levels of protein phosphatases that negatively regulate the activity of STAT1, were significantly higher in ESCs than ESC-FBs. Based on these results, we conclude that ESCs have attenuated

response to IFN γ and that the inactive status of STAT1 is, at least in part, responsible for the attenuated response of ESCs to IFN γ .

O2.11**11:30 CHARACTERIZATION OF INNATE IMMUNITY IN MOUSE EMBRYONIC STEM CELLS, TROPHOBLAST STEM CELLS, AND THEIR DIFFERENTIATED CELLS**

Mona Fendereski, Yan-Lin Guo

University of Southern Mississippi, Hattiesburg, MS, USA

Innate immunity is an evolutionarily conserved defense mechanism presumably developed in all cell types. Innate immune system can be activated by various immune stimuli, leading to the expression of interferons (IFNs) and inflammatory cytokines that participate in different aspects of immune and inflammatory responses. Surprisingly, our recent studies demonstrated that mouse embryonic stem cells (ESCs) are deficient in innate immune responses. In particular, they are deficient in expressing IFNs and lack responses to bacterial endotoxin and inflammatory cytokines. This finding challenges the concept of innate immunity as an inborn defense mechanism. ESCs are derived from inner cell mass of the blastocyst, the early embryo which is surrounded by trophoblast that gives rise to placenta. In this study, we extended our investigation to determine the immunoproperties of mouse trophoblast stem cells (TSCs), the progenitors of placental cells. Through *in vitro* differentiation, we are able to differentiate TSCs into trophoblast giant cells (TGCs), the primitive placental cells. We tested the responses of TSCs and TGCs to LPS and TNF α , two inflammatory agents that strongly induce inflammatory responses in embryonic fibroblasts. Both TSCs and TGCs failed to respond to LPS and TNF α as assessed by inflammatory gene induction and the lack of NF κ B activation, the transcription factor that mediates the effects of LPS and TNF α . Surprisingly, TSCs can express IFN β , suggesting that they have a functional IFN antiviral mechanism. Our data suggest that the immunologic properties of TSCs and ESCs are developmentally different, therefore may have important implications during early embryogenesis.

12:00 General Sessions

Thursday February 22, 2018

AFTERNOON

Room TCC 214

O2.12**1:00 THE IMPACT OF OXYGEN ON THE INTRACELLULAR SURVIVABILITY OF LISTERIA MONOCYTOGENES**

Amber Coats, Janet Donaldson

University of Southern Mississippi, Hattiesburg, MS, USA

Listeria monocytogenes is a gram-positive, facultative anaerobic pathogen that is responsible for the foodborne disease listeriosis. When this bacterium enters the gastrointestinal tract, it is exposed to different oxygen concentrations, which necessitates the ability of this bacterium to sense and respond to its environment. The goal of this study was to determine if the expression of oxygen sensors correlates with the ability of *Listeria* to invade host cells. The expression of three putative oxygen sensors (resD, dosP, and FNR) was determined under aerobic and microaerophilic conditions using qPCR, and the growth kinetics of the six strains used in this study (HCC23, 15313, 10403s, F2365, 2011-2626, and EGDe) were analyzed by performing percent survival over a time course of 6 hours. The intracellular survivability was determined through cell invasion assays over a time course of 5 hours. The aerobic growth

kinetics showed that there was not a significant difference between any of the strains. It is expected that an upregulation of the oxygen sensors will correlate with an increase in the ability of *Listeria* to invade and survive within host cells. Growth of these strains under microaerophilic conditions remains to be determined. The presence of oxygen is expected to have an impact on the ability of *Listeria monocytogenes* to invade and establish an infection within a host cell. Additionally, the impact of oxygen on the ability of *Listeria* to utilize host cell actin during its intracellular lifecycle will be investigated.

O2.13

1:15 EFFECT OF OCCIDIOFUNGIN ON MORPHOGENIC TRANSFORMATION OF CANDIDA ALBICANS

Rabina Kumpakha, Donna M. Gordon

Mississippi State University, Mississippi State, MS, USA

Candida albicans is a polymorphic fungus that can grow as yeast (Y) and hypha (H). The Y-H morphological switching is controlled through the MAPK, Cek1p. Prior work has shown that the antifungal compound occidiofungin, when added at the time of Y-H switching, prevents *C. albicans* from forming hypha. We hypothesize that occidiofungin may function to disrupt the signaling events associated with morphological switching. Occidiofungin was added to cells that were induced to undergo morphological switching. Samples were collected at defined time points post switching and extracted protein analyzed for changes in Cek1 MAPK activation by western. Cellular morphology of occidiofungin-exposed cells was analyzed using light microscopy. Differences in occidiofungin sensitivity for wild-type (WT) and Cek1 MAPK pathway mutants were determined by MIC, CFU, and spotting assays. Activation of Cek1p was inhibited with occidiofungin exposure, consistent with the absence of hyphae in treated cells. MIC data showed no differences in sensitivity between WT and Cek1 MAPK pathway mutants although cells induced to undergo hyphal formation were more sensitive to occidiofungin than the vegetative yeast form. These results were supported by CFU data. Inhibition of filament formation, coupled with the reduced levels of Cek1 activation, indicates that occidiofungin exposure negatively impacts the Cek1 MAPK signaling cascade. However, MIC and CFU data suggest that a functional Cek1 MAPK pathway is not required for occidiofungin bioactivity. We propose that the increased susceptibility to occidiofungin for these mutants may be due to the mutant's inability to respond the cellular stress induced by the antifungal compound.

O2.14

1:30 SCLEROSTIN'S THERAPEUTIC CAPABILITY AND EFFICIENCY IN VASCULAR CALCIFICATION

Lindsay Rexrode, Kelsey McArthur, C. LaShan Simpson

Mississippi State University, Mississippi State, MS, USA

Once regarded as a passive process induced by elevated calcium-phosphate interactions, vascular calcification (VC) is now distinguished as an active, cell-mediated process induced by competition among stimulatory calcification factors and inhibitory mineralization factors. Elevated levels of oxidative stress, phosphate, cholesterol, parathyroid hormone, calcium, and glucose have been noted as VC constituents. The Wnt/-catenin signaling pathway regulates homeostasis among the vasculature and bone systems; sclerostin (SOST), a monomeric osteocyte-derived glycoprotein, is a potent antagonist of this pathway. A recent study has recognized increased SOST expression in atherosclerotic plaque, and several clinical trials have investigated the therapeutic potential

of a humanized SOST monoclonal antibody in osteoporosis. Our *in vitro* model was created to stimulate VC, to recognize osteogenic differentiation within human vascular smooth muscle cells (HVSMCs), to investigate Wnt/-catenin signaling, and to utilize SOST's defensive and inhibitory properties. Within the model, HVSMCs were cultured and targeted for calcification and SOST therapy. Calcified HVSMCs subjected to SOST treatment exhibited a two-fold downregulation of RUNX2, an osteogenic differentiation transcription factor, providing validation that SOST is capable of preventing phenotypic switching within the vasculature. Within 7 days, a 45.8% recovery rate of -smooth muscle actin was observed in calcified HVSMCs subjected to SOST treatment. SOST's therapeutic efficiency was successfully justified, and future quantitative and qualitative investigations will continue to verify SOST's capabilities.

O2.15

1:45 GLYCINE-RICH PROTEINS OF LONE-STAR TICK (AMBYLOMMA AMERICANUM)

Surendra Raj Sharma, Shahid Karim

The University of Southern Mississippi, Hattiesburg, MS, USA

Glycine rich proteins (GRPs) found in many organisms are functionally diverse and found to be involved in a variety of cellular processes and structures. Tick secretes a variety of glycine rich proteins, many of these proteins are vital for the attachment of ticks to the host skin by forming a cement cone, establishment of the blood pool and prevention from the host immune response. The functional role of the GRPs in tick has not been fully elucidated. GRPs are thought to play role in the formation of cement cone; however, new evidences linked GRPs in other roles including biotic and abiotic stress responses, RNA binding and antimicrobial activity. Hence, we hypothesized that GRPs are differentially expressed under biotic and abiotic stress responses and are essential for successful blood feeding, serving as major structural component of cement cone or helping ticks to evading host immune response as well as maintaining microbiome homeostasis. Exposure of ticks to stress such as temperature, injury and oxidative stress caused significant increase in the expression of AamersigP-34358 and AamersigP-39259, which indicated vital role of such tick GRPs in stress responses. Furthermore, an RNA interference approach was utilized to silence AamersigP-41539 in the *Amblyomma americanum* females. Silencing of AamersigP-41539 significantly depleted its transcript level but no significant change in tick phenotype was noted. However, mass of fully engorged AamersigP-41539 silenced ticks was significantly lower than GFP injected ticks. Intriguingly, transcript level of other GRPs; Aam-40863, AamerSigP-39259 up-regulated 9-fold supporting the mechanism of compensation.

O2.16

2:00 STABILITY OF CFTR ON PLASMA MEMBRANE OF A LUNG EPITHELIAL CELL LINE

Sagarina Thapa¹, Diptika Raut¹, Lisa Shrestha², Shreya Ghimire³, Ghanshyam D. Heda¹

¹Mississippi University for Women, Columbus, MS, USA

²The University of Alabama at Birmingham, Birmingham, AL, USA

³The University of Iowa at Iowa City, Iowa City, IA, USA

INTRODUCTION: CFTR (Cystic Fibrosis Transmembrane-conductance Regulator) function as a chloride ion channel on epithelial cells of many organs. Mutations impair the function of CFTR, and are responsible for causing the pulmonary disease cystic fibrosis. Our laboratory has shown that the plasma membrane half-life of the most common of CFTR mutations (DF508) is much

shorter (~4 h) than that of wild-type CFTR (>48 h). [Heda et al, 2001]. **HYPOTHESIS:** We hypothesize that this reduced DF508-CFTR half-life may be due to the distinct role of proteasomes, lysosomes and/or CFTR-protein(s) interactions. In this study we present the effects of inhibitors of proteasomes and lysosomes on stability of plasma membrane DF508-CFTR. **METHODS:** Epithelial cell lines from human lung (CFBE) stably transfected with DF508 or wild type CFTR were pre-treated with 5 mM sodium butyrate at 27°C for about 60 hrs to up-regulate the plasma membrane CFTR expression. Cells were then “chased” at 37°C in the presence of protein synthesis inhibitor (cycloheximide) and/or inhibitors of proteasomes (MG132, lactacystin, ALLN, leupeptin), or lysosomal enzymes (E64, EST, chloroquine). Cell lysates were prepared and immunoblotted with anti-CFTR antibody. CFTR-specific signal was detected by chemiluminescence using c300 image analyzer (Azure Biosystems). **RESULTS:** All inhibitors except for chloroquine partially rescued the degradation of plasma membrane DF508-CFTR in CFBE cell line. There are little or no synergistic effects were observed when these inhibitors were used in combination. **CONCLUSION:** These data suggest that CFTR degradation is partially controlled by proteasomes and lysosomal enzymes.

O2.17

2:15 THE ROLE OF SIGNALING PATHWAYS IN ENDOTHELIAL-MESENCHYMAL IN TRANSITION IN VASCULAR CALCIFICATION

Cameron Roach, C. LaShan Simpson, Claire Travis

Mississippi State University, Mississippi State, MS, USA

Endothelial-mesenchymal transition (EndMT) is a process in which endothelial cells lose their genetic markers, VE-cadherin and CD31, and begin to express markers of mesenchymal cells, α -SMA, FSP-1, and fibronectin. EndMT has been shown to cause vascular calcification, a complication of atherosclerosis. However, the exact mechanism and process through which EndMT occurs is still unknown. Recently, studies have shown that overexpression of TGF- β /smad signaling and BMP, both belonging to the TGF- β superfamily, contribute to EndMT vascular calcification. In the TGF- β signaling pathway, smad2, smad3, and smad7 are combined to suppress the VE-cadherin marker, leading to EndMT. However, there are components in both pathways that inhibit EndMT, specifically, Smad7 acting in the TGF- β pathway and Matrix Gla Protein (MGP) regulating BMP in the BMP pathway. Previous studies noted that vascular calcification might arise from the potential imbalance between endothelial and smooth muscle cells, facilitated by the TGF- β and BMP signaling pathways. Thus far, we performed a gene array of healthy versus calcified smooth muscle cells showing the significant upregulation of smads, TGF- β , as well as BMP. In the gene array, smad1, smad2, smad4, TGF- β 1, TGF- β 2, TGF- β 3, BMP2, and BMP4 were all significantly upregulated, whereas smad3 was not significantly upregulated. In order to gain further insight on the role of EndMT in vascular calcification and how that impacts vascular smooth muscle cells, we will perform additional studies including a co-culture of smooth muscle cells and endothelial cells.

O2.18

2:30 TRANSCRIPTOMIC ANALYSIS OF LISTERIA MONOCYTOGENES IN RESPONSE TO BILE UNDER AEROBIC AND ANAEROBIC CONDITIONS

Damayanti Chakravarty¹, Gyan Sahukhal¹, Janet Donaldson¹, Morgan Wright², Mark Arwick²

¹University of Southern Mississippi, Hattiesburg, MS, USA

²Mississippi State University, Mississippi State, MS, USA

Purpose/Significance of the Project: *Listeria monocytogenes* is a food-borne pathogen and causes the disease listeriosis. The gram-positive facultative anaerobe can tolerate the stressors it encounters in the gastrointestinal tract, such as bile and acidic conditions. It was hypothesized that genes involving stress response will be differentially regulated under conditions mimicking different part of the Gastrointestinal System. The aim of this study was to determine how the differential gene expression of *L. monocytogenes* strain F2365 is regulated under acidic pH upon exposure to bile at anaerobic conditions, which mimics the physiological environment of duodenum. Methods: Whole transcriptomic analyses were carried out using RNA isolated from *Listeria monocytogenes* F2365 at both aerobic and anaerobic conditions, upon exposure to 0% and 1% bile at acidic and neutral pH. Gene Ontology analysis was performed on the differentially expressed genes. Results: Gene Ontology analysis indicated that genes responsible for oxidative stress responses are upregulated upon bile exposure under anaerobic condition at acidic pH. Conclusion: The study demonstrates that upon exposure to bile at pH of 5 under anaerobic conditions, stress response of *Listeria monocytogenes* F2365 is differentially regulated which helps it to survive better at the same condition. This agrees with previous data suggesting that bile resistance of *Listeria monocytogenes* strain F2365 increases under anaerobic condition at acidic pH.

Thursday, February 21, 2019

EVENING

3:30 Dodgen Lecture and Awards Ceremony TCC Theatre

General Poster Session

Immediately Following Dodgen Lecture

TCC Ballrooms 3rd floor

P2.01

EVALUATING THE IMPORTANCE OF PROBIOTIC MEMBRANE PROTEINS AND THE USE OF METAL SUPPLEMENTS IN FACILITATING PROBIOTIC BINDING TO PATHOGENIC BACTERIA

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Introduction: One of the ways yeast probiotics can confer health benefits is by directly binding to pathogens, thus limiting the binding of a pathogen to the host cells and facilitating the removal from the host. However, the exact mechanism of the adhesion phenomenon is uncertain. We hypothesized that yeast surface proteins facilitate the adhesion of probiotics to bacteria. Moreover, previous studies had shown that the binding efficiency is probiotic- as well as strain-specific. Thus, aiming to improve probiotic fitness, we hypothesized that the use of metal supplements improves binding efficacy. **Methods:** We used two different detergents, SDS (denaturing) and TritonX100 (non-denaturing) to disturb the surface proteins. We co-cultured SDS or Triton-treated probiotics with *Salmonella typhimurium* and qualitatively assessed the binding efficiency using Scanning Electron Microscopy (SEM). Similarly, we co-cultured *Salmonella* with probiotic grown in Zinc or Calcium-supplemented media and assessed the binding efficiency with SEM. **Results:** On quantifying the SEM data, we saw ~20% increase in the number of probiotics (grown in metal supplemented media) bound to *Salmonella* and ~40% decrease in binding of Triton-treated probiotics. However, treatment with SDS increased probiotic binding by ~30%. **Conclusion:** The decrease in binding efficiency of Triton-treated probiotic suggested that surface proteins facilitate binding since triton disturbs the protein-lipid interaction, displacing the protein from the surface. However, SDS-treatment increased probiotic binding, which might suggest that the

denaturation of proteins exposed other molecules that facilitate binding. The improvement in probiotic fitness with metal supplementation can aid in its effective use as an antibiotic alternative.

P2.02

MASS SPECTROMETRY BASED APPROACH TO ANALYZE HIV-1 INTEGRASE AND VIRAL RNA INTERACTION

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HIV-1 integrase (IN) is a viral protein required for viral DNA insertion into the host genome. In a recent study it was shown that, IN binds to the viral RNA and this interaction is required to produce infectious virions. Poor solubility and tendency to aggregation limits the ability to perform structural analysis on IN. Therefore, we implement a mass spectrometry based footprinting approach, we will show that we have successfully identified several residues which are important for interaction with viral RNA. Identifying the residues involved in viral RNA interaction will broaden our understanding of HIV-1 IN function throughout the life cycle of HIV-1.

P2.03

TNSEQ IDENTIFICATION OF POTENTIAL AZITHROMYCIN UPTAKE MECHANISM BY STREPTOCOCCUS PNEUMONIAE

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Streptococcus pneumoniae is a Gram-positive bacterium that is capable of causing invasive disease including pneumonia and meningitis. Antibiotic resistance is increasing and finding novel ways to treat infections is essential. Due to the inability of many antibiotics to freely diffuse through the cell wall, we hypothesized that certain antibiotics may be imported by transporters normally used to transport other small molecules. To test this hypothesis, a magellan6 transposon mutant library of strain D39 was utilized to screen for mutants capable of growing on various antibiotics. Several pneumococcal mutants were isolated that grew at concentrations of azithromycin above the minimum inhibitory concentration (MIC) for this species (~0.5 µg/ml). Azithromycin resistant mutants with the transposon insertion grew at concentrations >20 µg/ml as determined by 24-hour growth curves. Chromosomal DNA flanking the transposon insertion sites was sequenced and revealed SPD_0250 (SpuA) as the disrupted gene in multiple azithromycin-resistant clones. SpuA works in unison with solute-binding protein MalX (SPD_1934). Both are critical in the exogenous depolymerization of glycogen and transport of its breakdown products. MalT (SPD_0661) is a secondary PTS transporter that binds α-glucans that MalX cannot. Marker-less deletion mutants are currently being created for SpuA, MalX, and MalT to investigate their azithromycin sensitivity. This research will be extended to identify transporters for additional classes of antibiotics. Identifying compounds that can induce expression of such antibiotic transport/modification systems will allow us to increase the concentration of the antibiotics within bacteria, thus overriding resistance mechanisms and resurrecting antibiotics rendered ineffective against many drug-resistant pathogens.

P2.04

CORTICOTROPIN RELEASING FACTOR EXPRESSION ALONG CENTRAL AUDITORY PATHWAYS AND PLASTICITY IN RESPONSE TO COCHLEAR DAMAGE- A ROLE IN PRODUCTION OF TINNITUS?

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INTRODUCTION: Approximately 30 million Americans suffer from tinnitus, which often accompanies loss of hearing. Although the exact causes of tinnitus remain unknown, abnormal neural plasticity/excitation could play a major role in its production. Corticotropin releasing factor (CRF) alters neural plasticity and excitation in the brain. Changes to CRF in auditory centers of the brain could therefore underlie tinnitus. **METHODS:** Using genetically altered mice that express a “reporter” molecule (tdTomato) in CRF cells, we have mapped CRF along the auditory pathway and examined effects of altered hearing on nerve fibers containing CRF. **RESULTS:** Our mapping studies show tdTomato expression (indicating CRF production) in all major auditory centers of the brain. There is an especially dense fiber plexus in the central region of the inferior colliculus, a region critical for normal hearing. We next examined if CRF-positive neural elements change (expand or retract fibers, for example) following loss of hearing. We induced a profound deafening by surgically removing one or both cochleae in adult CRF:tdTomato mice. Removal of one cochlea produced a significant loss of CRF-positive nerve fibers in the central region of the contralateral inferior colliculus, suggesting a potential imbalance of excitation in the auditory pathway at this level. Bilateral cochlear removal resulted in loss of CRF fibers on both sides of the inferior colliculus. **DISCUSSION:** These data begin to connect hearing loss with plastic changes to fibers expressing CRF, a molecule known to modulate excitatory neurotransmission. It is possible that this fiber loss could play a role in producing tinnitus.

P2.05

NOVEL SMALL MOLECULE INHIBITORS OF HUMAN CYTOMEGALOVIRUS (HCMV) REPLICATION

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Human cytomegalovirus (HCMV) is a herpesvirus closely related to the viruses that cause oral and genital herpes, chickenpox, and shingles. Although HCMV is normally latent in healthy individuals, the infection can be life-threatening in immunocompromised individuals and neonates. There is no vaccine approved for HCMV infection and the antiviral drugs that are available suffer from side-effects, low efficiency, and resistance. Therefore, there is an urgent need to find newer drugs and therapies. Our laboratory screened several small molecules with antiviral promise. Most of these candidates came from a library of small molecules obtained from National Cancer Institute and a few were synthesized by a collaborating laboratory. Preliminary screening identified five candidates with excellent antiviral potential against HCMV and little to no cytotoxicity. The main hypothesis in this project is that these identified antiviral candidates block a specific stage of virus replication in host cells. Analysis of viral protein expression reveals that none of these five candidates block early to late viral protein expression. We are currently investigating the localization of viral proteins in inhibited cells to study impact on viral protein trafficking. The long-term goal of this project is to characterize the mechanism of action of identified antiviral candidates at molecular level using animal model of HCMV infection in order to

determine *in vivo* efficacy so that some of these candidates can be tried in future human clinical trials. Acknowledgement: This work was funded by Mississippi INBRE through the NIH-NIGMS grant number P20GM103476.

P2.06

PREPARATION AND CHARACTERIZATION OF VIRAL STOCKS OF INSECT SPECIFIC FLAVIVIRUSES

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Flaviviruses are a group of single-stranded RNA viruses including Zika, Dengue, and West Nile viruses that can cause a leading health concern to humans and animals in the world. Development of antiviral vaccines is an urgent and unmet demand to combat these viral infections. Insect-specific flaviviruses (ISV) are some of the flaviviruses that only infect and replicate in insects, such as mosquitos or ticks. These ISVs have the potential to be developed as a safe and efficient vaccine candidate against Zika virus and various other flavivirus infections. This research is a fundamental project in which the existence of cytopathic effects are the results. In this study, we prepared viral stocks of ISVs, i.e. Cell Fusing Agent (CFAV), Kampung Karu (KPKV), La Tina (LTNV), Long Pine Key (LPKV), and Nhumirim viruses (NHUV). These ISVs are a relatively new discovery; however, they can be found throughout the American continents and Asia. New viral stocks were established through the resuspension from powder and growth of the ISFs CFAV and KPKV in C6/36 cells. ISVs Zika, Dengue, and West Nile virus allow us to generate chimeric viral vaccine candidates. In addition, these viruses can also be studied for the mechanisms of flaviviral transmission between vertebrates and invertebrates.

P2.07

NICOTINE INDUCED OXIDATIVE STRESS IN MAMMALIAN CELLS

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Nicotine (NIC), a major tobacco alkaloid and component of E-cigarettes, causes injury of various organs which include kidney, prostate and colon. Our earlier *in vitro* studies confirmed that NIC stimulates mitochondrial ROS production, which leads to a mitochondrial depolarization- dependent injury of renal proximal tubule cells. In this study we are aiming to find out a dose dependence of nicotine exposure on the human breast cells. We chose HTB26 breast cancer cell as model for breast cell. 100, 200, 300 and 400 μ M nicotine in ethanol were used to dose the cell. Flavonols and related phenolic compounds of the flavonoid group are ubiquitous in plants of higher genera and are abundant in common plant-based foods and beverages such as citrus fruits, apple, strawberry, soy products, onion, broccoli, tea and red wine. The most recognized mechanism is their direct antioxidant activity, which involves scavenging of reactive oxygen species (ROS) and peroxynitrite. Additionally, flavonoids elicit indirect antioxidant activity through transcriptional induction of genes with antioxidant properties such as heme oxygenase-1 (HO-1) or the mitochondrial manganese superoxide dismutase (MnSOD). We used a flavonoid morin for this study. Phase contrast imaging and cell viability assays are performed, where we noticed dramatic changes in cell morphology and viability at 200 μ M and more concentrations of NIC. Further biochemical assays are underway. Acknowledgement: This work was supported by an Institutional Development Award (IDeA) from the NIGMS under grant number

P20GM103476. BS also likes to thank NSF-RIA award 1800732 and TIP award 1818528 for research support.

P2.08

EFFECTS OF HYPOXIA ON THE IMMUNE RESPONSE OF THE EASTERN OYSTER (CRASSOSTREA VIRGINICA)

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Oysters are extremely important to marine ecosystems. From creating habitat for other marine organisms to improving water quality via water filtration, oysters provide several extremely vital ecosystem services. It is critical that efforts are made to maintain healthy oyster reefs to promote resilient marine ecosystems. In recent years, a large reduction in oyster population has been observed. Several factors, including over-harvesting and poor water quality conditions, are thought to contribute to this reduction. Hypoxia (dissolved O₂ \leq 2 mg/L) is believed to be one of the many factors that is negatively impacting oyster reefs today. Hypoxic events, caused indirectly by algal blooms, are defined as low oxygen environments that can be extremely harmful to marine organisms. In this experiment, oysters were exposed to different durations of hypoxia (2, 4, and 8 days), each followed by a six day recovery period in normoxic conditions (dissolved O₂ \geq 8 mg/L). Oysters were sampled throughout the duration of the experiment, and gill tissue samples were taken to observe differential gene expression of immune and stress related genes, thymosin-beta 4 (T β -4), heat shock protein 70 (HSP-70), calmodulin, and hypoxia inducible factor 1-alpha (HIF1- α). Total hemocyte counts were also taken to further assess the effects of hypoxia on oyster immune status. Oysters exposed to four and eight days of hypoxia had lower total hemocyte counts after six days of recovery than oysters exposed to only 2 days of hypoxia. Responses of laboratory exposed oysters will be compared to those of oysters deployed in Mississippi Sound.

P2.09

THE ROLE OF THE AGE/RAGE SIGNALING PATHWAY IN CARDIAC FIBROBLAST MIGRATION

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Diabetes is one of the leading causes of death in the United States with around 30 million who suffer from diabetes and 84 million who are considered pre-diabetic. Diabetic individuals are at an increased risk for developing cardiovascular disease due to a stiffening of the left ventricle, which is thought to occur through fibroblast "activation" mediated by increased AGE/RAGE signaling. Advanced glycated end products (AGEs) accumulate within the body overtime and is accelerated under hyperglycemic conditions, and AGEs exert their effects by binding to their receptor (RAGE). Fibroblast "activation" is marked by elevated levels of α -smooth muscle actin expression and an increase in cell migration. While "active" fibroblast migration is increased during wound healing in a healthy individual, diabetics have decreased in fibroblast migration to prolong wound healing. Therefore, the goal of this study was to determine how the AGE/RAGE signaling pathway impacts cell migration in non-diabetic and diabetic cardiac fibroblasts. Using isolated cardiac fibroblasts from non-diabetic and diabetic mice, migration was assessed with a migration assay. Diabetic fibroblasts have a decrease in migration compared to non-diabetic fibroblasts. Whereas inhibiting the AGE/RAGE signaling pathway leads to a significant increase in fibroblast migration. The results suggest that the AGE/RAGE signaling cascade plays a role in cardiac fibroblast migration.

P2.10
THE USE OF NATURALLY OCCURRING COMPOUNDS FROM PLANTS TO INHIBIT QUORUM SENSING SIGNALING IN PSEUDOMONAS AERUGINOSA

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Pseudomonas aeruginosa is a multi-drug resistant pathogen, and the causative agent of life-threatening infections in individuals with serious health problems such as cystic fibrosis. It is ranked as one of the top five most problematic pathogens. Plant derived antimicrobials are currently being researched heavily as alternative therapeutics to antibiotics against infections caused by antibiotic resistant microorganisms. In this study, we tested 4-Hydroxy-2,5-dimethyl-3(2H)-furanone (HDMF) from strawberries for activity against surface motility, biofilm formation and production of pyocyanin in *P. aeruginosa* PAO1. We used a modified broth microdilution method to determine the minimal inhibitory concentration (MIC) of HDMF required to inhibit the growth of PAO1. Our results showed the MIC of HDMF against PAO1 is 7 mg/ml. At sub-MIC concentrations of HDMF, we showed that 3 mg/ml of HDMF caused PAO1 to produce 17 times less pyocyanin in comparison to control. Our motility assays also revealed that 3 and 4 mg/ml of HDMF significantly ($P < 0.05$) reduced the ability of PAO1 to swim, swarm, and twitch. We are currently trying to determine the effect of HDMF on biofilm formation and attachment in PAO1. So far, we have shown that sub inhibitory concentrations of HDMF affects important virulence factors controlled by quorum sensing in *P. aeruginosa* without significantly affecting bacterial growth. Findings from this study will contribute to identification of synergistic combinations of naturally occurring plant antimicrobials that can be used to overcome infections caused by multi-drug resistant pathogens.

P2.11
TOWARD A PHYSICOCHEMICAL UNDERSTANDING OF ADAPTATION OF NOVEL INFLUENZA VIRUSES TO THE HUMAN POPULATION

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The Objective of this project is to use biophysical properties to predict the evolution of the flu virus. By looking at influenza virus sequences, we can monitor the mutations (changes) in those sequences to more accurately predict the way the flu virus will mutate. We will study how mutations affect size, hydrophobicity, hydrophilicity, and charge of amino acid side-chain to aid our predictions. By studying the evolutionary sequences of influenza it allows us to have a sense of what changes affect the protein structure in the virus. We used NCBI flu to search for Influenza B sequences (from July 1, 2017, to March 14, 2018), searching for full-length sequences only. These were aligned, and a tree was constructed to show the different lineages. We then downloaded the sequences and uploaded them into COBALT, which allowed us to analyze the two lineages separately and upload them into two separate excel files. We then parameterized each amino acid with the values corresponding to ASAtot, ASAnp, ASApol, and Charge. This allowed us to calculate for each, the number of changes, the sum of the changes and the average change for both pairwise and rooted. We then took the data from these columns and put it into a summary page. We then opened up template sequence models in MacPyMOL and color-coded the sequences based on the data in the

sheet. This allowed us to visualize regions of the molecule where change was occurring in the 3-dimensional structure.

P2.12
MLST GENOTYPE AND TRICHOMONAS VAGINALIS VIRUS CHARACTERIZATION OF 37 SAMPLES OF TRICHOMONAS VAGINALIS FROM THE AMERICAN TYPE CULTURE COLLECTION, EXTERNAL LAB, AND MISSISSIPPI

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Trichomoniasis, the most common nonviral sexually transmitted disease in the world, is caused by the protozoan parasite *Trichomonas vaginalis* (TV), which exists in two populations as shown by a multilocus sequence typing (MLST) analysis based on seven single-copy housekeeping genes. Parasites can harbor up to four different strains of a double-stranded RNA virus called *Trichomonas vaginalis virus* (TVV1-4). In this study, twenty-six *T. vaginalis* isolates from the American Type Culture Collection (ATCC), five long-term cultures, and six Mississippi isolates were characterized. In addition to MLST genotyping, cultures were typed for the presence of specific TVV (1-4) by RT-PCR and confirmed by Sanger sequencing; 49% harbored at least one TVV and of the TVV-infected TV isolates nearly half (46%) carried more than one virus strain. TVV1 and TVV3 were the most common virus (found in 73% of infected TVs) and TVV4 was not detected in any ATCC strain. The analyzed regions of TVVs here were identical to those found in long-term cultures from an external lab. Bayesian analysis was used to construct phylogenetic trees of four TVV strains. Each strain was found to group with itself. We have included the ATCC isolates most frequently investigated in the literature. For example, 30001 alone has been referenced by the ATCC 48 times. These data will serve as an important resource for researchers investigating *T. vaginalis* and may yield improved strategies for trichomoniasis treatment.

P2.13
MODIFYING PROMISCUITY OF SULFOLOBUS TODOKAII HEXOKINASE

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Sulfolobus Todokaii uses a promiscuous hexokinase that is capable of using four different substrates in the same reaction. In order to improve promiscuity in the *S. Todokaii* hexokinase, three amino acids were selected for mutation. The mutations were based on predictions using Dr. Tanja Kortemme's Rosetta Backrub server hosted by the University of California San Francisco. The Sequence Tolerance program was used to determine which mutations of targeted residues would be unlikely to negatively affect protein folds. The mutants identified were Y36A, H94S and D140G. The mutated proteins were run through ab initio protein folding software to confirm the protein retained its native fold. Mutants of the *S. todokaii* were prepared and sequenced for confirmation.

P2.14
AGE/RAGE SIGNALING IN DIABETES-MEDIATED VASCULAR CALCIFICATION IN VASCULAR SMOOTH MUSCLE CELLS

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Advanced Glycation End-Products (AGEs)/Receptor for AGEs (RAGE) signaling cascade comprises many parts such as the complex nature of the receptor and ligand specificity. The

intersecting pathways of AGE/RAGE signaling is not well understood. AGE/RAGE signaling influences both cellular and systemic responses to increase bone matrix proteins through p38 MAPK and ERK1/2 signaling pathways in hyperglycemic and calcification conditions. AGE/RAGE signaling has also been shown to increase oxidative stress by promoting diabetes-mediated vascular calcification to promote a phenotypic switch of vascular smooth muscle cells (VSMCs) to osteoblast-like cells. The purpose of this research is to understand AGE/RAGE mediated vascular calcification as a complication of diabetes. Calcification was induced in primary mouse VSMCs of non-diabetic (db/wt), diabetic (db/db), non-diabetic RAGE knockout (db/wt^{RKO}), and diabetic RAGE knockout (db/db^{RKO}), and then subsequently treated with AGEs to activate RAGE. Intracellular calcium levels were quantified and showed a pronounced calcification in db/wt VSMCs and loss of RAGE resulted in a decrease in calcification in db/wt^{RKO} VSMCs. Western blotting analysis revealed VSMC marker protein (α-smooth muscle actin) was decreased in db/wt calcified cells. In addition, the presence of the bone marker, osteopontin (OPN), was found in both db/wt and db/wt^{RKO}, but OPN expression was decreased with the loss of RAGE. This result indicates an osteoblast-like phenotypic switch and this switch was negated in db/wt^{RKO} VSMCs. These data demonstrated that RAGE has a role in diabetes-mediated vascular calcification. By understanding the role, the AGE/RAGE signaling cascade plays diabetes-mediated vascular calcification will allow for possible targets for pharmacological intervention.

P2.15

SEQUENCE ELEMENTS IN THE TAIL OF A 3' TAILED MIRTRON IS CRITICAL FOR ITS BIOGENESIS

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microRNAs have been well established as a potent regulator of the gene expression and are generated through a number of pathways. Mirtrons are the class of non-canonical microRNAs produced via splicing that generates a lariat intermediate, which is debranched by lariat debranching enzyme and subsequently processed by dicer and then loaded onto RISC complex. Mirtrons, although show low expression as compared to canonical microRNAs, miR-1017, a 3' tailed mirtron, is highly expressed in *Drosophila melanogaster*. In this study, we focus on the key elements in the mirtron tail that contribute for their efficient processing. For this, first branch points were identified by generating all possible lariat signatures from specific introns using LaSSO and aligning the signatures to a genome-wide *Drosophila* circular RNA-sequence library using Bowtie2. Secondly, various deletion and branch point mutants were generated through site-directed mutagenesis, cloned and transfected into *Drosophila*S2 cells. The effects of the mutations on the miR-1017 were observed by northern analysis. We observed that perturbation of the tail significantly alter the mature mirtron expression. Mutated branch point construct results in higher expression of mature mirtrons while removing the adenine residues and polypyrimidine tract in the tail completely abolished the mirtron expression. The results suggest that the sequence elements within the tail are critical to mirtron biogenesis.

P2.16

A COMPARISON OF GROWTH RATE AND SERUM-FREE SURVIVABILITY IN THREE CLADES OF TRICHOMONAS VAGINALIS

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Trichomonas vaginalis is the protozoan parasite responsible for trichomoniasis, the most common non-viral sexually transmitted disease in the world. Though the clinical manifestations of trichomoniasis are typically mild, *T. vaginalis* infection has been linked to many more serious health outcomes such as cancers, pregnancy complications, and increased risk of HIV acquisition. Previous studies have revealed three distinct genetic clades of *T. vaginalis* based on multilocus sequence typing (GT1A, GT1B, and GT2). Previous studies have also demonstrated a high degree of variance in infectivity amongst strains which could be due to several factors including growth rate and survivability under nutritional stress. The goal of this study was to compare the growth rate and reaction to nutritional stress between the three clades. Three strains of *T. vaginalis* from each of the three clades were obtained (nine strains total) and evaluated using growth curves and serum starvation. In the serum starvation assay, each strain was suspended in TYM media in the absence of horse serum, a requirement for parasite survival, and then assessed for viability after 24 hours of incubation. Preliminary results of the serum starvation assay and growth curve show that there was no significant difference between the three clades. The results revealed substantial variance in growth rate and serum-free survivability among strains; however, the difference did not seem to relate to clade. To further compare these three clades, more strains from each clade must be evaluated. Future assessments include density stress survivability, low-serum survivability, and growth rate in differing pH levels.

P2.17

METABOLISM OF CHOLESTERYL ESTERS CORRELATE WITH THE PROGRESSION OF PROSTATE CANCER

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Background: Studies pinpoint that accumulation of cholesteryl esters (CE) could be a crucial biological process involving PCa progression. Because the metabolism of CE is mainly co-regulated by CE degradation enzyme, LAL, and CE synthesis enzyme, ACAT1, we hypothesize that the expression levels of LAL and ACAT1 correlate with the progression of prostate cancer. **Methods:** We performed Immunohistochemistry (IHC) for LAL and ACAT1 on a tissue microarray containing 71 prostatic tissues, including 20 benign prostatic tissues (BPT), 36 localized PCa (LPCa) and 15 metastatic PCa (MPCa) tissues. Student's T Test was used for data analysis. **Results:** Results showed that the IHC score for LAL was highest in BPT (4.71), higher in LPCa (4.16), and lowest in MPCa (3.17). The difference in IHC score for LAL was not statistically significant between BPT and LPCa (p=0.32) but was statistically significant between BPT and MPCa (p=0.049). In contrary, the IHC score for ACAT1 was lowest in BPT (1.34), higher in LPCa (3.74), and highest in MPCa (4.46). The difference in IHC score for ACAT1 was statistically significant between BPT and LPCa (p=0.0009), and between BPT and MPCa (p=0.0001). **Conclusion:** Therefore the expression levels of LAL and ACAT1 were reversely correlated with the progression of PCa: the more advanced PCa is the lower the expression level of LAL and higher the expression level of ACAT1 is. The significance of this study not only reveals a new mechanism in PCa progression but also discovers novel therapeutic targets in treatment of advanced PCa through regulating CE metabolism.

P2.18

ANTIPROLIFERATIVE AND ANTITUBULIN EFFECTS OF ERGOSTEROL IN MIA-PACA-2 CELLS

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Pancreatic cancer is the fourth leading cause of cancer death in the United States, and has the least five-year survival rates (1-8.5%) among other types of cancers. An estimated 55,400 new cases will be diagnosed in 2019. Although numerous drugs and other treatment options have been directed to cure the cancer, incidence and survival rates have continued to fester. Moreover, these treatments are normally accompanied by serious side effects. Therefore, new treatment options are necessary. In this study, growth inhibitory, apoptotic induction and antitubulin activities of Ergosterol, a secondary metabolite in *Vernonia amygdalina* (VA) was investigated in pancreatic adenocarcinoma cancer (MiaPaca 2) cell lines, in vitro. Cell viability was tested using MTT assay. Apoptosis was measured using Vybrant Apoptosis Assay Kit. Antitubulin activity was examined by immunofluorescent technique. Our results show that Ergosterol inhibits cell viability in a dose-dependent manner, with higher concentrations (1mM-10mM) eliciting greater inhibition (73-90 %) relative to control, compared to lower doses (0.001mM-0.1mM) that showed a 42-56% inhibition. Apoptosis assay revealed marked nuclear fragmentation, chromatin condensation and DNA fragmentation. Tubulin structure in treated cells was depolymerized and disassembled. These results suggest that Ergosterol inhibits growth and proliferation of MiaPaca 2 cells by inducing apoptosis and disrupting microtubule. Although further work is necessary, these results demonstrate the therapeutic potential of Ergosterol in pancreatic ductal adenocarcinoma.

P2.19

CHARACTERIZATION OF A FUNCTIONAL CATHEPSIN B ANTIBODY IN ZEBRAFISH

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Early embryonic processes are regulated by maternal factors. Including embryonic cleavage, epiboly, and dorsoventral patterning. Previous research has identified a role for the maternal factor, Cathepsin B, in dorsoventral patterning, however, its precise localization within the embryo is unknown. Therefore, we screened human and zebrafish Cathepsin B antibodies to identify an antibody expressed in zebrafish embryos. Of the three antibodies screened only the zebrafish Cathepsin B antibody was expressed in zebrafish embryos. In wildtype embryos Cathepsin B was localized to the marginal cells of mid to late gastrulation stage embryos. We also looked at Cathepsin B localization in split top embryos, which have reduced Cathepsin B expression. In split top mutants Cathepsin B was reduced in the marginal cells at mid to late gastrulation stages relative to wildtype expression levels. This work was supported by the Mississippi INBRE, funded by an Institutional Development Award (IDeA) from the National Institute of General Medical Sciences of the National Institutes of Health under grant number P20GM103476.

P2.20

BETAHERPESVIRUS-CONSERVED REGION 2 (CR2) OF CYTOMEGALOVIRUS TEGUMENT PROTEIN PP150 IS AMENABLE TO TARGETING BY PEPTIDE INHIBITORS

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Human cytomegalovirus (HCMV) is a betaherpesvirus that causes congenital birth defects in newborns and life-threatening complications in immunocompromised people. The HCMV UL32 gene encodes a prominent betaherpesvirus conserved virion tegument protein pp150, which accumulates within cytoplasmic viral assembly compartments (vAC), where final steps in virus maturation occur. Earlier studies used cryo electron microscopy

reconstructions of HCMV virions to illustrate the pp150 structure and its binding interface with capsid proteins. In brief, three pp150nt (N terminal one-third of pp150) conformers cluster on each triplex (Tri1, Tri2A and Tri2B, also known as minor capsid binding protein) and extend towards small capsid proteins (SCPs) atop nearby major capsid proteins (MCPs) forming a net-like layer of tegument densities that enmesh and stabilize HCMV capsids. Based on this atomic detail, we designed peptides that were targeted to the betaherpesvirus conserved regions (CR1 and CR2) in pp150nt. Cells (human foreskin fibroblasts (HFF-1)) were pretreated with the control and test peptides before infecting them with HCMV. Virus growth measurement indicated significant impact when cells were treated with the peptide that targeted a specific region of pp150nt-CR2 but not the peptides that targeted the pp150nt-CR1 or the cysteine triad region of pp150nt-CR2. These preliminary observations indicate that CR2 of pp150 is amenable to targeting by peptide inhibitors. These results will be confirmed by studying the specific stage of virus replication block upon peptide treatment in cell culture and later for effectiveness in a mouse model of HCMV infection.

P2.21

FUNCTIONAL ROLE OF TICK α -D-GALACTOSIDASE IN CARBOHYDRATE METABOLISM AND RED MEAT ALLERGY

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Tick-borne meat allergy is an emergent allergy, increasing widespread in tick endemic areas in the United States of America, and worldwide. Bites from the lone-star tick (*Amblyomma americanum*) are believed to be involved as the source of the sensitization of humans to the oligosaccharide galactose- α -1,3-galactose (alpha-gal or a-gal), which is found in most mammalian derived food products, including gelatin, broths, and red meat. The purpose of this study is to functionally characterize the lone-star tick α -D-galactosidase (AGS) enzyme and assess its role in α -gal synthesis. This enzyme cleaves terminal alpha-galactose moieties from glycoproteins and glycolipids. Hence, we hypothesized that silencing of AGS in the lone-star tick will impair the tick's ability to synthesize α -gal and overall carbohydrate metabolism. A reverse genetic approach was utilized to characterize the functional role of α -D-galactosidase in carbohydrate metabolism, and to discover its link to red meat allergy. Our results from AGS gene silencing revealed a significant increase in tick weight, supporting a critical functional role in energy utilization. The silencing of AGS had deleterious effects on the downstream genes in the Galactose pathway and ultimately led to the decrease in the incorporation of alpha-gal by reducing the amount of available UDP-galactose. Furthermore, we are currently conducting experiments in order to further elucidate the role of alpha-D-galactosidase in tick-host interactions and the possible involvement in the newly described "Red Meat Allergy".

P2.22

OPTIMIZING IN VITRO BIOFILM ANALYSIS IN *XENORHABDUS NEMATOPHILA*

Alycee Moity

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Bacterial biofilms, aggregated bacterial cells within an extracellular matrix, can pose a significant risk to human health, particularly in hospital and clinical settings. Multiple species of bacteria are capable of forming biofilms on nonliving and living surfaces such as medical equipment and the human urinary tract, therefore it is

important to study the role of biofilms in host association. The gram-negative bacterium *Xenorhabdus nematophila* is an ideal model to study biofilms because it participates in a mutualism with the entomopathogenic nematode *Steinernema carpocapsae*, and is also a pathogen of a variety of Lepidopteran insect larvae. *X. nematophila* can form both attached biofilms, which adhere to surfaces, and pellicles, which occur at the liquid-air interface of a culture. We are interested in analyzing the effects of biofilm formation on host association; however there is currently no quantitative method for assessing pellicle formation, making it difficult to isolate and study mutants with pellicle-specific phenotypes. In this study, we developed a method to quantitate pellicle formation by *X. nematophila* using average fluorescence intensity as a relative measure of biofilm mass. Results obtained from the quantitative pellicle assay showed that the procedure could differentiate between the pellicle phenotypes of different strains, and exhibited high levels of precision.

P2.23

THE INVASION OF CACO2 EPITHELIAL COLON CELLS IN ANAEROBIC AND MICROAEROPHILIC CONDITIONS BY LISTERIA MONOCYTOGENES STRAIN F2365 AND MUTANT STRAIN PDED

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Listeria monocytogenes is a gram-positive bacterium accountable for the severe foodborne illness listeriosis. Capable of infecting the immunocompromised, the elderly, pregnant women, and neonates, *L. monocytogenes* can cause septicemia along with infections of the central nervous system such as encephalitis or meningitis. Through the process of internalization, *L. monocytogenes* facilitates entrance into the epithelial cells of the generally uninhabitable inner gastrointestinal tract. Indications from previous studies have shown that the proliferation of *L. monocytogenes* within the colon can differentiate due to variations in oxygen levels ranging from aerobic conditions to anaerobic conditions causing the bacteria to react pathophysiologically. Recently, our laboratory has identified that *L. monocytogenes* deficient in *pdeD*, which is involved in the regulation of intracellular concentrations of cyclic- dimeric GMP (c-di-GMP), has reduced ability to survive in the presence of stressors encountered within the gastrointestinal tract, but this reduction varied depending upon oxygen availability. Therefore, the hypothesis for this project was that invasion of *L. monocytogenes* into colon epithelial cells will vary between a wild-type strain F2365 and a mutant strain of *pdeD*, which lacks the phosphodiesterase gene disabling the regulated production of c-di-GMP, in variations of oxygen availability. Initial data indicate that the absence of the gene, *pdeD*, does in fact effect the potential of *L. monocytogenes* for invasion of the colon epithelial cells and that oxygen availability also influences this invasion potential. However, further research is needed to determine whether the invasion is related to an alternation in the expression of invasion associated genes by c-di-GMP.

P2.24

THE IMPORTANCE OF RND-TYPE EFFLUX PUMPS IN THE INTERACTIONS OF PSEUDOMONAS AERUGINOSA WITH 4-METHOXYBENZALDEHYDE

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Antimicrobial plant-derived aldehydes exhibit a broad range of activity against microbial pathogens, and a low propensity to trigger

resistance. However, their volatility and insolubility preclude the widespread application of these compounds. We recently reversed these drawbacks by incorporating plant aldehydes into Pro-Antimicrobial Networks via Degradable Acetals (PANDAs), which are polymer networks that release antimicrobials in response to changes in pH and humidity. We studied the antimicrobial action of 4-methoxybenzaldehyde, a metabolite from star anise and a key component of PANDAs that kill the multi-drug resistant pathogen *Pseudomonas aeruginosa* PAO1. In our previous work, we generated 10,000 transposon mutants of *P. aeruginosa* PAO1 and screened them for the hypersensitivity to sub-inhibitory concentrations of 4-methoxybenzaldehyde. Two of the confirmed 46 hypersensitive mutants had mutations in the *mexAB-oprM* operon, which encodes a key multi-drug efflux pump in *P. aeruginosa* PAO1. The addition of natural efflux pump inhibitor, epigallocatechin, reduced the minimal inhibitory concentration of 4-methoxybenzaldehyde from 2.0mg/mL to 0.8mg/mL, confirming the role of efflux for the ability of *P. aeruginosa* PAO1 to resist the effect of antimicrobial phytoaldehydes. Our current study focuses on elucidating the role of several different resistance-nodulation division (RND) efflux pumps, including MexAB-OprM, in the interaction of *P. aeruginosa* PAO1 with 4-methoxybenzaldehyde using molecular biology tools. Studies are ongoing to measure the expression level of RND-type efflux pump genes in *P. aeruginosa* PAO1 when exposed to 4-methoxybenzaldehyde and epigallocatechin by isolating mRNA and running real-time qPCR.

P2.25

INVESTIGATING THE ROLE OF COMPATIBLE SOLUTE TRANSPORTERS IN PSEUDOMONAS SYNXANTHA 2-79 UNDER CONDITIONS OF WATER STRESS

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Background: *Pseudomonas synxantha* 2-79 is a beneficial rhizobacterium that is naturally adapted to water limited environment. Majority of bacteria respond to osmotic stress via the accumulation of small organic molecules called compatible solutes or osmoprotectants through transport and/or biosynthesis. In this study, we aim to characterize the role of several transporters involved in the uptake of compatible solutes particularly, quaternary ammonium compounds (QACs) and their contribution to osmoadaptation of 2-79 under water stress. **Methods:** We have constructed 2-79 mutants deficient in one or more transporters involved in the uptake of QACs. We then evaluated the mutants' capability to utilize QACs as sole carbon source, and benefit from exogenous QACs under conditions of water stress simulated by NaCl and PEG. Reporter strains were constructed to assess the relative gene expression of individual transporter systems under water stress. **Results:** Glycine betaine, as C source, promoted the highest growth rate of 2-79 and provided superior osmoprotection over choline and other osmoprotectants under NaCl-induced water stress. The reporter assays revealed that QACs transporter genes were up-regulated relative to background transcription under water stress. Moreover, subjecting the transporter-deficient mutants of 2-79 to water stress has provided insight into the substrate specificity of individual QACs transporter systems. **Conclusion:** This study suggests that the uptake of plant-derived QACs is important for the water stress response of 2-79, and likely contributes to its fitness in arid soils.

P2.26

POSSIBLE ROLE OF AMPHIOXUS RNA INTERFERENCE IN THE EVOLUTION OF MODERN CHORDATES

Jacob Oche Peter, Alex S. Flynt

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RNA interference (RNAi) pathways have been known to be active in nearly all eukaryotes and play a major role in controlling gene expression as well as genome surveillance. The nature of RNAi in a given ancestral organism can be used as a tool to understand how new features evolved in modern relatives of such organism. Numerous studies have focused on providing evidences for the two round whole genome duplication (2RWGD) seen in vertebrate genomes. In this study, we sort to understand the nature of RNAi in the basal chordate, *Branchiostoma floridae*. In other to make inferences on how genome surveillance in Amphioxus might have contributed to evolution of modern chordates using bioinformatics approach, we used high throughput analysis of small RNAs in this basal deuterostomes to not only understand how their RNAi work but also to attempt answering major evolutionary questions such as the possible source of the 2RWGD. Our analysis revealed that some Amphioxus RNA-dependent RNA polymerases (RdRp) are active and possibly contribute to their RNAi by generating long dsRNA dicer substrate. The presence of RdRps in their genome could influence the fate of transposable elements and how they are controlled by impacting RNAi. Also, We observed a low siRNA population and believed that the siRNAs originated from RdRP and could have a role in Amphioxus RNAi. Analysis of how transposable elements in this group are repressed through RNAi could be key in explaining the possible source of the 2RWGD seen in higher chordates and possibly, modern vertebrate evolution.

P2.27

EXPRESSION OF SNARE PROTEINS INVOLVED IN MAST CELL DEGRANULATION

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Mast cells are crucial to many immune, cardiovascular, allergic, and cancerous diseases. They release granular contents via the fusion of vesicular/granular membranes with the plasma membrane. This fusion process is mediated by Soluble NSF (N-Ethylmaleimide-Sensitive Factor) Attachment Protein Receptor (SNARE) proteins. One R-SNARE (Vamp 2, 3, 7, or 8) on the vesicular membrane interacts with two Q-SNAREs (SNAP-23, Syntaxin-3, or Syntaxin-4) on the plasma membrane to form a four-helical structure called the trans-SNARE complex. The complex initiates degranulation and causes allergic inflammation. We express SNARE proteins to purify them and observe how Q-SNAREs and R-SNAREs interact in an artificial environment. We hypothesize that adding IPTG to *E. coli* with the gene of interest will induce protein expression by triggering the lac operon. To test this hypothesis, we added IPTG to Terrific Broth containing *E. coli* and allowed the broth to incubate at 37°C for 4 hours or 16°C overnight. Next, we ran SDS-PAGE gel of the cell pellets with and without IPTG induction. Afterward, we stained the SDS-PAGE gels with Coomassie Blue staining solution to confirm the protein expression by IPTG. The protein bands were at the proper molecular weight and showed clear expression. Our study demonstrated that IPTG induced the lac operon which coded for the gene of interest and expressed the recombinant SNARE proteins. This work was supported by the Mississippi INBRE, funded by an Institutional Development Award (IDeA) from the National Institutes of General Medical Sciences of the National Institutes of Health under grant number P20GM103476.

P2.28

OPTIMIZATION OF WESTERN BLOTTING FOR THE DETECTION OF PROTEINS OF DIFFERENT MOLECULAR MASS

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Western blotting is a common procedure for the detection of specific proteins in a complex biological mixture. Some of the key factors in obtaining optimum protein-specific signal include, type of membrane, blocking agent, and concentration of methanol used in Towbin's Transfer Buffer (TTB). Aim of this study is to obtain optimal signal for proteins of different molecular mass using combination of these variables. Cell lysates were prepared from a lung epithelial cell line (CFBE) and subjected to SDS-PAGE and transferred to either nitrocellulose (NC) or PVDF membrane. Membranes were then blocked with a variety of blocking agents (BSA, gelatin, non-fat dry milk, FBS or their equimolar mixture), and immunoblotted with antibodies against randomly chosen protein markers representing high (CFTR; MW 170 kDa), medium (LAMP1; MW 110 kDa), and low (Rab11; MW 25 kDa) molecular mass proteins. Optimal conditions were identified, and then subjected to another set of experiments to determine the effects of methanol concentration (0-20%) in TTB in maintaining or further enhancing the optimized protein-specific signals. Our data suggests that optimum protein-specific signals can be obtained when NC membrane was used and blocked with a mixture of blocking agents. Presence of methanol in TTB appears to have little to no effects on improving signals of high molecular mass protein. However, in case of medium and small size proteins a lower concentration of methanol (10%) was sufficient to produce optimal signal. Methanol, a toxic solvent, therefore can be removed or reduced from TTB without compromising with the optimized protein-specific signals.

P2.29

INVESTIGATING THE EFFECTS OF VASCULAR SMOOTH MUSCLE CELL CALCIFICATION ON MEDIA PH

Angelica Smith, Rachel Caulkins, C. LaShan Simpson

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Cardiovascular diseases are the leading cause of death globally. Vascular calcification (VC), which is a consequence of cardiovascular disease, is characterized by calcium and phosphate minerals being deposited along the vascular walls. These minerals that are deposited along the vascular walls are also known as hydroxyapatite crystals, which can also be found in bones. Elevated calcium levels promote phenotypic changes in native cells, causing stiffness. Although there are many factors that can affect VC, substrate mechanics are significant in determining how cells calcify. There has been evidence to show that cells are able to recognize the mechanical aspects of the environment in which they are growing in, then grow accordingly. In this study, vascular smooth muscle cells will be cultured in normal and calcifying media to determine the effect of surface stiffness on the calcification process. By taking the pH of cells after 24 hours, 3 days, and 7 days, the health and viability of cells will be tested to determine which surface is more conducive to cell growth and proliferation. By understanding the relationship between pH and calcification, we can have more knowledge to design future studies.

P2.30

PCR PRIMER DESIGN AND OPTIMIZATION FOR AMPLIFICATION OF ACTIN AND SPHINGOMYELINASE CDNA

Ashley Snow, Karthik Balamurugan, Matthew Bear, Amaani Belton, Dastinee Duncan, Clayton Jago, Clayton Lewis, Aaliyah McCallister, Niquia McKenzie, Steve Meregini, Brandon Moore, Tan'nell Peoples, Ayana Robinson, Kevin Stoll, Nathan Wang, Sushant Prem, Angela Whittom Reiken, Courtney Haycraft

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Using cDNA sequences, a series of PCR primers were designed to amplify actin and acid sphingomyelinase cDNA produced from J774, a mouse monocyte macrophage cell line. Initial screening was performed using a mouse kidney cDNA library. Several forward and reverse primers were designed at various locations along the mRNA for each gene. A variety of primer combinations were screened by PCR to determine the optimal primers to amplify each gene. Based on the screening results, primer sets were chosen based on single bands produced, predicted band size, and intensity of bands. The optimal primer sets were verified by amplification of actin and acid sphingomyelinase cDNA produced from J774 cells.

P2.31

INVESTIGATING THE ROLE OF POLYMERS IN ANHYDROBIOSIS

Terrance Stamps¹, Jared S. Cobb², Pallabi Pal², Parminder Vig², Amol V. Janorkar²

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Organ and tissue donations are essential to transplant patients who are in critical need of these vital parts. As soon as the organ is removed for transplant the viability can only be maintained for 4 to 72 hours on ice. While maintaining the viability of the organ, a patient must be found to match the organ. This presents a major issue for organs that need to be transported over a prolonged distance. One possible approach to solve this issue is by incorporating the method of anhydrobiosis into organ preservation. Anhydrobiosis means "Life without water" and is a process used by certain organisms to preserve cells during desiccation. This research will investigate the individual roles that the molecules and polymers play in anhydrobiosis by observing their behavior both inside and outside of a cell. Fourier Transform-Infrared Spectroscopy, Scanning Electron Microscopy, and Optical Fluorescent Microscopy will be used to analyze the behavior of molecules and polymers in different combinations inside and outside of a cell. We found that we were able to penetrate the cellular membrane with a polymer and a molecule that could essentially preserve the cell. We dehydrated the cell by a variety of methods and attempted to rehydrate the cell. The cell was unable to rehydrate, but it was determined that it could be possible with more time and study of organisms that can undergo anhydrobiosis.

P2.32

DYNAMIC EPIGENETIC CONTROL OF TRANSPOSON SILENCING

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Transposable element (TE) activity results in genome instability in a wide variety of organisms, including humans. This instability has been associated with several diseases, including neurofibromatosis, hemophilia and cancer. Epigenetic silencing is an efficient mechanism for the initiation and maintenance of TE repression on a genome-wide scale. Recent studies have revealed that maintenance of epigenetic control of TEs involves dramatic changes in silencing of TEs in different tissues at different times in both plants and

animals. We have developed a novel model system in which an active transposon can be silenced by a silencing trigger that is a source of small RNAs. This makes it possible for us trigger and monitor the initiation of silencing in various tissues and at various time points. We have obtained high throughput sequencing data for mRNA and small RNA in various tissues at various developmental stages in maize. Our preliminary data suggests that in the germinating embryo of maize, the de novo RNA directed DNA methylation (RdDM) pathway is replaced by post-transcriptional inhibition. In this poster we will present our preliminary on the RNA seq data analysis that identified Differential Expressed Genes (DEGs) which may be involved with changes in the initiation of TE silencing. These results will provide fundamental knowledge concerning epigenetic control of TEs during development, which will ultimately provide new opportunities for the treatment of diseases that are associated with TE transpositions. Acknowledgement to MS-INBRE grant support.

P2.33

THE HISTOPLASMA CAPSULATUM DDR48 PROTEIN MODULATES THE ERGOSTEROL BIOSYNTHESIS PATHWAY AND CONFERS PARTIAL AMPHOTERICIN B RESISTANCE

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Histoplasma capsulatum (Hc) is a systemic, dimorphic, fungal pathogen. Hc grows as a multicellular mold at environmental temperatures (25 °C) and transforms into a unicellular, pathogenic yeast upon inhalation into a mammalian host (37 °C). This mold-to-yeast shift is required for pathogenesis. Our research aims to characterize the DNA damage-responsive protein DDR48, an Hc homolog sharing sequence similarity to *C. albicans* DDR48p. Previously in our lab an allelic replacement deletion-mutant was generated (ddr48Δ) to elucidate the function of HcDDR48. Interestingly, DDR48 is constitutively expressed in the mold-phase of Hc growth, 6-fold greater than expression in the yeast-phase. However, DDR48 expression can be upregulated in the yeast-phase under stressful conditions (e.g., oxidants, antifungals, DNA damage, heat shock). We hypothesize that if DDR48 mRNA levels increase in Histoplasma yeasts in response to amphotericin B, a potent antifungal compound, that DDR48 has a role in conferring antifungal resistance to the fungus. Yeast-phase of Hc, the addition of amphotericin-B up-regulates DDR48 expression at least 4-fold using qRT-PCR, while no significant difference in DDR48 expression occurred in the mold-phase after antifungal addition. The presence of DDR48 also appears to play a regulatory role in the synthesis pathway of the membrane sterol, ergosterol by modulating transcription of numerous genes in the ergosterol synthesis pathway. Research is ongoing to further elucidate the role of DDR48 in the synthesis and maintenance of the cell membrane of the fungus. This study confirms the role of DDR48 in antifungal drug resistance, demonstrating the importance of DDR48 in fungal survival.

P2.34

AGMATINE PLUS ALLIED ENDOGENOUS AMINE EFFECTS ON TIGHT JUNCTIONS BETWEEN INTESTINAL EPITHELIAL CELLS IN ASSOCIATION WITH NITRATE : NITRITE RATIO

John Piletz, Sabrina Yen

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Introduction: The intestine is constantly turning-over cells yet maintains a microbial barrier. It does this by regulating tight junctions between epithelial cells, allowing macrophages and

neurons to infiltrate as needed. Agmatine, the decarboxylated metabolite of arginine, is a candidate modulator of this system that exists at high (mM) levels in the gut, and in a companion poster we show that agmatine acts trans-epithelially to raise nitric oxide and support neuron proliferation. Agmatine's effects on human epithelial model cells (C2BBE1) are now reported independent of co-cultures with neurons, in three ways. **Methods:** (1) Compared activity of the immediate precursor of agmatine, arginine, to its alternative metabolite, ornithine, to determine if these allied compounds can mimic or modify the properties of agmatine in the C2BBE1 model system; (2) Directly measured strength of tight junctions by trans-epithelial electrical resistance (TEER) in culture; (3) Performed cellometry and basal nitric oxide measurements after treatment with these compounds. **Results:** There were no discernible effects of agmatine alone (2 mM) on TEER, however, in combination with the other amines (+2 mM), TEER was lowered. This was not due to a change in C2BBE1 proliferation or cell viability. Nor did arginine or ornithine in combination with agmatine modify the effect of agmatine alone on cell numbers of exponentially dividing or stationary cells. Instead, the combination of agmatine plus these amines lowered the ratio of nitrate to nitrite. **Discussion:** Intestinal agmatine plus other nitrogenous sources may modify tight junctions by stimulating endogenous nitrate reductase leading to lowered nitrate levels.

P2.35

IMPLICATING RIBONUCLEASES IN MAMMALIAN TAILED MIRTRON BIOGENESIS

Farid Zia, Alex Flynt

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Mirtrons are small RNAs which bypass Drosha cleavage and they are classified in three categories of 5' -tailed, 3' -tailed and conventional. At first, the 2'OH on branch point (an Adenine nucleotide about 40 nt upstream of 3' end) attacks the 5' phosphate group during splicing and forms a structure called "Lariat". Then this lariat is debranched by Ldb1 enzyme and exported to the cytoplasm. Though many tailed mirtrons have been recognized in recent years, their biogenesis pathways particularly the removal of tail residues have not been studied well. This is due to low abundance of these small RNAs and absence of an experimental system to directly examine their expression. In this study, we have focused on the biogenesis of two-tailed mirtrons miR-668 (mouse 3') and miR-5010 (human 5'). To achieve this, at first, we have detected the expression of these two mirtrons in HEK cells by transfecting them with different constructs to find out, in the first step, whether the RNases involved in trimming the mirtrons are endo- or exonucleases. The RNA Seq results revealed that in 5010 and 660 mirtrons, the responsible nucleases are Endo and Exonuclease, respectively. Furthermore, knocking down the enzymes to find out the specific ones responsible for trimming the mirtrons ended us to ELAC1 enzyme which plays a role in trimming the 5' -tailed mirtrons.

P2.36

Sydney Jackson¹, Pratikshya Adhikari², Hao Xu²

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Mast cells play an important role in immunity, allergies, cancer, and cardiovascular disease by the release of mediators that are stored in the mast cells' granules. Mast cells degranulate involving membrane fusion proteins, SNAREs (Soluble NSF(N-ethylmaleimide-sensitive factor) Attachment Protein) REceptor). There are two different kinds of SNAREs, Q-SNAREs (SNAP-23, Syntaxin3, and

Syntaxin4) which are found on the plasma membrane, and R-SNAREs (VAMP 2,3,7,8) found on the vesicles/granule membrane. One set of Q and R- SNAREs interact with each other to form a functional trans-SNARE complex; which is required for the fusion of two membranes. These trans-SNARE complexes are selectively regulated for fusion and one of such regulators are Munc 18 proteins. We use reconstitution methods to explore the functional pairing of Q-SNAREs and R-SNAREs along with the presence of Munc 18 regulators. For these reconstitution fusion reactions; purified recombinant SNARE and Munc 18 proteins are required. We hypothesize that using IPTG in *E. coli* will activate the Lac Operon causing the proteins to be expressed. To test this hypothesis: to the *E. coli* culture containing the gene of interest; we added IPTG, incubated the cells at 37°C for 4hrs or 16°C overnight and ran the resuspended cell lysates in SDS-PAGE to observe if the proteins were induced or not. A clear protein band of right molecular weight, only in the presence of IPTG in the sample indicated that proteins have been successfully induced. Acknowledgement: This work was funded by Mississippi INBRE through the NIH-NIGMS grant number P20GM103476.

P2.37

NEUROPROTECTION WITH NOVEL ANTI-OXIDANT AND CANNABINOID-BASED SMALL MOLECULES

Jacqueline McGrath, Jessica Posey, Nicole M Ashpole

University of Mississippi, University, MS

Excitotoxicity is a hallmark of many neurodegenerative diseases. Neurons over excite due to increased glutamate signaling and eventually induce a cell death response. Many compounds extracted from plants have been shown to protect neurons from excitotoxicity. We are particularly interested in whether compounds based off of natural, plant-derived antioxidants and cannabinoids can prevent neuronal death. Working with chemist collaborators, we exposed neurons to novel small molecules and subsequently stimulated the cells with high levels of glutamate. Twenty-four hours later, we assessed viability. Our results show the potential of several new neuroprotective compounds. Concentration-response curves were performed on all efficacious compounds. We are now working to see whether these compounds will protect neurons from other forms of stress, including oxidative stress and protein aggregation. Future application of these findings would include administering the neuroprotective compounds to animals to prevent neurodegeneration and the accompanying behavioral deficits.

P2.38

CHANGES IN NEURONAL STRUCTURE AND KINASE FUNCTION IN ADVANCED AGE

Gabriella Hartman, Sariya Khan, Disha Prabhu, Erik Hodges, Jessica L Posey, Nicole M Ashpole

University of Mississippi, University, MS

It is understood that the aging brain is marked by alterations in cellular structure and functions. Neurons lose synapses, astrocytes change shape, and neuronal excitability decrease with age. We explored various signaling cascades that might be altered in the aging brain that could contribute to these changes in cellular structure and function. In particular, we focus on two cascades-calcium/calmodulin-dependent protein kinase II (CaMKII) and insulin-like growth factor 1 (IGF-1). CaMKII is a serine/threonine protein kinase that is an important regulator of learning and memory. Evidence from our laboratory indicates that CaMKII activity is reduced in the aging brain. In this study, explored the protein levels and

post-translational modifications that cause these activity changes in alpha, beta, and delta isoforms of CaMKII. Reductions of IGF-1 also cause impairments in learning and memory. We measured whether reduced IGF-1 directly caused synapse loss and astrocyte remodeling. By investigating the changes of CaMKII and IGF-1 in the aging brain, we may establish an increased understanding of the causes of memory declination with age.

Friday, February 22, 2019

MORNING

Room TCC 214

8:00 WELCOME

O2.19

8:10 msaABCR OPERON REGULATES WEAK ACID DEPENDENT CELL DEATH VIA cidABC PATHWAY DURING STAPHYLOCOCCAL BIOFILM FORMATION

Bibek G C, Gyan S. Sahukhal, Mohamed O. Elasi

University of Southern Mississippi, Hattiesburg, MS, USA

Key problem with *Staphylococcus aureus* as a pathogen is the acquisition of antibiotic resistance and their ability to form robust biofilm under sub-inhibitory cell wall targeting antibiotic stress. Studies indicates that a subpopulation in *S. aureus* undergoes tightly regulated programmed cell death (PCD) during biofilm development. Previously, we showed that deletion of *msaABCR* operon led to increased cell death during biofilm formation. However, the mechanism behind unregulated cell death in *msaABCR* mutants' biofilm is still unknown. To define the role of *msaABCR* in cell death, we performed biofilm formation assays under antibiotic stress condition. We performed stationary phase survival assays, glucose consumption, acetate generation, ROS production and respiration rate under biofilm micro-environment mimic condition. Finally, we measured the expression of genes involved in PCD and studied if MsaB regulates these genes directly using chromatin-immunoprecipitation. We observed that sub-inhibitory concentration of vancomycin induces biofilm formation but failed to do so in the *msaABCR* mutant. *msaABCR* mutant produced more amount of acetate and free radical under biofilm microenvironment leading to increased cell death which is reversed in presence of MOPS buffered condition. Deletion of *msaABCR* resulted in increased expression of *cidR* regulon that has been shown to play role in cell death mechanism. We also observed direct binding of MsaB to *cidR* promoter. These results suggest that *msaABCR* directly regulates *cidR* regulon to control weak acid dependent programmed cell death phenomenon during biofilm formation.

O2.20

8:25 HRPF-FPOP METHOD DEVELOPMENT

Niloofar Abolhasani Khaje, Joshua Sharp

The University of Mississippi, University, MS, USA

Hydroxyl radical protein footprinting (HRPF) by fast photochemical oxidation of protein (FPOP) is a mass spectrometry based technique that HRPF measures amino acid oxidation rate and correlates it with changes in the solvent accessibility of the amino acid targets. Each HRPF-FPOP experiment is performed in triplicate allowing the errors in oxidation rate to be measured. Variability is a major problem in HRPF. We identified that the major source of variability in HRPF was poor peptide signal in both the oxidized and unoxidized versions of the peptide. We corrected this problem by injecting more sample, which greatly improved the precision of measurement. In HRPF-FPOP, relative quantification of protein

modifications in mixtures of peptide modification isomers is challenging due to the high resolution hydrophobic chromatography separation of the peptides results in non-coelution of peptide isomers and unequal sampling during data-dependent fragmentation. We are developing a separation method to coelute peptide modification isomers. It has been shown that large inner diameter (ID) SEC columns can coelute isomeric peptides while separating different peptides. However, using large ID SEC columns requires a lot of sample which is not feasible for most applications. Capillary SEC yielded coelution of oxidation isomers, but had performance issues with sensitivity. Currently, we are testing hydrophilic interaction chromatography (HILIC) ability to obtain the desired result. So far we have obtained coelution of isomeric peptides and BSA peptides separation. The HILIC method is still underway to be tested on real FPOP samples.

O2.21

8:40 RADICAL SCAVENGING PHYTOCHEMICALS CAUSE CHANGES IN CYTOKINE EXPRESSION AND REDUCE PROLIFERATION OF COLON CANCER CELLS UNDER OXIDATIVE STRESS

Ayana Robinson, Karthik Balamurugan, Matthew Bear, Amaani Belton, Clayton Jago, Clayton Lewis, Aaliyah McCallister, Niquia McKenzie, Steve Meregini, Brandon Moore, Tan`nell Peoples, Ashley Snow, Kevin Stoll, Nathan Wang, Dastinee Duncan, Sushant Prem, Angela Whitom Reiken

Mississippi College, Clinton, MS, USA

Human colorectal adenocarcinoma cells have been shown to exhibit more oxidative stress than non-tumorous adenoma cells which stimulates their proliferation and aggressive behavior. We have previously shown that *Pseudognaphalium obtusifolium*, a member of the Asteraceae family, produces phytochemicals having significantly more radical scavenging activity than ascorbic acid. To determine if these phytochemicals may have significant effects on colon cancer cells under oxidative stress, we used hydrogen peroxide- stressed C2BBE1 colorectal adenocarcinoma cells. Expression of 80 different cytokines were compared for treated and untreated vehicle-only cells. The proliferation of oxidative-stressed C2BBE1 cells treated with phytochemicals was significantly reduced compared to cells treated with vehicle only. Data and semi-quantitative analyses of detected array proteins having significant changes in expression are presented and their possible roles in colorectal adenocarcinoma oxidative stress are described.

O2.22

8:55 TICK-PATHOGEN INTERACTIONS: CONNECTING THE DOTS BETWEEN INNATE IMMUNITY AND REDOX SIGNALING PATHWAYS

Faizan Tahir, Shahid Karim

University of Southern Mississippi, Hattiesburg, MS, USA

Dietary selenium, through its incorporation into selenoprotein, plays an important role in immunity and inflammation responses due to its crucial roles in regulating reactive oxygen species and redox status in almost all tissues. In previous studies, it has been shown that selenophosphate synthetase 2 (SPS2), a homologue of selenophosphate synthetase (SeI) identified in mammals, is essential for selenoprotein biosynthesis. Relish, a homologue of nuclear factor-kappa B (NF-kB), in the immune deficiency signaling pathway, regulates the expression of microplusin, an antimicrobial peptide (AMP). In this study, we hypothesize that silencing of SPS2 and Relish will cause an increase in *Rickettsia parkeri* level in infected *A. maculatum* ticks. To define the functional role of SPS2 and Relish in hematophagy and pathobiome colonization, an RNAi approach was utilized to deplete target genes expression in pathogen infected ticks. The transcriptional expression of target genes was

confirmed in the knockdown tissues of both SPS2 and Relish. A significant decrease in replete weight, and a marked increase in distress in the host provided evidence for the critical role of target genes during feeding of knocked down ticks. A qPCR and 16s rRNA diversity assays showed that the gene-silenced ticks had significant increase in *R. parkeri* load than the control, proving that SPS2 and Relish play a role in the maintenance of tick pathobiome. Interplay between redox signaling and innate immunity pathways will be discussed in the context of tick-pathogen interactions.

O2.23

9:10 THE MSAABCR OPERON REGULATES PERSISTENT CELLS FORMATION VIA PROTON MOTIVE FORCE DEPENDENT GENTAMYCIN UPTAKE IN STAPHYLOCOCCUS AUREUS

Shanti Pandey, Gyan S. Sahukhal, Mohamed O. Elashi

University of Southern Mississippi, Hattiesburg, MS, USA

A bacterial phenotypic variant that shows extreme antibiotic tolerance are termed as 'persister cells'. Increasing evidences suggest the association of bacterial persisters with chronic and recurrent infections. Despite this clinical relevance, there are currently no viable means for eradicating persisters. Previously, we showed the involvement of *msaABCR* operon in *in-vitro* persister cells formation in *Staphylococcus aureus* against different antibiotics. Particularly, on exposure to gentamycin, we observed no persister formation in stationary phase *AmsaABCR* cells within 24 hours of treatment while the wildtype and the complementation strains formed persister cells for extended period. Given the gentamycin uptake is dependent on the proton motive force, we hypothesized that deletion of *msaABCR* renders cells to have increased proton motive force consequently increasing the gentamycin-uptake in *S. aureus* cells. We measured the gentamycin uptake using gentamycin-Texas red conjugation method by flow cytometry and found the drug uptake is more in *AmsaABCR* cells as compared to wildtype *S. aureus* cells. Herein we report, the regulatory role of *msaABCR* operon in persister formation that is dependent on the proton motive force. This study highlights the importance of *msaABCR* operon as a drug target for eradicating staphylococcal persisters and overcome recalcitrant infections.

9:25 BREAK

9:40 Cellular, Molecular, Developmental Biology Division Awards

10:10 Cellular, Molecular, Developmental Biology Division Meeting

O2.24

10:30 DEVELOPING A METHOD TO FACILITATE QUANTITATIVE ANALYSIS OF PELLICLE FORMATION IN XENORHABDUS NEMATOPHILA

Elizabeth Hussa

Millsaps College, Jackson, MS, USA

The bacterium *Xenorhabdus nematophila* engages in a mutualistic relationship with *Steinernema carpocapsae* nematodes, and together these partners invade and kill a variety of insect larvae, mostly of the Lepidopteran order. Though some microscopic data has suggested that *X. nematophila* and related species form aggregated communities called biofilms inside the nematode host, the role of biofilm formation in host association and/or transition between hosts is unknown. Further, the bacterium demonstrates two unique forms of biofilms *in vitro*: both surface-attached biofilms and pellicles, or aggregates of bacterial cells floating at the air-liquid interface of a

culture. In order to characterize biofilm-associated phenotypes and their effects on host association in various mutant strains, we must first have reliable methods by which to analyze both types of biofilm *in vitro*. Quantitative methods of measuring surface-attached biofilm formation exist, however pellicles are studied less frequently and not often quantitated. Therefore, we developed a high-throughput method using fluorescence microscopy to reliably quantify pellicle formation in *X. nematophila*, and demonstrated its efficacy using strains with visible differences in pellicle formation. Future studies will use this assay to screen mutants and ultimately determine if attached biofilm and pellicle phenotypes can be uncoupled, which would suggest that they are independently formed, and therefore may play different roles in host association.

O2.25

10:45 ASSOCIATION OF DIFFERENT DCLK1 ISOFORMS WITH HUMAN COLORECTAL CANCER

Lianna Li

Tougaloo College, Tougaloo, MS, USA

Doublecortin-like kinase 1 (DCLK1) plays critical roles in the initiation and progression of human colorectal cancer (CRC) and it is correlated with poor prognosis of CRC patients. There are five isoforms exist, and epigenetic studies identified promoter of DCLK1 isoform 1 (DCLK1-L) is hypermethylated in colorectal cancer, and DCLK1 isoform 2 (DCLK1-S) may be activated and play roles in CRC tumorigenesis. We aim to further define the association of DCLK1-L and DCLK1_S with CRC tumorigenesis and their effect on the sensitivity of CRC cells to chemotherapeutic agents. In order to achieve our goals, we established the DCLK1-L and DCLK1-S stably expressed cell lines using HCT116 cells. Effects of DCLK1 on the stemness of CRC cells, including capability of self-renewal and pluripotency were determined. IC₅₀ of 5-Fluorouracil (5-Fu) for the treatment of DCLK1-L and DCLK1_S overexpression cells was evaluated. Our results demonstrated that DCLK1-L and DCLK1-S were both correlated with stemness of CRC cells, and they affect the chemosensitivity of CRC cells to 5-Fu treatment. Results from our research provided more evidence for the association of different isoforms of DCLK1 with human colorectal cancer, and will have a positive impact on providing new therapeutic targets for CRC treatment, decreasing relapse of CRC and increasing survival of CRC patients after surgery.

O2.26

11:00 RNASEQ AND GENE REGULATION: HONEY BEES ARE HOMESICK WHEN CAGED

Mohamed Alburaki¹, Scott Stewart², Shahid Karim¹

¹University of Southern Mississippi, Hattiesburg, MS, USA

²University of Tennessee, Knoxville, TN, USA

In this study we characterized the impact of the caging stress on honey bee *Apis mellifera* regulation of 45 genes using targeted-RNA seq. Two cohorts of one-day-old sister bees were subjected to different conditions. One cohort was fed different imidacloprid concentrations within a cage environment, and the second was marked and introduced back to its original hive. RNA of the bee brains was extracted from both bee cohorts and differentially expressed gene analyses were conducted. Among the cages, no alterations were identified at gene regulation level related to imidacloprid exposure. However, a surprising divergence in gene regulation was recorded between caged and hive bees. Caged bees showed delay in gene regulation and significantly lower activated genes when compared to hive bees. We identified uncharacterized genes constantly up-regulated in caged bees when compared to hive bees, and a set of 7 genes exclusively regulated in caged bees that could potentially characterize caging stress in honey bees. Our



findings characterize for the first time significant variation at gene level between caged and hive bees, which could significantly affect the outcome of the toxicological and behavioral studies conducted on caged bees.

O2.27

11:15 TETRAHYMENA RETICULON MAY BE REQUIRED FOR TETRAHYMENA MATING

Sabrice Guerrier

Millsaps College, Jackson, MS

Cell fusion is important for the development of bone and muscle development as well as fertilization in many species including humans. This process occurred when the plasma membranes (barrier separating the outside of the cell from inside) of each cell come into close contact then fuse leading to two cells becoming one. This contact and fusion of membranes is mediated by complex changes in membrane shape but how these changes in shape are regulated or accommodated are poorly understood. We now show that reticulon, a homolog of a human protein known to deform membranes, localizes to the sites of fusion in mating *Tetrahymena*. Importantly, deletion of reticulon results in reduced pair formation suggesting that cell fusion may be impaired. Future experiments will focus on understanding the contribution of the functional domains of reticulon towards its overall function. Acknowledgement: This work was funded by an Institutional Development Award (IDeA) from the NIGMS under grant number P20GM103476.

O2.28

11:30 REGULATION OF EARLY ZEBRAFISH DEVELOPMENT BY CATHEPSIN B

Yvette Langdon¹, and Mary Mullins²

¹*Department of Biology, Millsaps College, Jackson, MS, USA*

²*University of Pennsylvania, Philadelphia, PA, USA*

Maternal factors are critical for early development, but little is known about their role in morphogenetic movements during early zebrafish embryonic development. A recessive maternal-effect mutagenesis screen performed in the zebrafish, *Danio rerio* identified the mutant *split top*. Mutant embryos exhibit a dorsalization of the embryonic axis and altered morphogenesis, including defects in epiboly progression, the process by which the blastoderm cells migrate over and surround the yolk. Specifically, mutant embryos have disrupted microtubule and actin cytoskeletal networks in the yolk cell (epiboly defects) and defective convergence and extension (cell movement defects). The *split top* mutants were found to be mutant for *cathepsin B, a*. To identify candidate genes/ pathways for the morphogenesis defects observed in mutant embryos proteomic analysis was performed. This work was supported by NIH grant R01-GM56326, NIH training grant T32HD007516, the PENN-PORT training program, and by the Mississippi INBRE, funded by an Institutional Development Award (IDeA) from the National Institute of General Medical Sciences of the National Institutes of Health under grant number P20GM103476.

Friday, February 22, 2019

AFTERNOON

12:00-1:00 Plenary Speaker

1:00-3:00 Mississippi INBRE/ Millsaps HHMI Symposia

CHEMISTRY AND CHEMICAL ENGINEERING

Chair: Ifedayo Victor Ogungbe

Jackson State University

Vice-Chair: Julie Pigza

University of Southern Mississippi

Vice-Chair: Colleen Scott

Mississippi State University

Thursday, February 21, 2019

MORNING

Room TC 218A

8:55 Welcome

9:00 – 10:15 Session 1

Session Chair: Dr. Md Alamgir Hossain

O3.01

9:00 DESIGN AND DISCOVERY OF NOVEL SEMICONDUCTOR BASED NUCLEAR RADIATION DETECTOR

Saiful M. Islam

Jackson State University, Jackson, MS, USA

Nuclear radiation detectors operating at room temperature (RT) constitute an important aspect of the current technological era because of their importance in nuclear medicine imaging, environmental radioactivity monitoring, spacecraft, and national security equipment. To date, only a few binary and ternary semiconductors have been proposed and utilized as detector materials such as Si, high purity Ge, CdTe, TlBr, CdxZn1-xTe (CZT), Pb₂P₂Se₆, CsPbBr₃ and HgI₂. Among them, Ge is the best but its use is limited due to its requirement of auxiliary cryogenic system. The top room temperature γ -ray detector material is CZT, but it has limited use because of its high cost deriving from the difficulty in obtaining detector grade single-crystal in high yield. These result a tremendous research interest to discover RT active novel detectors. This study shows a systematic search of novel semiconductors, Ba₂HgS₅, CsHg₃S₄, Pb₂BiS₂I₃, Sn₂BiS₂I₃, Sn₂BiSI₅. Among them, CsHg₃S₄ shows mobility and life time products ($\sigma \cdot \tau$) for both electrons and holes, known as the figure of merit of nuclear radiation detectors, which is equivalent to unoptimized CZT. Apart from this, we also showed a series of antiperovskite chalcogenides, Hg₃Q₂I₂ (Q = S, Se, and Te) that are demonstrated to be very promising for RT γ -ray semiconductor detectors.

O3.02

9:15 DITOPIC BINDING OF HALIDES BY A M-NITROPHENYL-FUNCTIONALIZED HEXAUREA RECEPTOR

Bobby Portis¹, Mohammad H. Hasan², Corey R. Johnson¹, Ritesh Tandon², Md. Alamgir Hossain¹

¹*Jackson State University, Jackson, MS USA*

²*University of Mississippi Medical Center, Jackson, MS, USA*

A tripod-based hexaurea receptor appended with m-nitrophenyl groups has been studied for halide binding by proton NMR and UV-Vis titrations. As demonstrated by experimental results, the receptor effectively binds a halide ion in a 1:2 binding mode showing the binding strength in the order of fluoride > chloride > bromide >

iodide. The strongest affinity for fluorides is attributed to the best fit of two fluoride anions within the host's cavity. The receptor was further investigated for its biocompatibility on HeLa cells, showing excellent cell viability. Acknowledgments: The project described was supported by Grant Number W911NF-19-1-0006 from the US Department of Defense.

O3.03

9:30 MASS PRODUCTION OF Mn²⁺-DOPED CSPbCl₃ PEROVSKITE NANOCRYSTALS WITH HIGH QUALITY AND ENHANCED OPTICAL PERFORMANCE

Jinju Zheng, Qilin Dai

Jackson State University, Jackson, MS, USA

In the present work, an improved hot injection technique, namely microwave-assisted hot injection, for mass production of Mn²⁺-doped CsPbCl₃ (Mn²⁺:CsPbCl₃) perovskite nanocrystals (NCs) was reported. This strategy combines the advantages from both microwave irradiation and hot injection, which represents the characteristics such as homogenous heating and rapid production of Mn²⁺:CsPbCl₃ NCs with homogeneous size distribution. Meanwhile, it exhibits the capacity for gram-scaled synthesis of Mn²⁺:CsPbCl₃ NCs. The Mn²⁺ doping concentrations can be facilely tailored by control on the reaction temperatures and feed ratios of the MnCl₂ precursor, bringing their enhanced optical property with a PL QY up to 65%, which is the highest one among the Mn²⁺-doped perovskite NCs ever reported. The as-constructed light emitting diodes (LED) based on Mn²⁺:CsPbCl₃ NCs emits highly bright white light, suggesting their potential applications in optoelectronic devices.

O3.04

9:45 PHOTOCHEMISTRY OF PYROMELLITIMIDES: STABLE RADICAL ANIONS IN AQUEOUS SOLUTION

Wolfgang Kramer¹, Donya Razinoubakht¹, Gurjit Kaur¹, Sabrina Molitor², Anne Zimmer², Axel G. Griesbeck²

¹Millsaps College, Jackson, MS, USA

²Universität zu Köln, 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.

Aromatic imides such as phthalimide undergo the decarboxylative photocyclization, which yields medium to large ring structures, tolerating several functional groups and giving excellent yields. 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. This is the first time pyromellitimides have been shown to exhibit synthetic photochemical potential.

O3.05

10:00 BIOGEOCHEMISTRY OF DEPLETED URANIUM IN US ARMY SHOOTING SITE AND POTENTIAL REMEDIATION

Fengxiang Han

Jackson State University, Jackson, MS, USA

Anthropogenic activities, such as ore mining and processing, nuclear power generation, and weapon tests, have generated depleted U (DU) contamination to soils and waters. DU is a radioactive material and is also a flammable metal. The mobility, bioavailability, and redistribution of DU are influenced by its sources and speciation, and plants species. Phytoremediation has emerged as an environmentally friendly, cost-effective green technology to remediate radioisotope and heavy metal contaminated soils. The main objectives of this study were to investigate biogeochemistry of DU in Army shooting soils and explore the feasibility using coupled electro-kinetic and phytoremediation in cleaning up DU polluted soils. Especially, Sunflower and Indian mustard were tested in cleaning up soils contaminated with various U species, as well as field DU polluted soil. DU was found to be bioaccumulated in plant roots over plant shoots. U uptake by both plant species was significantly higher from the UO₃ and uranyl contaminated soils than from UO₂ contaminated soils. Overall U removal efficiency after one growing season reached 3.5% in the UO₃ polluted soil with Indian mustard, followed by uranyl and least in UO₂ polluted soils. Effects of electrokinetic treatment on efficiency of phytoremediation of DU will be discussed as well. This study indicates the importance of U speciation in soil with regards to the potential use of Sunflower and Indian Mustard for phytoremediation of U contaminated soils.

10:15 Break

Room TCC 218A

10:30 – 11:45 Session 2 *concurrent with Session 3

Session Chair: Gavin Rustin

O3.06

10:30 HETEROCYCLE SYNTHESIS VIA ELECTROPHILE INITIATED CYCLIZATION OF CHIRAL, NON- RACEMIC HOMOALLYLIC AMINES

Gavin Rustin, Matthew Donahue

University of Southern Mississippi, Hattiesburg, MS, USA

In an effort to expand the synthetic utility of chiral, non-racemic homoallylic amines, we have been investigating electrophile-initiated cyclizations to access nitrogen heterocycles. This research capitalizes on the preferred conformations that enantiomerically pure homoallylic amines adopt in intramolecular cyclization events. Our working hypothesis is that the C2 position bearing an aryl substituent will control the cyclization event via a six- membered chair-like transition state setting the C4 stereogenic center. In one example, enantiomerically pure sulfonamides were acylated at the nitrogen position with di-*tert*-butyl dicarbonate to afford carbamates to deliver oxygen via intramolecular cyclization. Investigation of halosuccinimides has shown that the *N*-iodo electrophile readily induces cyclization whereas *N*-bromo is kinetically slower and *N*-chloro is unreactive. Examination of molecular halogens, specifically iodine, showed that the halocyclization is complete within 5 minutes affording relatively pure product with isolated yields of 74%. One and two- dimensional NMR experiments were used to elucidate the stereochemistry of the cyclization event. Current studies involve the acylation of the sulfonamide with isocyanates, isothiocyanates, and carbodiimides to install oxygen,

sulfur or nitrogen. The conversion of these heterocycles into biologically active molecules is also under investigation.

O3.07

10:45 APPLICATION OF THE AZA-PRINS CYCLIZATION REACTION TOWARD POLYCYCLIC NITROGEN HETEROCYCLES

Hayley Allen, Matthew Donahue

University of Southern Mississippi, Hattiesburg, MS, USA

In this talk, the asymmetric synthesis of polycyclic nitrogen heterocycles from chiral, non-racemic amines will be discussed. The aza-Prins reaction is a cyclization strategy to construct piperidines from acyclic substrates. In the approach currently under investigation, enantiopure homoallylic amines are synthesized from the stoichiometric chiral ammonia reagent (SCAR) (R)-tert-butanesulfonamide. The SCAR reagent is condensed with non-enolizable aldehydes to provide imines that are allylated with allylbromide promoted by indium metal in either THF or DMF. Observations have led to the conclusion that DMF is a better solvent for ease of aqueous work. High diastereoselectivities of >20:1 in either solvent have been observed for many aromatic substrates indicating that a closed Zimmerman-Traxler like transition state is in operation. This talk will examine two substrates, 2-bromobenzaldehyde and 3,4-dimethoxybenzaldehyde, as case studies for the synthesis of isoindolone valmerins and the quinolizidine alkaloid lasubine. Cleavage of the SCAR reagent under acidic conditions affords the ammonium salts that are cracked to the free base. In divergent synthetic routes, the free base has been condensed with phthalic anhydride to afford phthalimides toward the valermin molecules. Alternatively, condensation with glutaric anhydride affords the glutarimides for quinolizidine synthesis. Resulting imides have been reduced with sodium borohydride to *N,O*-acetals as precursors to the aza-Prins cyclization. We are currently investigating Brønsted and Lewis acid initiation of *N*-acyl iminium ion formation to trigger cyclization of the pendant olefin. Our hypothesis is that the C2 stereogenic carbon will control the ensuing cyclization setting stereochemistry at C6 and C4 of the incipient piperidine ring.

O3.08

11:00 ENANTIOSELECTIVE ADDITION OF MASKED ACYL CYANIDES TO β -NITROSTYRENES

Caroline J. DeGraw, Alison P. Hart, Matthew G. Donahue, Julie A. Pigza

University of Southern Mississippi, Hattiesburg, MS, USA

The use of umpolung reactivity has been a critical tool in organic synthesis to access natural products with unnatural synthetic connectivity. Masked Acyl Cyanides (MAC) reagents have been of particular interest recently for their innate umpolung reactivity and enabling access to a wide variety of organic compounds that are otherwise difficult to synthesize. Of note is their use as nucleophiles for 1,2; 1,4; and 1,6 additions, giving access to a variety of bioactive compounds. Additionally, MAC reagents have been used in tandem with organocatalysts to create enantioselective adducts. Our research focuses on the enantioselective 1,2 Michael addition of MAC to β -nitrostyrenes (β -NS) using squaramide organocatalysts. An extensive substrate screen will be shown with both alkyl and aryl nitroalkenes, as well as reaction parameters. Additionally, it will be shown that these adducts can act as a precursor to the enantioselective synthesis of β -amino acids, β -lactams, and 3-carboxylate indolines.

O3.09

11:15 INVESTIGATION OF THE COMPETENCY OF THE TERT-BUTANESULFONAMIDES IN THE AZA-

ACHMATOWICZ RING EXPANSION REACTION

Kesia W. Lopes, Matthew G. Donahue

University of Southern Mississippi, Hattiesburg, MS, USA

Ring expansion reactions constitute a powerful strategy in organic synthesis to access complex carbo and heterocyclic ring systems. The Achmatowicz reaction is one such example in which a furfuryl alcohol is expanded into a pyranone acetal upon treatment with an oxidizing agent such as meta-chloroperoxybenzoic acid or *N*-bromosuccinimide. With our interest in the synthesis of multi-substituted piperidines, we chose to investigate the competency of the aza-variant of this ring expansion reaction. In the aza-Achmatowicz, a furfuryl amine undergoes intramolecular rearrangement to an dihydropyridinone acetal. To access the starting substrate for this investigation, the stoichiometric chiral ammonia reagent (SCAR) (R)-tert-butanesulfonamide was condensed with furan-2-carbaldehyde. The chiral, non-racemic imine was allylated with indium metal powder to afford the homoallylic amine in high yield and high diastereoselectivity. The resulting *N*-sulfinyl amine was chemoselectively oxidized to the tert-butanesulfonamide with one equivalent of mCPBA in the presence of the furan ring, nitrogen and pendant alkene. This oxidation was proven successful by observing a shift in the tert-butyl peak downfield after oxidation. Published examples of the aza-Achmatowicz commonly employ the para-toluenesulfonamide so the tert-butane group would be a notable increase in steric bulk about the SO₂ moiety. Our working hypothesis is that the chiral furfuryl amine with tert-butanesulfonamide would undergo ring expansion when treated with an appropriate oxidant. To that end, we are currently investigating ring oxidation with a second equivalent mCPBA to initiate the aza-Achmatowicz reaction.

O3.10

11:30 A BRIEF REVIEW ON SPIRO-CYCLIC COMPOUNDS: OUR JOURNEY AND SUCCESS

Prasanta Das¹, Mohammad H. Hasan², Dipanwita Mitra², Ratna Bollavarapu², Edward J. Valente³, Ritesh Tandon², Drazen Raucher², Ashton T. Hamme II¹

¹Jackson State University, Jackson, MS, USA

²University of Mississippi Medical Center, Jackson, MS, USA

³University of Portland, Portland, OR, USA

Spirocycles have been the important molecular scaffolds found in many natural products, biologically active compounds, and drug molecules. Spiro compounds are cyclic structure bearing a central tetrahedron carbon, which may be fully carbocyclic (all carbon) or heterocyclic (having one or more heteroatom). As a result, their interesting 3D conformational features have not only stimulated synthetic interest, but they are also associated with numerous biological properties. In this context of interest, we have been working in the field of spiro-isoxazoline containing natural product and corresponding spiro-analogues as potential means to initiate a drug discovery research. In this report, we will discuss the first total synthesis of 11-deoxyfistularin-3 *via* a divergent approach. We will also discuss our success in several spiro-heterocycles, including but not limited to spiro-ethers, -lactones, and -peroxides, following 1,3-dipolar cycloaddition and halo-cyclization. We have synthesized a plethora of bromo- and fluoro- derivative along with various substitutions (alkyl, aromatic, and ester) on isoxazole ring. The ester functionality on isoxazoline ring was also transformed into its amides and diamides to extend the substrate scope. To our delight, *in vitro* biological assay showed anticancer activity against prostate, breast, and glioblastoma (GBM6) and antiviral activity against human cytomegalovirus HCMV. Therefore, spiro-isoxazoline-heterocycles could be the potential candidates for drug discovery-based research in the near future. Keywords: Natural product

synthesis, Spiro-isoxazoline-heterocyclic analogues, anti-cancer, anti-viral. The project described was supported by NIH/NIGMS (Award Number: 2SC3GM094081-05) and Analytical and NMR CORE facilities were supported by NIH/NCRR (Award Number: G12RR013459) and NIH/NIMHD (Award Number: G12MD007581).

Room TCC 218B

10:30 – 11:45 **Session 3 *concurrent with Session 2**
Session Chair: Dr. Shelley Smith

O3.11

10:30 ARE CONVENTIONAL STRAIN ENERGIES IN BICYCLIC ADDITIVE?

David H. Magers

Mississippi College, Clinton, MS, USA

Whether or not ring strain is additive in bicyclic and polycyclic compounds has been discussed for years, and evidence with varying degrees of reliability have been presented both for and against additivity. In the current study, conventional strain energies for a series of bicyclic compounds containing cyclopropane and cyclobutane rings and heterocyclic derivatives of these systems are computed within the homodesmotic and hyperhomodesmotic models. In addition, homodesmotic and hyperhomodesmotic equations for determining the conventional strain energies of individual rings within each bicyclic system are presented. Thus, the conventional strain energies of the molecules as a whole can be compared to the sums of the individual rings within each system. Optimum equilibrium geometries, harmonic vibrational frequencies, and the corresponding electronic energies and zero point vibrational energy corrections are computed for all relevant molecules using self-consistent field theory, second-order perturbation theory, and density functional theory (B3LYP) with the correlation consistent basis sets cc-pVDZ and cc-pVTZ. Single-point CCSD(T) energies are also computed at the MP2/cc-pVTZ optimized geometries to ascertain the importance of higher order correlation effects. Any deviations from additivity are discussed and compared to earlier studies.

O3.12

10:45 COMPUTATIONAL STUDY OF CNT- GRAPHENE COMPLEXES, BOTH UNFUNCTIONALIZED AND FUNCTIONALIZED, AND THEIR EFFECT ON NYLON 6 NANOCOMPOSITES

Michael Roth¹, Manoj K. Shukla², Gopinath Subramanian¹

¹*University of Southern Mississippi, Hattiesburg, MS, USA*

²*Environmental Research and Development Center, Vicksburg, MS, USA*

The addition of carbon nanotubes (CNTs) is a possible route for enhancement of the physical properties of polymers. However, CNT aggregation within polymer matrices remains a problem. Graphene could be used as a dispersant for the nanotubes within the polymer matrix. This research seeks to understand the effects of the addition of CNT-graphene complexes, both functionalized and unfunctionalized, to nylon 6 polymer in terms of the composite's physical properties. This is accomplished using the Class 2 empirical force field in LAMMPS. This research studies the effects of functionalization on the CNT-graphene complex's properties, and the physical properties of the nylon 6 nanocomposite after addition of both functionalized and unfunctionalized CNT-graphene complexes at different loading. Initial calculations have shown that

minimal functionalization of the complexes can enhance interaction with the polymer without a large loss in Young's moduli. Further, the research has shown that an increase in the concentration of the complexes in the nanocomposite results in an increase in Young's moduli at small concentrations.

O3.13

11:00 HYDROGEN CYANIDE STRETCH VIBRATIONAL ENERGIES OBTAINED FROM A NEW POTENTIAL ENERGY SURFACE

Joe Bentley and Kathryn Penton

Delta State University, Cleveland MS

Hydrogen cyanide has been frequently used as a test case for new theoretical models. We have used the electronic structure program GAUSSIAN to compute a set of single point energies for various C-H bond lengths in HCN. A potential energy curve was created by fitting the dataset to a polynomial. This became input to a one-dimensional quantum calculation solving the Schrödinger equation to obtain the C-H vibrational energies. The discrete variable representation (DVR) was used as a basis set. The resulting vibrational frequencies agree well with the experimental results.

O3.14

11:15 ENVIRONMENTAL OIL RECOVER USING ENGINEERED BIOCHAR

Everett Henderson, Chanaka Navarathna, Narada Bombuwala Dewage, Cameron Keeton, Jaylen Pennisson, Todd Mlsna

Mississippi State University, Starkville, MS, USA

Oil spills can cause widespread environmental damage, which can be incredibly costly to fishing and tourism industries. Current methods used for oil spill cleanup can be very expensive, have secondary environmental impacts, and be difficult to implement. This study employed both undecorated high surface area Douglas fir biochar, as well as Douglas fir biochar that had been decorated with lauric acid and magnetite as oil adsorbents. Several types of motor and transmission oils were used to simulate the oil spills. The ability of both kinds of biochar to adsorb oil was found to be independent of pH, both biochar types equilibrated with all oil types in under 15 minutes following pseudo 2nd order kinetics, and the lauric acid decorated biochar was found to have a higher oil adsorption capacity than the undecorated biochar. The adsorption capacities of oils were found to be in 3-9.5 g/g range. Biochar composites and oil-laden composites were extensively characterized by SEM, TEM, EDX, XRD, FT-IR, BET, TGA, DSC, heating value experiments and XPS. Electrostatic and π - π stacking interactions are thought to play a significant role in adsorption mechanisms. The lauric acid decoration was found to increase the oil adsorption capacity of the biochar by increasing its hydrophobicity, while the magnetic decoration allows the exhausted adsorbent to be captured using an external magnet. These factors should allow both undecorated and lauric acid decorated biochar to be used in future oil spill cleanups.

O3.15

11:30 THE ISOMERS OF DIPHOSPHETANE

Shelley A. Smith

Mississippi College, Clinton, MS, USA

The conventional strain energies of the diphosphetanes are determined within the isodesmic, homodesmotic, and hyperhomodesmotic models. Isomers of diphosphetane obviously include 1,2-diphosphetane and 1,3-diphosphetane. In addition, each of these have *cis* as well as *trans* isomers with respect to the hydrogens bonded to the two phosphorus atoms in the ring.

Additional conformations are possible because these hydrogens may be axial or equatorial. Specifically, both axial and equatorial conformations exist for *trans*-1,2-diphosphetane and for *cis*-1,3-diphosphetane. Only one conformation can exist for *cis*-1,2-diphosphetane and for *trans*-1,3-diphosphetane because in these two systems one of the hydrogens must be axial while the other must be equatorial. Additionally, the relative energies of the isomers of the diphosphetanes will be analyzed in terms of the attractive versus the repulsive forces.

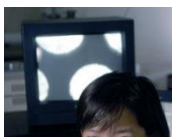


Optimum equilibrium geometries, harmonic vibrational frequencies, and corresponding electronic energies and zero-point vibrational energies are computed for all pertinent molecular systems using SCF theory, second-order perturbation theory, and density functional theory and employing three correlation consistent basis sets of Dunning and coworkers: cc-pVDZ, cc-pVTZ, and cc-pVQZ. Single point fourth-order perturbation theory, CCSD, and CCSD(T) calculations employing the cc-pVTZ and the cc-pVQZ basis sets are computed using the MP2/cc-pVTZ and MP2/cc-pVQZ optimized geometries, respectfully, to ascertain the contribution of higher-order correlation. Three DFT functionals, B3LYP, ω B97XD, and M06-2X, are considered to determine if they can yield results similar to those obtained at the CCSD(T) level.

Thursday, February 21, 2019

AFTERNOON

Room TC 218A



12:00 – 1:00 Divisional Keynote
Talk

*lunch will be served

Moderator: Dr. Julie Pigza



Dr. Lin He, Deputy Division Director in the Division of Chemistry at the National Science Foundation (NSF). Dr. He joined NSF in 2011. Since joining NSF, Dr. He has managed the Chemical Measurement and Imaging (CMI) program, the Chemistry Center of Innovation (CCI) program, and the data-driven discovery research program. Dr. He obtained her bachelor's degree in chemistry from Peking University in China, and her PhD from Pennsylvania State University. Before joining NSF, Dr. He was a member of faculty at North Carolina State University and an adjunct faculty member at the University of North Carolina, Chapel Hill. Her research focuses on developing novel analytical tools and exploiting their applications in the field of bioanalysis. In particular, she is interested in coupling novel properties of nanomaterials with conventional mass spectrometric imaging and biosensing techniques to monitor biomolecular interactions. Dr. He is committed to building strong partnership between government, academia and industry, and she is very committed to promoting chemical research and STEM education.

1:00 Break

Thursday, February 21, 2019

AFTERNOON

Room TC 218A

1:15 MISSISSIPPI INNOVATE PANEL: NAVIGATING
PRODUCT DEVELOPMENT AND MAKING A
CONVINCING SALES PITCH

Moderator: Dr. Victor Ogungbe

Tony Jeff is the president and chief executive officer of Innovate Mississippi. Innovate Mississippi help startups and entrepreneurs connect with investors, grow their companies, and create jobs in Mississippi. Tony holds a Bachelor of Science in industrial engineering and a Master of Engineering degrees from Mississippi State University and Northwestern University, respectively. He also holds an MBA from the Kellogg School of Management at Northwestern University. Before leading Innovate Mississippi, Tony had corporate experience at Florida Power & Light, General Motors and Delphi Automotive Systems. Under his leadership, Innovate Mississippi has successfully raised more than \$172 million for startups and entrepreneurs in Mississippi.

Dr. Almesha L. Campbell currently serves as the Director for Technology Transfer and Commercialization at Jackson State University. She facilitates the development, disclosure and protection of intellectual property; develops, coordinates and conducts training on intellectual property policies and procedures, and technology transfer best practices; and facilitates the licensing and commercializing process. Dr. Campbell is the Principal Investigator for the National Science Foundation funded JSU Innovation Corps Site designed to train teams of faculty, students and business mentors how to commercialize their ideas using the lean start up methodology. She also serves as Site Lead for the NIGMS funded Southeast XLerator Network, led by XLerateHealth and the University of Kentucky, to develop a technology transfer accelerator hub for biomedical technologies in the Southeast region.

Dr. T. Keith Hollis is an Associate Professor of Chemistry at Mississippi State University. His research interest is the design and development of organometallic ligands and complexes for energy-efficiency, direct conversion of solar energy to useful forms, and more cost-effective access to medicines. Prior to joining Mississippi State University, Dr. Hollis was a member of the chemistry faculty at the University of California, Riverside and the University of Mississippi. His work has received support from the National Science Foundation, the Department of Education, ACS-Petroleum Research Fund, etc. Dr. Hollis has served on a university taskforce that evaluated invention, patenting and copyright policies, and he holds a US patent on Air-Stable, Blue light Emitting Chemical Compounds.

Room TCC 218A

2:00 – 3:00 Oral Presentations, Session 4

Session Chair: Dr. Wolfgang Kramer

O3.16

2:00 A MESOSCALE STUDY OF STRESS
RELAXATION IN RUBBERY ELASTOMERS

Gopinath Subramanian

University of Southern Mississippi, Hattiesburg, MS, USA

Mesoscale models for rubbery elastomers have the capability to bridge the atomistic- and macroscopic- timescales. In this talk, we

present to preliminary results obtained on the study of stress-relaxation using a mesoscale model. The mechanism behind the stress relaxation is stochastic chain breakage, which is incorporated using an Arrhenius-like expression for the breakage of a single bond. Activation energies for bond breakage are calculated using a nudged elastic band method.

O3.17

2:15 NOVEL BIOBASED RANDOM COPOLYMERS

Guery Saenz, Colleen Scott

Mississippi State University, Starkville, MS, USA

Conventional polymers are obtained from petrochemical monomers. However, the unsustainability of petroleum and environmental pollution have attracted not only the academic but also industrial attention on bio-based polymers. Bio-based polymer can be synthesized by biomass-derivatives. For example, an enormous source of building blocks to produce new polymeric materials can be found in lignin, which is the second most abundant naturally occurring organic polymer. Herein we report the synthesis of novel and sustainable random copolymers by melt polycondensation as alternative thermoplastics. The starting materials used were lignin-derived monoaromatic compounds, such as methyl vanillate, vanillic acid and methyl paraben. The thermal properties of the new copolymers show that the glass transition temperature (T_g) is around 100–120 °C, and the decomposition temperature (T_d) is in the range of 330–380°C. Furthermore, they are susceptible to degradation under acidic conditions, a property that is highly desirable for degradable polymers. These new and promising copolymers could be used as replacements for commodities plastics because their thermal properties are in the desirable range for thermoplastic materials used in the packaging, storage, and coating industry.

O3.18

2:30 CHEMICAL DOPING OF POLY(3-HEXYLTHIOPHENE) (P3HT)

Kan Tang, Trishal Zaveri, Nicholas Kreis, Song Guo

University of Southern Mississippi, Hattiesburg, MS, USA

Recently, organic electronics has attained great research interest, since it is regarded as a promising complement for the traditional semiconductor materials. Unlike rigid semiconductor materials such as silicon, soft organic electronics based on conjugated polymers (CPs) possesses advantages including flexibility, cost, and processing convenience. However, the performance of polymeric material is highly dependent on the processing parameters such as concentration, temperature, solvent, polymorphism, doping level, etc. In this content, we will mainly focus on the influence on the properties of typical conjugated polymer, poly(3-hexylthiophene-2,5-diyl) (P3HT) brought by its polymorphism and doping level. The chemical doping reaction of P3HT by F4-TCNQ in solution will be studied by UV-vis absorption spectroscopy. By adopting solvent-induced aggregation, we will demonstrate the priority of P3HT aggregation step compared to the charge transfer step, which highlights the critical impact of morphology on chemical doping reaction of conjugated polymers at a molecular level. On the other hand, ultrathin P3HT films with well characterized structures will be systematically investigated upon F4-TCNQ doping. Electronic effect caused by doping level of P3HT film will also be characterized by a combination of physical chemistry techniques including spectroscopy, atomic force microscopy (AFM), kelvin probe force microscopy (KPFM). Electrical effect of the doping will be investigated by electrical measurements on microfabricated P3HT devices, aiming at unveiling hidden correlation between morphology and property of P3HT.

O3.19

2:45 NEW EMITTERS FOR ORGANIC LIGHT EMITTING DIODES (OLEDs)

T. Keith Hollis

Mississippi State University, Starkville, MS, USA

OLEDs are the most energy-efficient device for the generation of light. Recent advances have led to their adoption in the latest generations of smart phones to improve battery life, to provide a true black, to allow for shape control in design, and to access thinner and therefore lighter devices. Recent discoveries in CCC-NHC pincer chemistry have led to the observation of blue and white light emission from these complexes. Synthesis and characterization of these new materials along with their photophysical properties will be discussed. The latest results from fabrication of OLED devices based will be presented.

3:00

Break

Thursday, February 21, 2019

EVENING

3:30 Dodgen Lecture and Awards Ceremony TCC Theatre

General Poster Session

Immediately Following Dodgen Lecture

TCC Ballrooms 3rd floor

P3.01

QUINOLINE-BASED PHENYL SULFONE DERIVATIVES AS ANTITRYPANOSOMAL AGENTS

Huaisheng Zhang, Jasmine T. Collins, Rogers Nyamwihura, Ifedayo Victor Ogungbe

Jackson State University, Jackson, MS, USA

Human African trypanosomiasis (HAT), caused by *Trypanosoma brucei*, a kinetoplastid protozoan parasite, endemic to sub-Saharan Africa (especially in central Africa) is serious life-threatening disease. In this work, a series of natural products-based phenyl sulfone derivative and their property-based analogues were investigated as potential growth inhibitors of *Trypanosoma brucei*. We found that nopol- and quinoline-based phenyl sulfone derivative were the most active and selective for *T. brucei*, and they were not reactive towards the active thiol of *T. brucei*'s cysteine protease rhodesain. A thiol reactive variant of the quinoline-based phenyl sulfone was subsequently investigated and found to be a moderate inhibitor of rhodesain. Analogues of the quinoline-based compound, that is non-thiol reactive, have been synthesized and investigated as *T. brucei* growth inhibitors using phenotypic-screening approach, while its thiol-active congener is being used to design active site-based inhibitors of rhodesain as antitrypanosomal agents. The compounds have the potential to become lead compounds for drug development against HAT.

P3.02

ELECTRO-KINETIC REMEDIATION COMBINED WITH PHYTOREMEDIATION TO REMOVE URANIUM FROM CONTAMINATED SOIL

Liangmei Chen¹, Linchun Wu¹, Qinku Zhang¹, Youhua Ma², Zikri Arslan¹, Fengxiang Han¹

¹ Jackson State University, Jackson, MS, USA

² Anhui Agricultural University, Anhui, China

The coupled electrokinetic phytoremediation has been proved to be effective to remove heavy metals from contaminated soil. The

objectives of this study were to investigate distribution and solubility of uranium in soils with UO_2 , UO_3 and Uranayl under electrokinetic field and to examine the processes of coupled electrokinetic phytoremediation in removing U from soils. A low direct electric current (typically $2 V \cdot cm^{-1}$) was used for 10 d at $8 h \cdot d^{-1}$ to the contaminated soil after Ryegrass grew for two weeks. Uranium redistribution took place among various solid phase components due to changes of biogeochemical conditions of the soil, such as redox potential, pH and the chemistry of the electrolyte solution. Under the electric field the soil pH became acidic in the anode and basic in the cathode, resulting mobilization of U into more soluble and potential bioavailable forms such as soluble, exchangeable, and carbonate binding fractions after electrokinetic processes. Electrokinetic treatment enhanced plant uptake of U, depending upon the soil U sources.

P3.03

MICROWAVE ASSISTED SYNTHESIS AND NMR CHARACTERIZATION OF ORTHO- AND PARA-ALKYLATED DIMETHYL SUBSTITUTE ANILINES WITH 1-ARYLETHANOLS

Romans Grant, Rachaud Brown, George Armstrong

Tougaloo College, Tougaloo, MS, USA

Ortho-alkylation of 2, 4-dimethylaniline with 1-(para-chlorophenyl) ethanol and para-alkylation of 2, 6-dimethylaniline with 1-phenylethanol were carried out in a matter of minutes under solvent-free conditions in a conventional household microwave oven. The alkylating agents (catalyst) was triflic acid (CF_3SO_3H). The crude reaction products were dissolved in ethyl acetate, washed in a separatory funnel with saturated sodium bicarbonate, dried over magnesium sulfate, solvent removed and further purified on a flash chromatograph with silica as the stationary phase, and 98/2 hexane/ethyl acetate as the mobile phase. NMR was used to determine if the reaction took place and then to characterize the purity of the final purify product. HPLC using C18 column was used to determine the purity of products as well. These compounds will be tested as drug candidates for treating breast and prostate cancer.

P3.04

MICROWAVE ASSISTED ALKYLATION OF ANILINES: ALKYLATION OF 2, 4- DIMETHYLANILINE WITH VINYLARENES

RaChard Brown, Romans Grant, George Armstrong

Tougaloo College, Tougaloo, MS, USA

Molecules with benzylic carbon stereocenters are widely observed natural products which are used as building blocks for many medicinal compounds. The objective of this research is to use microwave assisted organic synthesis for ortho-alkylation and para-alkylation of disubstituted anilines to get compounds with a benzylic carbon stereocenters. Ortho-alkylation of substituted 2, 4-dimethylaniline was carried out in a matter of minutes under solvent-free conditions, in a conventional household microwave oven. Styrene, 4-chlorostyrene and 4-tert-butoxystyrene were used as alkylating agents with triflic acid (CF_3SO_3H) as catalyst. Products were easily recovered in good yields and characterized using proton NMR. The purity of the product was deterring using HPLC using a C18 column. The chiral racemic mixtures of compound, as synthesized, were resolved into the R and S enantiomers with HPLC on a chiral column.

P3.05

THE USE OF AN MTT ASSAY TO DETERMINE THE EFFECTIVENESS OF NOVEL ORTHO-AND PARA-ALKYLATED DISUBSTITUTED ANILINES WITH BENZYLIC CARBON STEREOCENTER FOR KILLING

BREAST CANCER CELLS (HTB-26)

Brittnie-lee Duffus, George Armstrong

Tougaloo College, Tougaloo, MS, USA

Molecules with a benzylic carbon stereocenter are widely observed natural products which are used as building blocks (synthons) for many medicinal compounds. They are found in more than four thousand natural product isolates. This stereochemical structure has gained an important status in medicinal chemistry, and frequently found in therapeutic agents. We used microwave assisted synthesis of ortho-alkylation or para-alkylation of methyl di-substituted anilines and resolution to synthesize several novel compounds with benzylic carbon stereocenter. These drug candidates were characterized by the 500 MHz NMR. We hypothesized that these compounds would be effective in killing breast cancer cell, a first step in developing a breast cancer drug. The objective of this research was to determine the effect of these drugs on killing breast cancers using MTT assay (3-(4,5-dimethylthiazol-2-yl)-2, 5-diphenyltetrazolium bromide). MTT Assay provides a simple and accurate method to quantify cell proliferation and viability. We found that these drugs were effective in killing breast cancer cells.

P3.06

APTAMER-CONJUGATED GRAPHENE OXIDE MEMBRANES FOR HIGHLY EFFICIENT CAPTURE AND ACCURATE IDENTIFICATION OF MULTIPLE TYPES OF CIRCULATING TUMOR CELLS

Bhanu Priya Viraka Nellore¹, Paresh C. Ray²

¹Mississippi Valley State University, Itta Bena, MS, USA

²Jackson State University, Jackson, MS, USA

Tumor metastasis is responsible for 1 in 4 deaths in the United States. Though it has been well-documented over past two decades that circulating tumor cells (CTCs) in blood can be used as a biomarker for metastatic cancer, there are enormous challenges in capturing and identifying CTCs with sufficient sensitivity and specificity. Because of the heterogeneous expression of CTC markers, it is now well understood that a single CTC marker is insufficient to capture all CTCs from the blood. This study reports for the first time highly efficient capture and accurate identification of multiple types of CTCs from infected blood using aptamer-modified porous graphene oxide membranes. The results demonstrate that dye modified S6, A9, and YJ-1 aptamers attached to 20–40 μm porous graphene oxide membranes are capable of capturing multiple types of tumor cells (SKBR3, LNCaP, and SW-948) selectively and simultaneously from infected blood. Our result shows that the capture efficiency of graphene oxide membranes is ~95% for multiple types of tumor cells; for each tumor concentration, 10 cells are present per milliliter of blood sample. The selectivity of our assay for capturing targeted tumor cells has been demonstrated using membranes without an antibody. Blood infected with different cells also has been used to demonstrate the targeted tumor cell capturing ability of aptamer-conjugated membranes. Aptamer-conjugated membranes reported here have good potential for the early diagnosis of diseases that are currently being detected by means of cell capture technologies.

P3.07

A COMPUTATIONAL AND SPECTROSCOPIC STUDY OF CU(II) IMIDAZOLE4 Cl₂

Virginia Baker¹, Nathan I. Hammer²

¹Delta State University, Cleveland, MS, USA

²University of Mississippi, Oxford, MS, USA

Mycorrhizal fungi networks are essential for the nutrient uptake of higher order plant species. These fungi secrete enzymes that allow

for the uptake of water, nitrogen, phosphorus, and other minerals needed by the host plant. One of the enzymes that is secreted by the fungi is laccase. This enzyme is known to oxidize para-diphenols through free radical reactions. The active site structure of laccase is made up of copper (II) histidine complexes. The most interesting part of these complexes is the bond between the nitrogen in the imidazole ring of the histidine and the copper at the center of the complex. In order to study the interactions between the copper and the nitrogen in this complex, a model was created: $\text{Cu(II)Imidazole}_4\text{Cl}_2$ [$\text{Cu(ImH)}_4\text{Cl}_2$]. The copper-nitrogen intramolecular interactions were studied in both solid and solution form through Raman spectroscopy, solid form through diffuse reflectance, and in solution form through UV-Vis spectroscopy. This data was then compared to electronic structure calculations. This resulted in a good correlation between computational and experimental data. The authors would like to acknowledge MS INBRE for summer financial support.

P3.08

EFFECTS OF TALL FESCUE AND LANDSCAPE SLOPES ON MERCURY FLUX INTO SURFACE WATER IN FORM SOILS IN OAK RIDGE, TN

Linchun Wu¹, Qinku Zhang¹, Liangmei Chen¹, Zikri Arslan¹, Jiangxia Li¹, Youhua Ma², Fengxiang X. Han¹

¹ Jackson State University, Jackson, MS, USA

² Anhui Agricultural University, Anhui, China

During the 1950s and 1960s, the U.S. Department of Energy's Y-12 National Security Facility in Oak Ridge, TN caused a large amount of mercury to be released into the soil. This study explored the effect of grass cover on reducing mercury in surface runoff from soil by simulating surface slope and rainfall intensities. We collected surface runoff water after both simulated and natural rainfalls from soils with various slopes. Mercury concentration in the water and runoff sediment samples was measured. Results show that the increase in the grass coverage, significantly lowered the concentration of mercury in the runoff water. The increase in the slope increased mercury content in the runoff water. We can conclude that planting higher density of grasses may reduce mercury transfer into the river.

P3.09

FRET BASED THERANOSTIC NANOHYBRID FOR TWO-PHOTON BIOIMAGING AND PHOTODYNAMIC THERAPY OF SUPERBUGS

Kaelin Gates, Avijit Pramanik, Paresh Chandra Ray

Jackson State University, Jackson, MS, USA

The need for theranostic materials that can eliminate multidrug resistant bacteria (MDRB) has called for the development of materials that can perform two-photon photodynamic therapy (PDT) that can achieve a higher depth penetration in the second biological window. These materials should also be able to be used for two-photon bioimaging. We have developed gold nanoclusters (GNCs) attached graphene quantum dot (GQD) based two-photon excited theranostic nanoplateform with high two-photon absorption, very strong two-photon luminescence, as well as two-photon stability in the NIR region. Experimental results show strong two-photon luminescence and two-photon-induced PDT, which is based on the fluorescence resonance energy transfer (FRET) mechanism, where the GQDs with very high two-photon absorption act as two-photon donors and GNCs act as acceptors. The data indicates that singlet O_2 generation efficiency enhances tremendously due to the FRET process, which increases the two-photon excited PDT efficiency for multiple drug resistance bacteria. The data also shows that the

nanoplateform has the capability for bright two-photon bioimaging and two-photon photodynamic therapy for MRSA and carbapenem-resistant (CRE) *Escherichia coli*.

P3.10

SYNTHESIS OF ENANTIOENRICHED ALPHA-METHYLSELENOCYSTEINE ANALOGUES

Robert Wehrle¹, Douglas Masterson¹, Robert Hondal²

¹University of Southern Mississippi, Hattiesburg, MS, USA

²University of Vermont, Burlington, VT, USA

Replacement of the α -hydrogen with a methyl group has found increasing use in synthetic peptides due to the increased stability and resistance to enzymatic degradation due that α -methyl substitution affords. There is interest in synthesizing unnatural selenocysteine analogues because of its unique antioxidative properties and potential anti-cancer uses and, up to this point, published protocols for synthesizing α -methylselenocysteine (α -MeSec) result in low yield. Initial attempts at synthesizing α -MeSec in our lab also resulted in poor yields. We relied on the nucleophilic attack on the side chain methylene of an α -methylserine derivative by an appropriate selenolate. The reason for the low yield was most likely due to the steric hindrance at the α -carbon. A different synthon was developed using an enolate to attack a seleno-alkylating agent forming a *tert*-butyl protected selenomalonate (1). By employing pig liver esterase on 1, a highly enantioenriched (88% ee, 98% yield) *tert*-butyl protected seleno-half ester (2) was synthesized, and by comparing to previously synthesized cysteine analogues, polarimetry suggests the (R) enantiomer was made. Through additional synthetic steps, 2 was converted to a protected version of α -MeSec (3) in moderate yields (54%) while preserving the stereocenter. A similar approach can be utilized to synthesize the opposite enantiomer as well as the β -amino acid analogues.

P3.11

SPATIAL STUDY OF MICROPLASTIC POLLUTION IN THE MISSISSIPPI RIVER BASIN

Austin Scircle, James Cizdziel

University of Mississippi, Oxford, MS, USA

Recent studies have shown high concentrations of microplastic pollution in the Northern Gulf of Mexico, likely with most of the particles originating from the Mississippi River. However, the Mississippi River is an intricate system of waterways, tributaries, and commercial routes which necessitates an in-depth spatial study to fully assess microplastic pollution in the system. A lack of understanding of microplastic pollution in terms of river loads, polymer type and size, and sources, represents a fundamental gap in our understanding of microplastics in America. This study examines the spatial distribution and characteristics of microplastics in the Mississippi River, its tributaries, and at oyster reefs along the Gulf Coast. We used Nile red staining and subsequent fluorescence microscopy for microplastic counting and vibrational spectroscopy to confirm the identity of plastics found in samples. We found that the majority (>70%) of microplastic particles counted were fibers. We also found that the concentration of microplastics is lower for small tributary rivers (Tennessee and Yazoo) than in the Mississippi River; however, some larger tributaries (Ohio and Missouri) have higher concentrations of microplastics than the Mississippi River at the area where they converge. In summary, this work presents a useful method for microplastic analysis, and highlights the widespread nature of microplastic pollution.

P3.12
INVESTIGATION OF AN ENANTIOPURE PENTAFLUOROBENZYL ISOTHIOCYANATE AS A CHIRAL DERIVATIZING AGENT FOR NMR SPECTROSCOPY
Emily B. Crull, Matthew G. Donahue
University of Southern Mississippi, Hattiesburg, MS, USA

A pentafluorobenzyl derived chiral derivatizing agent (CDA) that is chemoselective for primary and secondary amines has been investigated to differentiate between enantiomers through the formation of diastereomeric thioureas. The CDA was synthesized from pentafluorobenzaldehyde over a four-step sequence to give an enantiomerically pure isothiocyanate. The perfluorinated benzene ring was chosen to minimize ¹H NMR signal contributions from the CDA and to provide a strongly electron-withdrawing environment to discriminate between enantiomers in both ¹H and ¹⁹F NMR. Thus far, test substrates include both isomers of *a*-methylbenzylamine and both isomers of *N*-ethyl-*a*-methylbenzylamine. A predictive model for determining enantiomeric excess by NMR has been developed by comparing the calculated isotropic shielding and the observed chemical shifts. The calculations have been carried out at the B3LYP 6-31G* and mPW1PW91/6-311+G** levels of theory using Gaussian 09.

P3.13
SYNTHESIS OF VARIOUS SPACERS AND DRUGS FOR CONJUGATION TO ELPs
Andy T. Cassity¹, Wolfgang Kramer¹, Parth R. Patel¹, Rachel D. Bravenec¹, DJ Hawkins¹, Valeria Zai-Rose², John J. Correia², Jacob E. Pruett²
¹Millsaps College, Jackson, MS, USA
²University of Mississippi Medical Center, Jackson, MS, USA

ELPs (Elastin-like Polypeptides) are synthetic biopolymers that have unique properties. They are known to undergo liquid-liquid phase separation reversibly above a concentration-dependent transition temperature. Thus they are thermo-responsive and can be equipped with cell-penetrating peptides and loaded with other molecules via cysteine-maleimide crosslinking. Consequently, compounds such as cancer drugs like doxorubicin, can be delivered with ELPs by hyperthermia to target cancer cells. The transition-temperature is influenced by the conjugated drug and this study aims to investigate the effect of various parameters on the thermodynamic functions responsible for the phase separation. Various amino acids are converted into their maleimides and *p*-nitroaniline amides. *p*-Nitroaniline absorbs at 365 nm as a free amine, while the amide absorbs at 325 nm. The conjugation to ELP is determined by the ratio of the 280 nm and 325 nm absorptions. Acknowledgement: This work was supported by the Mississippi INBRE, funded by an Institutional Development Award (IDeA) from the National Institute of General Medical Sciences of the NIH under grant number P20GM103476.

P3.14
SYNTHETIC APPROACHES TO PHOTOACTIVABLE AROMATIC HETEROCYCLES FOR PHOTOINDUCED CELL DEATH
Reagan M. McGuffee, C. Taylor Sledge, Shizhe Zhang, Wolfgang H. Kramer
Millsaps College, Jackson, MS, USA

N-Methoxy substituted aromatic heterocycles are photoactivatable compounds that produce two transient reactive species upon excitation. The reactive species, a methoxy radical and a heteroaromatic radical cation, have been shown to cleave DNA, which makes them candidates for photoinduced cell death.

Applications of photoinduced cell death are found in Photodynamic Cancer Therapy. The efficiency of DNA cleavage is limited by weak ground-state association for the quinoline and isoquinoline derivatives. To increase cleaving efficiency, a DNA-binder (1,8-naphthalimide) has been synthetically attached. To further improve binding and cleaving efficiency, attempts to synthesize novel amino-heterocycles are undertaken. Our approach is to functionalize alkylquinolines or related heterocycles by radical bromination and then modify the products by various Grignard reactions or direct substitution with potassium phthalimide. The isolation of the alkylamine proved to be the most challenging step and it appears that alkaline work-up does not yield the desired product. Consequently, reaction such as the Delepine reaction, which require acidic conditions, are selected. Acknowledgement: This work was supported by the Mississippi INBRE, funded by an Institutional Development Award (IDeA) from the National Institute of General Medical Sciences of the National Institutes of Health under grant number P20GM103476.

P3.15
PYRIDINE DERIVATIVES AS HIV INTEGRASE INHIBITORS
R. Victor Mishoe¹, Sharon E. Suffern¹, Miller J. Cochran¹, Jacques J. Kessl², Julie A. Pigza², Matthew G. Donahue², Wolfgang H. Kramer¹
¹Millsaps College, Jackson, MS, USA
²University of Southern Mississippi, Hattiesburg, MS, USA

Potential drug targets in AIDS patients are the three unique enzymes in the life cycle of the virus: HIV reverse transcriptase, integrase, and protease. This project aims to develop inhibitors for HIV integrase. An assay has been developed in the Kessl lab to determine the effectiveness of potential HIV integrase inhibitors. The inhibitors are based on aromatic heterocycles with some conserved substituents. A variety of substituents in select positions are introduced via Palladium-coupling reactions, after the heterocyclic core has been established previously. Simple precursors are employed for the synthesis of the heteroaromatic core. For the pyridine core, substituted malonic esters allow for a versatile and easily manipulated building block. The initial cyclization reaction involves an aminocrotonate ester and utilizes the deprotonation of an amide by sodium ethoxide. The goal of this project is the optimization of reactions forming the pyridine core.

P3.16
DNA INTERACTIONS OF BIFUNCTIONAL HETEROAROMATIC SALTS
Kelvin D. Gardner¹, Lakedra J. Gatlin¹, Wolfgang H. Kramer²
¹Provine High School, Jackson, MS, USA
²Millsaps College, Jackson, MS, USA

N-Substituted heteroaromatic salts are photoactivatable compounds that are investigated for their impact on DNA. The compounds contain a DNA binding moiety which consists of the intercalator 1,8-naphthalimide. The separate DNA cleaving part can be activated by light and is producing two transient, reactive species: a heteroaromatic radical cation and an oxygen centered radical. Both of those species can damage DNA, each by a separate mechanism. To effectively cleave DNA, sufficient ground-state association is desired. DNA binding is measured by spectroscopic titrations (UV/Vis, fluorescence and CD). To determine DNA cleavage, gel electrophoresis is employed for analysis of cleavage fragments of pUC DNA. Supercoiled pUC migrates fastest. Double-strand cleavage produces linear DNA of that size which migrates slower. Single strand cleavage will relax the supercoils and produces circular DNA which migrates even slower. Time and concentration

studies are performed to determine cleavage type. Addition of quenchers assists in the elucidation of the cleaving mechanism. Acknowledgement: This work was supported by the Mississippi INBRE, funded by an Institutional Development Award (IDeA) from the National Institute of General Medical Sciences of the National Institutes of Health under grant number P20GM103476.

P3.17

FRACTIONAL ANALYSIS OF P3HT FILMS

Kan Tang, Song Guo

University of Southern Mississippi, Hattiesburg, MS, USA

Poly-3-hexylthiophene (P3HT) is a commonly used conjugated polymer for electrical devices ranging from organic solar cells to field-effect transistors. The need to study this polymer stems from the notion of enhancing its electrical properties. In this experiment, we will be studying impacts of molecular weight of P3HT on its electronic properties. Soxhlet extraction is used to obtain low molecular weight (LMW) and high molecular weight (HMW) fraction of P3HT. MALDI-MS is attempted to analyze the molecular weight of the P3HT fractions. A kelvin probe force microscope (KPFM) is used to investigate the surface potential of the LMW and HMW P3HT film samples. The surface potential mapping is compared to morphological mapping to provide a better morphology-property correlation at nanometer scale. Washing effects by polar solvents such as acetonitrile is revealed to significantly affect the surface potential mapping of the P3HT films. Both conductivity and mobility testing of the washed and unwashed P3HT films are performed to see which sample provides the best result.

P3.18

BREAST CANCER CELL IMAGING WITH RED EMISSIVE CARBON DOTS

Saadman Alamgir¹, Salma Begum², Avijit Pramanik², Paresh Chandra Ray²

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Cancer is the second leading cause of death worldwide and was responsible for 8.8 million deaths in 2015 globally. In particular, breast cancer is the most common cause of cancer death among US women. According to U. S. Breast Cancer Statistics, about 1 in 8 U.S. women (about 12%) will develop invasive breast cancer over the course of her lifetime. In 2017, there was an estimated 252,710 new cases of invasive breast cancer, 63,410 new cases of breast carcinoma in situ, and 40,610 breast cancer deaths. Therefore, it is important to detect breast cancer at an early stage to increase the chances for successful treatment. Recently, carbon-based fluorescent nanomaterials, such as carbon dots (CDs), have attracted much attention because of their unique optical properties and low to non-toxic features. Alternatively, this new class of nanomaterials is considered to be a potential substitute to semiconductor Quantum Dots (QDs). The aim of this study was to detect the cancer cells and image them with red emissive carbon dots, synthesized from 1, 4-phenylenediamine. We picked this organic dye because this is cost effective and easy to handle. Moreover, in this experiment we have studied the binding mechanism of different drugs such as neurotransmitters and anticancer etc., to find the multiple interactions and selectivity using the fluorescence technique. We used several spectroscopic and imaging tools such as UV-vis, Fluorescence, FTIR, TEM, for characterization and studied the compositions of these compounds and used them for cell imaging of breast cancer cells SK- BR-3.

P3.19

ACRYLATE AND VINYL SULFONE-BASED INHIBITORS OF VENEZUELAN EQUINE ENCEPHALITIS VIRUS CYSTEINE PROTEASE

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Venezuelan equine encephalitis virus (VEEV) is a highly aerial infectious "New World" alphavirus of the Togoviridae family. This arthropod-borne (arbovirus) can be transmitted via mosquitos to birds, horses, rodents and can cause severe encephalitis in humans. The virus is not only neuroinvasive but neurotropic; it replicates in the brain and lymphoid tissue. VEEV possess a nonstructural protein 2 (nsP2) cysteine protease that is vital to viral replication and is associated with the cytopathic effect (CPE) of the virus. Due to its role in the virus's ability to replicate, it is a potential target for drug development and clinical intervention. Recently, a series of acrylate and vinyl sulfone-based inhibitors were identified as VEEV inhibitors, and we hypothesized that the molecular mechanism of the compounds is via inhibition of nsP2. The goal of this project is to test that hypothesis. To accomplish this, VEEV nsP2, and a FRET-based protein substrate (CFP-YFP) were recombinantly expressed in *E. coli*. The proteins were purified and used for FRET-based inhibition assays, as well as SDS-PAGE gel-based enzyme assays. The results showed that the compounds are indeed nsP2 inhibitors. The molecular interactions between the protease and the inhibitors are currently being investigated using X-ray crystallography. Future work will focus on structure-based optimization of the compounds' antiviral activity.

P3.20

KINETIC AND THERMODYNAMIC STUDY OF URANIUM ADSORPTION ON THREE DIFFERENT HYDROXYAPATITES AND THEIR CARBONATE EFFECTS

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Nuclear energy has been significantly developed as a clean energy worldwide. This requires increasing production of U fuel from mining, processing and manufacturing. Depleted U has been also used for weapon systems such as penetrator systems. There is an increasing need for an environmentally friendly way to remediate uranium polluted soil and water. Hydroxyapatite (HA or HAP) is a natural mineral showing high affinity for uranium in groundwater removal. At the same time, groundwater contains high carbonate concentrations that may affect uranium removal due to the formation of uranyl phosphates (U-P) and uranyl carbonate complexes. Therefore, systematic study on interactions between uranium and HAP is desired. This research focuses on batch adsorption experiments with 3 different HAPs. The ICP-MS results showed fast adsorption rate onto HAP. Temperature had no effect on the adsorption of uranium onto HAP. However, higher pH values (9-11) and carbonate concentrations (100mM) decreased its adsorption especially on 2 HAPs, both containing phosphates in its structure. For one HAP studied, which was without phosphate, it showed no significant changes in temperature, pH, or carbonate. These findings could possibly conclude that U-P phases are the key to adsorption of uranium from groundwater and must be further investigated.

P3.21
UNUSUAL DNA MOTIF STABILIZERS: A COMPARATIVE STUDY ON A POLYHYDROXY FLAVONOL MORIN AND BANANA PEEL EXTRACT

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Tetraplex (G4/C4) forming sequences in telomeric DNA and promoter regions of oncogenes are associated with tumorigenesis. Stabilizing the formation of these quadruplexes can prevent tumor cell proliferation, which have been regarded as potential pathways for cancer therapy. In our previous studies we have proved plant flavonols as useful G4/C4 binders. In the present study, we have prepared an extract from banana peel (BE) and performed a comparative study on the binding of BE and a flavonol morin with G4/C4 using steady state absorption, fluorescence, circular dichroism and size exclusion chromatography (SEC) measurements. Two complementary G4 and C4 single stranded oligonucleotide along with the duplex (made by hybridizing the G4/C4) were used. We noticed that in C18 HPLC the retention time of BE and morin are same, indicating similar size of the two. BE shows significant solvent dipolar relaxation when studied in solvents of different polarity. BE also exhibits excited state intra-molecular proton transfer (ESPT) similar to common flavonol like fisetin. We extended our studies on G4/C4 in presence of nicotine (NIC), which is a potent oxidative stress inducer. BE and morin exhibited different characteristics in presence of NIC. BE served as a better extrinsic probe than morin. Dynamic light scattering (DLS) studies determined the size of DNA molecules in bound and free states. Further studies using NMR and FTIR are underway. Acknowledgement: This work was supported by MS-INBRE from NIGMS award # P20GM10347, NSF-RIA award 1800732 and NSF-TIP award 1818528.

P3.22
COLORIMETRIC DETECTION OF OXALATE IN WATER BY INDICATOR DISPLACEMENT ASSAY AT NEUTRAL PH

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The field of anion recognition chemistry has raised attention over last few decades due to the pivotal roles played by anions in the biomedical science. The quantitative information of oxalate is widely used in medical science in identifying several diseases including hyperoxaluria, vulvodynia, and kidney stones, which are costly and tedious. Therefore, it is important to design suitable hosts for the selective recognition and sensing of oxalate in water at neutral pH. During this work, a polyamine macrocycle was synthesized by Schiff's base reaction between 2,2'-diamino-N-methyldiethylamine and thieno[2,3-b]thiophene-2,5 dicarboxaldehyde followed by diborane reduction. The synthesized macrocycle was converted to dinuclear copper(II) complex which was characterized by single crystal X-ray diffraction. The metal complex was used to detect oxalate by indicator displacement assay in water at neutral pH. Acknowledgments: The project described was supported by Grant Number W911NF-19-1-0006 from the US Department of Defense.

P3.23
DESIGN OF GARLIC BASED TWO PHOTON IMAGING NANOPROBES FOR TARGETED TRIPLE-NEGATIVE BREAST CANCERS IMAGING

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Triple-negative breast cancer (TNBC) is responsible for the death of

~ 40,000 women in 2017 in USA. Since TNBC lacks estrogen (ER) and progesterone (PR), as well as human epidermal growth factor receptor 2 (HER-2), it is the only breast cancer subgroup which is still lacking effective therapy in clinics. As a result, early stage detection of TNBC is vital and it will have huge significant in the society. For real life TNBC imaging, two-photon fluorescence (TPF) using near-infrared (NIR) light excitation need to be used for deeper penetration depth, better image contrast, and reduced phototoxicity and photobleaching. To facilitate the use of TPF imaging tools in clinics for TNBC, here we report the development of a water-soluble antibody-conjugated two photon imaging nanoprobe derived from naturally available garlic, which have capability to be used for targeted detection of TNBC via two photon imaging. Reported results show that garlic based two-photon photoluminescence probe can be used for targeted bioimaging of TNBC using light in the biological I and II transparency windows. Experimental data demonstrate that garlic based two photon imaging probe has capability of accurate identification of TNBC and it can separate TNBC from other common type breast cancer, such as HER-2 (+) or ER/PR (+) breast cancer cells. Our reported result shows that garlic based two photon imaging probe can be an excellent candidate for selective detection of TNBC in clinical environments.

P3.24
A COMPARATIVE STUDY OF URANIUM DETERMINATION WITH ICP-MS AND XRF SPECTROSCOPY FOR RAPID SCREENING OF HOTSPOTS

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Radioactive nuclides such as Uranium 238 exist in nature in trace amounts, but in large bioavailable concentrations they may be very toxic to living organisms. The United States utilize domestic firing ranges in several locations for training and research purposes, that lead to a buildup of Depleted Uranium (DU) which is isotope 238 of Uranium. To prevent exposure or secure areas contaminated with DU called hotspots, easy and rapid screening methods are needed. This study explores feasibility of X-ray fluorescence spectrometers (XRF) as a fast screening tool for hotspots in the fields. A XRF spectrometer was used to compare uranium concentration results in contaminated army soil and soil spiked with Uranium Dioxide, Uranyl Nitrate, and Uranium Trioxide to ICP-MS measurements after acid digestion of the samples. The XRF spectrometer measurements was optimized through sample preparation, time analysis and soil moisture content, as well as lab sample containers to demonstrate how these variables effect XRF measurements. Sample preparation did affect the uranium measurements with XRF at lab. A slight packing of the samples in the sample cups and sample occupancy of the sample cups did yield significantly higher measurements, but sample analysis time and moisture content did not.

P3.25
SYNTHESIS OF THERMALLY STABLE CHIRAL POLY(ESTER AMIDE)S FROM SUSTAINABLE RESOURCES

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This project seeks to develop alternative thermoplastics from a bio-based feedstock, which unlike petroleum is a sustainable resource. Hereof, we are exploring the combination of lignin-derived precursors with bio-based chiral substrates containing various side chains to synthesize a series of poly(amide ester)s via melt polycondensation with *p*-TsOH as a catalyst. The synthesized polymers exhibit moderate molecular weights and excellent thermal stability (Ton ranging from 320 to 350°C and Tg exceeding 300°C in

some cases). Furthermore, the thermal properties of the polymers can be controlled by varying the size of the alkyl substituent on the chiral substrate. Predictably, as a result of the low packing density, there is a decline in the thermal stability that coincides with the increased size of the side chains. We will discuss our results of the preparation (including the effect of the catalyst), characterization and thermal properties of our polymers in this presentation. Overall, our method utilizes affordable bio-based starting materials to design thermally stable poly (ester amide)s. Such polymers possess a variety of applications, such as in packaging, high strength composites, chiral resolution columns, and the like.

P3.26

2D CORRELATION IR ANALYSIS OF PROTEIN FRACTIONS IN VERNONIA AMYGDALINA

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Extraction, purification and characterization of natural products rely on chromatographic and spectroscopic techniques. However, discrete discrimination of structural behavior and pattern in complex samples of similar spectral fingerprints poses a difficult challenge. In this study, we have distinguished subtle molecular variations arising from perturbation- induced band position shifts in FPLC-purified protein fractions A, B, C and D in *Vernonia amygdalina* (VA) leaf extracts, utilizing FT-IR and Two-dimensional Correlation Infrared spectroscopic (2D-IR) analyses. 1D FT-IR analysis revealed amides A and B bands, and amides I, II and III vibrational modes consisting of α -helices, β -sheets and turns within the 2^o, 3^o and 4^o protein structures of VA extracts, confirming presence of proteins in the extracts. Further, analysis of synchronous and asynchronous 2D-IR correlation maps revealed auto peaks, and negative and positive cross peaks indicating that band intensity change of amine groups due to NH₂-deformation decreases while those due to phosphodiester (ν (P-OH)) and β -sheet Carbonyl (ν (C=O)) vibrations increases, with increase in temperature, and that intensity change in ν (P-OH) occurs prior to that of NH₂-deformation. This dynamical change suggests that complete formation of ν (P-OH) component occurs at a higher temperature range than that for the loss of NH₂-deformation.

P3.27

SYNTHESIS OF POLYPHENOXAZINE DERIVATIVES BY BUCHWALD/HARTWIG POLYAMINATION FOR CONDUCTIVE POLYMER AND BIOSENSOR APPLICATIONS

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The electrochemical and photophysical properties of Phgenoxazine will allow it to be used in biosensors technology. These properties are caused by the conjugation of electrons in the compound's fused ring system. Aside from its properties, this compound is also highly accessible since it can be found in diverse products like natural antibiotics, dyes, and anti- cancer agents. These properties of phenoxazine make it suitable for biosensor applications. Biosensors must be capable of transmitting chemical signals through optical or electrical activities. Our group has been interested in developing biosensors for a variety of analytes. In this study, we describe our efforts towards a selective biosensor capable of detecting low to trace concentration of hydrogen peroxide. Note that hydrogen peroxide is a compound found in minute quantities within the human body that is responsible for some of the bioprocesses involved in the redox signaling pathway. The phenoxazine-based polymer was synthesized as a step growth polymerization with p-phenylenediamine as the co-monomer via a Buchwald/Hartwig

reaction. The diamine co-monomer can be varied to allow for the fine tuning of polymer's optoelectrical properties and stability. We will describe our synthetic approach, characterization of the small molecules and polymer, and the optoelectrical properties of the polymer.

P3.28

THE SYNTHESIS OF SMALL SENSORY MOLECULES FOR BIOSENSING APPLICATIONS

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The concentration of certain analytes such as some metal ions, anions, pH, and reactive oxygen species play an important role in maintaining the metabolism processes in biological systems. Out of various techniques, fluorescence is one of the most highly used today for the detection and measurement of different analytes, due to low cost, high sensitivity and high spatiotemporal resolution. The xanthene-based dyes, fluorescein and rhodamine have unique structural and photophysical properties that allow them to act as chemosensors; thus, many chemosensors based on these molecules have been the focus for many years. Our group is focused on the synthesis of novel xanthene-based sensory molecules to use as pH probes. Our probes are based on modifying the xanthene core with a conjugated molecule; in order to investigate the effect on this moiety on the photoluminescence properties as well as the rate of the molecular switching mechanism. Here we are focusing on synthesis of the sensory molecules by modifying the spiroactam ring and xanthene core of fluorescein bis-triflate using Buchwald/Hartwig coupling and Suzuki coupling reaction conditions. In the reaction sequence, the spirocyclic ring is opened under acidic conditions and gives rise to a highly fluorescent form, while the neutral or basic were colorless. We will discuss our results of the preparation, characterization and properties of our small molecule in this presentation. Overall, this sensory model will be a better approach to analyze pH and selected analyte ions in a biological system.

P3.29

ALKALOID ANALYSIS IN A POST- CHACOAN CYLINDRICAL VESSEL FROM NORTHERN BLACK MESA, ARIZONA

Timothy Ward, Zahra Faizi, Anna Wilson, Andrew Hollenshead, Shivangi Patel, Josh Shearin, Josh Miller, Ramya Sarna

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A recently identified Tusayan Polychrome (A.D. 1125–1290) jar from northern Black Mesa, Arizona, represents the only known Post-Chacoan cylindrical vessel. Identified within a small late Pueblo II-early Pueblo III period habitation site, the jar circumstantially connects Ancestral Puebloan groups in the Kayenta area to Chaco Canyon and the Chacoan system. Biomarkers are compounds that can be used to determine the presence of specific drinks, food or other substances. In the case of archaeological artifacts, these biomarkers, when combined with relevant anthropological data, can provide insight into the culture, social interactions, and religious practices of civilizations. Samples of this jar were taken and residue analysis performed for possible beverages the jar may have contained. For example, Mesoamerican cultures utilized a variety of psychoactive plants such as peyote cactus, jimson weed, and tobacco in their religious practices. Since it is not known what specific plant was used, multiple biomarkers were examined.

P3.30
ANALYSIS OF CACAO RESIDUE ON CERAMIC SHERDS FROM THREE JORNADA MOGOLLON SITES IN SOUTHERN TULAROSA BASIN, NEW MEXICO

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The samples analyzed in this project were from El Paso phase Jornada Mogollon villages that contained melted adobe roomblock complexes and from a Doña Ana phase pithouse village. These villages are located in White Sands Missile Range and at White Sands National Monument in southern Tularosa Basin of south-central New Mexico. Since cacao is not grown in the Southwestern United States, cacao residue in these pottery sherds would indicate trade routes in this area. The procedures to extract the caffeine, theobromine, and theophylline included dremmeling and extracting the first and second layer. The samples were analyzed by liquid chromatography – mass spectrometry for theobromine, theophylline, and caffeine, known biomarkers for cacao. Blanks were analyzed in between each sample to confirm there was no carry-over or contamination between samples. Cacao is the only Mesoamerican plant that contains theobromine as the primary methyl xanthine and its presence and ratio compared to that of caffeine was used as biomarker for our analysis. Pottery samples analyzed contained varying amounts of theobromine to caffeine ratios.

P3.31
HIV-1 INTEGRASE MULTIMERIZATION BY QUINOLINE-BASED COMPOUNDS

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Human Immunodeficiency Virus (HIV-1) affects over 36 million people world-wide and is characterized by the progression of flu-like symptoms, making it difficult to diagnose in its early stages. Currently, a combination of several drug treatments are used to prevent progression of HIV by targeting multiple areas in its disease course from entry to maturation. However, the high probability of mutation of the virus, and thus resistance against current treatments, creates the urgency for finding new and effective therapeutic targets and designing complementary inhibitory molecules. Recent studies have shown the HIV-1 integrase enzyme as a promising target in suppressing the disease's ability to integrate its genetic material into the immune cells, which would essentially block HIV replication. Our research is focused on comparing the potency of quinoline based molecule derivatives on the multimerization of the HIV-1 integrase enzyme. Using a newly designed assay, the potency of these quinoline based compounds were examined for their integrase multimerization properties.

P3.32
SYNTHESIS OF HIV-1 INTEGRASE INHIBITORS CONTAINING A QUINOLINE SCAFFOLD

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The CDC claims that approximately 1.2 million people are currently affected by HIV in the United States. There are six steps in the HIV life cycle that are potential drug targets. The HIV-1 integrase enzyme is responsible for inserting viral RNA into the host cell DNA, allowing the healthy cells to replicate the viral DNA until eventual cell death. While only a few inhibitors have been developed for this enzyme, they have all targeted the active site of

the enzyme, and HIV has already begun to develop drug resistance. Our target instead is an allosteric site of the enzyme. This collaborative project describes the exploration of substitution along a quinoline scaffold to probe for HIV integrase inhibition. Within the quinoline scaffold, the 2-methyl and 3-acetic acid side chain must be retained for maximum inhibition. We undertook a study then of 4-position substitution, which probes a non-polar pocket, and substitution at the 5-, 6-, 7-, and 8-position, which also interact with amino acid side chains within the enzyme. This poster will describe our structure activity relationship studies at the 4-position and the new route used utilized to be able to address substitution at the other positions on the quinoline ring.

P3.33
MASKED ACYL CYANIDE ADDITION TO HETEROCYCLIC ALDEHYDES AS A METHOD TO ACCESS MANDELIC ACID DERIVATIVES

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The use of nucleophilic acylation reagents has become a method of high utility for delivery of acyl groups. One such method is the use of "masked" acyl anions as carbon monoxide equivalents. Specifically, masked acyl cyanides (MACs) have been developed and utilized for a variety of synthetic purposes including acylations to aromatic aldehydes, imines, and Michael additions. When TBS-protected MAC reagents are added to an aromatic aldehyde, the ensuing alkoxide can undergo a Brook rearrangement, transferring the TBS to the alkoxide and resulting in the formation of an unstable acyl cyanide, which can be captured by an alcohol solvent. The products that result are mandelic acid derivatives containing an alpha-silyloxy ester. We wish to extend this methodology to heteroaromatic aldehydes, providing an entry into the synthesis of chiral heterocyclic scaffolds.

P3.34
INHIBITION OF HIV-1 INTEGRASE WITH LEDGF

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Human immunodeficiency virus type 1 (HIV-1) attacks the body's immune system by targeting CD4 T cells. HIV-1 uses a viral enzyme called integrase (IN) that enables its genetic information to be integrated into the DNA of the host cell. Lens-epithelial-cell-derived growth factor (LEDGF) is an essential cellular cofactor of IN hijacked by the virus. The IN-LEDGF interaction tethers IN to chromatin and guarantee the proper integration site. The discovery of small drug-like molecules capable of modulating this interaction would create a new class of antiviral. The approach used in this research measures the in vitro potency of a library of quinoline based derivatives capable of disrupting this essential protein-protein interaction.

P3.35
SELECTIVE BINDING STUDIES OF ANIONS WITH A NITROPHENYL-BASED TRIPODAL THIOUREA

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A tris(3-thioureido-N'-(4-nitrophenyl)propyl)amine (L) was synthesized and assayed for its anion binding affinities by UV-Vis and ¹H NMR titrations in DMSO. Naked-eye detection studies exploited color change from yellow to dark red upon the addition of

fluoride exclusively. However, addition of sulfate to ligand:fluoride [LF] complex resulted in discoloration indicating selective anion displacement. Selective binding by L towards sulfate was further supported by a blue shift of [LF] in UV-Vis titrations and upfield shift of NH peaks in ^1H NMR titrations.

P3.36

ENTHALPIES OF FORMATION OF METHYL DERIVATIVES OF FURAN, PYRROLE, OXAZOLE, ISOXAZOLE, AND IMIDAZOLE BY HOMODESMOTIC REACTIONS

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Furan, pyrrole, oxazole, isoxazole, and imidazole are all examples of heterocyclic aromatic compounds. They and their derivatives have a variety of uses. 2,5-dimethyl-furan has been proposed as a possible biofuel; pyrrole is a component of both heme and chlorophyll; ibotenic acid, a derivative of isoxazole, is a powerful neurotoxin; and histidine is a derivative of imidazole. In the current study, we focus on the computation of the standard enthalpy of formation of methyl derivatives of these aromatic heterocycles by homodesmotic reactions. In homodesmotic reactions the number and types of bonds and the bonding environment of each atom are conserved. The enthalpy of all the reactants and products in each homodesmotic equation is computed using SCF theory, second-order perturbation theory (MP2), and density functional theory. The DFT functionals employed are Becke's three-parameter hybrid functional using the LYP correlation functional, the M06-2X high nonlocality hybrid functional from Thular and Zhao, and the ω B97XD functional from Head-Gordan and coworkers which includes empirical dispersion. The basis sets employed are Dunning and coworkers' correlation consistent basis sets, cc-pVDZ, cc-pVTZ, and cc-pVQZ. From the resulting enthalpy of reaction, the desired enthalpy of formation is determined by use of reference values for all other systems in the reaction. Thus, the calculation of atomization energies is avoided. We gratefully acknowledge support from the Mississippi College Catalysts, the alumni support group of the Department of Chemistry & Biochemistry.

P3.37

REGIOSELECTIVITY OF ACID-CATALYZED EPOXIDE RING-OPENING REACTIONS

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Epoxide opening reactions occur through two known mechanisms: base catalyzed, in which nucleophilic attack opens the ring, followed by a proton transfer to produce the substituted alcohol, and acid catalyzed, in which the oxirane oxygen is protonated via proton transfer, followed by nucleophilic attack to produce the substituted alcohol. There is little debate about base catalyzed reactions involving the least substituted carbon in the epoxide due to the lack of steric hindrance to nucleophilic attack. Two leading textbook authors, however, disagree about the regioselectivity involving acid catalyzed epoxide opening reaction when the carbons are primary and secondary. Joel Karty asserts that the more substituted carbon is attacked in the acid catalyzed mechanism and offers bond length data to augment his argument. David Klein, on the other hand, suggests that the less substituted carbon is attacked when the competing electrophiles are primary versus secondary due to "the steric effect predominating over the electronic effect." To investigate these dissenting opinions, we consider a series of asymmetric derivatives of oxirane. Specifically, the optimized

equilibrium geometries of 2-methyloxirane, 2,2-dimethyloxirane, 2,2,3-trimethyloxirane, 2-ethyloxirane, 2,2-diethyloxirane, 2,2,3-triethyloxirane, 2-tert-butyloxirane, and 2,2-di-tert-butyl-oxirane are computed using SCF theory, second-order perturbation theory, and density functional theory. The DFT functionals employed are B3LYP, M06-2X, and ω B97XD. The basis sets employed are Dunning and coworkers' correlation consistent basis sets, cc-pVDZ and cc-pVTZ. Bond lengths should be indicative of bond strength; thus, the different C-O bonds are compared in each optimized structure and each protonated optimized structure.

P3.38

SYNTHESIS OF HYBRID GRAPHENE OXIDE FOR TARGETED DRUG DELIVERY

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Graphene nanomaterials show great promise for use in targeted drug delivery and theranostic applications. The ability of these materials to interact with near-infrared light, biocompatibility, and affinity for absorbing molecules make them ideal for these applications. In this work, the efficacy of a series of functional graphene oxide nanoparticle hybrids are evaluated for use in targeted drug release systems. Nanomaterials conjugated with cancer-specific antibodies were characterized using dynamic light scattering, transmission electron microscopy, and UV-visible, FT-infrared, Raman, and fluorescence spectroscopy. Kinetic properties of drug release and nanoparticle degradation was evaluated spectroscopically.

P3.39

GRAPHENE OXIDE NANO-HYBRIDS FOR CANCER THERANOSTICS

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Early detection, diagnosis, and treatment are critical for survivability of cancer. This research evaluates the synthesis of a multifunctional graphene oxide-based nanomaterial and its efficacy for use in a colloidal assay for detection and destruction of multiple myeloma cells. Both graphene and gold family nanomaterials exhibit excellent biocompatibility with demonstrated application in optical sensing and photothermal therapy. In this research, graphene oxide colloids were synthesized and hybridized with gold nanoparticles. The hybrids were then functionalized with antibodies for multiple myeloma cells. These hybrid systems were characterized using dynamic light scattering, transmission electron microscopy, UV-Visible, FT-IR, Raman, and fluorescence spectroscopy. The systems were evaluated for selective binding and destruction of multiple myeloma cells.

P3.40

OPTIMIZATION OF COLLOIDAL GOLD NANOPARTICLE ASSAYS FOR SKBR3 BREAST CANCER THERANOSTICS

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In this research, we demonstrate the preparation and optimization of a bioconjugated spherical gold nanoparticle assay for breast cancer detection. The study investigated the optimal conditions for preparation of stable, monodisperse spherical gold nanostructures. The nanomaterials were synthesized using the standard citrate reduction method by varying the ratio of gold chloride to sodium citrate, temperature, and aging conditions. Kinetics studies were performed to evaluate the progression of nanoparticle formation and stabilization. After an optimized preparation protocol was

established, conditions were refined for concentration of the nanoparticles for maximum assay sensitivity. The concentrated colloids were conjugated with SKBR3 breast cancer antibodies and evaluated for detection and photothermal destruction of the SKBR3 cancer cells.

P3.41

VERSATILE AZOHETEROARENE MOLECULAR PHOTOSWITCHES-- GOVERNING SITE-SELECTIVITY IN SYNTHESIS AND INCORPORATION IN NOVEL ORGANIC PHOTOVOLTAIC AND BIOMATERIALS

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The recently studied photochromism of azoheteroarenes, where one substituent attached to the azo moiety is a five-membered heterocycle ring, has revealed unique and advantageous photochemical and physical properties. The unique "T-shape" excited conformer of azoheteroarenes has afforded unprecedented opportunities in governing site-selectivity for C-H functionalization. A photoinduced "C-shaped" template is currently employed for functionalization at remote arene C-H bonds. These attractive attributes are exploited elsewhere in the preparation of biocompatible, photo-triggered drug delivery systems and in the creation of novel polymeric band-gap materials for organic photovoltaic materials.

P3.42

THE EFFECTS OF COMONOMER DISTRIBUTION ON THE RING CLOSURE OF POLYACRYLONITRILE CARBON FIBER PRECURSORS VIA RAFT

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While polyacrylonitrile (PAN) based carbon fiber is highly utilized in high performance composite materials, there is a reduction in fiber tensile modulus due to morphological defects that develop during precursor synthesis and fiber processing. In an effort to understand how to reduce morphological defects, precursor synthesis was controlled by co-monomer choice and placement via Reversible Addition Fragmentation Chain Transfer (RAFT) and compared to traditional uncontrolled free radical polymerization methods. Four well defined PAN copolymers were afforded with all precursors were structurally characterized through Nuclear Magnetic Resonance and Gel Permeation Chromatography, then thermally investigated with Fourier Transform Infrared Spectroscopy, Thermogravimetric Analysis Mass Spectrometry, and Differential Scanning Calorimetry. It is hypothesized that through controlled co-monomer placement via RAFT an increase in cyclization leads to a decrease in fiber defects. This research will improve our understanding of co-monomer placement on thermal ring closure during cyclization processing conditions for the next generation of improved carbon fibers.

P3.43

ENANTIOSELECTIVE SYNTHESIS OF PIPERIDINE DERIVATIVES THROUGH AN ENYNE METATHESIS

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University of Southern Mississippi, Hattiesburg, MS, USA

The goal of this project is to investigate the utility of chiral non-racemic amines to access novel highly substituted nitrogen heterocycles. To accomplish this goal, we have proposed a five-step method to generate the desired piperidine derivatives. The first step begins with an aldehyde that is treated with tert-butanefulfonamide in refluxing triisopropyl borate to undergo a condensation reaction

and form an N-sulfinylimine. The next step of the reaction involves allylating the N-sulfinylimines with allylbromide and stoichiometric indium metal powder to produce homoallylic amines. The N-sulfinyl group was oxidized to the sulfonamide with mCPBA. This was carried out to increase the acidity of the N-H bond so that a weaker inorganic base could be used. The rationale for this was to avoid expensive organic bases that are pyrophoric. The sulfonamide was alkylated with propargyl bromide in acetone with cesium carbonate. The resulting substrates are now primed for the key transformation involving a transition metal catalyzed alkyne-alkene metathesis. My hypothesis is that the piperidine ring can be constructed in a stereoselective manner through the relay of the C2 stereogenic carbon. To that end, treatment with the ruthenium catalyst, known as Grubbs catalyst, in refluxing toluene was carried out to metathesize the compound. In this process, a carbon-carbon double bond is formed between Cb and Cg. Concomitantly, Ca is metathesized to Ch, forming a carbon-carbon double bond. This ultimately results in the formation of a substrate with a conjugated diene that is the required functional for the next key transformation.

P3.44

INVESTIGATION OF QUINOLINE-BASED NOPYL ANALOGUES AS GROWTH INHIBITORS OF DRUG-RESISTANT *PLASMODIUM FALCIPARUM*

Rogers J. Nyamwihura, Huaisheng Zhang, Ifedayo Victor Ogungbe

Jackson State University, Jackson, MS, USA

Drug resistant-*Plasmodium falciparum* remains a serious problem in many tropical and sub-tropical countries despite the push to effectively control and eradicate malaria in those countries. Clinical use of several generations of quinoline-based antimalarials such as quinine, chloroquine and mefloquine as well as artemisinin- and pyrimethamine-based compounds have suffered varying degrees of limitations largely because of drug resistance. Such resistance has resulted in suboptimal clinical outcomes. In this work, a new generation of quinoline-based natural product hybrids are being investigated as antiplasmodial agents. While retaining some structural scaffold found in quinine, the new natural products hybrids have structural motifs that could potentially circumvent currently known drug resistance mechanisms peculiar to quinolines. Also, the flexible aliphatic amine chain in chloroquine-based compounds was replaced with a more rigid lipophilic dimethylbicycloheptenyl ring. The ring allows some synthetic modification that includes the formation of epoxides, vicinal diols, and aziridines. Calculated adsorption and metabolism chemical descriptors were used to guide the modifications. The synthetic transformations include oxidation, amidation, peroxidation, esterification, and N-H aziridation reactions. The compounds have been evaluated against 3D7, K1, and NF54 strains of *P. falciparum*. One of the compounds displayed nanomolar potency against multidrug resistant *P. falciparum*. More compounds are being synthesized. Compounds that are selective and potent against drug resistant-strains will be advanced to in vivo antimalarial studies.

P3.45

DIVERGENT STRATEGIES FOR MODULATING THE DIVERGENT GLASS TRANSITION TEMPERATURES OF PERFLUOROCYCLOHEXYL ARYL ETHER (PFCH) POLYMERS

Ganesh Narayanan^{1,2}, Behzad Farajidizaji^{1,2}, Ketki Shelar^{1,2}, Karl Mukeba^{1,2}, Andrzej Sygula^{1,2}, Charles U. Pittman, Jr.^{1,2}, Dennis W. Smith, Jr.^{1,2}

¹ Mississippi State University, Starkville, MS, USA

² Martin B. Dow Advanced Composites Institute, Starkville, MS, USA

Perfluorocyclo aryl ether homo and copolymers were obtained by step-growth condensation polymerization of bisphenols containing aromatic cores with decafluorocyclohexene at 80 °C in dimethyl formamide under basic conditions. Acenaphthenequinone (or phenanthrenequinone)-based bisphenols were synthesized by reacting with excess phenol under acidic conditions affording four monomers: M1, M2, M3, and M4 (Scheme 1) with polycyclic aromatic cores (PAH). The chemical structures of the M1, M2, M3, and M4 were validated by Fourier transform infrared spectroscopy (FTIR), single-crystal X-ray diffraction, high-resolution mass spectrometry (HR-MS), and nuclear magnetic resonance spectroscopy (NMR) analyses. The physico-chemical and thermal properties of the as-synthesized PFCH polymers were evaluated by FTIR, NMR, gel permeation chromatography (GPC), and differential scanning calorimetry (DSC) and thermogravimetric analyses (TGA), respectively. DSC analyses of PFCH polymers showed significant variations in the glass transition temperatures (T_g) ranging from 170 – 240 °C, which were dependent on the PAH type and the type of substitution on the PAHs. As a comparison, homopolymer of DFCH with commercial bisphenol (bisphenol-A) was synthesized, which showed low T_g (100 °C). Unlike T_g s, no variations in the thermal stabilities among were observed among the PFCH polymers bearing PAH moieties. The onset of decomposition onset (T_d 5%) was observed at 340-350 and 350-360 °C in air and nitrogen atmospheres, respectively. By this work, we highlight development of PFCH polymers containing enchaind PFCH olefin and PAH moieties for application in optics and opto-electronics, where high thermal stabilities and high T_g s are desired.

P3.46

EXPLORING TRANSITION METAL COMPLEXES FOR SELECTIVE RECOGNITION OF BIOLOGICALLY RELEVANT ANIONS

Md. Alamgir Hossain, Md Mhahabubur Rhaman

Department of Chemistry, Physics and Atmospheric Sciences, Jackson State University, Jackson, MS 39217

Selective recognition of biologically relevant anions with synthetic receptors is an important aspect in supramolecular chemistry. Although, there are numerous synthetic hosts that are capable of binding transition metal, examples of water-soluble synthetic receptors for selective binding of biologically important anions are still limited. This presentation will highlight dinuclear metal(II) complexes showing selective binding of a variety of biologically relevant anions in water under neutral conditions. Acknowledgments: The project described was supported by Grant Number W911NF-19-1-0006 from the US Department of Defense.

P3.47

SYNTHESIS OF N,N'-DIALKYL-3,6-DIMETHYL-2,5-DIHYDROPYRROLOPYRROLE (DPP-DM): A NEW DPP SCAFFOLD FOR THE FORMATION OF VINYL-FLANKED DPP COMPOUNDS

Daijun Feng¹, Colleen Scott¹, George Barton²

¹Mississippi State University, Starkville, MS, USA

²Parkland College, Champaign, IL, USA

The unique optoelectrical properties and good thermo- and photo-stability of diketopyrrolopyrrole (DPP)-based compounds have resulted in their extensive utilization in organic semi-conductive materials. Several scientific hundred reports on organic field effect transistors (OFETs), organic photovoltaics (OPVs), organic light emitting diodes (OLEDs), and dye-sensitized solar cells (DSSC) are being published annually. Dimethyl-2, 5- dihydropyrrolopyrrole (DMDPP) is a new DPP scaffold with two flanked methyl groups

that can't be reached through the conventional synthetic route. Due to the electron-deficient nature of DPP, H atoms at the DPP-flanked methyl groups are granted with remarkable acidity, which make the methyl group reactive. One example of functionalizing the methyl group of DMDPP is the installation of vinyl groups to flank the DPP ring, which extends the pi-conjugated system. This functionalization can be achieved through a transition-metal-free C-H approach in contrast with the ubiquitous transition-metal coupling ways. We have developed the first efficient synthetic route to DMDPP with proven scalability.

P3.48

BINDING STUDIES OF CARBOXYLATE ANIONS WITH A MACROCYCLE-BASED DINUCLEAR RECEPTOR AND CYTOTOXICITY ASSESSMENT

Mohammad H. Hasan, Md Mhahabubur Rhaman,

University of Mississippi Medical Center, Jackson, MS and Jackson State University, Jackson, MS

A macrocycle-based dinuclear receptor has been synthesized and studied for carboxylate anions by spectroscopic techniques in water at neutral pH. Results from fluorescence titration studies show that the receptor selectively binds citrate anions over a range of carboxylate anions, exhibiting the binding order: citrate > oxalate > glutamate > adipate > tartrate > acetate > benzoate. The biocompatibility of the receptor as an intracellular carrier in a biological system has been evaluated on primary human foreskin fibroblasts (HF) cells, showing an excellent cell viability. Acknowledgment: The project described was supported by US Department of Defense (Grant Number W911NF-19-1-0006). M.H.H. and R.T. are supported by American Heart Association (Award No. 14SDG20390009).

Friday, February 22, 2019

MORNING

Room TC 218A

9:00 – 9:45

Oral Presentations, Session 5

Session Chair: Dr. Jacques Kessl

O3.20

9:00 DEVELOPMENT OF A SYNTHETIC ROUTE FOR QUINOLINE BASED DRUG TARGETS FOR HIV-1 INTEGRASE INHIBITION

Jared D. Hume, Nicholas G. Jentsch, Alison P. Hart, Jian Sun, Julie A. Pigza, Jacques J. Kessl, Matthew G. Donahue

University of Southern Mississippi, Hattiesburg, MS, USA

Human immunodeficiency virus (HIV) has a high rate of mutation which results in drug resistance. HIV integrase is key enzyme in the life cycle of the virus, yet there are currently only three food and drug administration (FDA) approved medicines that target this stage. These inhibitors all act at the catalytic site and the enzyme has already developed resistance to two of the drugs. Recent developments have shown that quinoline based inhibitors bind at an allosteric pocket of the enzyme and block integrase activity. A synthetic endeavor was undertaken with a focus on derivatization of the 4-, 6-, and 7-positions of the quinoline ring as these positions most effectively interact with amino acid residues in the active site pocket. Two routes were developed that addressed installation of the challenging 3-position *tert*-butoxyacetic acid side chain. The first route involved metalation of a 3-bromoquinoline substrate and a quench with ethylchlorooxacetate. A second route introduced the

side chain at the appropriate oxidation state by a direct addition to an existing aldehyde using either a masked acyl cyanide addition. The initial route was developed to examine the 4-position derivatization, while the latter route was developed to address competing metalation of the 3-position bromine in the presence of the 6- and 7-position halogens. Derivatization of the 4-, 6-, and 7-positions of the quinoline ring system are then achieved in later stages of the synthesis by a palladium-catalyzed Suzuki coupling reaction for structure activity relationship (SAR) studies.

O3.21

9:15 INVESTIGATION OF NOVEL BENZIMIDAZOLE DERIVATIVES AS ANTITRYPANOSOMAL AGENTS

Jasmine T. Collins, Huaisheng Zhang, Kinta Morris, Ifedayo Victor Ogungbe

Jackson State University, Jackson, MS, USA

Neglected tropical diseases (NTDs) impact more than one billion people living in tropical and sub-tropical regions. NTDs are a diverse group of infectious diseases that are generally transmitted by insect vectors. The control and elimination of these diseases remain a challenge. The drugs available to treat the diseases and mostly ineffective. One of such diseases is the human African trypanosomiasis (HAT). HAT is endemic to sub-Saharan Africa. It is caused by the kinetoplastid protozoan *Trypanosoma brucei*. The goal of this project is to synthesize and evaluate analogues of a benzimidazole-based compound, MMV7703, as antitrypanosomal agents. The compounds were obtained via oxidative coupling of *o*-phenylenediamines and aldehydes, zinc/iron-catalyzed reduction reactions, and acid chlorides-enabled amidation reactions. The results show that several nitroaromatic analogues have superior or similar potency as MMV7703. In addition, amide-based analogues seem to be the most selective and drug-like antitrypanosomal agents. In conclusion, the active compounds can serve as drug leads for HAT.

O3.22

9:30 MECHANISM-BASED INHIBITORS OF VENEZUELAN EQUINE ENCEPHALITIS VIRUS

Huaisheng Zhang¹, Caitlin Richmond², Ifedayo Victor Ogungbe¹

¹Jackson State University, Jackson, MS, USA

²Tougaloo College, Tougaloo, MS, USA

Venezuelan equine encephalitis virus (VEEV) is a highly aerial infectious "New World" alphavirus of the Togoviridae family. The virus can be transmitted via mosquitos to birds, horses, rodents and can cause severe encephalitis in humans. The virus is not only neuroinvasive but neurotropic; it replicates in the brain and lymphoid tissue. VEEV possess a nonstructural protein 2 (nsP2) cysteine protease that is vital to viral replication and is associated with the cytopathic effect (CPE) of the virus. Due to its role in the virus's ability to replicate, it is a potential target for drug development and clinical intervention. The goal of this project is to investigate potential inhibitors of nsP2 as VEEV inhibitors. A library of acrylate and vinyl sulfone-based drug-like fragments was designed, synthesized and evaluated against the virus in a phenotypic screen. A couple of active and selective fragments were identified and we hypothesized that the molecular mechanism of the compounds is via inhibition of nsP2. The mechanism of action of the compounds was subsequently verified using recombinant VEEV nsp2. Structural analogues of the hit compounds are being investigated as leads compound for the treatment of infections caused by VEEV.

9:45

Break

9:30 High School Poster Session

*held with Health Sciences

P3.49

DNA INTERACTIONS OF BIFUNCTIONAL HETEROAROMATIC SALTS

Kelvin D. Gardner¹, Lakedra J. Gatlin¹, Wolfgang H. Kramer²

¹Provine High School, Jackson, MS, USA

²Millsaps College, Jackson, MS, USA

N-Substituted heteroaromatic salts are photoactivatable compounds that are investigated for their impact on DNA. The compounds contain a DNA binding moiety which consists of the intercalator 1,8-naphthalimide. The separate DNA cleaving part can be activated by light and is producing two transient, reactive species: a heteroaromatic radical cation and an oxygen centered radical. Both of those species can damage DNA, each by a separate mechanism. To effectively cleave DNA, sufficient ground-state association is desired. DNA binding is measured by spectroscopic titrations (UV/Vis, fluorescence and CD). To determine DNA cleavage, gel electrophoresis is employed for analysis of cleavage fragments of pUC DNA. Supercoiled pUC migrates fastest. Double-strand cleavage produces linear DNA of that size which migrates slower. Single strand cleavage will relax the supercoils and produces circular DNA which migrates even slower. Time and concentration studies are performed to determine cleavage type. Addition of quenchers assists in the elucidation of the cleaving mechanism. Acknowledgement: This work was supported by the Mississippi INBRE, funded by an Institutional Development Award (IDeA) from the National Institute of General Medical Sciences of the National Institutes of Health under grant number P20GM103476.

P3.48

BREAST CANCER CELL IMAGING WITH RED EMISSIVE CARBON DOTS

Saadman Alamgir¹, Salma Begum², Avijit Pramanik², Paresh Chandra Ray²

¹Madison Central High School, Madison, MS, USA

²Jackson State University, Jackson, MS, USA

Cancer is the second leading cause of death worldwide and was responsible for 8.8 million deaths in 2015 globally. In particular, breast cancer is the most common cause of cancer death among US women. According to U. S. Breast Cancer Statistics, about 1 in 8 U.S. women (about 12%) will develop invasive breast cancer over the course of her lifetime. In 2017, there was an estimated 252,710 new cases of invasive breast cancer, 63,410 new cases of breast carcinoma in situ, and 40,610 breast cancer deaths. Therefore, it is important to detect breast cancer at an early stage to increase the chances for successful treatment. Recently, carbon-based fluorescent nanomaterials, such as carbon dots (CDs), have attracted much attention because of their unique optical properties and low to non-toxic features. Alternatively, this new class of nanomaterials is considered to be a potential substitute to semiconductor Quantum Dots (QDs). The aim of this study was to detect the cancer cells and image them with red emissive carbon dots, synthesized from 1, 4-phenylenediamine. We picked this organic dye because this is cost effective and easy to handle. Moreover, in this experiment we have studied the binding mechanism of different drugs such as neurotransmitters and anticancer etc., to find the multiple interactions and selectivity using the fluorescence technique. We used several spectroscopic and imaging tools such as UV-vis, Fluorescence, FTIR, TEM, for characterization and studied the compositions of these compounds and used them for cell imaging of breast cancer cells SK- BR-3.

Room TCC 218A

10:00 – 11:00 **Session 6 *concurrent with Session 7**
Session Chair: Dr. Yongfeng Zhao

O3.23
10:00 ANTIMICROBIAL-PEPTIDE CONJUGATED MoS₂ BASED NANOPLATFORM FOR MULTIMODAL SYNERGISTIC INACTIVATION OF SUPERBUGS

Salma Begum, Avijit Pramanik, Kaelin Gates, Ye Gao, Paresh Chandra Ray

Jackson State University, Jackson, MS, USA

Development of new antibacterial therapeutics material is becoming increasingly urgent due to the rapid emergence of antibiotic-resistant superbugs which are responsible for more than half million death each year in this world. Driven by the need, current article reports the development of novel nano-biomaterial based on melittin antimicrobial peptide (AMP) attached transition metal dichalcogenide MoS₂ based nanoplatform for targeted identification and synergistic inactivation 100% multidrug-resistant superbugs by combined photo thermal therapy (PTT), photo dynamic therapy (PDT) and AMP process. A facile design approach for synthesis and characterization of melittin antimicrobial peptide attached MoS₂ based nanoplatform is reported, which emits very bright and photo stable fluorescence. It also generates heat as well as reactive oxygen species (ROS) in the presence of 670 nm NIR light, which allow it to be used as PTT & PDT agent. Due to the presence of AMP, multifunctional AMP exhibits significantly improved antibacterial activity for superbugs via multimodal synergistic killing mechanism. Reported data demonstrate that nanoplatforms are capable of identification of multidrug-resistant superbugs via luminescence imaging. Experimental results show that it is possible to kill only ~45% of superbugs via MoS₂ nanoplatform based on PTT & PDT processes together. On the other hand, killing of about 20% of superbugs is possible using melittin antimicrobial peptide alone. Whereas, 100% of carbapenem-resistant (CRE) *Escherichia coli*, β -lactamase (ESBL) producing *Klebsiella pneumoniae* (KPN) and Methicillin-resistant *Staphylococcus aureus* (MRSA) can be killed using antimicrobial peptide attached MoS₂ QDs, via synergistic killing mechanism.

O3.24
10:15 COPPER DOPED IRON OXIDE NANOPARTICLES FOR POTENTIAL DUAL MODALITY MRI/PET IMAGING

Terriona Cowan, Pohlee Cheah, Yongfeng Zhao

Jackson State University, Jackson, MS, USA

Falling under the ranks of heart disease, cancer is the United States second leading cause of massive mortality. To better treat the disease, it is key to diagnose the malignant disease at an earlier stage. Among all imaging modalities, magnetic resonance imaging (MRI) has been widely used in clinics. MRI can produce images with extraordinarily high temporal and spatial resolution, especially in soft tissue. It has been demonstrated that magnetic iron oxide nanoparticles are able to effectively enhance the contrast between normal and pathological tissues. However the sensitivity of MRI is relatively low. Positron emission tomography (PET), on the other hand, uses signaling produced by positron emitting radiotracers to attain an image. Because of very high sensitivity, up to 10-12 mol/L, PET is widely used in clinics for disease diagnosis. Although used frequently, PET usually gives low resolution. Therefore the combination of MRI and PET will give synergy of high anatomical spatial resolution of MRI as well as incomparable sensitivity and functional imaging of PET. Although significant progress has been

made to label iron oxide NPs for dual modality for PET/MRI imaging, the current probes are either unstable, polydisperse in size, irregular in shape, or have uncontrollable iron oxide surface chemistry. To address this problem, we developed a stable dual modalities magnetic NPs by incorporating copper ion into the core of the magnetic NPs with tunable size and surface coating reagents. We will further demonstrate that the nanoparticle can be used for PET-MRI dual-modality imaging after doped with radioactive copper.

O3.25
10:30 A SYNERGISTIC APPROACH TOWARDS UNDERSTANDING THE MECHANISTIC BEHAVIOR FOR SEQUESTRATION AND ERADICATION OF SUPERBUGS USING MULTI-FUNCTIONALIZED NANOPLATFORMS

Avijit Pramanik, Kaelin Gates, Ye Gao, Salma Begum, Paresh Chandra Ray

Jackson State University, Jackson, MS, USA

Despite numerous superior disinfection/advanced sterilization methods being available in modern clinical settings to control the deadly superbugs infections, the sensitive detection, early in vivo diagnosis and complete removal of superbugs infections are still the major challenges. Functional carbon-based materials such as, graphene oxide, oxidized carbon nanotube and carbon dots have become rising stars with high interest in the scientific community due to their unprecedented tunable properties such as high mechanical strength, excellent photostability, biocompatibility, highly tunable photoluminescence (PL), exceptional multiphoton excitation, ease to be conjugated with biomolecules, chemical inertness, cost effectiveness and their ability to serve as effective carriers for drug delivery. For example, Graphene oxide based ultrathin porous membranes exhibit exceptional molecular permeation properties which have many applications in water purification by the disinfection of pathogen bacteria, specifically methicillin-resistant *Staphylococcus aureus* (MRSA) and multidrug resistant superbugs. Aptamer-modified two-dimensional graphene oxide nano-sheets can be used for multicolor targeted bio-imaging of antibiotics resistant bacteria (MRDB) in the first and the second biological transparency windows. Three dimensional (3D) porous membrane produced by attaching nisin (polycyclic antibacterial peptide) identify, effectively separate, and completely disinfect MRSA pathogens from contaminated water. A number of multi-functionalized nanoplatforms were synthesized for the selective detection as well as rapid and effective killing (~100%) of the multi-drug resistant superbugs within a few minutes. We will discuss the detailed mechanism insight the sequestration and eradication process and how to tune the limit of sensitivity as well as effectiveness. This material would be great promise for use in clinical settings.

O3.26
10:45 EXCITED STATE PROTON TRANSFER AND FLUORESCENCE ANISOTROPY AS TOOLS TO STUDY THE MECHANISM OF GRAPHENE OXIDE FOR DRUG TRANSPORT

Bidisha Sengupta

Tougaloo College, Tougaloo, MS, USA

We have studied the selectivity of graphene oxide (GO) to recognize its ligands (e.g. flavonoids) and facilitate the binding with their respective cellular targets. Despite the vast medicinal importance of plant flavonoids, their bioavailability is low. In this exploratory study, GO has been used as the transporter of three flavonols: fisetin(3, 7, 3', 4'-OH flavone), quercetin (3, 5, 7, 3', 4'-OH flavone),

and morin (3, 5, 7, 2', 4'-OH flavone) for the physiological target DNA. Calf thymus DNA is chosen as the model physiological target. Characterization of GO is performed using FTIR, Raman and dynamic light scattering (DLS) spectroscopy. The strong absorption peak at 1730 cm^{-1} indicated the presence of carbonyl groups (C=O) of carboxylic acid and carbonyl groups present at the edges of GO. The presence of sp^3 carbons due to oxidation of sp^2 carbons in GO is further proved by Raman spectroscopy. DLS provided the average size of the GO particles to be $\sim 9\ \mu\text{m}$. The dual luminescence behavior of the flavonols has been used in this study for noninvasive sensing of the GO-flavonol and GO-flavonol-DNA interactions and the selectivity of GO for one flavonol over other. Furthermore, circular dichroism (CD) indicated that the optical activity of GO undergoes drastic change when conjugated with flavonols. Molecular modeling corroborated the findings from fluorescence studies. GO provides high promise as facilitators for drug delivery. Acknowledgement: This research was supported by MS-INBRE award P20GM103476, NSF-RIA award 1800732 and TIP award 1818528.

Room TCC 218B

10:00 – 11:00 **Session 7 *concurrent with Session 6**
Session Chair: Dr. Bidisha Sengupta

O3.27

10:00 SYNTHESIS OF A WATER SOLUBLE SEMICONDUCTING POLYRHODAMINE: TOWARDS AN AMINE VAPOR SENSOR

Ranganath Wahalathantrige Don, Colleen Scott

Mississippi State University, Starkville, MS, USA

In the past years, conjugated polymers (CP) have caught the attention due to their superior electronic, thermal, and optical properties. The tunability of optical and electronic properties, by changing the monomers, make them great candidates in Organic Light-Emitting Diodes (OLEDs), Organic Field Effect Transistors (OFETs), sensors, photovoltaic devices, and power storing devices. Among the other applications, CPs can be used as sensors in detecting toxic metal ions and anions, explosives, enzyme activity, DNA, biomolecules, etc. Conjugated polymer molecular wire sensors (CPMWS) are a special class of polymer sensors that have an extreme sensitivity compared to small molecule molecular sensors. This enhanced sensitivity of CPMWS is due to an electronic communication along the polymer backbone. We report the synthetic route, chemical stability, sensory properties and redox properties of a novel water soluble semiconducting polymer, polyrhodamine (PRho). A Buchwald/Hartwig cross-coupling reaction was used to co-polymerize fluorescein ditriflate and *p*-phenylenediamine. According to the UV-visible spectroscopic studies, the material showed very good chemical stability towards extremely acidic and basic conditions. Furthermore, under acidic conditions, the wavelength of the maximum absorbance ($\text{abs } \lambda_{\text{max}}$) of the diluted polymer solution was blue shifted from 549 nm to 526 nm when it was exposed to hydrazine (N_2H_4). When doped with polyprotic acids such as polystyrene sulfonic acid, *p*-phenylene sulfonic acid and sulfuric acid, the material acted as an electrical semiconductor, and the cyclic voltammetry studies showed good redox stability with reversible redox potentials. The results obtained indicate that this polymer could be a potential amine vapor sensor.

O3.28

10:15 DEGRADABLE THIOL-ENE THERMOSETS: INCORPORATING HYDROLYSABLE CROSSLINKS TO ACHIEVE TUNABLE NETWORK DISSOLUTION IN AQUEOUS SOLUTIONS AT LOW PH

Benjamin Alameda¹, Catherine Sarantes¹, Nicholas Pierini², Derek L. Patton¹

University of Southern Mississippi, Hattiesburg, MS, USA

California Polytechnic State University, San Luis Obispo, CA, USA

In recent years interest in degradable polymers has risen greatly due to the concerns of plastic waste in the environment and has inspired our investigation into degradable thiol-ene materials. Fully degradable thiol-ene thermosets were synthesized using hydrolysable monomers in combination with a multifunctional thiol and photoinitiator. A library of different acetal-based monomers was synthesized using a simple acetalization reaction between various carbonyl containing compounds and alkene functionalized glycols. All samples were easily cured after only seconds of exposure to UV light. The network degradation rates in acidic solutions were found to be highly tunable based on the acetal stability of each monomer. Mass loss vs. time was determined gravimetrically for all thermoset compositions. For each composition, samples were removed from their solution at specific degradation times, lyophilized and weighed. Time-lapse images were also produced via optical microscopy to observe the visual differences in degradation between samples. Dynamic mechanical analysis was used to find the glass transition temperatures and mechanical properties, while degradation temperatures for all thermoset compositions were found using thermogravimetric analysis.

O3.29

10:30 IMPROVED EFFICIENCY AND STABILITY OF PEROVSKITE SOLAR CELLS BY STRUCTURE ENGINEERING

Qilin Dai

Jackson State University, Jackson, MS, USA

Solar cells are believed to be a kind of very promising candidate to replace fossil energy to solve the energy crisis problem because solar energy is renewable, free, clean energy. Currently, Perovskite solar cells (PSCs) dominate solar cell research due to their high efficiency, which is reported to achieve an efficiency of $\sim 23\%$. However, it is still challenging to obtain PSCs with high efficiency and high stability for outdoor applications due to the decomposition of perovskite material under moisture, UV light and thermal conditions. In our work, we used structure engineering including interface layer manipulation and nanoparticle incorporation to improve the stability and efficiency of PSCs. Moisture stability of the devices were improved by hydrophobic layer introduced into PSCs. UV light stability was enhanced by light converter, which can convert UV light into visible light. The converted visible light can be absorbed by the perovskite layer to contribute to the photocurrent of the devices. Therefore, both the efficiency and the UV light stability are improved by the UV light converter. Thermal stability of the devices was enhanced by bismuth doping into perovskite film, leading to better crystallinity, uniform morphology, less grain boundaries, and larger grain sizes, which benefited the PSC device performance. To increase the light harvesting, Metallic nanostructures are also introduced into devices to increase the optical path length of the incident light leading to improved light harvesting and increased device efficiency.

O3.30

10:45 MACROSCOPIC CONJUGATED POLYMER FIBERS ASSEMBLED UNDER ELECTRIC FIELD

Song Guo

University of Southern Mississippi, Hattiesburg, MS, USA

Ordered structures of conjugated polymers have been shown to possess superior properties compared with their disordered or amorphous forms. For example, our group have reported that in

toluene or similar marginal solvents, P3HT (poly(3-hexylthiophene-2,5-diyl)) aggregate into nanowhiskers with length of several μm and width of ~ 30 nm. However, due to conjugated polymers' intrinsic flexibility and tendency to entangle with each other, it remains challenging to assemble them into macroscopic ordered structures. Here we report that by employing the P3HT nanowhiskers as building blocks, macroscopic P3HT fibers (lengths > 6 cm) can be formed under external DC electric field. Further studies show that this assembly is highly dependent on the aspect ratio of the building blocks, the electric field strength, and the solvent polarity. The electric-field assembled macroscopic fibers maintain its morphological form and crystallinity after the electric field is turned off. This work provides a general hierarchical method to potentially align and assemble other soft matters into large scale ordered structures.

11:00 Break

Room TCC 218A

11:15 CHEMISTRY GRADUATE SCHOOL IN THE STATE OF MISSISSIPPI: PERSPECTIVES AND PATHWAYS TO SUCCESS

Moderator: Dr. Colleen Scott



Dr. Joseph Emerson is Associate Professor of Chemistry at Mississippi State University. He serves as the coordinator of the chemistry graduate program in his department. Dr. Emerson is a bioinorganic chemist. Some of his research interest include substrate and cofactor cooperativity in nonheme proteins, conformational stability changes in proteins induced by metal ion(s) coordination, metal ion transcription factors and N atom transfer

reactions.



Dr. Dalephine Davis serves as the Associate Director of Graduate Studies in the Department of Chemistry, Physics and Atmospheric Science at Jackson State University. Her current portfolio includes managing admission processes, advising students, monitoring students' progress towards graduation, and coordinating community outreach and recruitment activities. Dr. Davis is an organic chemist.



Dr. Song Guo is an Assistant Professor of Chemistry in the Department of Chemistry and Biochemistry at the University of Southern Mississippi. Dr. Guo is a member of the graduate committee in his department. His research focus is on studying nanomaterials and organic materials at the molecular level. His current project is focused on determining how domain/aggregate morphology, molecular packing, and the conformational structures of organic/polymer molecules influences the performance of organic electronic devices.

12:00 – 12:05 Business Meeting

12:05 – 12:30 Awards Ceremony, Sponsor Acknowledgments, Group Picture

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ECOLOGY AND EVOLUTIONARY BIOLOGY

Chair: Mac Alford

University of Southern Mississippi

Vice-Chair: Nina Baghai Riding

Delta State University

Thursday, February 21, 2019

EVENING

**3:30 Dodgen Lecture and Awards Ceremony TCC Theatre
General Poster Session**

**Immediately Following Dodgen Lecture
TCC Ballrooms 3rd floor**

P4.01

BARN OWL PELLETS FROM SHELBY, MISSISSIPPI

Ashley Braden Horton, Anne-Claire Melton, Gabrielle Core, Shelby K. Babb, Reuben K. Alawode, Delta State University Cleveland, MS

Owl pellets are full of information that conservation biologists can use to learn what prey species are abundant in each area. In this study, approximately 25 *Tyto alba* (barn owl) pellets from Shelby, Mississippi were dissected using forceps, tweezers, and microscopes. The pellets were dark-brown and oval-shaped. Approximately 47 individuals representing six species were tallied from the pellets: 0.12% snake, 10.37% bird, 16.84% shrew, 18.61% rat, 21.32% mouse, 24.85% vole, and 7.89% unidentified bone fragments. Approximately 2,000 individual elements were found in the pellets. Post-cranial and cranial elements include humeri, mandibles, femurs, skulls, teeth, ribs and vertebrae. Noteworthy elements included the presence of three snake skulls, an intact bird wing, and shrew mandibles with blood-red tooth coloration. Skeletal elemental coloration ranged from dark brown to bright white, which may be due to the age of owl pellets or depositional conditions along with sun bleaching. Compared to owl pellets collected in the Northwestern USA, the Shelby, Mississippi pellets possessed a greater abundance of prey items. It is apparent that barn owls are responsible for helping to keep rodent populations down as well as other pests.

P4.02
**INVASIVE JOHNSONGRASS (*SORGHUM HALAPENSE*)
In MISSISSIPPI**

*Helen Simmons and Terrell Johnson
Delta State University, Cleveland, MS*

Johnsongrass originated in Eurasia and was intentionally planted in the Southeastern United States during the 1800s as a forage crop. It occurs in tropical and temperate climates and is classified as one of the world's 10 worst weeds. It was named after Colonel William Johnson, who grew this species in his fertile river bottom farm in Alabama around 1840. Today, Johnsongrass (*Sorghum halepense* (L.) Pers.) is a troublesome perennial grass that reduces yields in corn, grain sorghum, soybean, cotton and leguminous forages. Johnsongrass was recently added to the list of glyphosate-resistant weeds that occurs throughout both Arkansas and Mississippi. In Mississippi, Johnsongrass is abundant in the northern Delta, outside Clarksdale. Populations of Johnsongrass found in northwestern Mississippi are more tolerant to glyphosate compared to populations that exist in Arkansas. This species can quickly spread by underground rhizomes and wind blowing its seeds. For example, seeds often are found in haystacks, and in soil that borders roadsides and fields. Successful Johnsongrass control may include the use of Johnson grass herbicide, post emergence products such as fluzafop (Fusilade II), sethoxydim (Vantage), clethodim (Envoy), imazapic (Plateau) and glyphosate (Roundup).

P4.03
**WHO'S WHO AT RAGLAND HILLS: A FOREST SURVEY
OF MISSISSIPPI'S RELIC MAGNOLIA- BEECH FOREST**

*Mary Grace Fuller
University of Southern Mississippi, Hattiesburg, MS*

Natural habitats are often understudied and therefore undervalued; however, baseline data from natural sites can be used to support ecosystem preservation and land-management practices. Ragland Hills is a relic Beech-Magnolia forest in south Mississippi that has hosted little scientific research except for two species indexes, the most recent from 1977. I conducted a point-center quarter data collection on the ~150 acres of this forest owned by the University of Southern Mississippi. At each point (n=24), I sampled four cardinal- direction quadrants (NE, NW, SE and SW). In each quadrant the nearest tree over 35 centimeters was identified, representing the overstory; the distance to this individual was measured in meters and the diameter was measured in centimeters. The same process was repeated for trees under 35 cm, representing the understory, resulting in eight individuals per data point. Relative frequency, relative density, and relative dominance were calculated, resulting in importance values (a metric of frequency, density, and dominance) for each species. Southern Magnolia (*Magnolia grandiflora*) and American Beech (*Fagus grandifolia*) were expected to dominant the canopy, yet Spruce Pine (*Pinus glabra*) had the highest overall importance value at 42.37%. The overstory tree with the highest importance value was Tulip Poplar (*Liriodendron tulipifera*) at 52.8%; the understory tree with the highest importance value was Southern Magnolia (*Magnolia grandiflora*) at 55.83%. My findings reveal an unexpected forest dynamic not apparent in previous studies and can be used as benchmark data in future forest-dynamic research.

P4.04
THE DELTA STATE UNIVERSITY HERBARIUM

*Marqiatte Ware, Takayla Pratt, Ryan Carroll, and Kenneth Bonds
Delta State University, Cleveland, MS*

The Delta State University Herbarium (DSC) is a small, regional herbarium that has been around since the 1930s, located on the Delta State University (DSU) Campus. The herbarium contains more than 17,000 specimens. The DSC herbarium is used as a resource for many courses taught at DSU such as Principles of Biology, and Conservation Biology, as well as for scientific research. More than

70% of the specimens are from Mississippi, with emphasis on the Mississippi Delta. There are specimens, however, from 37 other states and eight different countries. The herbarium contains specimens from most plant groups including Bryophyta, Lycophyta, Pteridophyta, Pinophyta, Anthophyta, and more. There are 280 families; heavily represented families include the Asteraceae, Brassicaceae, Cyperaceae, Fabaceae, Fagaceae, Poaceae, and Rosaceae. More than 11,550 specimens are digitized and represented on the Southeast Regional Network of Expertise and Collections (SERNEC). Specimen information includes collectors name and specimen number, collection date, location, morphological details, and digital tiff file photos. Notable collectors, who have contributed to this collection include Robert Stewart, Henry Jacob, Albert Radford, Harry Ahles, Delzie Demaree, John MacDonald, J.A. Duke, and Samuel Faulkner. Recent contributors include Nina Baghai-Riding, Charles Bryson, and assorted students enrolled in the Division of Mathematics and Sciences.

P4.05
**PIGWEEDS, A THREAT TO AGRICULTURE IN THE
MISSISSIPPI DELTA**

*James Maverick-Harrison and Tyler Kitchings
Delta State University, Cleveland, MS*

Pigweeds (Amaranthaceae) are competitive plants and are tolerant of growing conditions in the Mississippi Delta. It occurs with vegetative crops such as soybeans, corn, cotton, and rice throughout the summer months. Pigweeds can become a noxious weed if not controlled right when these row crops are growing. On a research farm in Winterville, Mississippi, Palmer amaranth (*Amaranthus palmeri*) is the most common pigweed. This species can thrive in hot weather, growing up to two inches a day under the right growing conditions and is dioecious. This particular species can be identified by its redroots, ovate to diamond-shaped leaves, and the long seed heads that can reach 30 inches in length. The Palmer amaranth produces seeds that are easily dispersed by wind, birds, harvesting, and from contaminated equipment. Pigweeds drastically effect crop yields and can cost farmers hundreds to thousands of dollars. Pigweeds can cause a row crop to not reach full growth potential due to its light absorption characteristics.

P4.06
**FALL 2018 CONSERVATION BIOLOGY BIRD SURVEY AT
BEAR PEN PARK, CLEVELAND, MS**

Bethany Walker, Caitlynn Casey, Mary Scott Waldrop, and Nina Baghai-Riding

Delta State University, Cleveland, MS

The Mississippi Flyway is a vital migratory route for many species of birds in North America. The Flyway is almost 3,000 miles long and covers parts of many states including Arkansas, Indiana, Illinois, Iowa, Kentucky, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Ohio, Tennessee, Wisconsin, and various provinces in Canada. Many birds utilize this migratory flyway to travel to warmer, more comfortable climates. Birds also use this flyway for foraging, reproduction, and breeding.

Bear Pen Park in Cleveland, MS is along the Mississippi Flyway and has assorted habitats: trackway, ballfields, and a pond. In this study, Conservation Biology students recorded twelve bird species that were present in the park on the afternoon of August 24, 2018. Species included blue jays, ducks, woodpeckers, and more. Blackbirds and Greater Canada geese were the most abundant species. Rare birds included black capped chickadees. The different species of birds exhibit the diversity of birds that utilize the Mississippi Flyway. Previous studies recorded by other conservation biology classes in prior semesters (2008-2016) have documented more than 55 species including twenty-eight perching, one upland/ground, eleven ducks/geese, two gulls, nine wading birds, and four raptors.



P4.07

FERAL HOG (*SUS SCROFA L.*) DAMAGE SURVEY AT DAHOMEY NATIONAL WILDLIFE REFUGE IN BOLIVAR COUNTY, MISSISSIPPI

Joshua Glover, Chase Clanton, Christian Frew, and Nina Baghai-Riding

Delta State University, Cleveland, MS

Feral hogs (*Sus scrofa L.*) are an invasive species in the southeastern US, causing damage to agricultural land, native habitats, and private property. Feral hogs are a particular problem at Dahomey National Wildlife Refuge, Bolivar Co., MS and have been hunted in recent years to reduce their numbers. In this study, three distinct habitat types were surveyed to determine environmental damage caused by this species: woody areas, open clearings, and banks along water bodies. Overall, hog rooting was most extensive near bodies of water. Minor damage was found in wooded areas and clearings. In fall 2018, hog populations at Dahomey tend to be most destructive by stream banks that border Christmas Lake Branch, approximately 200 ft. west of Happy Hollow Lake. Tracks were found in clearings but there were no visible signs of rooting. Resting sites, found in a wooded area on the northern side of Dahomey, also had little rooting. Nearby agricultural land could have served as a rooting area, reducing intraspecific competition, which would normally keep a population in check.

Friday, February 22, 2019

MORNING

Room TCC 226

Invited Presentations

9:00 MOSQUITOES OF PUERTO RICO: WHAT WE KNEW THEN, WHAT WE KNOW NOW, AND HOW IT AFFECTS UNDERSTANDING OF DISEASE

Donald Ye,

University of Southen Mississippi, Hattiesburg, MS

10:00 ANCIENT FORESTS OF THE CENTRAL GULF COAST

Brian Axsmith

University of Southern Alabama, Mobile, AL

Friday, February 22, 2019

MORNING

11:30

OFFSITE

Field Trip to Bouie River

GEOLOGY AND GEOGRAPHY

Chair: Paul Parrish

Mississippi Department of
Environmental Quality-Office of Geology

Vice-Chair: Jerme Deans

University of Southern Mississippi

Thursday, February 21, 2019

MORNING

Room Union C

8:40 WELCOME/INTRODUCTION

05.01

9:00 GEOPHYSICAL SURVEYING OF POSSIBLECEMETERYBURIALSITES

David Harms Holt and Ashley Chasez

The University of Southern Mississippi, Hattiesburg, MS

Over the past few years, the geography department has been involved in doing geophysical surveys of cemeteries and suspected cemeteries using ground penetrating radar (GPR). The 400 MHz GPR has shown to be a good tool to identify unmarked interred individuals and to give evidence to lack of burial sites. We incorporated GPR into our geographic information system (GIS) cemetery mapping projects of Saint James, Live Oak, and Long Beach Cemetery and created a system of surveying properties for known and unknown grave sites. We have identified grave locations for the Ladner Cemetery in Waveland, Spring Branch Cemetery near Stennis, and a Jane Doe at Rotten Bayou Cemetery in Diamondhead. We verified the absence of gravesites at Diamondhead United Methodist Church, a property on Railroad Drive in Gulfport, and Turkey Creek Cemetery in Gulfport. This paper will discuss the stories and techniques used in identifying graves with and without markers using a non- invasive GPR approach implementing a live utility scan feature.

05.02

9:20 GEOPHYSICAL ANALYSIS OF THE KINGTOWN LINEAMENT, PHILLIPS COUNTY, ARKANSAS

¹Cooper Cearley, ¹James Harris, ¹Michael Rohrer, ²Mark Teague

Millsaps College and TeaCo Geophysical, LLC, Jackson, MS

Aerial photographs and LIDAR imaging have identified a set of three NE-trending lineaments in east-central Arkansas (Phillips County), collectively known as the Kingtown lineament (KL). Geomorphically, the KL is characterized by distinct tonal contrasts, small (0.5-to-1.5 m) linear escarpments, and deflected drainages. To further investigate the shallow subsurface structure of the KL, we acquired a combined geophysical data set consisting of shear wave (S-wave) seismic reflection and ground-penetrating radar (GPR) data across the southern strand of the KL. The seismic profile was collected using a 24- channel land- streamer with a sledgehammer/I-beam energy source. The GPR data were collected coincidentally with the seismic profile using both 100 MHz and 200 MHz antennas on a cart-mounted system. The most noticeable feature on the processed profile is a strong reflection from a depth of approximately 50-60 m that exhibits a down-to-the-south monoclinial flexure. The hinge area

of the structure is coincident with the surface expression of the southern strand of the KL. Diffractions, minor reflection offsets, and changes in reflection amplitude on the upthrown limb of the fold indicate complex localized folding and/or faulting. A subtle shallow reflection mimics the structures seen in the deeper part of the section and suggests that the deformation is present within 5-10 m of the surface. The GPR data further supports this upward continuation and shows distinct zones of apparent deformation in the upper 3 m that correlate with features observed on the seismic profile.

O5.03

9:40 FRACTURE ANALYSIS OF THE LOWER OCEANIC CRUST, ATLANTIS BANK, SOUTHWEST INDIAN RIDGE

Trent Jackson, Jeremy Deans, Christopher Macleod

University of Southern Mississippi, Hattiesburg, MS

Atlantis Bank (AB), an oceanic core complex (OCC), formed at the slow-spreading (<80 mm/yr) Southwest Indian Ridge (SWIR)-Atlantic II transform junction. AB is a domal massif composed of lower crustal and mantle rocks that exhumed in the footwall of an ocean-floor detachment fault. AB has two deep and one moderate depth holes distributed along the massif. Each hole has been cored and logged, along with several submersible studies, making AB one of the most intensively sampled OCCs in the world. However, little has been done to understand the brittle history of OCCs. Petrophysical image logs (FMS, UBI) were used to identify and determine orientation of fractures throughout the holes. By completing dynamic analysis using fracture orientation across all holes, we are able to infer the paleo-stress field(s) responsible for the formation of AB. Holes 735B and U1473A show a NE-SW striking fracture set in the upper portion of holes, then become more N-S with depth. Below 150 m the majority of the fractures in 735B have steep N-S orientation, but also include a subsidiary moderately dipping E-W oriented fracture set. Hole U1473A fractures are moderate to shallow, whereas 1105A has moderately dipping fractures oriented E-W. Fracture orientation could be the result of: 1) a 10° horizontal rotation of the spreading direction of SWIR causing transtension along the Atlantis II transform, 2) flexure of the footwall during exhumation, and/or 3) late stage, high angle normal faults.

O5.04

10:00 MODELLING OBSIDIAN EXCHANGE IN THE PUUC, YUCATAN, MEXICO

Nathan Brownstein, Betsy Kohut, George Bey, Zachary Musselman

Department of Geosciences and Department of Sociology and Anthropology Millsaps College, Jackson, MS

In recent years, the use of portable X-Ray Fluorescence (p-XRF) spectrometers has become increasingly common to determine the geological sources of obsidian artifacts. This study used p-XRF to obtain trace elemental data for 354 obsidian artifacts from the sites of Huntichmul, Kiuc and Escalera Al Cielo in the Puuc region of the northern Maya lowlands. These sites were heavily occupied during the Late and Terminal Classic periods [700-1050 AD] and research is ongoing. The elemental data for each artifact was compared to that of 31 known sources from Mexico, Guatemala, and Honduras in order to determine the geological source. The source data were then combined with chronological data obtained from the ceramics associated with each excavated context in order to compare the various obsidian sources utilized at each of the three sites. Results suggest that a variety of sources were used at each site and provide further evidence regarding the nature

of obsidian exchange networks in place in the Puuc during that time.

O5.05

10:20 ASSESSMENT OF VIRTUAL ROCK SPECIMENS IN A TRADITIONAL INTRODUCTORY GEOLOGY LAB

Youngwoo Cho and Renee M. Clary

Mississippi State University, Mississippi State, MS

The Department of Geosciences (Mississippi State University) have operated several sections for the introductory geology lab course over years. Students taking that course have often experienced difficulties in accessing specimens out of the classroom when they wanted to have the extra time to study or to make up the lab due to their absences in normal class hours. Some of the distance learning students who are outside of the US were limited in accessing the physical specimens as well. We researched whether virtual specimens will be useful in helping them learn without physical specimens in such cases. In this study, we have tested a few 3D virtual rock specimens to assess their effectiveness and to study their possibility to replace physical specimens in traditional lab learning. In the Fall of 2018, we grouped twelve sections of the introductory geology lab course into an experimental group of seven sections and a control group of five sections. Each section is composed of approximately thirty students. After having feedback from students and instructors, we found that virtual specimens are quite useful and students have enjoyed them. However, their feedback to the virtual models revealed their satisfaction varied depending on the quality of 3D models. Most of the students have also pointed out that they can't have the physical feelings from virtual specimens. However, they think virtual specimens will be very useful if they will be used with physical specimens in the face-to-face and distance learning classes.

O5.06

10:40 EXAMINING THE FAUNAL DISTRIBUTION AND FACIES CHANGE OF THE CLAYTON FORMATION ACROSS THE K-PG BOUNDARY IN OKTIBBEHA COUNTY

¹Joshua Broussard, ¹Renee Clary, and ²George Phillips

¹Mississippi State University, Mississippi State, MS and

²Mississippi Museum of Natural Sciences, Jackson, MS

The Clayton Formation is a Paleocene (Danian) marine unit outcropping across the southeastern United States, including across Northeast Mississippi. The Clayton Formation is comprised of several fossiliferous layers of limestone, clay, and a variety of sands and sandstones. It is the first chronostratigraphically occurring unit immediately following the Cretaceous-Paleogene (K-Pg) extinction in the southeast region. However, the marine macrofauna of the Clayton has been largely undocumented in the Mississippi Embayment. The unit outcrops across the western portion of Oktibbeha County, Mississippi, and unconformably overlies the Late Cretaceous (Masstrichtian) Prairie Bluff Formation. Marine fossils such as mollusks, solitary corals, polychaetes, and fish teeth and bones can be found weathering out of these outcrops. Significantly, the index fossil for the Danian in North America, *Pycnodonte pulaskensis*, can be found in the beds of the Clayton (Smith, 1997). Other outcrops of this unit in areas of Alabama and the Gulf of Mexico have been documented, but little information is available about these beds in Mississippi. This research aims to

collect, identify, and map fossils found in these beds in Oktibbeha County. Fossils will be compared to much more documented specimens in the underlying Prairie Bluff and more studied Clayton outcrops in other areas. Results will be used to form interpretations of the marine ecosystem turnover following the K-Pg extinction in Oktibbeha County and provide a much more confident understanding of this undocumented and geologically significant formation.

O5.07**11:00 ACCESSIBLE GEOLOGY: EDUCATION AS OUTREACH THROUGH EXPLORATION USING MULTIPLE MEDIAS**

Kelly Truax

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

Geology is a multifaceted field of study which incorporates science, mathematics, problem solving, and hands-on experience to build a more complete understanding of the Earth. Due to its foundation of physical exploration, Geology can largely be limiting and inaccessible to a number of individuals. Instead of spending resources attempting to take only a few students into the field, multiple media sources could be utilized to make the field, and its resources, come to a larger audience. 3D modeling and virtualization of the site of interest, "Choose Your Own Adventure" styled exploration, and hands on comparison of some specimen (rock, mineral, fossil, etc.) are the media methods of primary focus. The goal is to build a complete experience that enhances understanding of geology and geological methods to help individuals of all ages learn how to think like a geologist. Particular interest has been pointed to the 16th section land located in Oktibbeha County that contains the Osborne Prairie. Owned by the Starkville Consolidated School District (SCSD), Osborn is leased by the Friends of the Black Belt Prairie and is a unique site for geology and ecology in Mississippi. As a resource in our backyard, there are few individuals that know of its existence and rarity. Extension of outreach to the community and the local schools would help build awareness of the site, help with conservation, and provide a geologic understanding of its importance.

O5.08**11:20 A PRELIMINARY REVIEW ON THE IMPACT OF WEATHER ON THE GEOMORPHOLOGY OF OSBORN PRAIRIE SELMA CHALK, STARKVILLE, MS**

Jessica Leesburg, Kelly Truax, Youngwoo Cho, Renee M. Clary

Mississippi State University Mississippi State, MS

Located on 16th section land in Oktibbeha County and controlled by the Starkville Consolidated School District (SCSD), Osborn Prairie is a unique geological and ecological area situated on the Black Belt of which only 1% remains. It is home to unique flora and fauna greatly used in research spanning across Mississippi. Currently, it is leased to Friends of the Black Belt Prairie (FOTBB), an NPO interested in conserving the prairie. Exposed Selma Chalk allows access to a plethora of Cretaceous fossils visible at the surface such as mosasaur bones, shark's teeth, fish scales, and oysters like *Exogyra*. Conservation of Osborn Prairie has been taken with specific concern given to the unique geology, fossils, and ecology found there. Preliminary research and partnership with FOTBB and the SCSD will eventually lead to further understanding impacts that could threaten the site. Understanding impacts of weather phenomena on the geomorphology of Osborn Prairie will be the first step taken. Data will be gathered using a UAV to scan exposed chalk

year-round with initial results presented within the first few months. 3D models will be constructed from the scans using SfM-MVS photogrammetry. Multiple scans are compared via CloudCompare to view geomorphological changes and to gauge impacts of weather events. Potential outreach to the community and the SCSD has been proposed in the form of presenting created 3D models for virtual reality use in the classroom. By informing students and the community about Osborn Prairie, we hope to gain support for its protection and conservation.

O5.09**11:40 VADOSE-ZONE RECHARGE WELLS AS AN ARTIFICIAL RECHARGE METHOD IN THE MISSISSIPPI DELTA**

¹Kyungwon Kwak, ¹Andrew M. O'Reilly, and ²J.R.Rigby

University of Mississippi, Oxford, MS and U.S. Department of Agriculture, Agriculture Research Service, National Sedimentation Laboratory

Increasing concerns regarding depletion of groundwater in the Delta region of Mississippi have led to a need to augment natural recharge. Infiltration basins are often one of the simplest means of artificially recharging aquifers. However, the Delta has a layer of clay and silt at the surface, so it is a better idea to use vadose-zone recharge wells that are not limited by the surficial layer of fine soils. The purpose of this study is to use full-scale field testing to assess the feasibility of using vadose-zone wells for artificial recharge of the Mississippi River Valley alluvial aquifer by using a combination of field, laboratory, and computer simulation techniques.

An initial field test indicated each of two vadose-zone wells could intake 200 to 270 m³/day by gravity flow. Ten soil samples were collected from the site and their saturated hydraulic conductivities (Ksat) and wetting/drainage curves will be determined using falling head permeability test, METER Hyprop, and hanging water-column method. An axisymmetric model was developed using VS2DTI software from USGS. The simulations were run with a range of Ksat and porosity (n) values. The results of the simulations show that head changes at the nearest monitor well are likely to be smaller with a greater ratio of Ksat/n and vice versa. This research will provide understanding of the hydraulic properties controlling vadose-zone wells and operation of the artificial recharge system. As most alluvial aquifers have similar geological settings as the Delta, results are expected to be relevant to other areas.

12:00 General Sessions

Thursday, February 21, 2019

AFTERNOON

Room Union C

1:00 Guest Speaker Guest Speaker: Dr. Mark Puckett**TOWARDS HIGH-RESOLUTION BIOSTRATIGRAPHY OF THE LATE CRETACEOUS OF THE EASTERN FLANK OF THE MISSISSIPPI EMBAYMENT**

Mark Puckett

The University of Southern Mississippi, Hattiesburg, MS

Significant events in biostratigraphy include First Appearance Datums (FADs), Last Appearance Datums (LADs), and co-occurrences of taxa. Defining the relative order of these events is straightforward if they are measured from common lithostratigraphic markers, and their ranges can be maximized quantitatively using graphic correlation. In the absence of common lithostratigraphic markers, however, the task of ordering these events is much more problematical. In addition, typical biostratigraphic zones



are based on very few taxa and last millions of years. Including all FADs and LADs can potentially increase resolution of time using fossils by orders of magnitude.

Over many years, data on ostracods and planktonic foraminifera have been collected from the marine Upper Cretaceous deposits of the eastern flank of the Mississippi Embayment, which includes about 100 measured sections, 350 taxa, and 7000 fossil occurrences. Two composite reference sections were constructed in the offshore areas, one in eastern Mississippi and one in central Alabama, and fossils ranges composited using graphic correlation. The nearshore deposits near the basin margins are, however, more diverse than in offshore areas, yet lack the lithostratigraphic markers that defined the line of correlation.

Constrained optimize (CONOP) is a computer system that can integrate all the taxonomic data into a single ordinal scale. Many types of analyses can be calculated from these data, including diversity through time and measures of misfit. The overall goal of this research program is to explore the applications of high-resolution biostratigraphy to understanding paleobiologic problems.

05.11
2:00 MOSASAUR OCCURENCES IN CRETACEOUS MISSISSIPPI STRATA

Joseph Moffitt and Renee Clary
Mississippi State University, Mississippi State, MS

Most mosasaur research has been conducted in Alabama, Kansas, and Texas, within specimens from Upper Cretaceous embayment material. However, Mississippi has been lacking for mosasaur research. This should not be the case since many of the same chalk formations that can be found in South-Central Alabama are located in East Mississippi, practically in the backyard of Mississippi State University. The Selma Group, from the Coffee Sand to the Prairie Bluff Chalk, is exposed in Eastern Mississippi, the same strata that have produced some of the United States best *Mosasaurus*, *Clidastes*, *Platecarpus*, *Plioplatecarpus*, and *Tylosaurus* specimens. Using both field research and museum collection specimens from the Dunn-Seiler Museum of Mississippi State and from the Mississippi Museum of Natural Science in Jackson, this research aims to increase the knowledge of mosasaurs in the state of Mississippi. Specimens documented in GIS will be used to demonstrate the geographic distributions of mosasaurs across the state, showing the widespread distribution of fossil data across Mississippi. Field data is currently restricted to the Prairie Bluff Chalk of the latest Maastrichtian surrounding Starkville, MS. Museum collections are non-restricted to age or location.

05.12
2:20 SALVAGING CORES FROM SUPERFUND SITES FOR STUDENT STUDIES

¹David T. Dockery III and ²Emily Welch
Mississippi Department of Environmental Quality, Office of Geology, Jackson, MS and Mississippi State University, Department of Geosciences, Mississippi State, MS

Contracting coring is an expensive item for a low budget study. At two Superfund sites in central Mississippi at Canton and Flowood, coring in search of pollution products penetrated the fossiliferous marine sediments in the Yazoo Clay and Moodys Branch Formation and deltaic sediments in the Cockfield Formation. The 30-foot-thick Moodys Branch interval of three cores were salvaged from the Southwestern Wood Superfund site in Canton. The first core was stored at the

Geology Department of Millsaps College, and the second was stored in MDEQ Office of Geology's North West Street building. Mississippi State University geology student Emily Welch processed the third core for a paper published in MDEQ Office of Geology Open File Report series. The paper reference is: Emily Welch and David T. Dockery III, 2018, The Moodys Branch Formation molluscan fauna from a core drilled on the Southwestern Wood Preserving Superfund site in Canton, Mississippi: Mississippi Department of Environmental Quality, Office of Geology, Open File Report OF-304, 13 p., 12 fig., one table. Eighty molluscan species were identified from this one core.

2:40 Division Student Awards
3:00 Dodgen Lecture and Awards Ceremony

Thursday, February 21, 2019

EVENING

3:30 Dodgen Lecture and Awards Ceremony TCC Theatre
General Poster Session
Immediately Following Dodgen Lecture
TCC Ballrooms 3rd floor

Friday, February 22, 2019

Room Union C

MORNING

8:00- Welcome and Divisional Business Meeting

05.13

8:20 SURFACE GEOLOGIC MAPS OF THE JACKSON, JACKSON SE, MADISON, AND RIDGELAND 7.5-MINUTE USGS QUADRANGLES IN MADISON, RANKIN, AND HINDS COUNTIES

¹Jonathan R. Leard, GIT and ²David E. Thompson
Mississippi Department of Environmental Quality, Office of Geology, Jackson, MS and Weyerhaeuser Company

The area encompassed by the Jackson, Jackson SE, Madison, and Ridgeland 7.5-Minute USGS Quadrangles in Madison, Rankin, and Hinds Counties is the most populated region in Mississippi. The city of Jackson, the state's capital, has the largest population at 165,000. Madison, Ridgeland, Brandon, and Pearl are four of the state's twenty cities with populations exceeding 20,000. Madison, Hinds, and Rankin county surface geologic maps are available through the State Survey's Bulletin series and were reprinted at 1:24000 scale in the Survey's Environmental Series, but they have not been remapped as detailed 7.5-minute quadrangles. Units outcropping are the Claiborne age Cockfield Formation (Fm.), the Jackson age Moody's Branch and Yazoo Fm., the Forest Hill Fm. and the Vicksburg Group, the Catahoula Fm. of the Grand Gulf Group, and the terraces and alluvium of streams. The influence of the Jackson Dome, the phonolitic stock of a Cretaceous age intrusion, is from subsidence of overlapping units due to the structure's Tertiary uplift, differential compaction, or both, resulting in a wide outcrop belt of the Yazoo Fm. The Flora-Madison Syncline preserves erosional outliers of Vicksburg Limestone northwest of the dome. The primary geo-hazard in this area is the expansive montmorillonitic clay of the Yazoo Fm., which causes extensive structural damage. These maps will delineate the outcrop belt of the Yazoo Fm. as well as outcrops of more stable units, highlighting locations more suitable for engineering projects. Units outcropping also contain resources beneficial to the metro area's growth such as lime, aggregate, and industrial clay.

**O5.14****8:40 A GEOPHYSICAL INVESTIGATION OF SAND BOILS AT A WATERSHED DAM IN CARROLL COUNTY, MISSISSIPPI***Andrew Cummings**Mississippi Department of Environmental Quality, Office of Geology, Jackson, MS*

In Late March of 2016, the Mississippi Department of Environmental Quality (MDEQ) Dam Safety Division discovered seepage and sand boil activity at Potacocawa Creek Watershed Structure Y-31A-06 (State ID: MS01075) in Carroll County, Mississippi. Though the dam is a relatively small earthen dam in a rural environment, the presence of these sand boils is concerning, as Potacocawa Creek Watershed Structure Y-31A-06 is classified as a High Hazard structure. The sand boils could indicate water piping under the dam, a condition that commonly leads to dam failure. In 2017, the MDEQ collaborated with The National Center for Physical Acoustics (NCPA) at the University of Mississippi to perform a geophysical investigation of the sand boils. The NCPA team performed seismic refraction tomography (SRT), electric resistivity tomography (ERT), and electromagnetic ground conductivity (EM) studies at the site. This presentation will discuss the methods, analysis and results of the study, as well as the lessons learned and implications for dam safety.

O5.15**9:00 MISSISSIPPI OFFICE OF GEOLOGY'S STRATEGIES AND DATA FOR CURRENT AND UPCOMING STATEMAP PROJECT IN JEFFERSON COUNTY, MS***Paul C. Parrish, RPG, Andrew P. Newcomb, RPG, James E. Starnes, RPG, and Jonathan Leard, GIT**Mississippi Department of Environmental Quality, Office of Geology, Jackson, MS*

The Mississippi Office of Geology's ongoing participation in the USGS's STATEMAP program has led the Surface Geology and Environmental Geology Divisions to their current project area in Jefferson County, MS. The 2019 STATEMAP grant year will complete the mapping of three quadrangles which continues the Mississippi Office of Geology's mission of remapping the state's geology at the 1:24,000 scale.

In 2009, Jefferson County, Mississippi, had the highest African-American population percentage of any county in the United States and was also ranked as the fourth poorest county in the nation. The county seat, Fayette, ranked 40th poorest community with a population greater than 1,000 in the country (2008-12 American Community Survey).

The purpose of Mississippi's 2019 STATEMAP project is three-fold. Firstly, mapping and delineating the contact between the Hattiesburg and Pascagoula formations is important to water resources concerns in the area. Secondly, highlighting the valuable sand and gravel resources of the Pre-Loess Terrace and Brookhaven Terrace deposits will be useful to a poor county with no industry. Lastly will be mapping the extent of the Pleistocene Loess deposits. All of these will help Jefferson County in planning and promoting development.

O5.16**9:20 GLACIAL ORIGINS OF A PLEISTOCENE AGE ANCESTRAL MISSISSIPPI RIVER PRE-LOESS TERRACE DEPOSIT AS EVIDENCED BY BOULDER ERRATICS AND GLACIALLY-FACETED STONES FROM THE HAMMETT GRAVEL COMPANY'S REDWOOD PIT IN WARREN COUNTY, MISSISSIPPI***¹James E. Starnes, RPG, ²Ken McCarley, ³Donald Hearn and ³Melissa Hill**MDEQ, Mississippi Office of Geology, Jackson, MS, Hammett Gravel Company, Jackson, MS, and Mississippi Gem and Mineral Society, Jackson, MS*

The ancestral Mississippi River Pre-loess Terrace Deposits underlie the Loess Bluff region and parallel the eastern valley wall that borders the river's modern alluvial plain. Mining of this extensive gravel resource occurs above an elevation of ~220 ft. MSL at the Hammett Gravel Company's Redwood facility. This operation overlooks the Big Black River in east Warren County near the Hinds County line (32°28'19.49"N, 90°37'27.25"W). Here, coarse cross-bedded quartz sand is stratified with gravel in repeated graded-bedding sequences overlain by a thick mantle of Peorian loess. Gravel is dominantly chert derived from mid-continent Paleozoic limestones, but also contains sandstone, metaquartzite, milky quartz, and rhyolite clasts. Johnson Shut-ins rhyolite clasts and Lamotte Sandstone both originated from bedrock in the St. Francois Mountain region. The bedrock source for the metaquartzite is the Sioux Quartzite. Originating in Minnesota/South Dakota, it made its way into Kansan end moraines along a glacial margin now occupied by the Missouri River. Boulders of chert, sandstone, and metaquartzite that randomly occur throughout the section, indicating some episodic ice-rafting transport of material at this pit. Glacially-faceted, polished, and striated cobbles also have been documented here. This Pre-loess Terrace is the deposit of a gravel-choked braided stream system which experienced episodic flooding. These floods were likely caused by ice-dam failures along the glacial margin in the upper reaches of the ancestral Mississippi River during the Pleistocene.

O5.17**9:40 TRANSPORT AND FATE OF CYANOBACTERIAL TOXINS IN SOIL AND GROUNDWATER***Andrew M. O'Reilly and Justin L. Hobart**University of Mississippi, Oxford, MS*

Groundwater shortages are increasing worldwide, leading to an increasing use of artificial recharge techniques to support sustainable aquifer management. Enhancement of aquifer recharge using surface water carries with it the risk of contaminant impacts on groundwater quality. One group of contaminants of emerging concern are toxins produced by cyanobacteria—also called cyanotoxins—which commonly proliferate in rivers, lakes, and reservoirs. Cyanotoxins pose a risk to human and livestock health and can bioaccumulate in food crops. This risk is of particular concern for artificial recharge facilities where infiltrated water may subsequently be withdrawn for consumption or irrigation, such as riverbank filtration and stormwater harvesting.

We estimated the potential transport and fate of three cyanotoxins—microcystin-LR (MCLR), cylindrospermopsin (CYL), and anatoxin-a (ATX)—in several natural soils (collected from Grenada County, MS) and in sand using batch sorption experiments (MCLR and ATX) and column experiments (MCLR and CYL). Column experiments indicate relatively little sorption of MCLR and CYL to sand, whereas during batch experiments ATX experienced substantial sorption to soils with textures ranging from sandy loam to clay. Additionally, column experiments indicate little degradation of CYL and substantial degradation of MCLR, which we hypothesize was predominantly due to biodegradation. Overall, under the given experimental conditions, results suggest that CYL has greater potential to migrate with flowing groundwater and persist within an aquifer, whereas MCLR and ATX have greater potential to be removed from groundwater by biogeochemical and physicochemical processes, respectively.



05.18

10:00 GEOLOGY FOR ALL MISSISSIPPIANS: MSVCC ONLINE COURSES EXTEND GEOLOGY COURSE OPPORTUNITIES THROUGHOUT THE STATE

¹Renee M. Clary, ¹Athena Owen Nagel and ²Eric Shows / *Geosciences, Mississippi State University, Mississippi State, MS, and/ Jones County Junior College*

Although the Geosciences offer many career opportunities, Mississippi students are only guaranteed Earth Science instruction in the 8th grade. College-bound students do not typically take Earth Science courses, and many high schools do not offer it. Furthermore, students who attend community colleges are unlikely to encounter geology courses since only one Mississippi community college offers geology courses with some regularity. When community college students transfer to a 4-year university, they are behind on coursework if they want to major in geology.

In order to make students aware of geosciences career opportunities and provide geology courses for community college students, the Geo-SPARCC program housed at Mississippi State University develops online geology courses in partnership with Jones County Junior College that are available through the Mississippi Virtual Community College (MSVCC) consortium. The courses are designed through a research-based SCALE approach, incorporating self-directed learning, an online community of learners, active learning strategies, and local environments. Geo-SPARCC uses rock, mineral, and fossil kits, local environment investigations, and follow-along demonstrations with common objects. By focusing upon Mississippi geology, Geo-SPARCC courses tap into the geographic Sense of Place affiliation of our students. High school students may also enroll in Geo-SPARCC courses as a dual enrollment option. Thus far, Geo-SPARCC geology courses attract students requiring physical science courses, including elementary education majors.

05.19

10:20 CREATING BUILDING FOOTPRINTS FROM LIDAR POINT CLOUD DATA USING 3D ANALYST IN ARCGIS

Barbara E. Yassin
Mississippi Department of Environmental Quality, Office of Geology, Jackson, MS

Building footprints serve many, from the emergency response community to the tax mappers in local government, but very few agencies/communities have this layer. The Classify LAS Buildings tool was added to the ArcGIS 3D Analyst extension in version 10.5 and is also available in ArcPro. Now that we have LiDAR covering all of Mississippi, creating this important layer is possible. In order to successfully derive final clean polygons, many repetitive steps were necessary, so Model Builder, a workflow-based visual programming language, was utilized. Downtown Jackson, Mississippi tiles from the 2016 NRCS Southwest Mississippi LiDAR project were tested because of the high quality. This data's resolution is 0.7-meter point spacing and 10-centimeter vertical RMSE. LAsTools software also creates building footprints and was tested concurrently to compare building footprint output along with other footprint sources. Microsoft released nation-wide imagery-generated building footprints, which surpass the ArcGIS footprints in both content and characteristics, but still lacks 100% coverage. Microsoft's building footprint layer covers most of the state; therefore, this data can be updated and the gaps filled in with the new 3D Analyst tool and LiDAR point cloud data.

05.20

10:40 PREHISTORIC UTILIZATION OF FERRUGENOUS ORTHOQUARTZITE IN SOUTHEAST MISSISSIPPI

¹James E. Starnes, *RPG* and ²David Abbott, *RPA*

¹MDEQ, *Mississippi Office of Geology, Jackson, MS* and ²Moreland Altobelli, *LLC*.

Limonite, goethite, and siderite cemented ferruginous sandstones and claystones are earthy, sedimentary ironstones common throughout Mississippi. Ironstones are typically soft and easy to work materials that saw widespread cultural utilization by prehistoric peoples as peck, ground, and even polished artifacts. A goethite-cemented quartzite (ferruginous orthoquartzite) was extensively quarried for its knapping qualities in southeast Mississippi from stream terraces along the lower Leaf and Chickasawhay River watershed. Ferruginous orthoquartzite is sufficiently cemented to break preferentially across the quartz grains to exhibit predictable subconchoidal fracture. Ferruginous orthoquartzite has a concentration of occurrence on prehistoric sites in Wayne, Greene, Jones, and Perry counties in southeast Mississippi. The utilization of ferruginous orthoquartzite had a long tradition which began as early as Dalton and San Patrice, during the transition of the Paleolithic into the Early Archaic, and likely continued to the Woodland cultural period as more suitable material was necessary for production of ever smaller projectile points. Ferruginous orthoquartzite was utilized because a naturally-occurring resource of high-quality chert gravel is lacking in southeast Mississippi. The dominant lithic material on archaeological sites in southeast Mississippi is typically Tallahatta Quartzite from Basic City outcrops well to the north of this region, and limited resources can also be found locally as float in the alluvium of the Chickasawhay River. Also common, are lithics made from higher-quality chert gravel derived from terrace outcrops further to the west, and milky quartz from terrace gravel from piedmont-derived resources further east in south Alabama.

05.21

11:00 HYDROGRAPHY OF MISSISSIPPI FOR INFORMED RESOURCE MANAGEMENT

¹Swatantra R. Kethireddy, ¹Brandon L. Hawkins III, ¹Timothy Misoy, and ²Remata S. Reddy / *Mississippi Valley State University, Itta Bena, MS* and ²Jackson State University, *Jackson, MS*

Water is an essential element for the life to exist on planet earth. For conducting science and effective management of water, it is important to have the quality data sets on the variables considered. The goal of the research is to spatially integrate and analyze the surface water variables for understanding water resource availability for sustainable management of resources. As a part of the National Hydrography Dataset (NHD), Mississippi hydrography shapefiles and geodatabase files were downloaded from the USGS National Hydrography Products website. Geographical Information queries and enquiry were performed on the hydrography data. The water availability from lake-pond, stream- rivers, perennial and intermittent stream rivers was estimated by spatial queries and mapping in Geographical Information Systems (GIS). The amount of water resource in terms of Area Square Kilometers in Stream-rivers is 3013, Lake-pond is 7090, and perennial and intermittent stream rivers is 297. The total surface area of water in Mississippi is estimated at 10,400 Area Sq. Kms and the total surface area of USGS Hydrologic Unit 08 found to be 186156 Area Sq. Kms. The total water area for HU 08 sub basin is found to be 5.58%. The current work is continuing to evolve, and the further research is towards the water budget analysis for resource allocation and agricultural management applying the data from NASA remote sensing Landsat and GPM missions.

**O5.22****11:20 HOW FAR DO FLUIDS GET INTO THE LOWER OCEANIC CRUST? STUDY OF FRACTURES AND VEINS IN THE OMAN OPHIOLITE, HOLES GT1 AND 2, OMAN DRILLING PROJECT***Jeremy Deans**University of Southern Mississippi, Hattiesburg, MS*

Models of lower oceanic crust formation at fast-spreading ridges (e.g., sheeted sill model) require the advection of heat for basalt to crystallize in the lower crust. However, there exists very little documentation of fluid flow beneath the sheeted dike complex. The Oman Drilling Project drilled several 300-400 m deep holes in the Wadi Tayin massif to better understand the high and low temperature history of the Oman ophiolite, thought to have formed as a fast-spreading back arc spreading center. Hole GT1A drilled through layered gabbros (deeper crust) and Hole GT2A drilled through the foliated-layered gabbro transition (shallower crust). In both holes most planar brittle structures are veins, which were observed consistently throughout both holes. Veins are usually filled by amphibole, epidote, chlorite, prehnite, laumontite, and quartz and to a lesser extent by gypsum and anhydrite. Dips range from subhorizontal to subvertical and an average of $\sim 55^\circ$. Amphibole veins tend to have the highest dips, while other vein types are more moderate. There are clear crosscutting relationships between higher temperature veins like epidote and lower temperature veins like laumontite and quartz. Shear sense of veins includes both normal and reverse sense of shear. Based on the ubiquity of veins in both holes, it is clear that hydrothermal fluids were an important part of the alteration history of the lower oceanic crust. However, it is unclear when and how close to the spreading-axis did the veins form, especially considering reverse sense veins, which may instead record obduction.

O5.23**11:40 A LOW-COST SMALL UNMANNED SURFACE VEHICLE (sUSV) FOR MAPPING AND MONITORING MARINE BIODIVERSITY IN SHALLOW AREAS***George Raber**The University of Southern Mississippi, Hattiesburg, MS*

Marine protected area managers often rely on periodic transect surveys to assess changes in coral reef and benthic habitat conditions. These areas are important to monitor because they provide important coastal defense ecosystem services, absorbing much of the energy of incoming waves. Current methods for systematic monitoring of changes in the reef crest are difficult due to the shallow, high energy environment that exists. We present the design of a low-cost and transportable small Unmanned Surface Vehicle (sUSV) running open source software that can be used by marine managers to map and monitor marine environments in shallow areas (<20m). The system uses multiple cameras, an autopilot control board, GPS, and sonar transducer that are controlled using an onboard linux computer. The propulsion system consists of two small brushless motors powered by lithium batteries. The vehicle operates via pre-programmed survey transects, collecting stereo-paired photos, depth, location, and heading that can be later processed to create underwater high resolution orthophoto mosaics and digital surface models. These products provide very detailed images and measurements that can be used for monitoring changes in biodiversity, reef erosion/accretion, and assessing health conditions. Results from our pilot project suggest the sUSV provides a viable and low-cost solution for measuring high resolution change in benthic environments on a frequent basis.

12:00 General Session**Friday, February 22, 2019****AFTERNOON****Room Union C****O5.23****1:00 OVERVIEW OF MDEQ'S PARTICIPATION IN THE NATIONAL GROUND-WATER MONITORING NETWORK***Kristen Sorrell, RPG, Austin Brister, GIT, and Mary McKay**Mississippi Department of Environmental Quality, Office of Geology, Jackson, MS*

Water is a vital resource, and water resource management is a high priority concern at both the state and federal level. The National Ground-Water Monitoring Network (NGWMN) was established by the Subcommittee on Ground Water (SOGW) in 2007 to establish a network of wells to monitor ground-water availability and quality in major aquifers and aquifer systems across the United States. The goal of this project is to create a collaborative network of local and state agencies to collect and compile groundwater level and water quality data of known quality in a common shareable format so that long term trends can be identified and used to aid in current and future water resource management decisions.

The Office of Land and Water Resources (OLWR), a division of the Mississippi Department of Environmental Quality (MDEQ), has maintained a network of observation wells in the state of Mississippi with recorded water level data dating back to 1930. In 2015 the OLWR began work to incorporate its existing observation well network into the NGWMN database. The OLWR currently records and submits data for 167 wells across the state of Mississippi to the NGWMN. This information can be accessed by users via a data portal available to the public. This presentation will present the methods and processes used to provide a consistent data set to the database and will demonstrate how end users may access the database.

O5.25**1:20 GEOLOGIC RESOURCE UTILIZATION FOR MINING WITH HAMMERSTONE TOOLS AT TWO DISTINCT PREHISTORIC ORTHOQUARTZITE QUARRIES IN MISSISSIPPI***James E. Starnes, RPG, Jonathan Leard, GIT, David Abbott,**Mississippi Department of Environmental Quality, Office of Geology, Jackson, MS, and Moreland Altobelli, LLC.*

Native Americans exploited high-quality orthoquartzite resources in central and south Mississippi along Tertiary outcrops of Tallahatta, Kosciusko, Cockfield, Catahoula, and Hattiesburg formations. In these prehistoric quarries, Hammerstone tools were utilized to mine thick orthoquartzite beds. This type of activity required durable tools much harder than that of the stone being quarried. Therefore, the tools utilized must have been acquired from separate geologic resources than the quarried stone. This became apparent after studying lithic assemblages in two prehistoric quarries located in different geological settings. At site 22Ne579, hammerstone tools of exclusively Kosciusko Quartzite were identified at an extensive prehistoric quarry in Neshoba County located in the Basic City (Tallahatta Formation). Kosciusko Quartzite is an orthoquartzite derived from fine-grained sandstone by interlocking regrowth of quartz grains. It is durable stone much harder than the opaline/chalcedony-cemented orthoquartzite of the Tallahatta Fm. Quartzite-bearing Kosciusko Sandstone



outcrops are limited to the Attala County area. Therefore, these stone tools were imported a considerable distance for the sole purpose of mining. At site 22Fr1431, hammerstone tools exclusively of Sioux Quartzite were identified in Franklin County at a prehistoric quarry of Hattiesburg Quartzite. Sioux Quartzite is a Precambrian age metaquartzite found in Pre-loess Terrace Deposits which underlie west Mississippi's Loess Bluff region. It is common as large gravel clast and extremely impact-resistant making it ideal as a tool to mine the fine-grained, opal-cemented orthoquartzite of the Hattiesburg Fm. Cobbles of Sioux Quartzite were likely collected west of the Homochitto River from gravel in nearby streams.

HEALTH SCIENCES

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University of Mississippi Medical Center
- Chair: Gouri Mahajan**
University of Mississippi Medical Center
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- Program Committee: George Moll**
University of Mississippi Medical Center
- Population Health Consultant: Joshua Mann**
University of Mississippi Medical Center

Thursday, February 21, 2019

MORNING

Room Union B

Oral Presentation Session: Clinical/Therapeutics

Moderators: Drs. Frank Spradley and Josie Bidwell

8:55 Welcome

06.01

9:00 MULTIPARAMETRIC MR BRAIN TUMOR IMAGING THROUGH RADIOMIC FEATURES AS A METRIC FOR GUIDED RADIATION TREATMENT PLANNING.

Edward Florez, Seth T. Lirette, Candice M. Howard-Claudio, Ali Fatemi

University of Mississippi Medical Center, Jackson, MS

Introduction: The definition of radiotherapy target volume is a critical step in treatment planning for all tumor sites. We propose the use of multiparametric MRI combined with radiomic features to improve the differentiation of tumor from edema for GTV definition and to differentiate vasogenic from tumor cell infiltration edema. **Methods:** Twenty-five patients with brain tumor and peritumoral edema were assessed: 17 were diagnosed with glioblastoma

multiforme (GBM) and 8 with meningioma. After the acquisition process using a 3T-MRI scanner, two neuroradiologists independently used an in-house algorithm to segment two regions of interest (ROI; edema and tumor) in all patients using functional and anatomical MRI sequences (Figure1). Radiomic features were extracted from all ROIs through different approaches with and without normalization, leading to the calculation of around 300 different parameters for each ROI. Next, a least absolute shrinkage and selection operator (LASSO) analysis was used to isolate the parameters that best differentiated edema from tumors while irrelevant parameters were discarded. Finally, statistical assessment was performed. **Results:** Receiver operating characteristic results showcase both the best single discriminator to differentiate tumor from edema and the discriminant capacity of the model using all variables selected by LASSO. T1-weighted sequence postcontrast with normalization offered the best tumor classification (AUC>0.97) for patients with GBM with all MRI sequences. For patients with meningioma, a good model of tumor classification was obtained through the T1-weighted sequence without normalization (AUC>0.71). **Conclusion:** A small subset of radiomic features showed an excellent ability to distinguish edema from tumor tissue through its most discriminating features.

06.02

9:10 USE OF CANCER STEM CELL DRUG RESPONSE ASSAY TO IMPROVE THE OUTCOME OF GLIOBLASTOMA PATIENT.

Candace M. Howard, Elliot T. Varney, Tulika Ranjan, Jagan Valluri, Pier Paolo Claudio

Department of Radiology, University of Mississippi Medical Center, Jackson, MS 39216

Department of Neurology, Medical Oncology, Allegheny Health Network Cancer Institute, Pittsburgh, PA 15212

Department of Biological Sciences, Marshall University, Huntington, WV 25755

Department of BioMolecular Sciences, National Center for Natural Products Research

Department of Radiation Oncology, University of Mississippi, MS.

Over the past 20 years the prognosis of glioblastoma (GBM) has minimally improved from 12 to 14 months. This is due in large part to the presence of chemo- and radiation-resistant GBM cancer stem cells (CSCs) that contribute to treatment resistance. We are using ChemoID, a CLIA certified and CAP accredited drug response assay to identify the most effective chemotherapy treatment against CSCs and bulk of tumor cells from of a panel of chemotherapies. A prospective study was conducted evaluating the use of the ChemoID drug response assay in 61 glioblastoma patients enrolled in an IRB approved protocol. Patients were prospectively monitored for tumor response, time to recurrence, progression-free survival (PFS), and overall survival (OS). Odds Ratio (OR) associations of 12-month recurrence, PFS, and OS outcomes were estimated for CSCs, bulk tumor and combined assay responses to treatment; sensitivities/specificities, areas under the curve (AUC) were examined. We observed that ChemoID guided treatment significantly enhanced tumor response. For every 5% increase in cell kill of CSCs by assay-guided chemotherapy, 12-month patient response (non-recurrence of cancer) increased 2.5-fold, OR=2.3 (p=0.01). Bulk of tumor assay was found not statistically significant. Median recurrence time was 20 months for patients with a positive (>40% cell kill) CSCs test versus only 3 months with a negative CSCs test. Similar favorable results for the CSC test were observed for PFS and OS outcomes. The data suggests that the ChemoID CSCs drug response assay has the potential to help guide

individualized chemotherapy choices to improve glioblastoma patient outcomes.

O6.03

9:20 POSS IN MEDICAL AND BIOLOGICAL PRODUCTS

Joseph Lichtenhan

Hybrid Plastics Inc.

POSS additives are known to enhance medical and personal care products and have been in the UK and US markets for several years. In particular, a liquid trisilanol hepta-isoOctyl POSS is uniquely well suited for use as a hemostatic device for non-compressible bleeding and wound healing. Upon contact with blood trisilanol hepta-isoOctyl POSS rapidly prevents fluid loss and simultaneously forms a viscoelastic polymeric clot (thrombus) with blood components. The mechanism of action for the POSS viscoelastic hemostat, along with its comparative performance relative to other hemostatic devices will be presented. This presentation will include in vitro and in vivo findings.

O6.04

9:30 MARIJUANA EXPOSURE IS ASSOCIATED WITH HYPERCOAGULABILITY AFTER INJURY.

Kristen T Carter

University of Mississippi Medical Center

Introduction: Previous studies suggest that marijuana use may modulate the coagulation system, specifically identifying that cannabinoids signal through receptors on platelets to modulate their activation. However, the clinical relevance of these findings is unclear. Therefore, we used thromboelastography (TEG), a dynamic viscoelastic clotting assay, to investigate the effects of recent marijuana exposure (ME) on coagulation in critically injured patients. We hypothesized that exposure to marijuana is associated with hypercoagulability. **Methods:** Critically injured trauma patients admitted to an urban Level One trauma center were prospectively enrolled under a waiver of consent. Platelet-mapping TEG was performed and correlated with clinical parameters, standard laboratory values, and outcomes. **Results:** Of 37 enrolled patients, 24 underwent UDS; 7 patients (29%) were positive for ME. ME exposure was significantly associated with admission hypercoagulability based on TEG parameters: K-time was 1.5-fold shorter ($p=0.05$) and angle was 1.1-fold steeper ($p=0.03$). In contrast to ME, neither current tobacco use nor recent cocaine use correlated with admission hypercoagulability (all $p>0.07$). Marijuana-associated hypercoagulability based on the TEG parameters R ($p<0.01$), K ($p<0.01$), and angle ($p<0.01$) persisted through 72h after admission. Patients with recent ME were younger (29 ± 6 vs. 47 ± 18 , $p<0.01$), but did not otherwise differ in demographics, history, or injury characteristics from those without exposure. There were no thromboembolic events in either group. **Discussion/Conclusion:** Exposure to marijuana is a previously unrecognized risk factor for hypercoagulability after injury. Recent marijuana exposure may identify injured patients at increased risk for thromboembolic events, with important implications for risk stratification and prevention.

O6.05

9:40 EXPLORATION OF A RELATIONSHIP BETWEEN TRANSARTERIAL RADIOEMBOLIZATION (TARE) TREATMENT RESPONSE AND 99mTc-MAA SPECT/CT TREATMENT PLANNING SCANS FOR HEPATOCELLULAR CARCINOMA (HCC).

Edward Florez, Candace M. Howard-Claudio, Ali Fatemi

University of Mississippi Medical Center

Introduction: TARE using yttrium-90 (Y-90) microspheres is an effective treatment of HCC. Current imaging assessment occurs one to two months post-treatment to determine effectiveness due to radical tissue changes in response to radiation. This delay may hinder patient outcomes, necessitating identification of faster biomarkers of treatment outcome. All patients at UMMC prior to receiving TARE undergo a 99mTc-macroaggregated albumin single-photon emission computerized tomography (99mTc-MAA SPECT) scan for treatment planning. Our goal is to explore the relationship between dose volume histograms (DVH) and dosimetric maps generated from the 99mTc-MAA SPECT/CT scan and treatment outcomes. **Methods:** Nine patients who received TARE with Y-90 as their first treatment of HCC were retrospectively analyzed. Radiation dosage maps and DVH using pre-treatment 99mTc-MAA SPECT/CT or MRI data and post-treatment CT or MRI were generated through licensed software (Figure 1). All patients were stratified into 3 categories (3 Complete Response, 5 Partial Response, 1 Progressive Disease) based on treatment response determined by modified Response Evaluation Criteria in Solid Tumors (mRECIST). **Results:** Area under the curve (AUC) values were generated and used to quantify the information from the DVH. Then, AUC values were compared with the treatment response determined by mRECIST. **Discussion:** Analysis of dosage distribution maps calculated from 99mTc-MAA SPECT/CT may enable us to optimize dose delivery methods and may prove useful as a planning tool to predict tumor response to TARE. **Conclusion:** The data obtained from 99mTc-MAA SPECT/CT scans of 9 patients who underwent TARE do not show any obvious relationship with their treatment responses as determined by mRECIST.

9:50 Break

10:05 Welcome: D. Olga McDaniel

**10:10 Population Health Symposium I
'THE MIND AND DISEASE'**

In Memory of Dr. Raymond Grill

(Speaker information can be found in the section on Divisional symposia and workshops)

Moderators: Drs. Frank Spradley and Josie Bidwell

Speakers:

10:20 Alexander P. Auchus, MD, UMMC

"DEMENTIA AND ALZHEIMER"

10:50 Ronald Klein, PhD, LSU, Shreveport LA

"ALS RESEARCH, GENES AND THERAPEUTIC OPTIONS"

11:20 Robert Annett, PhD, UMMC

"GENOME WIDE ASSOCIATION CONTRIBUTIONS TO UNDERSTANDING AUTISM SPECTRUM DISORDERS"

11:45 -Noon Symposium Discussion

12:00 General Session



Thursday, February 21, 2019

AFTERNOON

Room Union B

1:15 Population Health Symposium II
**"POPULATION HEALTH AND DISEASE-
 INFANCY TO ADULTHOOD"**
 (Speaker information can be found in the section on
 Divisional symposia and workshops)

Moderators: Drs. Olga McDaniel and Frank Spradley

Speakers:

1:15 Thomas Dobbs, MD, MS State DH
"POPULATION HEALTH IN MISSISSIPPI"

1:45 Barbara Alexander, PhD., UMMC
**"RENAL MECHANISMS OF FETAL
 PROGRAMMING OF HYPERTENSION AND
 RENAL INJURY IN LOW BIRTH WEIGHT"**

2:15 Alejandro Chade, MD, UMMC
**"BIOTECHNOLOGY AND THERAPEUTIC
 TARGETS IN CARDIOVASCULAR AND RENAL
 DISEASE"**

2:44 Symposium Discussion

3:00 – 3:15pm HSD Business Meeting

Thursday, February 21, 2019

EVENING

3:30 Dodgen Lecture and Awards Ceremony TCC Theatre
General Poster Session
Immediately Following Dodgen Lecture
TCC Ballrooms 3rd floor

Coordinators for Health Science Posters:
 Drs. Gouri Mahajan and Frank Spradley

P6.01

**DETERMINING THE ASSOCIATION BETWEEN SOCIAL
 SUPPORT, SEXUAL BEHAVIORS AND HIV RELATED
 STIGMA IN AAMSM IN THE DEEP SOUTH**

Zoe Beckworth, Daniel Chavez-Yenter.

My Brother's Keeper, Inc. Tougaloo College

The HIV epidemic among African American men who have sex with men (MSM) is one of the most urgent public health challenges in the United States. African Americans comprised 14% of the national population but accounted for 44% of new HIV infections in 2009, with MSM accounting for 51% of new infections among all African Americans. In 2015, there were twice as many Black MSM diagnosed with HIV than white MSM. The Centers for Disease Control and Prevention estimates that 1 in 2 Black MSM will become infected with HIV if current trends in HIV prevention, care and treatment continues. Findings of existing studies have suggested that higher level of social support might be generally related to fewer HIV-related risk behaviors in MSM. Chi-squared testing was used to test for associations in data from the MARI survey to understand the relationship between social support and sexual behaviors that lead to HIV. The MARI study is a two-city,

population-based cohort study designed to study behaviors and psychosocial factors among Black MSM in the Deep South (Jackson, MS and Atlanta, GA) and to investigate the determinants of HIV risk and sexual behaviors. Surprisingly, more men who have sex with men have medium to high levels of social support. Out of the 330 men surveyed, only 84 reported having low levels of social support. There was no significant association that linked higher levels of social support to safer sex practices or lower prevalence of HIV.

P6.02

**THE EFFECTS OF NEAR GROUND OZONE ON THE
 INCIDENCE OF LUNG CANCER**

Nuriya Bonner

MCIS

The purpose of this investigation is to analyze the effect of ozone in the tropospheric region of the earth environment. This area is generally occur in the region from the ground extending up approximate six miles. Particular interest is the relationship on human health in Mississippi between near ground ozone region and lung cancer; and how this relationship differs with gender, race, and age groups. The data source is taken from information provided in publications by (the Centers for Disease Control and Prevention) CDC NOAA, and the Environment Protection Agency. The data will be organized and statistically analyzed using the Statistical Package for the Social Sciences (SPSS). Scientists have studied the effects of the ozone of health for decades. Research studies have confirmed that the ozone harms people at levels currently found in the U.S. Ozone aggressively attacks lung tissue by reacting chemically with it. When ozone is present, there are other harmful pollutants created by the same processes that make ozone. The ozone layer found high in the upper atmosphere (the stratosphere) shields us from much of the sun's ultraviolet radiation. However, ozone air pollution at ground level where we can breathe it causes serious health problems. Anyone who spends time outdoors where ozone pollution levels are high may be at risk. One particular group is people with existing lung diseases, such as asthma and chronic obstructive pulmonary disease (COPD, which includes emphysema and chronic bronchitis)

P6.03

**BENZODIAZEPINE RESPONSE IN RHESUS MACAQUES
 WITH POLYMORPHISMS 878T>A AND 463A**

Carlie Reeves.

INBRE.

Cytochrome P450 (CYP) is a gene that produces enzymes responsible for the metabolism of many drugs, including benzodiazepines (BZPs). BZPs are a class of psychoactive drugs used to treat a range of conditions, including anxiety and insomnia. To investigate whether the behavioral differences observed in rhesus macaques when administered drug triazolam under controlled conditions can be explained by single nucleotide polymorphisms (SNPs), we analyzed 18 DNA samples from rhesus macaques that have data on BZP response. Using polymerase chain reaction (PCR) and sequencing, we established the complete sequence of exon 7, 8, and 10 from CYP3A4 and exon 6 and exon 11 from CYP3A5 in each DNA sample. Because human and rhesus macaque genes share 97.5% similarities, the behavioral responses and their correlated SNPs in the rhesus macaques will have paralleled functional effects in humans. The sequenced data revealed two statistically significant SNPs: 878T>A and 463A>G. It was found that for 463A>G subjects with genotypes A/A require a higher minimal effective dosage of triazolam compared to those with genotype A/G. Discovery of new alleles and their affects on metabolisms of BZPs are imperative to

understanding the interindividual variation in activity. Such discoveries will aid in tailoring BZPs to patients according to their genome. By doing so, therapeutic effects will be optimized and toxicity and side effects will be reduced.

P6.04

TRENDS IN THE PREVALENCE OF HEART FAILURE AMONG US ADULTS, NHANES 2005-2014.

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Introduction: Management of Heart Failure (HF) are very important for reducing morbidity and mortality associated with the heart conditions. This study examined the trends in the prevalence of HF among adults in the United States in the period of 2005-2014.

Methods: We used the National Health and Nutrition Examination survey 2005-2014. A stratified multistage probability sampling design was used in the survey. Heart failure information on 18,634 individuals (3056 in 2005-2006, 4025 in 2007-2008, 4135 in 2009-2010, 3603 in 2011-2012 and 3815 in 2013-2014) aged ≥ 20 years was used. The percentage of self-reported prevalence of heart failure for each year was analyzed using weights and design factors reported by NHANES. The prevalence of HF was examined according to gender, age group, and race/ethnicity. Analyses were performed using SAS 9.4. **Results:** The prevalence of HF in 2013-2014 was 5.8%, 8.4% and 11.1% in the 20-44, 45-74 and ≥ 75 age groups, respectively. When compared with 2005-2006, there were no significant increases in the overall prevalence. The overall prevalence was 23.8%. The prevalence in males (3.2%) was higher than females (2.1%) in 2005-06 at $p=0.051$. The HF rate was 2.6% in 2005-2006 and 2.4% in 2013-2014. According to race/ethnicity, non-Hispanic black (3.4%) had a higher prevalence of heart failure than non-Hispanic white (2.9%) in 2013-2014 at $p=0.032$.

Conclusions: The heart failure rate increased significantly in male and non-Hispanic blacks. Among the ≥ 70 age group, the prevalence of heart failure increased significantly. More attention should be focused on male and non-Hispanic blacks.

P6.05

AIR POLLUTION & SLEEP APNEA: INFLUENCE ON CARDIOVASCULAR DISEASE IN CHICAGO

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Acute exposure to particulate matter (PM) air pollution causes thrombotic cardiovascular events, leading to increased mortality rates. Obstructive sleep apnea (OSA) is a common and often unrecognized condition with detrimental complications including hypertension (HT) and more serious cardiovascular diseases (CVD). The aim of this study was to assess the combined influence of sleep apnea and particulate matter (PM_{2.5}) on cardiovascular risks in multi-ethnic populations, disproportionately affected by CVD. The study consisted of 4140 Chicago residents from 25 randomized census tracts. Participants were evaluated with through clinical assessments and a questionnaire to assess sleep parameters and CVD risks and diagnosis. The average amount of PM_{2.5} in the city of Chicago was 11.4 ± 2 mg/mg³. The results revealed a significant relationship between PM_{2.5} and heart attacks. There was no significant relationship between PM_{2.5} and HT, type II diabetes, and sleep apnea. There was a significant relationship between sleep apnea and hypertension and type II diabetes. In conclusion, the results of this project and future studies will provide important insight into potential avenues for the prevention of cardiovascular disease at the community and individual levels.

P6.06

LIVER ISCHEMIA/REPERFUSION INJURY AND INFLAMMATORY RESPONSES IN OBESE FEMALE RATS.

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Liver ischemia/reperfusion injury (IRI) occurs in clinical situations like transplantation. Obesity with hepatic fat accumulation (steatosis) exaggerates risk for liver IRI via inflammatory mediators, like tumor necrosis factor- α (TNF- α). Males have a higher incidence of fatty liver disease. Although steatotic males have exaggerated liver IRI, it is not as well known whether this also occurs in females. We tested the hypothesis that liver IRI and TNF- α levels are exaggerated in obese female rats. Obese melanocortin-4 receptor (MC4R)-deficient or lean wild-type (WT) female rats were subjected to 45' of 70% warm liver ischemia with plasma and liver tissue harvested at 24 hours of reperfusion or Sham surgeries. EchoMRI revealed that liver fat was greater ($P < 0.05$) in obese ($7 \pm 1\%$) versus lean rats ($2 \pm 1\%$). Plasma levels of the liver enzyme, ALT, were measured to estimate liver injury, with exaggerated levels ($P < 0.05$) in obese (I/R: $6,621 \pm 1,922$ vs. Sham: 55 ± 25 IU/mL) compared to lean rats (I/R: $1,185 \pm 389$ vs. Sham: 69 ± 21 IU/mL). Although hepatic TNF- α levels were lower in obese compared to lean Shams (6.8 ± 1.1 vs. 13.7 ± 3.1 pg/mg, $P < 0.05$), liver IRI increased ($P < 0.05$) TNF- α in obese (10.0 ± 1.8 pg/mg) but not lean rats (11.6 ± 1.9 pg/mg). Indeed, the % change in hepatic TNF- α levels following IRI was $-15 \pm 14\%$ in lean and $47 \pm 26\%$ in obese rats ($P < 0.05$). Conclusively, these data implicate increased inflammatory responses in mediating the exaggerated liver IRI in obese female rats.

P6.07

A MULTI-DIMENSIONAL HPLC-MS METHOD FOR HEPARIN/HEPARAN SULFATE OLIGOSACCHARIDE TOP-DOWN ANALYSIS.

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Introduction: Heparin and heparan sulfate (HS) are structurally diverse, highly negatively charged glycosaminoglycans, with repeating disaccharide units of a uronic acid sugar (either glucuronic or iduronic acid) and a glucosamine residue [1]. Due to the various patterns of sulfation and uronic acid epimerization, it is a significant challenge for researchers to separate heparin/HS and study the structure-function relationship. Here, we develop a MS-compatible multi-dimensional HPLC separation method to enrich substructures of enoxaparin sodium octosaccharides for functional glycomics study. **Methods:** Enoxaparin Sodium Injection (Winthrop®) was loaded to the size exclusion column, eluting with 0.5 M ammonium bicarbonate. The heparin size fraction samples were derivatized with AEAB. The derivatized samples were analyzed on a C18 column by IPRP. The mobile phase for IPRP consisted of [A: 95% water and 5% acetonitrile and B: acetonitrile] with pentylamine and acetic acid. Eluent fractions were injected on an Amide-HILIC column by LC-MS. Mobile phase C was 10 mM ammonium formate (pH 4.4) and mobile phase D was 98% acetonitrile with 2% phase C. **Results:** By coupled SEC, IPRP, and Amide-HILIC, this three-steps separation method was able to separate synthesized hexasaccharide isomeric structures and resolve more detailed structural information of heparin sulfate oligosaccharide top-down functional analysis.

P6.08**INTERLEUKIN-17 MEDIATES ACTIVATION OF CYTOLYTIC NATURAL KILLER CELLS IN PREGNANT RATS.**

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P6.09**VERNONIA AMYGDALINA SHOWS PROMISE IN THE MANAGEMENT OF ACUTE PROMYELOCYTIC LEUKEMIA.**

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Jackson State University

The treatment of acute promyelocytic leukemia (APL) has been based on the administration of all-trans retinoic acid plus anthracycline chemotherapy, which is very effective as first line therapy; however 25 to 30% of patients will relapse with their disease becoming refractory to conventional therapy. To achieve this goal, HL-60 cells were treated with different doses of medicinal plant for 24 hours. Cell viability was determined by MTS, trypan blue, and propidium iodide assays respectively. Cell apoptosis was assessed by the flow cytometry. The results obtained from the MTS, trypan blue, propidium iodine assay indicated that at very low dose, medicinal plant has a stimulatory effect on the growth of HL-60 cells. A significant ($p < 0.05$) gradual decrease in live cells was observed when exposed to high level of medicinal plant. Data generated from the propidium iodide indicated that medicinal plant exposure significantly ($p < 0.05$) increased the proportion of fluorescence positive cells (necrotic death cells) compared to the control. This cytotoxicity was found to be associated with necrosis as revealed by a significant increase in dead cell concentration (Fluorescence) with increasing of medicinal plant doses. Data generated from the flow cytometry demonstrated that Vernonia amygdalina induced apoptosis through caspase-3 activation. These results provide useful data on the anticancer activities of our medicinal plant in leukemia and demonstrated the novel possibilities of this medicinal plant in developing leukemia therapies.

P6.09**MILLIMOLAR AGMATINE LEADS TO RISE IN NITRIC OXIDE IN 3D CO-CULTURE WITH C2BBE1 CELLS.**

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Introduction: To explore trans-epithelial signaling from the gut microbiota to enteric nerves we have developed an *in vitro* human co-culture system wherein SH-SH5Y neuroblastoma cells, a model of enteric neurons, are cultured with an overlying confluent layer of C2BBE1 cells, a model of the gut epithelial lining, separated by a semi-porous polycarbonate membrane. The membrane contains 400 nm pores which allow only small molecule communication to occur between the cells while maintaining a physical separation of the two cell types. **Methods:** Bacterial metabolites are added over the apical side of the C2BBE1 cells, and changes in the underlying SH-SY5Y growth dynamics observed. Previously we reported that agmatine, a bacterial metabolite of arginine made by gut bacteria at mM levels, causes anti-proliferation in SH-SY5Y and C2BBE1 cells in monocultures, respectively. **Results:** Co-cultured C2BBE1 cells were found to send underlying SH-SY5Y cells into cytostasis without toxicity. The addition of apical mM agmatine over the

confluent C2BBE1s in co-culture was found to release this cytostasis on SH-SY5Y cells. We hypothesized this was due to a transient gas because of the inability to replicate the effect of agmatine by transplanting conditioned media. It was also found that mM agmatine raised nitric oxide levels in the basal media when in 3D co-culture with C2BBE1, but not when C2BBE1s were grown on inserts without underlying SH-SY5Y cells, indicative of nitric oxide being generated due to the SH-SY5Y cells. **Discussion:** It is suggested that bacterial agmatine signals trans-epithelial neurons to proliferate and cooperate with the microbial inhabitants.

P6.10**ATTITUDES OF MISSISSIPPI NURSES' TOWARDS EDUCATION ON COMPLEMENTARY & ALTERNATIVE MEDICINE IN MISSISSIPPI UNIVERSITIES.**

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The growing consumer demand for complementary and alternative therapies (CAM) in health care has had an effect on all health professionals. The discipline of nursing is rooted in many holistic processes but the role of providing such services has not been fully defined in many states, including the state of Mississippi. Nurses are the members of the healthcare team who often initiate such a conversation with patients about CAM. We took a look at the state of Mississippi nurses and their perception of such a growing consumer demand, with effective healthcare services in mind. This was a descriptive quantitative study, with a sample size of 116 Mississippi Nurses. Participants in attendance to the 2016 MS Nurses Association Annual Meetings & Conventions voluntarily completed a questionnaire. Results found that 66.39% of participating nurses felt comfortable talking about CAM with patients, but only 20% of participating nurses felt prepared educationally. That left 80% of the nurses feeling unprepared when discussing CAM with patients. Only 38.60% nurses said they actually initiate any type of discussion with patients on CAM. These findings support our hypothesis that there is a lack of congruence between nurses' beliefs and knowledge of CAM, and the incorporation of CAM into their current practice.

P6.11**MENTAL HEALTH CONTINUUM OF CARE AMONG MALE TO FEMALE (MTF) AND FEMALE TO MALE (FTM) TRANSGENDER INDIVIDUALS.**

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Individuals who identify as transgender tend to experience higher rates of mental health issues than the general population. While approximately 6.7 percent of the general population suffers from depression and other mental health disorders, nearly half of all individuals who identify as transgender experience these issues. Pervasive discrimination, sex-segregated discrimination, harassment by government agency staff, police harassment, and refusal of medical care are all issues that transgender individuals often experience that lead to depression and other mental health disorders that require mental health continuum of care and treatment. A comparative analysis was conducted to determine the number of transgender individuals-MTF versus FTM who are more likely to seek mental health continuum of care service. Data was extracted from Advanced MD Electronic Health Records system at Open Arms Health Care Center for population-level surveillance of mental health follow-up appointments for 120 randomly selected transgender individuals aged 16 to 61. Using Microsoft Excel, the data was analyzed through frequency distribution and graphed to interpret and illustrate the results of the analysis. The Pearson correlation analysis showed that transgender assignment and

attended follow up mental health appointment has no significant correlation therefore; Hypothesis 1 was rejected. Data revealed that transgender assignment and age of client has a significant correlation therefore, Hypothesis 2 was accepted. The study revealed that transgender assignment has no correlation with mental health continuum of care but it was shown that the age of the client significantly correlated with the attended follow up mental health appointment

P6.12

A COMPARATIVE ANALYSIS OF HIV RISK-FACTORS AMONG AFRICAN AMERICAN HETEROSEXUAL MEN AND AFRICAN AMERICAN HETEROSEXUAL WOMEN IN THE JACKSON, MS MSA

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This project is a comparative analysis that focuses on heterosexual men and women aged 18-30 in the Jackson, MS MSA area. The purpose was to determine if the men or women involved were more vulnerable to contracting HIV based on an analysis of self-reported answers used to create a Client Risk Profile. This sheet contains the main risk factors that would put them at higher risk for contracting HIV. After creating a frequency report with the answers of the participants; we were able to identify prevalence of risk in both men and women. The analysis revealed insignificant difference in the number of women vs. men who tested positive for HIV; however, there were a larger number of women who participated in high-risk sexual activities. In fact, the numbers were larger for women in the risk factors that follow: sex while intoxicated and/ or high on drugs, sex with person of unknown HIV status, sex with anonymous partner, diagnosed with a sexually transmitted disease (STD), unprotected sex with multiple partners, and sex with someone who is HIV positive. Although they were not diagnosed with HIV in the previous 12 months of this study, if these women continue have these at risk sexual behaviors, then they might come in contact in the near future. Being that women were in fact more susceptible; my hypothesis was rejected.

P6.13

INVESTIGATING THE RELATIONSHIP BETWEEN HIV DIAGNOSIS AND DEPRESSION AMONG AFRICAN AMERICAN MSM AGED 18-29 IN THE JACKSON MSA

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Little is known about the prevalence and impact of depression in persons newly diagnosed with HIV. People living with the HIV exhibit more severe mental health symptoms than do members of the general public (including depression and PTSD symptoms). Most studies focus on depression in outpatients already in the process of establishing care. The purpose of this project was to determine if there is a significant relationship between HIV diagnosis and depression. Participants in the study were African American MSM, living in the Jackson, MS area. A questionnaire, of various topics regarding social support and depression, was given to examine personal experiences. Of the 323 participants, 133 reported as being HIV positive. Of those HIV positive individuals, 50% reported experiencing fewer symptoms of depression, which determined there was no significant relationship between depression and HIV diagnosis. Though these results did not reach statistical significance, screening for and treating depression at the time of HIV diagnosis may improve linkage to and retention in HIV care. There is also a lack of knowledge among health care providers about LGBT related issues and training around mental health

services for the LGBT population in medical education. If left untreated, depression can cause HIV-infected individuals to stop their treatments, stop going to medical appointments, and to actively not stay engaged in personal care in general.

P6.13

THE FUTURE OF HEALTHCARE: HOW DOES THE COST OF HEALTH INSURANCE AFFECT ACCESS TO AFFORDABLE HEALTHCARE SERVICES?

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The Affordable Care Act (ACA) gained historical recognition by extending Medicaid coverage and providing Marketplace subsidies for individuals below 400% of poverty. Currently, 28 million Americans are uninsured due to cost, unemployment, ineligibility, etc. Mississippi ranks 50th when it comes to accessibility and affordability to medical care. The purpose of this study is to examine the number of individuals that are currently uninsured or insured to improve access to healthcare services. We conducted a community survey amongst individuals seeking healthcare services. The survey contains a range of questions pertaining to uninsured status, reasons for being uninsured, and whether or not income prevents accessibility and affordability of healthcare. Upon completion of survey collection, surveys were entered into Microsoft Excel and analyzed using SPSS. According to data analysis, there are an equal number of individuals that are insured or uninsured. There is a significant association between income and insurance status. Findings show that most individuals are ages 19-29 with average incomes ranging between less than \$15,000 to \$25,000 annually. Therefore, concluding that most individual who stated they did not have insurance reasoning that they are uninsured due to affordability. Individuals that do have insurance also stated that the cost of health insurance, co-pay, and deductibles sometimes prevent them from receiving healthcare services regularly as well.

P6.14

CANCER: EARLY CATCH! IS IT WORKING? UNUSUAL PRESENTATION OF COMMON CANCERS

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Purpose: To evaluate the burden of the common solid organ cancers in our institute and test the impact of early screening. **Material and Methods:** We reviewed 7227 patients with prostate (1370), breast (2052), colon (1044) and lung cancer (2761) treated at UMMC between 2002 and 2017. All data was obtained from the UMMC Cancer Registry. Descriptive analysis was done and frequencies were calculated for each stage in the four cancers. Stage 0, I and II were combined and Stage III and IV were combined and separate percentages were calculated. **Results:** In breast cancer, 72.13% of the patients presented with Stage (0, I, II) in comparison to 24.12% with Stage (III, IV). Prostate cancer, 67.45% presented with Stage (0, I, II) vs 27.74 % with Stage (III, IV). Interestingly in colon cancer, 35.53% of the patients presented with Stage (0, I, II) vs 56.61 % with Stage (III, IV). The lung cancer results also showed the same trend with 25.64 % (0, I, II) vs 69.61% (III, IV). **Conclusions:** Here prostate and breast cancer patients presented at early stages. This may be due to increased awareness about them and good screening measures and implementation. Colon and lung cancer patients in our cohort mainly presented at the later stages. The reasons behind the later stage presentation among colon and lung cancer patients need to be further studied; we hypothesize a combination of poor screening measures and implementation along

with less awareness and ignorance; we intend to study these factors in the future.

P6.15**INCREASING THE SUSTAINABILITY OF YOUTH SERVING ORGANIZATIONS TEEN PREGNANCY PREVENTION INITIATIVES BY PROVIDING STRUCTURED, EVIDENCED- BASED CAPACITY BUILDING**

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Mississippi ranks second highest in Teen Pregnancy nationally with a prevalence of 50.2 per 1000 female adolescents ages 15-19 years. Central-Southwest Mississippi River Region is 71.8 per 1,000 adolescent females ages 15-19, which exceed the national average (26.6 per 1,000 adolescent females, ages 15-19). MBK provided a total of 14 population-focused, programmatic and organizational capacity building assistance (CBA) services to 12 youth-serving organizations in the Central-Southwest Mississippi River Region, (which includes the following six counties: Issaquena, Warren, Claiborne, Jefferson, Adams, and Wilkinson) to build their capacity to develop, manage and implement evidence-based TPP programs. This study examines how Capacity Building Assistance trainings' impacted knowledge and efficacy of youth-serving organizations in the Central-Southwest Mississippi River Region. Providing Conducting an array of CBA services and trainings to the selected cohort of organizations resulted in the implementation of twenty-four, 8- hour Teen Pregnancy Prevention trainings to a total of 446 adolescents in the Central-Southwest Mississippi River Region. Evaluation data obtained from these CBA trainings found a significant increase in subject matter knowledge, awareness and future utilization of information.

P6.16**The IMPACT OF ENVIRONMENTAL FACTORS ON RISKY SEXUAL BEHAVIORS IN THE JACKSON MSA**

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According to the CDC, Jackson, MS is ranked 4th among US cities with the highest rate of HIV infection. Specifically, sexually active persons are more likely to experience HIV/STI exposure and/or unplanned pregnancies due to risky sexual behaviors which is commonly defined as behavior that increases a person's risk of exposure to sexually transmitted diseases/infections and/or experiencing unintended pregnancies. This study was designed to examine the perceptions of the impact of environmental factors on risky sexual behaviors. Presumably, environmental factors such as socioeconomic status, lack of sexual and reproductive health education, and substance use are perceived to stimulate the probability of risky sexual behaviors. For the purpose of this study, a brief survey was developed and disseminated to elicit responses regarding perspectives about risky sexual behavior. All data collected was voluntary and self-reported. According to the data collected, surveyors supposed the lack of sexual and reproductive education (84.5%), drug and alcohol use (58%), and lack of appropriate income-generating activities for youth (48%) impact risky sexual behaviors in the Jackson, MS MSA. Based on qualitative and quantitative study results, implantation of sexual and reproductive education courses in schools as well as contraception courses should be strongly considered in order to reduce the frequency of sexual risk behavior.

P6.17**ANALYZING THE EFFECTIVENESS OF THE DUAL SEX EDUCATION PROGRAM ON STI KNOWLEDGE FOR PARTICIPANTS IN THE ICAN PROJECT.**

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Adolescents account for approximately 3 million of the 340 million STI cases in the United States. Research suggests lack of sex education in schools could be linked to STI rates because students' knowledge and awareness of STIs is poor. Additionally, lack of communication between parents and students about sex could be a factor in the increasing STI rates. Many students who have prior knowledge of STIs receive information from their parents, friends, or the media, but the perceived information could be inaccurate. The David and Lucile Packard foundation funded the ICAN Reproductive Health Program, which is a community-based program to improve sexual education and STI knowledge among adolescents in the Jackson public school district and surrounding school districts. Participants in the program are educated on STI knowledge, puberty, and preventative methods. To determine perceived knowledge, students and parents were given a pre-assessment. The groups were educated separately about different components of sex education and given post-assessments. STI knowledge scores were isolated from other components of the pre and post-assessment, and a single factor ANOVA was conducted to analyze data using the Statistical Package for the Social Sciences (SPSS), a statistical software analyzing tool. Although there was an increase of knowledge, the results indicated that there is no statistical significance (p-value = 0.139) of increasing knowledge before and after the intervention.

P6.18**CT DELTA-RADIOMICS ALGORITHM PREDICTS PROGRESSION-FREE SURVIVAL (PFS) IN METASTATIC RENAL CELL CARCINOMA (RCC) TREATED WITH ANTI-ANGIOGENIC (AAG) THERAPY.**

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Introduction: To develop a CT delta-radiomics algorithm to predict progression-free survival (PFS) in patients with metastatic RCC treated with AAG therapy. **Methods:** A multi-institutional prospective phase III trial evaluating sunitinib as first-line agent in patients with metastatic RCC was conducted on 275 patients with digital CT images. CT radiomic features (RCT=250) were measured on baseline and initial post-therapy CT images using a quantitative software (Figure 1). Tumor length and CT radiomic features with high inter-observer agreement (ICC>0.60; RIO=14 candidate parameters) among 11 readers who independently evaluated 20 randomly selected patients were incorporated into a statistical model (CT delta-radiomics algorithm) and associated with PFS using Cox-proportional hazards ratio and log-rank test. **Results:** The final CT delta-radiomics algorithm included: change in both target lesion length and tumor area, gray level non-uniformity, and run length non-uniformity. CT delta-radiomics algorithm non-responders (NNR=135) on the initial post-therapy CT exam were 2.6 times more likely to progress than responders (NR=140; HR=2.6, p<0.001). The median PFS of 0.7 years for non-responders was significantly different than the median PFS of 1.6 years for responders (p<0.001). **Discussion:** Delta-radiomics analysis in CT images has the ability to measure changes in tumor heterogeneity. Two radiomic features had both high inter-observer agreement and a

statistically significant association with PFS. **Conclusion:** A CT delta-radiomics algorithm with higher inter-observer agreement was predictive of PFS in patients with metastatic RCC treated with AAG therapy and could be used to identify non-responders after one cycle of therapy and thereby reduce drug toxicities and costs from a failing therapy.

P6.19

ALLOPREGNANOLONE AS A THERAPEUTIC TARGET FOR NEUROLOGICAL DYSFUNCTION CAUSED BY EXPOSURE TO HIV-1-TAT AND MORPHINE IN A MOUSE MODEL

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Individuals infected with human immunodeficiency virus type 1 (HIV-1) suffer from neurocognitive and neuropsychiatric perturbations that cannot be ameliorated by combined antiretroviral therapy (cART). One regulatory HIV-1 protein that contributes to CNS-related toxicity is the trans-activator of transcription (Tat). Tat pathology is worsened in animal or cellular models when combined with opiates, which is of clinical interest given that ~1/5 of HIV+ individuals acquired the infection via injection drug use. Pregnane steroids can ameliorate some of the neurological deficits associated with HIV-1 Tat, but the effects on steroid biosynthesis and interactions with opiates are not known. Using a Tat-transgenic mouse model, we found that pregnane neurosteroids were dysregulated in the whole brain by HIV-1 Tat exposure. Tat increased pregnane steroid content at baseline; however, the proportional synthesis of these steroids was attenuated in response to an acute morphine injection. Inducing Tat expression in mice significantly potentiated the psychomotor effects of acute morphine and add-back of one protective neurosteroid (allopregnanolone, a.k.a AlloP) ameliorated this behavioral response. Follow-up in vitro experiments using primary striatal mouse neurons, revealed Tat to significantly increase neuronal cell death and a physiological concentration of AlloP (10 nM) was able to fully attenuate this effect. On the contrary a supraphysiological concentration of AlloP (100 nM) was neuroprotective on its own, but significantly interacted with morphine to induce neurotoxicity. Thus, these data provide proof-of-concept that AlloP (10 nM) protects against the neurotoxic effects of HIV-1 Tat on the CNS, alone or in conjunction with prior opiate exposure.

P6.20

PROSPECTIVE VALIDATION OF COLORED NON-ENHANCE HEAD CT IMAGES FOR DETECTING ACUTE STROKE IN THE SETTING OF A CODE GRAY

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INTRODUCTION: To decrease time and maintain diagnostic accuracy for detection of acute ischemic stroke in the setting of code gray. **METHODS:** For this prospective observational study, 100 consecutive Code Gray adult patients from 2/1/2018 and 3/17/2018 with a gold-standard MRI were included. Grayscale-NECT and CT-angiograms (CTA) were collected and colorized-NECT images were generated using a previously established method. Images were de-

identified, and two reading sets (100 grayscale NECT+CTA images and 100 grayscale NECT+CTA+colored-NECT images) were generated. Four experienced readers (N=2 neuroradiologists, N=2 residents) independently assessed each reading set. Sessions were separated by >2 weeks to minimize recall bias. Assessments were timed and recorded by a co-investigator. The mean accuracy, sensitivity, specificity and time of assessment were compared between grayscale and grayscale+color 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 grayscale images+color NECT images ($p=0.08/p=0.006/p=0.858$). There was no significant difference in mean accuracy between neuroradiologists and residents ($p=0.142/p=0.711$, respectively). Mean time of interpretation of 59 seconds using grayscale only images decreased by 19 seconds for interpretation using grayscale+color images ($p<0.001$). The mean time of interpretation for neuroradiologists/residents decreased by a mean of 10 and 28 seconds, respectively. **DISCUSSION:** Significantly decreasing the time of assessment without degrading diagnostic accuracy could be widely applicable among general radiologists with no additional patient expense or radiation potentially improve stroke outcomes. **CONCLUSION:** Colorization of Code Gray NECT images maintains accuracy while significantly decreasing assessment time.

P6.21

THE RELATIONSHIP OF ABDOMINAL FAT DENSITY WITH SIMPLE ANTHROPOMETRIC MEASURES AND ITS CORRELATION WITH CARDIOVASCULAR DISEASE (CVD) RISK FACTORS IN AFRICAN-AMERICANS (AA)

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Introduction: In both visceral adipose tissue (VAT) and subcutaneous adipose tissue (SAT), decreases in adipose attenuation and increases in adipose volume have been shown to be correlated with increased CVD risk. This study assessed the relationship of fat density and anthropometric measures and its correlation with CVD risk factors in AAs. **Methods:** For this IRB-approved retrospective observational study, non-enhanced abdominal CTs from African Americans were gathered (N=2006). Attenuation measurements of psoas/paraspinal/abdominal wall skeletal muscle and abdominal fat depots (VAT and SAT) were measured using a multi-layer segmentation software. In addition, anthropometric measures of waist circumference (WC) and sagittal abdominal diameter (SAD) were measured. Finally, associations of HU (fat density) with anthropometric indices were performed using linear regression and Pearson correlation coefficients. Inter-observer agreement was assessed using intra-class correlation coefficients. **Results:** WC was moderately correlated with VAT ($R^2=0.18, 0.42, p<0.001$) and SAT volumes ($R^2=0.20, 0.45, p<0.001$). SAD most notably represented VAT volume ($R^2=0.25, 0.5, p<0.001$). Attenuation measurements showed no significant correlation with WC or SAD. The inter-observer agreement was excellent between two readers in a random sub-cohort ($ICC>0.96, 95\% CI; N=300$). **Discussion:** Previous studies have reported VAT as a valuable predictor of obesity-related metabolic complications; however, efficient and cost-effective biomarkers are needed to estimate the effect of VAT. **Conclusion:** SAD and WC are easily measured and showed an acceptable

association with VAT and SAT density values, respectively. These anthropometric indexes can potentially serve as useful biomarkers to identify and predict cardiometabolic risk in AAs.

P6.22

EFFECT OF LIVER SURFACE NODULARITY, SARCOPENIA AND VISCERAL OBESITY AS RISK FACTORS IN AFRICAN AMERICANS ADULTS

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Introduction: To assess the association between Liver Surface Nodularity, muscle mass (sarcopenia) and visceral fat depots in a high-risk population of African Americans (AAs). **Methods:** This retrospective observation study included non-enhanced abdominal CT images from AAs were analyzed (N=2006). Waist circumference (WC) and sagittal abdominal diameter (SAD) were measured. Muscle volumes (paraspinal, abdominal wall, psoas) and regional abdominal fat volumes, including visceral adipose tissue (VAT) and superficial adipose tissue (SAT), were quantified using a multi-layer segmentation software. Liver surface nodularity (LSN) scores were measured by two readers using a validated quantitative software. Linear regression models were used to associate LSN scores with body composition. Intra-class correlation coefficients (ICC) were used to assess inter-observer agreement. **Results:** LSN scores showed direct proportionality with WC ($R^2=0.18, 0.42, p<0.001$), SAD ($R^2=0.20, 0.45, p<0.001$), and all fat compartments. There was no statistically supported relationship between WC, SAD and LSN when $WC < 100\text{cm}$ ($\beta=0.0, p=0.707$) and $SAD < 25\text{cm}$ ($\beta=0.01, p=0.267$). However, for $SAD \geq 25\text{cm}$, each 1cm increase in SAD was associated with a 0.07 unit increase in LSN score ($\beta=0.07, p<0.001$). $WC \geq 100\text{cm}$ also correlated with an increase in LSN ($\beta=0.02, p<0.001$). Finally, inter-observer agreement was excellent ($ICC>0.89, N=300$). **Discussion:** With direct correlation between the LSN score, anthropometric indices, abdominal fat deposits and muscle volumes, anthropometric measures could serve as low-cost biomarkers for liver disease even before conventional methods (i.e. lab tests) detect active disease. **Conclusion:** Anthropomorphic measurements above a certain cut-off point ($SAD \geq 25\text{cm}; WC \geq 100\text{cm}$), were linked to increased LSN scores.

P6.23

EMBEDDING MULTIWALLED CARBON NANOTUBES IN NATURAL POLYMER NANOFIBROUS MATS

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In recent years, healthcare systems across the globe have begun searching for an alternative to the common wound wrappings and bandages used today. While most of the fibers used to protect open abrasions to the human body perform reasonably well at protecting against infection, emerging superbugs are becoming increasingly able to penetrate and establish themselves in covered wounds. To combat these superbugs and provide a more biocompatible healing patch, natural polymers, such as alginate and chitosan, are being sought for spinning into nanofibrous mats that can be placed over an open lesion. It has also been found that carbon nanotubes greatly enhance the ability of natural polymers to deliver antimicrobial drugs and the ability of natural polymers to remain rigid yet flexible within the body. By performing this experiment, multiwalled carbon nanotubes will be successfully intertwined with both alginate and chitosan polymers by the process of electrospinning. The

precise ratio of nanotubes to natural polymer will be determined, and the resulting fibers will be examined using a scanning electron microscope to determine the efficiency of each ratio. Antimicrobial drugs will also be loaded into the nanotubes to assess their efficiency at delivery of the drug. Also, in doing so, data will be collected for a drug release profile library in order to preserve the rates and efficiency of the carbon-nanotube-embedded natural polymer fibers.

P6.24

DIETARY-LEVEL ARACHIDONIC ACID RECOVERS TEER IN A HEAT-STRESSED MODEL OF NORMAL GUT EPITHELIUM BY DAMPENING THE PRO-INFLAMMATORY CYTOKINE RESPONSE

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Introduction: Arachidonic acid (AA) is a poly unsaturated fatty acid (PUFA) derived from the essential fatty acid linoleic acid. Consumption of red meat and eggs delivers AA to the gut, which is integrated into cell membranes and released for metabolism into prostaglandins, leukotrienes, and thromboxanes. It has been previously shown that heat stress, like that of a fever or inflammatory bowel disease (IBS), stimulates the release of AA, presumably as a protective method of preserving tight junction integrity of gut epithelial cells. In instances of fever and inflammatory bowel disease, the release of inflammatory cytokines is known to enhance degradation of the extracellular matrix and loosen tight junctions. **Methods:** The integrity of tight junctions was quantified experimentally in vitro by employing human transformed C2BBE1 cells grown on semi-permeable inserts for 14+ days and measuring trans-epithelial electrical resistance (TEER). We used this model system and daily measured TEER in response to exogenous AA (varying doses over 7 days of treatment with heat stress at 45°C on day 5). We explored the effects of exogenous AA on the release of cytokines using a cytokine dot array (Ray Biochem). **Results:** C2BBE1 cells treated with AA (50-150 µM) showed a rise in TEER (before and after heat stress) and low release of pro-inflammatory cytokines. **Discussion:** The data suggests that dietary and/or naturally-released AA may serve to manage the leakiness of gut epithelia by modifying the integrity of tight junctions in response to a stressor.

P6.25

INFLUENZA B ANTIBODIES IN THE GENERAL POPULATION

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Influenza A and B viruses are major human pathogens capable of infecting a significant proportion of the human population each year. Influenza A viruses are typically the main cause of recurrent seasonal epidemics and pandemics, but, according to CDC data, there were numerous influenza B infections nationwide in the winter of 2017-18. Two genetically distinct lineages (Victoria and Yamagata) cocirculate. Both are represented in the "quadrivalent" influenza vaccine. Influenza B vaccines used for the current flu season have been in use for three years (Yamagata lineage) and nine years (Victoria lineage) respectively. We hypothesize that, within the general population, there is either a lack of pre-existing immunity to the influenza B virus, or that the existing immunity has failed to recognize the current influenza B virus that has been incorporated into the seasonal vaccine. If the latter is true, this could be due to a genetic mutation in the virus strain that has allowed it to escape the vaccine. To test our hypothesis, hemagglutination inhibition (HAI) assays were performed on 148 discarded,

deidentified human sera to determine whether or not each serum possessed neutralizing antibodies. Twenty sera were chosen for further characterization and found to have HAI titers between 1280 and 5120, and to inhibit virus growth at serum dilutions up to 1:10000. These data suggest that these antibodies were accumulated either through vaccination or through direct exposure by infection. Our study thus far has demonstrated high levels of neutralizing antibodies against influenza B in a randomly selected local population.

P6.26

THE EFFECT OF DONEPEZIL AND MECAMYLAMINE ON MIR-1017

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MicroRNAs (miRNA) have been well established as a potent regulator of the gene expression and are generated through number of pathways. Mirtrons are a class of miRNA that are generated through a droscha independent (non-canonical) pathway. Although the large population of mirtrons have been identified in animal genomes, their functional studies remain least explored. In this study, we try to uncover the biological role of tailed mirtron 1017 in *Drosophila melanogaster*. For this, we first tried to observe the expression pattern of Dalpha5 in the wild type flies as well as in the miR-1017 mutant background using Dalpha5-GFP flies. miR-1017 has been found to target the acetylcholine receptors, Dalpha5, and therefore decreases its expression. We hypothesized that expression of Dalpha5 is regulated in activity dependent fashion. To test the hypothesis, we feed the Dalpha5-GFP flies with Donepezil, which elevates AchR activity and Mecamylamine, which is a known AchR antagonist. Drug treated fly brains are dissected and immunohistochemistry is carried out using anti-GFP for visualizing GFP expression. The expected results are that the Dalpha-5 gene would affect the level of activity of acetylcholine. Therefore, Donepezil will increase the expression of Dalpha-5, and Mecamylamine will decrease the expression of Dalpha-5.

P6.27

EFFECTS OF CAMEL MILK ON HUMAN INTESTINAL EPITHELIAL C2BBE1 CELLS AND NEURONAL SH-SY5Y CELLS IN VITRO

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Introduction: Recent studies have suggested that camel's milk may be therapeutic for autism. We hypothesized that camel milk, distinct from cow's milk, should therefore be able to promote the health of cultured enteric neurons of the gut-brain-axis. **Methods:** Both species' milks were obtained from nature-fed animals, transported to the lab on ice, pasteurized, and fractionated into whole, skim, and cream portions by centrifugation. These were diluted 5.6-fold in culture media, applied to human gut epithelial C2BBE1 and neuronal SH-SY5Y cells, and studied for their effects. The epithelial cells were studied for tight junctions by trans-epithelial electrical resistance (TEER) before and during treatment. Other epithelial cell responses were numbers and viability, mitochondrial (MTT) metabolism, and cytokine array analysis (Ray Biochem). The basal effluents from these cells were transplanted onto the SH-SY5Y cells to assess their health. **Results:** The main finding was when human epithelial were treated with any of the milk fractions they grew well and showed increased cell proliferation and higher TEER after several days. When their basal media was transplanted onto SH-SY5Y cells, they also grew slightly better than control media,

favoring camel>cow, with cream showing the best effects. IGF1 protein induction was seen in cream-treated cells without inflammatory markers rising. **Discussion:** High cell counts and good viability indicate that camel milk has a significant effect on the cell lines and therefore the gut-brain axis, although little difference was shown between the camel and cow milk treatments. The cream-induction of IGF-1 may have important metabolic implications.

P6.28

AN IN VITRO RAMAN SPECTROSCOPY STUDY ON HYDRATION DISTRIBUTION OF ANIMAL SKIN SURFACES

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Raman spectroscopic analysis was conducted on multiple skin tissues with focuses on the hydration variation at different skin spots. Over a dozen of skin samples removed from chicken wing and pork belly were studied. The OH intensity distribution was presented after the OH signals were normalized against a CH signal that appears in both protein and Raman spectra in order to investigate the influences of compositional variation from lipids and protein. The study shows that hydration distribution over the skin surface is highly nonuniform on chicken skins than pork skins. The higher variation of the hydration distribution most likely due to the higher compositional variations of chicken skin. Specifically, the majority portion of chicken skin is found to be dominated by lipids, while pork skin is dominated with proteins.

P6.26

MOMMY & ME: DEVELOPMENTAL DELAYS IN CHILDREN BORN TO ADOLESCENT MOTHERS

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Teen pregnancy in the U.S. has been a pressing issue for many years. The rates have fluctuated over the years causing for further research. Birth control and condom usage have been strongly promoted in various communities in order to reduce the incidence of adolescent pregnancies and the spread of sexually transmitted diseases. According to the Centers for Disease Control and Prevention in 2013, teen births declined, but still more than 273,000 infants were born to adolescent mothers, ages 15 to 19. According to the National Center for Biotechnology Information (NCBI), 20% of children born to adolescent mothers have developmental delays. A developmental delay is defined as the condition of a child being less developed, mentally or physically, than is normal for its age. We used the scholarly article Developmental Status of Children of Teen Mothers: Contrasting Objective Assessments with Maternal Reports by the U.S. Department of Health and Human Services as a guide for our project. Data from various scholarly articles and other sources were also collected that highlighted multiple components of developmental delays in children. Using sets of secondary data, our research examined developmental delays reported of children born to adolescent mothers. Most areas of delays were in problem solving, personal/social, and gross motor skills. We conclude that adolescent mothers hinder developmental skills because they are less likely to be aware of the associated developmental risks among their children. Preventive programs and services can help adolescent mothers avoid physical, cognitive, communication, social, emotional, and behavioral delays in their children.

P6.27**MOM IS THE BEST: ACCESSING THE EVIDENCE THAT SUPPORTS THE BENEFITS OF MOTHER'S OWN MILK (MOM) AND FACTORS THAT INFLUENCE A MOTHER'S DECISION TO BREASTFEED.***Dyeisha Collins, Eva Carranza, Joseph Lindsey**My Brother's Keeper, Inc. Alcorn State University, Lorman, MS*

Infant mortality and premature birth are two catastrophes that are ignored far too often due to the uncomfortable idea of death, especially infant death. It is hypothesized that a correlation exists between low breastfeeding rates and high infant mortality rates in Mississippi. The purpose of this secondary data-analysis research was to access updated scientific evidence on the benefits and nature of Mother's Own Milk (MOM) and examine factors that influence a mother's decision to breastfeed. In total, 22 public reports, peer-reviewed literature, and data graphs that have been published between 2013-2018 were reviewed to analyze and synthesize information for this secondary data analysis to provide updated information pertaining to breast milk, breastfeeding, infant mortality, and factors that influence breastfeeding. The exploration demonstrates that factors, such as, but not limited to, household income, maternal (age, education, and race) represent vital justifications for a mother's decision to breastfeed. As reviewed, there are many health and wellness benefits for the mother and child if a mother chooses to breastfeed or provide human milk to her infant. The data spotlights breast milk as a vital source of nourishment and key ingredients for survival in term and preterm infants alike, while also underlining barriers associated with exclusive breastfeeding. Education on the benefits of breast milk and exclusive breastfeeding and supportive outreach among all Mississippi mothers, regardless of their age, race, education, or income, will be the next step towards reducing the high infant mortality rates in Mississippi.

P6.28**ASSESSING HEALTH LITERACY LEVELS AND THE QUALITY OF DOCTOR-PATIENT COMMUNICATION***Harold McWade, Sekiya Jones, Terra Cousin**Tougaloo College, Tougaloo, MS and Hinds Community College*

Health literacy and doctor-patient communication play an important role when patients visit their doctor. The Institute of Medicine defines health literacy as the degree to which individuals can obtain, process, and understand the basic information and services they need to make appropriate health decisions. According to the National Assessment of Adult Literacy, 43% of adults have below basic or basic prose literacy; 34% of adults have below basic or basic document literacy; 55% of adults have below basic or basic quantitative literacy, and for all three categories, only 13% of adults have proficient skills. Therefore, patients do not understand the health instructions and services given by their doctors. The purpose of our research was to assess the relationship between health literacy levels and direct communication between doctors and their patients. We assessed health literacy levels of 70 patients using a 16-question health literacy survey on a 5-point Likert scale, followed by a validated health literacy measure, the Short Test of Functional Health Literacy in Adults. After administering surveys, data collected showed a mean score of 42.43% indicating that majority of patients surveyed had below average scores. This finding suggests that low health literacy levels and poor health outcomes may be due to a lack of doctor-patient communication. Researchers at the U.S. Department of Health and Human Services have developed an active plan to help improve low health literacy. Healthcare providers can also offer services and

programs that promote effective communication to improve health outcomes for patients with low health literacy.

P6.29**A DESCRIPTIVE ANALYSIS OF THE OPEN ARMS HEALTHCARE CENTER'S BECOMING A HEALTHIER U (BHU) PREVENTATIVE HEALTH SCREENING PROGRAM***Ian Taylor, Sandra Melvin**My Brother's Keeper, Inc. Millsaps College, Jackson, MS and Open Arms Healthcare Center*

The BHU program is a community-based initiative that provides sexual health screenings to patients of Open Arms Healthcare Center (OAHCC) in order to identify those people at greatest risk for sexually transmitted infections (STI's) and HIV infection and link them to treatment and preventative services. The focus of this study was to identify and describe the trends among patients enrolled in the BHU program. This retrospective clinical chart review analyzed electronic health record data of patients who participated in the BHU program from February 1, 2013 to January 31, 2018 to describe the prevalence of sexual health risk factors. Data analysis was conducted using IBM SPSS Software. Of the BHU participants (n=1,913), a majority were male, African-American, Non-Hispanic, Heterosexual, and without insurance. About 45.8% of patients reported having unprotected sex. During the BHU screenings, 12% of patients tested positive for chlamydia, and 2.4% tested positive for HIV. Those who had positive screens were linked to care, however, a majority of patients who tested negative did not return for follow up preventive care. The BHU Program is a useful tool for identifying patients with STI's and linking them to treatment; it is also able to serve those without typical means of access to care due to lack of insurance. However, more efforts should be placed on follow up care and utilization of preventative services as part of a comprehensive prevention and control program.

P6.30**DEVELOPING A STD RISK PROFILE AMONG MS RESIDENTS***Jasmine Younger, Katterra Trevillion, Obie McNair**My Brother's Keeper, Inc. Tougaloo College, Tougaloo, MS and Alcorn State University, Lorman, MS*

Sexually Transmitted Infections (STI's) are currently a significant health disparity, with the most vulnerable groups affected being young adults ages 15-24, pregnant women, and men who have sex with men. The spread of STI's in the state of Mississippi are directly affected by economic, social, and behavioral factors, and have been increasingly rising since 2015. Reasons for the increasing rates include decreasing condom usage, a lack of awareness among doctors and patients, and a falling number of STD clinics. Mississippi ranked 5th in chlamydial infections and ranked 3rd in gonorrheal infections in 2015. The purpose of this study was to identify the "risk-profile" of individuals who tested positive for STI's at Open Arms Healthcare Center. We first identified patients who tested positive for STI's within the past two years. We highlighted key demographics, including year of diagnosis, multiple STI diagnoses, and status of insurance. Results showed an increase in the cases of all STIs over the past two years. African-American males, who have sex with men were shown to be the primary population of those tested positive with STI's within both years. Further research revealed that multiple cases of STIs occurred beyond the Jackson-Metro during the 2017-2018 sampling. Findings from this current research project indicated that African American men ages 20-30 who engages in the sexual behavior with men who have sex with men (MSM) were shown to have more cases of STI



infections than any other group. Future STI prevention methods should gear towards (AAMSM) ages 20 to 30 years old.

P6.31

BUT DO APPLES REALLY FALL FAR FROM THEIR TREE

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Teen pregnancy is a very common and important public health issue. The Center for Disease Control and Prevention (CDC) announced an 8% decrease in teen birth rates from 2014/2015. This decrease was present in all races, however, disparities which influence teen pregnancy persist. This trend suggest that there are compelling factors that contribute to the rates of teen pregnancy such as socioeconomic disparities. Youth today live in stressful environments that exhibit increased unemployment rates, violence, substance use, and poor housing conditions. Social determinants of health (environment in which a teen lives, high unemployment, low income, and low education) have been associated with teen pregnancy. Female teens in child welfare systems are at risk of teen pregnancy and birth than other groups; those living in foster care are more than twice as likely to become pregnant than those who are not. Many pregnant teens believe that their babies will lead lives very different from their own. They feel that having a child will improve their lives, when in fact they are only exposing their child to the same life they lead. Compared with babies of older mothers, those born to teenagers are more likely to have lower birth weights, increased infant mortality, an increased risk of hospital admission in early childhood, less supportive home environments, poorer cognitive development and, if female, a higher risk of becoming pregnant as teenagers. The aim of this study is to evaluate the influence of violence, drug abuse, and family relations and structures on teen pregnancy.

P6.32

EXPLORING THE ASSOCIATIONS OF SOCIAL DETERMINANTS OF HEALTH TO BREAST CANCER INCIDENCE AND MORTALITY IN AFRICAN AMERICAN WOMEN

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As defined by the American Cancer Society, breast cancer is a form of cancer that begins when cells of the breast grow uncontrollably. These cells typically form tumors which are malignant if they grow into surrounding tissues or metastasize into distance regions of the body. There are two common forms of breast cancer, ductal (cancer begins in the ducts that carry milk) and lobular (cancer begins in the glands that make breast milk). Cancer is the second leading cause of death in the United States, exceeded by heart disease. One in every four deaths in the United States is due to cancer. According to the Centers for Disease Control and Prevention (CDC), the leading form of cancer in women is breast cancer. In 2015, 816,453 new cases of cancer were reported, and 282,107 women died of cancer in the United States. This means for every 100,000 women, 415 new cancer cases were reported and 136 women died of cancer. Breast cancer incidence is lower among African American women than among Caucasian women; however, the breast cancer mortality rate is higher in African American women. The aim of this study is to evaluate the association of social determinants of health to the

incidence and mortality rates of African American women with breast cancer. Furthermore, this study will seek to determine if the social determinants of health are the contributing factors to African American women being disproportionately affected by breast cancer.

P6.33

INVESTIGATING THE ASSOCIATION BETWEEN HOUSEHOLD INCOME, FAMILY SIZE, AND HEALTHY EATING BEHAVIORS IN THE MISSISSIPPI DELTA

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The Mississippi Delta, also known as "The Most Southern Place on Earth" (Cobb, 1992), is rich in history but poor in health outcomes. More than 32% of adults in the MS Delta report that they are obese and almost 12% suffer from diabetes. Poor dietary patterns and obesity have been linked to neighborhood deprivation, neighborhood minority composition, and low population density, all of which have been used to describe the MS Delta (Larson, et al. 2009). The purpose of this study was to investigate whether household income and family size were significant predictors of self-reported healthy eating behaviors/dietary among residents in the MS Delta. County-level and participant-level data were extracted from the 2015 Mississippi Statewide Health Assessment conducted by My Brother's Keeper, Inc. and analyzed to test the null hypotheses. The analyses revealed that average household income was not a significant indicator of healthy eating habits. An average of forty-one percent of respondents with household incomes at the highest level (\$75,000 and over) reported healthy eating behaviors compared to an average of thirty-four percent of the respondents with incomes at the lowest levels (less than \$14,000). Data also revealed that family size was not a significant indicator of healthy eating behaviors as positive behavior was reported by 32% of respondents with 1-2 family members, 34% of respondents with 3-4 family members and 35% of respondents with 5 or more family members. Study Limitations: The study relied on self-reported data (income, eating habits, and family size) to determine associations between variables.

P6.34

ACETIC ACID REMEDIATION OF ANTHROPOGENIC CONTAMINATION OF WATER AT THE GBNERR IN MISSISSIPPI

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The objective of this study was to evaluate the interaction of physicochemical and microbiological water quality parameters at the GBNERR (GB) for the remediation of post-contamination of water and seafood by human fecal pollution. Water samples were collected aseptically from Bayous Heron, Cumbest, Point Aux Chenes Bay and Bangs Lake. Physicochemical parameters were determined using standard protocols. Eight bacterial species including *Campylobacter* were concentrated from water samples by membrane filtration. Water samples were tested for the presence of traditional indicator microorganisms including: heterotrophic (HPC), total coliforms (TC), fecal coliforms (FC), and enterococcus (ENT) in CFU/ml concentrations. Mean values of temperature, specific conductivity, dissolved oxygen, and pH were within acceptable levels in comparison to MDEQ, USEPA, and USGS standards during the time of investigation. However, the values of

turbidity in GB water exceeded USEPA recommended levels in several occasions during the investigation. Data from this study indicates significant variability ($p < 0.0001$) in mean bacteria concentrations between sites. The data also indicates significant impact of acetic acid treatment in the remediation of post contamination and survival of pathogens from the Bayous Heron, Cumbest, and Pine-O-Pine when compared with control findings. The interaction of physicochemical and microbiological parameters of water through external chemical manipulation by acetic acid may provide utility in the remediation of post-contamination with anthropogenic pathogens such as *E. coli*, Enterococci, *Campylobacter*, *Vibrio*, *Giardia*, and *Cryptosporidium*. Presence of high numbers of indicator bacteria suggests public health concerns for oyster and shellfish consumers as well as other water contact activities.

P6.35

THE NEUROSTEROID, ALLOPREGNANOLONE, MAY AMELIORATE HIV-1 TAT ASSOCIATED MITOTOXICITY

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Human immunodeficiency virus type 1 (HIV-1) infection is associated with neurocognitive disorders that are generally refractory with no efficacious therapeutic alternatives available. One of the factors contributing to neuropathology is the HIV-1 regulatory protein, trans-activator of transcription (Tat). Tat promotes neurotoxicity and neuroinflammation in neural cell cultures and in transgenic mouse models; effects that can be exacerbated by opiates such as morphine. We have observed previously that the neurosteroid, allopregnanolone (AlloP), attenuates neurotoxicity caused by Tat, but the mechanisms of AlloP neuroprotection and its efficacy against combined Tat/opiate challenge is not known. We hypothesized that combined HIV-1 Tat/morphine may induce mitochondrial dysfunction and that AlloP may ameliorate these effects. Tat depolarized mitochondrial membrane potential (MMP), as assessed via JC-10 dye, and inhibited complex I of the electron transport chain, as assessed via Clarke-type electrode. In physiological concentration, the natural neurosteroid AlloP (10 nM) restored MMP and alleviated complex I inhibition. However, supraphysiological concentrations of AlloP (100 nM) significantly interacted with morphine to promote a mitotoxic profile. Lastly, we assessed the protein content of the adenine nucleotide translocase (ANT) subunit of the mitochondrial permeability transition pore which was not altered by any manipulation. Therefore, AlloP may be a potential neuroprotective agent in combination with antiretroviral agents, however therapeutic indices will need to be assessed in consideration of opioid-using patients.

P6.36

PREVALENCE AND SOCIOECONOMIC DISPARITIES IN DEPRESSION SYMPTOMS AMONG US ADULTS FROM THE NATIONAL HEALTH AND NUTRITION EXAMINATION SURVEY (NHANES), 2009-2010

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Objective: The purpose of this study was to 1) determine the prevalence of depressive symptoms among US population 2) examine the magnitude of socioeconomic status (SES) association with depression symptoms among this population. We analyzed data from 5573 participants of NHANES, 2009-2010, which is a

multistage cluster sample design survey. The depression was assessed using Patient Health Questionnaire (PHQ-9). If a participant had total PHQ-9 ≥ 5 , considered as having depression of mild to severe depression symptoms. SES was measured by education and ratio of family income to poverty (PIR). The PIR was categorized into three groups as low (0-1.36), medium (1.37-4.99) and high (5 and above). We analyzed data using SAS 9.2.4 version and proc survey procedures were used. **Results:** Of the total 5573 sample, 23.8% had depression symptoms. Females had significantly more depression symptoms than males (14.1% vs., 9.6%, $p < 0.0001$). The odds of having depression symptoms was 1.71 (CI: 1.42-2.06) among females vs. males; 1.36 (CI: 1.05-1.76) among younger age vs. older age and 1.91, (CI 1.6-2.67) among low vs. high PIR. The odds of depression symptoms was 1.98 (CI: 1.42-2.77) for having education of 12- grades vs. college graduate or above; 1.79 (CI: 1.32-2.42) for 12-grade school/GED vs. College graduate or above and 1.54 (CI: 1.10-2.23) for some college vs. college graduate or above; respectively. **Implication for Public Health:** Given the high prevalence of depression symptoms, primary care practitioner should screen depression symptoms with particular attention to female sex, younger age, low PIR and less educated individuals.

P6.37

FENTANYL ABUSE DURING PREGNANCY: DELETERIOUS EFFECTS ON OFFSPRING DEVELOPMENT

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Opioids are the most commonly prescribed analgesics; however, their use is associated with side effects including abuse and dependence. While the effects of opioids are well described for adults, there is limited knowledge regarding the effects of these drugs on the developing child. We determined the effects of i.v. fentanyl self-administration during pregnancy on offspring development and behavior. Female rats were trained to self-administer the opioid fentanyl under a fixed-ratio schedule in daily 6-hr sessions; sham-operated dams served as controls. When stable self-administration was achieved, females were mated. Self-administration continued until litters were born. Health, weight and achievement of age-appropriate developmental milestones were assessed in all pups. As a measure of emotionality, offspring were evaluated for production of ultrasonic vocalizations. Analgesic effectiveness of fentanyl was assessed as a measure of sensitivity to opioids in adult offspring. Prenatal fentanyl exposure profoundly affected neonatal pup survival, significantly delayed the achievement of developmental milestones and induced more ultrasonic calls compared to control pups. While pup weight did not differ between groups at birth, weight differences emerged later with fentanyl-exposed pups presenting significantly lighter than controls, lasting into adulthood. Despite similar weight in early infancy, head circumference was significantly smaller in fentanyl-exposed pups. As adults, fentanyl-exposed offspring were more sensitive to fentanyl administration in a thermal nociception assay. Our results indicate that chronic high dose in utero fentanyl exposure, as a consequence of abuse, has widespread adverse effects on offspring survival, physical and social development, as well as long-lasting alterations in sensitivity to fentanyl. **Acknowledgement:** This work was funded by an Institutional Development Award (IDeA) from the NIGMS under grant number P20GM103476.

P6.38

MISSISSIPPI INBRE: COMMUNITY ENGAGEMENT RESEARCH

Michael Ramsey

Jackson State University, Jackson, MS and University of Southern Mississippi, Hattiesburg, MS

This oral presentation will discuss the Mississippi IDeA Network of Biomedical Research Excellence (INBRE) research partnership between The Department of Psychology at Jackson State University and Telenutrition Center at the University of Southern Mississippi. The health benefits of physical activity (PA) and a healthy diet are well known. Yet, health care providers, public health professionals and researchers struggle to identify the complex set of circumstances that will ensure adoption and maintenance of PA and healthy dietary habits. Moreover, minority adults are consistently less likely to benefit from behavior change interventions based upon existing research knowledge. Little is known about unique factors and barriers for minority men and women living in the Deep South. This qualitative study seeks to understand the strengths and limitations associated with understanding the unique contextual factors that promote adoption and maintenance of PA and healthy dietary habits. **Methods:** Focus groups will be conducted with AA men (n=15) and women (n=15) between the ages of 18 – 45 years old. Participants will be recruited from churches, medical clinics, and community organizations. Focus groups are 90 minutes and will assess PA interest, healthy diet preferences, motivation, spirituality, culture, barriers, and motivators for health behaviors. Focus group meetings will be recorded, transcribed verbatim, and coded based on apriori themes. **Results:** Healthy diet and PA preferences specific to minorities living in the Deep South will be provided. **Conclusions** will include discussion of the current qualitative examination of PA, dietary preferences, and factors that promote and limit health behaviors among AA. **Acknowledgement:** This work was supported by the Mississippi INBRE, funded by an Institutional Development Award (IDeA) from the National Institute of General Medical Sciences of the National Institutes of Health under grant number P20GM103476.

Friday, February 22, 2019

MORNING

Room Union B

Oral Presentation Session II

Molecular/Material Sciences

Moderators: Drs. Gouri Mahajan and Olga McDaniel (Each speaker 7 min talk 3 min questions)

O6.06

8:00 GENE EXPRESSION PROFILING OF CORONARY VASCULOPATHY AND REJECTION EPISODES AFTER CARDIAC TRANSPLANTATION

D. Olga McDaniel, Heather Gardner, Michael R. Garrett, Larry S. McDaniel, Charles K. Moore

University of Mississippi Medical Center

Introduction: Clinical outcomes after cardiac transplantation have greatly improved due to advances in immunosuppression, organ procurement, surgical techniques etc. However, long-term outcomes are still a challenge because of infection, cellular rejection (CR), coronary vasculopathy. Rejection, after cardiac transplantation is associated with the host inflammatory networking. The goal was to screen by microarray analysis the clusters of genes associated with these events and verify the association with CV/RE. **Methods:** CDNA microarray was developed from PBMCs of patients with RE and or CV using a combined Human 19K and 8K gene probes. The resulting database was normalized and underwent an unsupervised

cluster analysis comparing samples associated with RE/CV vs. no rejection, no CV. **Results:** Gene ontology-response to stimuli demonstrated multiple immune response pathways using H19K-Grade 0 vs. grade 3 Rejection. Therefore, extracting only the gene subset of interest we studied expression levels of TLR-signaling molecules and cytokine concentrations in a group of patients previously identified carrying genomic alleles CT vs. CC associated with early rejection episodes. The TLR2, HMGB1, CD86, IRAK4, NFK-B were increased with CC alleles in association with early rejection. The mean \pm SEM level of TLR2 mRNA was increased only 1.8-fold in PBMCs ($p < 0.05$) but 4.5-fold in biopsy samples from patients with grade 3A rejection. Protein concentration of IL-18 and IFN-g were in direct correlation with RE and CV. **Conclusions:** Peripheral concentration of cytokines correlate with the local production seen in biopsy specimens. Thus, suggesting that these markers have diagnostic potentials and may detect signals to predict early rejection episodes.

O6.07

8:10 CAN ANTHROPOMETRIC MEASURES OF OBESITY PREDICT LIVER SURFACE NODULARITY IN A DIVERSE NAFLD POPULATION?

Elliot Varney, Edward Florez, William Flowers, Sarah Miller, Seth Lirette, David Gordy, Ali Fatemi, Candace M. Howard

Radiology, University of Mississippi Medical Center, Jackson Mississippi

Introduction: To assess how specific anthropometric measures of obesity correspond to liver surface nodularity and NAFLD clinical index in patients diagnosed with NAFLD. **Methods:** For this HIPPA-compliant, IRB approved retrospective observation study, adult patients with various degrees of non-alcoholic fatty liver disease (NAFLD) and non-enhanced CT images of the abdomen and pelvis obtained (N=367). Abdominal diameters (SAD) were measured and two readers independently assessed liver surface nodularity (LSN) scores of the 367 patients. LSN scores were obtained using a previously validated quantitative technique. LSN scores were analyzed and correlated with SAD, NAFLD clinical index, body weight, and liver and spleen attenuation using a regression model and the coefficients of determination were calculated. Intra-class correlation coefficients (ICC) were used to assess inter-observer agreement. **Results:** In patients with NAFLD, SAD showed direct correlation with weight, LSN score, and NAFLD index and an inverse correlation to spleen and liver attenuation. SAD correlated best with patient weight ($R^2=0.64, p < 0.001$) and LSN score ($R^2=0.38, p < 0.001$). Correlations between SAD and liver attenuation / spleen attenuation / NAFLD were present but were of minimal clinical significance ($R^2=0.07/0.11/0.05$, respectively, $p < 0.001$) without the support of other clinical data. **Discussion:** Making quantitative associations between anthropometric measures and NAFLD could have major implications on the care and management of patients at high risk for obesity-related liver disease. **Conclusion:** Increasing SAD is correlated with increasing LSN and NAFLD index; however, more data is needed to assess SAD use as biomarker for NAFLD.

O6.08

8:20 OPTIMIZING IMMUNOHISTOCHEMICAL PROCEDURES FOR IDENTIFYING FOXL1+ TELOCYTES IN THE INTESTINAL MESENCHYME.

Zhang Caiying, Swisa Avital, Hannah Kolev, Kondo Ayano, Kaestner Klaus

Millsaps College

University of Pennsylvania, University of Pennsylvania, University of Pennsylvania, University of Pennsylvania

The intestinal epithelium is one of the most dynamic surfaces in the human body and is constantly renewed by active and reserve stem cell populations [Snippert et al, 2010]. The Wnt signaling pathway is one of the key regulatory pathways for intestinal stem cell differentiation and maintenance of the gut epithelium [Barker et al, 2009]. The cells responsible for initiating Wnt signals were recently identified as subepithelial telocytes marked by FoxL1 expression [Shoshkes-Carmel, 2018]. Currently, there is no robust way to detect and study FoxL1+ cells by immunostaining, as FoxL1 expression level is relatively low. We are therefore using a transgenic mouse model to detect and locate these FoxL1+ cells so that we can better characterize them in future studies. These transgenic mice express Cre recombinase under the FoxL1 promoter. By crossing these FoxL1-Cremice to mice carrying a ROSA26-lox-stop-lox-SUN1-GFP allele, we can specifically label the nuclear membrane of FoxL1+ cells with SUN1-GFP protein. Using FoxL1 antibodies generated by our collaborators, we optimized an immunohistochemical protocol to visualize the co-localization between GFP+ nuclei in our FoxL1-Cre; R26-LSL-Sun1-GFP mice and mesenchymal telocytes that are stained for the FoxL1 transcription factor. Using the lab's previously generated RNA-seq data, we also identified elevated expression of genes, such as FoxF1, in the FoxL1+ cell population. Therefore, we also successfully tested for co-localization of FoxF1 with FoxL1 using the optimized immunohistochemical staining protocol. This work provides an important tool that will allow us to further study the newly identified FoxL1+ cell population as well as the entire intestinal stem cell niche.

O6.09

8:30 DYNAMIN IS REQUIRED FOR EFFICIENT CYTOMEGALOVIRUS MATURATION AND ENVELOPMENT

Mohammad H. Hasan, Leslie E. Davis, Ratna K. Bollavarapu, Dipanwita Mitra, Rinkuben Parmar, Ritesh Tandon

University of Mississippi Medical Center, Jackson, MS

Cytomegalovirus secondary envelopment occurs in a virus-induced cytoplasmic assembly compartment (vAC) generated via a drastic reorganization of the membranes of the secretory and endocytic systems. Dynamin is a eukaryotic GTPase that is implicated in membrane remodeling and endocytic membrane fission events; however, the role of dynamin in cellular trafficking of viruses beyond virus entry is only partially understood. Mouse embryonic fibroblasts (MEF) engineered to excise all three isoforms of dynamin were infected with mouse cytomegalovirus (MCMV-K181). Immediate early (IE1; m123) viral protein was detected in these triple dynamin knockout (TKO) cells as well as in mock-induced parental MEF at early times post infection although levels were reduced in TKO cells, indicating that virus entry was affected but not eliminated. Levels of IE1 protein and another viral early protein (m04) were normalized by 48 hours post infection; however, late protein (m55; gB) expression was reduced in infected TKO cells compared to parental MEF. Ultrastructural analysis revealed intact stages of nuclear virus maturation in both cases with equivalent numbers of nucleocapsids containing packaged viral DNA (C-capsids) indicating successful viral DNA replication, capsid assembly and genome packaging. Most importantly, severe defects in virus envelopment were visualized in TKO cells but not in parental cells. Dynamin inhibitor (dynasore) treated MEF showed a phenotype similar to TKO cells upon MCMV infection confirming the role of dynamin in late maturation processes. In summary, dynamin-mediated endocytic pathways are critical for the completion of cytoplasmic stages of cytomegalovirus maturation.

O6.10

8:40 EVALUATION OF CANCER STEM CELL DRUG RESPONSE ASSAY IN THE TREATMENT OF RECURRENT OVARIAN CANCER PATIENTS

Candace M. Howard, Nadim Bou Zgheib, Jagan Valluri, Pier Paolo Claudio

¹Department of Radiology, University of Mississippi Medical Center, Jackson, MS, ²Edwards Comprehensive Cancer Center, Joan C. Edwards School of Medicine, Marshall University, Huntington, WV, ³Department of Biological Sciences, Marshall University, Huntington, WV, ⁴Department of BioMolecular Sciences, National Center for Natural Products Research., ⁵Department of Radiation Oncology, University of Mississippi, MS

Recurrent epithelial ovarian cancer (EOC) is associated with significant mortality and a median survival rate of only 12-18 months. EOC recurrence is common and this is due in large part to the presence of chemo-resistant cancer stem cells (CSCs). We are using ChemoID, a CLIA certified and CAP accredited drug response assay to identify the most effective chemotherapy treatment against CSCs and bulk of tumor cells from a panel of chemotherapies. Fresh tissue samples (surgical biopsies, ascites, and pleural fluid) were collected for drug sensitivity testing from 45 patients affected by poor prognosis (3rd - 5th relapse) recurrent ovarian cancer. Test results from ChemoID assay to measure the sensitivity of CSCs and bulk of tumor cells challenged with 15 FDA-approved chemotherapy regimens, were correlated to patients' clinical response, independently of other biomarkers. CT and PET scans were used to prospectively monitor patients for tumor response, time to recurrence, progression-free survival (PFS), and overall survival (OS). We found that recurrent ovarian cancer patients (3rd - 5th relapse) treated with ChemoID-guided chemotherapy (>50% cell kill for CSCs and >60% cell kill for Bulk of Tumor), had a median PFS of 9.5 months - 3rd relapse; 7 months - 4th relapse; and 6.5 months - 5th relapse, respectively, compared against historical data showing PFS of 5.6 months - 3rd relapse; 4.4 months - 4th relapse; and 4.1 months - 5th relapse, respectively. The data suggests that the ChemoID CSCs drug response assay has the potential to help guide individualized chemotherapy choices to improve ovarian cancer patient outcomes.

O6.11

8:50 SIMPLE ANTHROPOMETRIC BIOMARKERS OF COMPLEX BODY COMPOSITION AS PREDICTORS OF CARDIOVASCULAR RISK AMONG AFRICAN-AMERICANS.

Edward Florez, William Flowers, Lauren K. Dyess, Sarah Miller, Amir Khadivi, Charlene Claudio, Candice Johnson, Daniel Martin, Thurman Robertson, Elliot Varney, Ramin Hamidi, David Gordy, Seth T. Lirette

Department of Radiology, University of Mississippi Medical Center, Jackson, MS

Introduction: African Americans (AAs) disproportionately suffer from obesity-related CVD. Visceral adipose tissue (VAT) is known to show more metabolic activity than superficial adipose tissue (SAT) and is directly correlated with CVD risk. Our objective is correlate anthropometric biomarkers to CT body fat composition in AAs with the goal to predict CVD risk. **Methods:** This retrospective observational study included non-enhanced abdominal CTs from adult AAs (N=2006). Anthropometric measures of waist circumference (WC) and sagittal abdominal diameter (SAD) were measured in all subjects. Using a multi-layer segmentation software, regional fat volumes and abdominal skeletal muscle including psoas, paraspinous and abdominal wall were measured. Visceral adipose tissue (VAT) and subcutaneous adipose tissue (SAT) were separated

in abdominal adiposity. Additional, superficial (sSAT) and deep (dSAT) SAT were distinct anatomic regions. Correlations were examined using linear regression models. Inter-observer variability between two readers was assessed in a random 20% of the full cohort (n=300). **Results:** SAD and WC were directly proportional with VAT and SAT. A linear relationship between SAD and VAT was significant ($R^2=0.58, 0.76, p<0.001$). However, the strongest correlation was found between WC and SAT ($R^2=0.79, 0.89, p<0.001$). There was excellent inter-observer agreement for all parameters ($ICC > 0.96, 95\% CI$). **Discussion:** VAT is a critical biomarker of obesity-related CVD. Still, its calculation takes >35 min/subject on cross-sectional images. Anthropometrics are easily obtained and potentially can predict CVD risk. **Conclusion:** SAD and WC showed strong associations with VAT and SAT, respectively. This data supports anthropometric biomarkers use in stratifying cardiometabolic risk in AAs.

10:00 – 11:00 Poster Session II (High School)

Third floor TCC Ballrooms

Poster Coordinators: Drs. Gouri Mahajan and Olga McDaniel

P6.39

ACUTE KIDNEY INJURY DURING PREGNANCY DECREASES OFFSPRING SIZE AND SURFACE RIGHTING DEVELOPMENT

Sellena Dixon.

Base Pair-Murrah High School and University of Mississippi Medical Center, Jackson, MS

BACKGROUND. Acute kidney injury during pregnancy (NP+AKI) leads to growth restriction and a delay in neurodevelopment in the resulting babies. We hypothesize that similar to what is seen in humans with intrauterine growth restriction, there will be a sex difference in sensorimotor development between NP and NP+AKI rat pups. **METHODS.** Normal pregnant (NP) rats (n=4) had their renal pedicles isolated and occluded with microvascular clamps for 45 minutes under anesthesia. After delivery, 2-3 pups/litter were placed with a separate set of SHAM rats. Beginning on postnatal day (PND) 4 rat pups underwent the standard Irwin battery of developmental milestones. **RESULTS.** Rat pups born to NP+AKI dams weighed significantly less compared to NP pups ($p<0.0001$). Trend continued for female AKI pups through PND9 ($p<0.05$); after which both NP and NP+AKI females were significantly smaller than males. On PND3 NP+AKI females took longer to complete surface righting ($23.5+12.7$ sec) compared to controls. Similar results were seen in cliff avoidance between groups ($30.5+16.5$ vs. $48.7+11.3$ sec; respectively). There was a statistically significant difference in kidney size between both sexes. NP+AKI pups had significantly smaller brains compared to NP pups ($p=0.03$). **CONCLUSION.** NP+AKI pups are smaller compared to NP pups and have delays in surface righting. AKI during pregnancy did not affect kidney size in offspring, however both male and female NP+AKI pups had smaller brains more than 30 days post-birth compared to NP pups. The results from this study suggest that AKI during pregnancy leads to a significant delay in growth and sensorimotor development

P6.40

OXIDATIVE STRESS AND ITS INVOLVEMENT IN GESTATIONAL DIABETES ASSOCIATED WITH PREECLAMPSIA

Jayden Smith, Matthew Hairston, Lir-Wan Fan, Norma Ojeda

Base Pair – Murrah High School, and Department of Pediatrics, University of Mississippi Medical Center, Jackson, MS

Gestational diabetes mellitus (GDM) is a disease in which women without previously diagnosed diabetes exhibit high blood glucose levels during pregnancy. Preeclampsia (PE) is a disease in pregnant women characterized by high blood pressure and/or protein in the urine. The objective of this study was to investigate the roles of oxidative stress in GDM associated with PE. We hypothesized that GDM that is associated with PE involves an increase in oxidative stress. We performed serial measurements of blood's levels of glucose and markers of oxidative stress during late gestation in pregnant rats (dams) exposed to reduced uterine perfusion (RUP) or sham RUP (Controls). RUP-Dams have a significantly higher glucose level at delivery compared to controls (134 ± 5 vs. 119 ± 5 mg/dL; RUP vs. control respectively; $P< 0.05$); lower placental efficiency (4 ± 2 vs. 7 ± 0.8 ratio of offspring/placenta weight; RUP vs. control respectively), and higher placental oxidative stress (SOD: 22 ± 1 vs. 14 ± 1 U/mL; TBARS: 46 ± 5 vs. 22 ± 3 MDA/ uM RUP vs. control respectively). Offspring from RUP-dams show lower glucose levels (17 ± 4 vs. 42 ± 16 mg/dL; RUP vs. control respectively) and lower birth weight (3 ± 0.9 vs. 4 ± 0.3 grams; RUP vs. control respectively) compared with control ($P< 0.05$). Gestational diabetes is associated with preeclampsia and an increase in placental oxidative stress in a rat model of intrauterine growth restriction.

P6.41

RGD SEQUENCE TO PERMIT TIGHT BINDING ONTO TARGET CANCER CELLS

Stephen Stray, Kilando Chambers

Base Pair – Murrah High School and Department of Microbiology and Immunology, University of Mississippi Medical Center, Jackson, MS

Cancer is the second leading cause of death in the United States. In 2016, there were an estimated 600,000 deaths because of this disease. Many of the treatments for cancer, such as chemotherapy and radiation therapy, actually harm the patient because the body's healthy cells are also being destroyed in these processes. Because of these unfortunate statistics, my lab's main goal is to find a novel potential cure for cancer with the use of virus-like particles targeted to specific cancer cells. These particles are designed to carry a lethal cargo that will raze the cancer cells within the body without harming the healthy ones. We hypothesize virus-like particles containing the peptide sequence RGD will give us one of the tightest binds possible to the cancer cells. To test this hypothesis, we will introduce the RGD peptide sequence into HBV capsid protein (Cp). Once we have demonstrated that RGD-containing Cp bind cancer cells, we can test whether Cp can carry lethal cargo. Furthermore, we hope to quickly find the best DNA sequence for the virus capsid so we can continue to the next step of the experiment: finding exactly what substance to put into the cancer-killing cargo.

P6.42

CORTICOTROPIN RELEASING FACTOR EXPRESSION ALONG CENTRAL AUDITORY PATHWAYS AND PLASTICITY IN RESPONSE TO COCHLEAR DAMAGE- A ROLE IN PRODUCTION OF TINNITUS?

Sean Collins, Kathleen T. Yee, Douglas E. Vetter

Base Pair – Murrah High School, and Dept. of Neurobiology and Anatomical Sciences, Univ. Mississippi Medical Center, Jackson, MS

INTRODUCTION: Approximately 30 million Americans suffer

from tinnitus, which often accompanies loss of hearing. Although the exact causes of tinnitus remain unknown, abnormal neural plasticity/excitation could play a major role in its production. Corticotropin releasing factor (CRF) alters neural plasticity and excitation in the brain. Changes to CRF in auditory centers of the brain could therefore underlie tinnitus. **METHODS:** Using genetically altered mice that express a “reporter” molecule (tdTomato) in CRF cells, we have mapped CRF along the auditory pathway and examined effects of altered hearing on nerve fibers containing CRF. **RESULTS:** Our mapping studies show tdTomato expression (indicating CRF production) in all major auditory centers of the brain. There is an especially dense fiber plexus in the central region of the inferior colliculus, a region critical for normal hearing. We next examined if CRF-positive neural elements change (expand or retract fibers, for example) following loss of hearing. We induced a profound deafening by surgically removing one or both cochleae in adult CRF:tdTomato mice. Removal of one cochlea produced a significant loss of CRF-positive nerve fibers in the central region of the contralateral inferior colliculus, suggesting a potential imbalance of excitation in the auditory pathway at this level. Bilateral cochlear removal resulted in loss of CRF fibers on both sides of the inferior colliculus. **DISCUSSION:** These data begin to connect hearing loss with plastic changes to fibers expressing CRF, a molecule known to modulate excitatory neurotransmission. It is possible that this fiber loss could play a role in producing tinnitus.

P6.43

CHARACTERIZATION OF A POSS® THROMBUS

Evan Lichtenhan, Joseph Lichtenhan

High School and Hybrid Plastics Inc, Hattiesburg, MS

Hybrid Plastics has developed a material that possesses many of the qualities desired of an ideal battlefield hemostat. The trisilanol hepta-isoOctyl Polyhedral Oligomeric Silsesquioxane (POSS) rapidly prevents fluid loss and simultaneously forms a viscoelastic polymeric clot (thrombus) with blood components. The mechanism of action for the POSS viscoelastic hemostat, are under investigation. In this work we have sought to identify the amounts of POSS contained within the thrombus and at the thrombus-arterial interface. The mechanics of the thrombus have been investigated in vitro and are compared to in vivo pressure tolerance observations. The investigation has concluded that POSS is primarily located at the thrombus artery interface in 5-7% concentrations. The amounts of POSS within thrombus ranges from 0.5-1.0%. This finding supports the role of POSS providing an adhesive function, for the thrombus to the artery, as well as activating the clotting cascade. In its role as a clotting agent, POSS seems to function as a factor concentrator which can be considered to be an adhesive for blood components. Finally, POSS also plays a role as a plasticizer as it effectively enhances the elastic characteristics of the resulting thrombus.

P6.44

THREE DIMENSIONAL FINITE ELEMENT ANALYSIS OF CERAMIC FIXED DENTAL PROSTHESES

Matthew Araujo, Jason Griggs, Yuanyuan Duan

Base Pair – Murrah High School and University Mississippi Medical Center, Jackson, MS

The aim was to create three-dimensional numerical model of a multilayered three-unit all-ceramic fixed dental prosthesis (FDP) using finite element analysis (FEA) method. To achieve this micro-computed tomography (Skyscan1172, Microphotonics) was used to reconstruct 3D scans of specimens, and the data were uploaded into the 3D modeling software (Simpleware, Synopsis). During data reconstruction, the framework mask was constructed by thresholding based on radiolucency. The fusion glass-ceramic layer,

pre-molar, molar abutments, and cementation layer were constructed by segmentation, 3D editing, cavity fill, and Boolean operations to extract the necessary masks. Models were then exported into FEA software (Simulia) for stress analysis. Veneering porcelain, bridge framework and fusing glass-ceramic layer between them were defined as IPS e.max CAD, IPS e.max ZirCAD and IPS e.max CAD Crystal./Connect using elastic constants found in the literature to simulate the e.max CAD-on technique. An axial load of 100 N was applied on the central fossa of the pontic to simulate the physiological occlusal load. First principal stress was calculated and plotted to evaluate the stress distribution. A three-unit dental bridge model composed of seven components was successfully created. It was found that the highest stress resided in the veneering porcelain layer on the occlusal surface surrounding the loading area. For the bridge framework layer, the highest stress was located at the gingival embrasure of bridge connector. Three-dimensional finite element models of FDPs can be generated by combining micro-CT technique and Simpleware software. This all-ceramic system was resistant to fracture at the given physiological occlusal loading level.

P6.45

INFLAMMATION ENHANCES COGNITIVE DEFICITS IN JUVENILE RATS WITH INTRAUTERINE GROWTH RESTRICTION

Matthew J Hairston1, Jayden A Smith1, Norma Ojeda2, Jonathan W Lee2, Silu Lu2, Tanner C Nielson2, Chirag P Talati2, Yi Pang2, Abhay J Bhatt2, Renate D Savich2, Lir-Wan Fan2 Base Pair-Murrah High School and University of Mississippi Medical Center, Jackson, MS

Epidemiological and experimental studies suggest that intrauterine growth restriction (IUGR) is associated with neurodevelopmental impairments. Our previous studies demonstrated that systemic inflammation during pregnancy induced the priming activation of microglia and elevated levels of pro-inflammatory cytokines, which may contribute the behavioral dysfunction in offspring. This study was designed to further examine whether maternal inflammation via lipopolysaccharide (LPS) exposure enhances cognitive deficits associated with IUGR in juvenile rats. LPS (100 µg/kg) was administered intraperitoneally into pregnant rats on day 13 of gestation (E13) and the reduced uterine perfusion (RUP) surgery was performed on day 14 of gestation (E14) to generate IUGR rat offspring. The body weight and locomotion of offspring were determined on postnatal day 14 (P14) and P21, and the cognitive test were determined by Y maze (P23) and passive avoidance (P23 & P24). Our results show that offspring from dams exposed to LPS and RUP showed significantly lower birth weight compared to offspring from control dams at P21. Exposure to LPS during gestation enhances IUGR-associated motor disturbances including increases in rearing events in juvenile rats as well as cognitive deficits including short-term memory, learning and long-term memory. The current study suggests that exposure to LPS during gestation enhances IUGR-associated cognitive deficits including learning and memory in both male and female juvenile rats. This model may be useful for studying mechanisms involved in the development of children’s neurodevelopmental delays associated with exposure to inflammation and growth restriction during gestation, and could help to develop future potential therapeutic strategies.



11:00 – 12 Noon Population Health Workshop

Moderators: Drs. Larry McDaniel and Frank Spradley (Each speaker 10-15 min talk)

Title: "SCIENTIFIC CAREER DEVELOPMENT AND INNOVATION DEVELOPMENT AND LICENSING"

Speakers:

11:05 Justin Thornton PhD., Mississippi State University

11:20 Bianca L. Garner, PhD, Tougaloo College

11:30 Jim Petell, PhD., University of Mississippi Medical Center

11:45 Group Discussion

HSD program sponsored by: Sunshine Children's Clinic in Canton, MS and the Sigma Si of UMMC

HISTORY AND PHILOSOPHY OF SCIENCE

Chair: Tamara Nelson

University of Mississippi Medical Center

Chair: Robert Waltzer

Belhaven University

Vice-Chair: Shana Nelson

University of Mississippi Medical Center

Vice-Chair: Paula Smithka

University of Southern Mississippi

Vice-Chair: Kenneth Curry

University of Southern Mississippi

Thursday, February 21, 2019

MORNING

Room Union D

8:50 WELCOME

07.01

9:00 BIOLOGICAL SPECIES AS HOMEOSTATIC PROPERTY CLUSTERS: THE IMPORTANCE OF CONSTRAINTS

Kenneth J Curry¹ and Paula J. Smithka²

¹Independent Scholar, Hattiesburg, MS., ²University of Southern Mississippi, Hattiesburg, MS

We argue that species as homeostatic property clusters can be understood as a synthesis of (1) homeostasis as suggested by Kauffman (1993, 1995, 2000) in his discussion of self-organizing systems and (2) constraints as suggested by Salthe (1985, 1993) in his discussion of hierarchy theory. Homeostatic property clusters are characterized by self-organization and feedback loops that resist certain perturbations while yielding to others. Feedback loops can be further understood quantitatively or qualitatively as attractors which can be explored through computer simulations of self-organizing

systems. A homeostatic system can shift under slight perturbations from one attractor to another nearby attractor, thus simulating a population shift in phenotypic composition. These considerations help us understand potential states a homeostatic system can realize. Here we enhance that understanding by exploring constraints that prevent a system from achieving some states while allowing it achieve others. Constraints from hierarchy theory that we discuss include: (1) constraints inherently occur at a levels above and below those of the level under consideration; (2) differences in physical rates of process prevent systems from interacting dynamically; (3) physical systems that are rate-dependent are constrained by rate-independent systems contained within them, e.g., a genome (rate-independent) is a constraint on the physical system (rate-dependent) in which it resides; (4) constraints might manifest in terms of information that is not dynamically involved in the process it affects, e.g., phenotype fitness may depend on its frequency in a population. Our arguments focus on species, but are applicable at any level of biological organization.

07.02

9:30 POSSIBLE ORIGINS OF NATURAL TELEOLOGY AND THE UTILITY OF TELEOLOGICAL EXPLANATIONS IN BIOLOGY

Paula J. Smithka¹ and Kenneth J Curry²

¹University of Southern Mississippi, Hattiesburg, MS

²Independent Scholar, Hattiesburg, MS

Stuart Kauffman contends that order arises naturally and spontaneously: systems are self-organizing (1993, 1995). This is necessary for organisms to have evolved. Kauffman's more recent work focuses on molecular autonomous agency and propagating organization, suggesting conditions for minimal biological agency (2003, Kauffman & Clayton 2005, Kauffman, et al. 2007). We contend that such molecular autonomous agency may serve as a foundation for teleology in nature. The notion of goal-directed processes and behaviors dates back to Aristotle whose notion of 'final causality' focused on the generation and development of a living organism, in which "the coming to be" or any stage of development of an organism is *for the sake of* the mature organism (Gotthelf, 1987). The principle of organization and development is internal to the organism—not an external source—and is constrained by limits (Balme, 1987). An example of such a limit would be the genetic code. Teleology for Aristotle is not simply Kant's "as if" approach to goal-directedness; it is a real feature in living things. Many have argued that teleology is non-scientific or anthropomorphic. However, they wrongly attribute some external source of goal-directedness when it is an internal source or assume conscious intentionality, neither of which is present in Aristotle's notion of final causality. To avoid such historical "baggage," some have argued that 'teleology' should be replaced with 'teleonomic' (Pittendrigh, 1958); however, this terminological replacement is unnecessary if one understands teleology in the proper Aristotelian sense. Furthermore, teleological explanations are necessary for biology.

10:00 Break

07.03

10:15 BAYESIAN AND FREQUENTIST INTERPRETATIONS OF PROBABILITY IN THE PSYCHOSIS RISK SYNDROME CONTROVERSY

L. Paul Strait

University of Southern Mississippi, Hattiesburg, MS

Psychiatrists have attempted to develop effective early interventions

for psychotic disorders for over a century, and over 100 clinics devoted to the cause have been set up over the last decade (Kecmanović, 2011). Before the 2013 publication of DSM-5, these efforts were concentrated on developing and institutionalizing diagnostic criteria for the (putative) discrete disease entity psychosis risk syndrome (PRS). As a syndrome, PRS is characterized by a constellation of signs and symptoms that suggest a medically relevant morbid unity, an underlying disease process that will ideally respond to a specific indicated treatment (Sentissi et al., 2017). In this case, however, the syndrome signifies the risk of developing a future disease process, and the potential interventions—including cognitive therapy, essential fatty acid supplementation, and the prophylactic administration of anti-psychotic medication—carry substantial risks of their own (Davies et al., 2018).

This paper traces the historical arc of this controversy, focusing on how risk, uncertainty, and probability have been conceptualized and framed. While often unstated, distinct and mutually exclusive understandings of probability underlie many arguments that have animated this still-ongoing controversy. In particular, ambiguity between frequentist and Bayesian interpretations has characterized the controversy, sometimes contributing to consensus-formation by linking the work of different research groups into an apparently common construct, but just as often sustaining dissensus by subtly distorting stasis points and argumentative burdens of proof. While frequentist and Bayesian statistical models have an important role in this controversy, this analysis focuses on the arguments of key interlocutors, especially Allen Frances and Patrick McGorry.

07.04

10:45 THE HYPOTHETICO-DEDUCTIVE METHOD IN PSYCHOLOGY AND THE NEUROBIOLOGICAL ALTERNATIVE

Gregory Johnson

Mississippi State University, Starkville, MS

Shapiro (2017) argues that confirming psychological explanations indirectly—e.g., by using the hypothetico-deductive method—is just as warranted as confirming those explanations by examining the underlying neurobiological processes. As evidence that explanations can be successfully confirmed indirectly, he points to a historical example: the discovery of iridium in the earth's crust, which confirmed the Alvarez's hypothesis about dinosaur extinction. In this sort of case, a hypothesis is confirmed, to some degree, by evidence that is related to (or can be deduced from) the hypothesis but is separate from it. Given the nature of the Alvarez's hypotheses, an indirect method of confirmation was the only option.

While it is true that, at present, it is not possible to directly inspect the neurobiological operation of a cognitive process in primates, it looks very likely that the direct inspection of neurobiological processes (or something very close to their direct inspection) will eventually be possible. Two techniques with the potential to allow us to directly check a proposed explanation of our cognitive processes are (1) optogenetics, which allows researchers to control the excitation and inhibition of neurons, and (2) calcium imaging, which allows researchers to observe neuronal activity at the level of single cells.

Since observing how a process operates will provide a greater degree of confirmation than an indirect method of confirmation can provide, progress with these neurobiological techniques gives us a reason to, as a general standard, seek to verify psychological explanations by inspecting the relevant neurobiology.

11:15 Break

07.05

11:30 A BRIEF ANALYSIS OF THE BOOK *PRINCIPLES OF NEURAL DESIGN*

Robert Waltzer

Belhaven University, Jackson, MS

The book “Principles of Neural Design” by Sterling and Laughlin (2015 MIT Press) attempts to derive principles by which the brain and nervous system are organized. The authors, while not engineers, use engineering to give some context for their principles. They address how a brain can be successful at what it does while being small and using very little energy. The book considers matters such as speed of impulse transmission, analog vs. digital computation, and information storage needs. It also examines size, organization, and properties of components. From their analysis they have derived 10 principles. Examples of principles include 1) Send only what is needed; 2) Make neural components irreducibly small; 3) Send at the lowest acceptable rate; and 4) Combine analog and pulsatile processing. They address the issue of what the nervous system provides to the organism by looking at both physiology and behavior. They derive their principles in two ways. First, they compare various organisms through both their similarities and the differences. Secondly, they examine the visual systems. The authors hold to a mainstream view of evolution and consider their use of the term “design” to be merely a placeholder for making sense of the nervous system. But they also say that their principles are “neither arbitrary nor accidental”. They explicitly identify “natural selection” as the designer. I think this raises some interesting questions and problems regarding the mechanism by which natural selection accomplishes this and for which I will explore in this presentation.

12:00 General Session

Thursday, February 21, 2019

AFTERNOON

Room Union D

07.06

1:30 FRANKENSTEIN'S CREATURE IN MEDICO-SCIENTIFIC CONTEXTS

Emily B. Stanback and Ashley Hobson

University of Southern Mississippi, Hattiesburg, MS

In this presentation, we consider one of the most famous characters in literary and cinematic history, Victor Frankenstein's Creature, alongside contemporaneous medicine and science. We argue that when viewed in medico-scientific contexts, various adaptations of the Creature—from his original form in Mary Shelley's 1818 novel to early 20th-century cinematic adaptations to 21st century graphic novels—provide a unique opportunity to explore how attitudes towards medicine and embodied difference have shifted from generation to generation.

In order to demonstrate the importance of medical historical contexts to the Creature's embodiment, we will focus on two features of Mary Shelley's creature, one of which remains static between 1818 and early 20th-century cinematic adaptations (his gigantism) and one of which shifts significantly between Shelley's novel and James Whale's 1931 film (his skin tone). To assess the significance of the Creature's skin and stature, we will supplement our literary and cultural analysis with a consideration of published scientific and medical texts, as well as unpublished manuscripts related to yellow fever and gigantism that are housed at the College of Physicians in Philadelphia.



In Shelley's 1818 novel, the Creature is described in ways that gesture to gigantism, and he embodies symptoms of yellow fever—most notably through his yellow skin. However, by 1931, the still-gigantic Creature has lost his distinctly yellow hue, has gained his characteristic flat-topped head and neck bolts, and displays symptoms of mental disability. We argue that this evolving embodiment reflects evolving fears about bodily difference and the science.

O7.07

2:00 DE LA BECHE'S *DURIA ANTIQUIOR*: THE PIONEERING VISUALIZATION OF ANCIENT LIFE RECONSTRUCTIONS

Renee M. Clary

Mississippi State University, Starkville, MS

Although paintings, models, and animated scenes of extinct life are commonplace today, the first depictions of fossils illustrated the hard parts just as they had been found. Furthermore, any marine animal was depicted as washed ashore, or shown from an overhead viewpoint. This changed with the 1830 ground-breaking illustration, *Duria antiquior*. Drawn by geologist Henry De la Beche (1796-1855) as a fund raiser for Lyme Regis fossil collector Mary Anning (1799-1847), the image is the first published scene of Deep Time. The scene reconstructs the extinct Jurassic organisms that Mary Anning collected. Therefore, our modern reconstructions of ancient life, including *Jurassic Park* movies, can trace their humble beginnings to the pioneering illustration of Henry De la Beche.

Not only is the image revolutionary in its reconstruction of extinct animals, but De la Beche also created the first aquarium view graphic where the viewer is peering at these organisms through the water. While the viewpoint might not seem difficult to imagine, De la Beche created this scene decades before Victorian parlor aquaria made this view possible.

De la Beche's techniques were not immediately adopted: De la Beche himself reverted to an overhead view when illustrating marine reptiles in his second edition of *A Geological Manual*. Several versions of *Duria antiquior* were also subsequently published, including some which reverted to an overhead view. However, over time both ancient life reconstructions and aquarium views were eventually adopted.

Thursday, February 21, 2019

EVENING

**3:30 Dodgen Lecture and Awards Ceremony TCC Theatre
General Poster Session
Immediately Following Dodgen Lecture
TCC Ballrooms 3rd floor**

Friday, February 22, 2019

MORNING

Room TCC 228

8:50 Welcome

9:00 KEYNOTE ADDRESS

THE ASYLUM HILL PROJECT

Ralph H. Didlake

10:00 Break

O7.08

10:15 ONE STORY, THROUGH MANY LENSES: HOW ONE MISSISSIPPIAN HELPED PAVE THE WAY FOR WOMEN IN SCIENCE

Ralph Didlake, Mariam Ebeid and Jordan Cothorn

University of Mississippi Medical Center, Jackson, MS

O7.09

10:45 MISSISSIPPI STATE LUNATIC ASYLUM ADMISSIONS, 1855 to 1955: GEOGRAPHICAL REPRESENTATION AND DIAGNOSES

Jessica Jenkins and Denise Powell

University of Mississippi Medical Center, Jackson, MS

11:15 Break

O7.10

11:30 "PUERPERAL INSANITY" AND THE MISSISSIPPI STATE LUNATIC ASYLUM, 1855-1935

Margaret Cosnahan and Mariam Ebeid

University of Mississippi Medical Center, Jackson, MS

O7.11

12:00 THE STATE LUNATIC ASYLUM AND THE PRESS: AN OVERVIEW OF STATEWIDE COVERAGE FROM 1855 THROUGH 1935

Adam Niolet

University of Mississippi Medical Center, Jackson, MS

12:30 Divisional Business Meeting

Friday, February 22, 2019

AFTERNOON

1:00-3:00 Mississippi INBRE/ Millsaps HHMI Symposia

**MARINE AND ATMOSPHERIC****Chair: Dr. Francis Tuluri,**

Jackson State University

Co-Chair: Remata Reddy,

Jackson State University

Vice-Chair: Nicole Phillips,

University of Southern Mississippi

MORNING**Room TCC 226****8:50 WELCOME AND INTRODUCTION****08.01****9:00 CONNECTIVITY OF OYSTER REEFS ALONG THE COAST OF MISSISSIPPI BIGHT**

Kemal Cambazoglu, Jerry Wiggert, and Scott Milroy

The University of Southern Mississippi, Stennis Space Center, MS

The larval dispersal and transport from known oyster reef locations is studied using a coastal ocean modeling system to understand the connectivity of oyster reefs in Mississippi Sound to those in Chandeleur Sound, Breton Sound and Mobile Bay. The numerical modeling system is based on application of Coupled Ocean Atmosphere Wave Sediment Transport Modeling System (COAWST) to Mississippi Bight. The physical ocean model results are used to investigate the impacts of hydrodynamic processes on oyster larval transport and settlement. The model is used to release drifters that represent oyster larvae from oyster seed grounds and to track larval transport. Model drifter simulations are designed for 2016 and 2017 oyster spawning seasons and drifters are released from pre-defined oyster spawning locations and tracked during model simulations for 30-days. The oysters are assumed to settle within 14-28 days after spawning and the proximity of these settling locations to existing oyster reefs is observed. Model experiments are designed to provide oceanographic information along drifter tracks to a water quality and ecological productivity assessment model which will be used to investigate the impacts of multiple environmental stressors on oyster larvae growth, prior to settlement. Model results show that oyster spawning and settling locations in different state waters may be connected via larval transport due to circulation. This study shows that oyster larvae supply in Mississippi Sound is not only self-seeding but also receives contributions from Louisiana and Alabama oyster reefs as well.

08.02**9:20 ASSESSMENT OF WATER QUALITY USING REMOTE SENSING TECHNOLOGY OVER THE HENDERSON POINT AND PASS CHRISTIAN OYSTER REEFS, MISSISSIPPI**Helen Weber¹, Christian Jones², Jill Hendon³, Gregg Poulakis⁴, David Wells⁵, Nicole Phillips¹Padmanava Dash¹, and Robert J. Moorhead²¹*Department of Geosciences, Mississippi State University,**Mississippi State, MS, ²Geosystems Research and Northern Gulf Institute, Mississippi State University, Mississippi State, MS*

Oyster reefs in the Mississippi Sound have seen considerable decline in the past decade, primarily because of Hurricane Katrina in 2005, the Deep Water Horizon oil spill in 2010, and the historic Mississippi

River flood of 2011. Most recently, the oyster reefs were negatively impacted by the 2015 red tide event, 2017 hypoxia, and the Mississippi River flood in 2014 and 2018. To that end, the main objective this research was to generate remote sensing products displaying the spatio-temporal distribution of a suite of water quality parameters. Four week-long field campaigns were undertaken in the months of March, May, June, and July, 2018, and a hexacopter Unmanned Aerial System was flown with a 5-band sensor, RedEdge, and a hyperspectral sensor, Nano-Hyperspec, onboard. A total of 45 flights were conducted and in situ field data were collected from one site per flight from a total of 45 sites. The field data collection included water samples, in situ remote sensing reflectance, backscattering, and fluorescence measurements, and profiles of pH, salinity, dissolved oxygen, and temperature. The water samples were collected for suspended particulate matter, chlorophyll-a, phycocyanin, colored dissolved organic matter, nutrients, absorption, cyanotoxins, nutrients, microscopy, bacterial counts, and toxic metal analyses. Semi-analytical algorithms are being developed relating multi- and hyperspectral imagery and co-incident water quality data to generate remote sensing products displaying the spatio-temporal distribution of suspended particulate matter, chlorophyll-a, phycocyanin, and colored dissolved organic matter. A time-series analysis of these products will help to determine potential impacts of water quality on oysters.

08.03**9:40 GEOLOGIC CONTROL OF SUBMARINE GROUNDWATER DISCHARGE PROXIMAL TO OYSTER REEFS IN MISSISSIPPI SOUND**

Adam Skarke, Daniel Adcock

Mississippi State University, Starkville, MS

Submarine groundwater discharge (SGD) from coastal aquifers through the seafloor is a widespread phenomenon that occurs in the Mississippi Sound and has been shown, in other coastal environments, to impact the success of nearshore benthic communities including oyster reefs. The impact of SGD on marine species is likely related to its influence on localized salinity, and temperature gradients as well as nutrient advection. The spatial distribution of SGD in many coastal environments is not uniform due to lateral variability of subsurface hydrogeologic properties. Notably, buried Pleistocene paleochannel drainage networks, which underlie the Mississippi Gulf Coast likely exert substantial control on the location of SGD in the Mississippi Sound. Here we use multiple geophysical methods to assess the spatial relationship between paleochannels, subsurface salinity, groundwater discharge at the seafloor, and oyster reefs in the western Mississippi Sound. The buried paleochannel drainage network was mapped using newly collected as well as publicly archived seismic profile data. Subsurface salinity was measured with electrical resistivity tomography which produced continuous resistivity profiles along survey lines. The presence of SGD was determined with continuous radon-222 surveys. Results indicate that the position of oyster reefs relative to paleochannels and SGD hotspots may be a driver of ecosystem success and that geophysical surveys could be used to inform and optimize the location of future oyster reef restoration and establishment efforts

08.04**10:00 TRACKING SALINITY CHANGES IN THE WESTERN MISSISSIPPI SOUND**

Laura Elizabeth Hode

University of Southern Mississippi, Stennis Space Center, MS

The state of Mississippi oversees a number of public and private oyster leases. Oyster sack limits and lease access can change quickly as new information on the vitality of the reefs becomes available.

Drops in salinity cause oyster die off while increased salinity leaves oysters more open to predation. As such, pairing *in situ* hydrological measurements and remotely-sensed surface currents with operational forecasts can give insights into how and why salinity changes in the western Mississippi Sound. For this study, gridded salinity fields were generated from USGS-Mississippi Department of Marine Resources stations in the Sound. Additionally, surface velocity maps were estimated from radial currents measured by the Central Gulf of Mexico Ocean Observing System's 25 MHz high frequency radars. These provided a look at the seasonality of the western Mississippi Sound. Also, measurements were compared to predicted velocity and salinity values from the Northeast Gulf of Mexico Operational Forecast System over a two year period to establish the degree of agreement between model predictions and observational data. Average monthly salinities agreed fairly well, but while measured and predicted surface currents both indicate a net surface flow out of the Mississippi Sound, the two sometimes disagreed in both magnitude and direction south of the Bay of Saint Louis and around Cat Island. This study endeavored to track the monthly evolution of salinity in the western Sound and explore flow patterns from the Sound into the Mississippi Bight.

10:20 Break

O8.05

10:30 MONITORING AND ASSESSING THE DIVERSITY OF THE ST. JOE OYSTER REEF IN THE MISSISSIPPI SOUND USING HYDROGRAPHIC TECHNIQUES

*Kandice Gunning, Ryan Harner, and Anand Hiroji
University of Southern Mississippi, Hattiesburg, MS*

Oyster production numbers along the Gulf of Mexico has decreased considerably in recent years. To monitor and restore oyster harvest quantity, efforts are being made by Mississippi's marine departments and agencies including Mississippi Based RESTORE Act Center of Excellence (MBRACE) to understand the reasons for this decline. Sustained, multi-disciplinary spatial and temporal oyster reef monitoring can provide an understanding of the state of the reef ecosystem and how its components are influenced by the different hydrodynamic factors that change over time and space. Results from these monitoring efforts can provide baseline data that can be used to detect early warnings of potential environmental variability, for adaptive coastal management policy, assessing damage due to natural and man-made disasters, restoration project management, and to evaluate long-term trends.

Hydrographic techniques have been employed for the mapping component of this monitoring efforts. This involves repetitive bathymetric mapping of the oyster reefs using high resolution sonars. These surveys provide valuable temporal bathymetric changes on the seafloor. The backscattered signal intensities are also captured during this process by the sonars and these can provide information about the properties of material on the seafloor. The repetitive surveys were performed using Reson 7125 a 400kHz multibeam system and the Edgetech 4600 a 540kHz interferometric sidescan sonar system where both systems produce backscatter and bathymetric data. Three data collection campaigns have been completed using USM's RV Le Moyne. This presentation focuses on the field procedures involved during these surveys, data processing techniques used, challenges faced and preliminary results.

O8.06

10:50 EARLY RECRUITMENT OF CRASSOSTREA VIRGINICA TO RESTORED AND HISTORIC OYSTER REEFS IN THE WESTERN MISSISSIPPI SOUND: LARVAL SUPPLY AND POST-SETTLEMENT SUCCESS

Chet Rakocinski, and Leah Morgan

USM SOSE Coastal Sciences, Long Beach, MS

The eastern oyster (*C. virginica*) is an important foundation species within coastal ecosystems. Oysters improve water quality, provide refuge for smaller fish and invertebrates, and serve as an important fisheries resource. The successful early recruitment of eastern oyster is vital for resupplying adult populations in the face of harvesting. Healthy coastal oyster populations are also challenged by various sources of stress, including pollution, freshwater input, hypoxia, disease, and predation pressure. Thus, considerable efforts have been dedicated toward oyster restoration within the northern Gulf of Mexico. The objective of our study is to evaluate the role and importance of early recruitment to oyster restoration success in western Mississippi Sound. During the summer 2018 recruitment period, we compared larval supply and spat settlement among eight sites, including four recently restored inshore reef sites (2 limestone, 2 relic shell), two historic unrestored inshore reef sites, an unrestored offshore reef site, and a previously restored offshore reef site (1 limestone). Variation in recruitment success will be quantified relative to region, restoration materials, and the degree of background predation on post-settlement oysters. Local oyster spawning stock biomass will also be considered as a potential source of early recruits. Preliminary results from zooplankton samples as well as from spat settlement plates both with and without predator exclusion cages will be discussed.

O8.07

11:10 EMBEDDED SOFTWARE MODULES FOR THE OYSTERS' GAPE MEASUREMENT SYSTEM

Amin K. Ali¹, Kamal S. Ali², and Ali Abu El Humos²

¹Rooster Teeth and ²Jackson State University, Jackson, MS

This work provides an overview of the embedded software programs that have been used to develop the Oysters' Gape Measurement system at Jackson State University. We start with an overview of the programs used for sensors' calibration and linearization. The sensors used here are, Micronas Hall Effect sensors HAL2425. This is followed by a description of the code used on slave nodes and that used on the master node. A sensor system comprises a master node and one or more slave nodes. Each slave node is responsible for collecting data from 6 animals.

We then examine the code used in our GPRS system. This system is for field deployment and would hence use the Cellular network for communications. Finally, we look at the field deployable, underwater sensor. Here data is not transmitted but stored on an SD card on the sensor system. This card and the battery are replaced once a month or so. The code here is designed to use as little power as possible. The effort of prolonging the life of this sensor system is ongoing, we hope to have the sensor life prolonged to over two or three months by the time the work is presented.

O8.08

11:30 POWER MEASUREMENT SYSTEM FOR OYSTERS' GAPE MEASUREMENT APPARATUS

Kamal S. Ali, and Ali Abu El Humos

Jackson State University, Jackson, MS

The goal of this project is to reduce power consumption for an Oysters' Gape Measurement system that has been developed at

Jackson State University (JSU). The system measures the gape of an oyster and reports that gape size to a server in the cloud.

There are two types of sensors that can be deployed in the field. One is fully submerged, for 3 to 4 weeks at a time. The second has a surface component that transmits data via the cellular network to the cloud. In both cases, reducing the system's power consumption is vital to the effectiveness of these sensor systems.

To measure the power consumption, we propose to use a Data Acquisition Device capable of measuring low currents at high frequencies. The DAQ6510/7700 is capable of sampling current as low as 10pA at a sampling frequency of 1 Msps of 16-bit samples. Using this DAQ, the effect of current lowering activities can be observed immediately. Techniques that will be undertaken to reduce power consumption include removing all unnecessary hardware such as LEDs and Power regulators, shutting power down to all parts of the CPU that are not used, allowing the microcontroller to sleep as much as possible and using lower power devices such as SD card readers, etc. Finally, optimizing the software so that any component not used is powered down, and also, selecting lower power components.

12:00 General Session

Thursday, February 21, 2019

AFTERNOON

Room TCC 226

08.09

1:00 INVESTIGATING ENVIRONMENTAL DNA ACCUMULATION OF BULL SHARKS (*CARCHARHINUS LEUCAS*) IN THE NORTHERN GULF OF MEXICO USING DDPCR

Katherine E. Schweiss¹, J. Marcus Drymon², Toby S. Daly-Engel³, and Nicole M. Phillips¹

¹The University of Southern Mississippi ²Mississippi State University, ³Florida Institute of Technology

Identifying the distribution and habitat preference of elasmobranchs (sharks and rays) traditionally requires setting nets and handling the target species to collect tissue samples and attach tags. Such methods are costly, time consuming, and inflict stress to both target and non-target species. Environmental DNA (eDNA) sampling provides a non-invasive approach to studying elasmobranchs, eliminating the need to capture or even observe the target

organism. In the Gulf of Mexico, Bull Sharks (*Carcharhinus leucas*) are known to use the interface between freshwater and marine systems; however, the extent to which they use the rivers feeding these systems is unknown. To investigate riverine habitat use, we established a standard protocol for collecting and filtering highly turbid coastal water samples, preserving the filters, extracting the DNA, and amplifying a target sequence specific to *C. leucas* via polymerase chain reaction (PCR). Water samples were filtered with various filter pore sizes to test for efficiency and multiple DNA extraction protocols were compared to determine which produced the highest quality and quantity DNA. Droplet digital PCR (ddPCR) was used to detect *C. leucas* DNA in each water sample, if present. DdPCR can identify minute amounts of target DNA with unparalleled precision by partitioning the sample into individual droplets, conducting PCR reactions, and quantifying resultant products from each droplet. Having a reliable and consistent approach to filtering, isolating, and amplifying *C. leucas* eDNA will expand our knowledge of this species' distribution and preferential habitat.

08.10

1:15 VEGETATIVE COMMUNITY AND HEALTH ASSESSMENT OF A CONSTRUCTED JUNCUS-DOMINATED SALT MARSH IN THE NORTHERN GULF OF MEXICO

Nickolas Murphy, and Patrick Biber

Gulf Coast Research Laboratory, Ocean Springs, Mississippi

Deer Island is a coastal habitat which provides a buffer from storm and flood damage as well as shore-line stabilization to the mainland of Biloxi, MS. A third of the land has been lost since 1850, largely driven by tropical storm and hurricane impacts as well as sea level rise. The United States Army Corps of Engineers and Mississippi Department of Marine Resources have targeted the shores of the island as sites for restoration with beneficial use material, and two sites have since been planted with native salt marsh and sand-berm vegetation. If successful, the sites are anticipated to function similarly to the *Juncus roemerianus* dominated salt marshes natural to the northern Gulf of Mexico. Ecological assessment of this restoration project during the early development of the marsh provides a test case for the success of future salt marsh loss mitigation using *J. roemerianus* marsh. The study has assessed the vegetative health of the constructed sites using vascular plant community diversity and biomass, as well as relating these parameters to sediment and geomorphological characteristics of the area. Sampling in Spring and Fall 2017 and Spring 2018 has shown establishment of planted salt marsh and naturally-recruited sand-berm vegetation. Planted *J. roemerianus*, however, has failed to establish and exists sparsely on the marsh platform.

Development in the rhizosphere and canopy of restored sites is in some cases comparable to a natural reference site. Future assessment is needed to evaluate the success of the constructed marshes in the long term.

08.11

1:30 DISSOLVED ORGANIC MATTER BIOGEOCHEMISTRY AND ITS EFFECT ON OCEAN ACIDIFICATION OVER AN OYSTER BED IN THE WESTERN MISSISSIPPI SOUND, MS, USA

Sankar Manalilkada Sasidharan¹, Padmanava Dash¹, and Yuehan Lu²

¹Department of Geosciences, Mississippi State University, MS,

²Department of Geological Sciences, University of Alabama, Tuscaloosa, AL 35487, USA

The main objective of this study was to assess the relationship of dissolved organic matter (DOM) and its effect on ocean acidification over an oyster bed in the Western Mississippi sound. Water samples at three different depths from forty-five locations over the oyster bed were collected during four field campaigns from March to July, 2018. Ocean acidification parameters- pH, total alkalinity (TA), and dissolved inorganic carbon (DIC) were measured for the surface, mid-depth and bottom waters samples, while DOC was measured only for the surface water samples. Fluorescence and absorbance spectroscopy of colored dissolved organic matter (CDOM) was carried out using parallel factor (PARAFAC) analysis to gain insights into the DOM composition. Characterization revealed presence of five DOM components (C1-C5); C1 and C3: terrestrial humic-like and C2, C4 and C5: bacterially and photochemically processed components. While the terrestrial humic-like DOM composition (C1 and C3) increased, the bacterially and photochemically processed components decreased from March to July. pH, DIC and TA were lowest in March and showed an increasing trend to July over the oyster reef. Principal component analysis (PCA) of surface water samples indicated a strong association of TA, DIC, pH and bacterial activity during the months of June and July, and the low pH, DIC and TA in March and May were in close association with terrestrial DOM input. Combination of PARAFAC, PCA and geochemical data indicated that the biogeochemical processing of DOM in the coastal waters

causes acidification over the oyster beds in the Western Mississippi Sound.

O8.12

1:45 SAWFISH CSI: COLLECTING ENVIRONMENTAL DNA SAMPLES TO SEARCH FOR THE CRITICALLY ENDANGERED SMALLTOOTH SAWFISH IN THE NORTHERN GULF OF MEXICO

Ryan N. Lehman¹, Jill M. Hendon², Gregg R. Poulakis³ and Nicole M. Phillips¹

¹*School of Biological, Environmental, and Earth Sciences, The University of Southern Mississippi, Hattiesburg, MS,* ²*Center for Fisheries Research and Development, The University of Southern Mississippi, Ocean Springs, MS* ³*Fish and Wildlife Research Institute, Florida Fish and Wildlife Conservation Commission, Charlotte Harbor Field Laboratory, Port Charlotte, FL*

The Critically Endangered Smalltooth Sawfish, *Pristis pectinata*, was once common throughout the Gulf of Mexico, but experienced a significant reduction in range and number in the last century, with known populations currently restricted to Southwest Florida. Over the past decade, however, juvenile *P. pectinata* have sporadically been reported by recreational fishers in historically occupied habitat in the northern Gulf of Mexico, implying that they may still be present here, or are recovering, but a full understanding of their status in these waters is unknown. The recent reports of juveniles, which tend to exhibit site fidelity, are promising and suggest that they may be using these waters as a nursery. Environmental DNA (eDNA) surveys, conducted by collecting and analyzing water samples, can be a powerful tool for supporting sawfish recovery worldwide, especially in remote regions. If strict protocols are implemented to avoid cross contamination, eDNA surveys could be used as a technique for early detection of species presence, identifying where to focus outreach efforts and fieldwork. To better understand the status of *P. pectinata* in these waters, we conducted eDNA surveys in areas with recent public encounters reports, specifically in the Mississippi Sound, USA. eDNA presents a cost effective, rapid-assessment alternative to traditional elasmobranch survey methods like gill netting, and we have developed optimized protocols for our target species and study area. If *P. pectinata* are reintegrating back into historic portions of their range in the northern Gulf of Mexico, it is imperative to designate and protect any critical region(s).

O8.13

2:00 CHARACTERIZATION OF SOUND CHANNEL AXIS AND DEPTH IN THE GLOBAL OCEAN

Mukunda Acharya, Likun Zhang

National Center for Physical Acoustics and Department of Physics and Astronomy, the University of Mississippi

Sound speed in the ocean depends on temperature, pressure, and salinity. In the ocean sound speed has a minimum at a certain depth that forms a sound channel for long-range underwater sound propagation. In this project, we characterized axial sound speed and depth with longitude, latitude, and depth for the four oceans. The characterization is possible after calculating 16,000 sound speed profiles using CTD data collected in the World Ocean Circulation Experiment (WOCE). We found the tropical region of the Indian Ocean and subtropical region of the North Atlantic Ocean with higher axial speed and deeper depth. Polynomial fits allow us to find practical formulae, which shows the dependence of axial sound speed and depth on latitude. The global characterization of the axial sound speed and depth could be useful for modeling sound propagation in the global ocean.

O8.14

2:15 CLIMATE CHANGE AND GLOBAL WARMING USING EMPIRICAL MODEL

Remata Reddy, Francis Tuluri, and Mehri Fadavi

Jackson State University, Jackson, Mississippi

Normal events and human activities are believed to be contributing to an increase in average global temperatures. This is caused primarily by increases in “greenhouse” gases such as Carbon Dioxide (CO₂). It is being clear that human activities have caused most of the century’s warming by releasing heat-trapping gases-called greenhouse gases into the atmosphere. In the present study, an attempt has been made to develop an empirical model and study the empirical aspects of the global climate change by applying the mass energy concept to the earth atmosphere system, assuming that the atmosphere is in hydrostatic balance. Further, we assumed that the earth atmosphere system behaves as a black body. The presence of the gas in the atmosphere keeps some of the radiant energy received by the earth from being returned to space, thus producing the so-called greenhouse effect. The results of the study pointed out that the global temperature changes due to mass increase as a whole of the earth atmosphere system for the period 1900-2050. These changes in global warming are due to temperature increases from 0.053°C to 0.84°C. The predicted changes are in good agreement with the observed global warming (IPCC, 1990). The temperature changes due to doubling of CO₂ are only 0.02°C by 2050. The global warming due to temperature changes may be attributed to increase in mass as a whole including greenhouse gases (CO₂, water vapor, particulate and other CFC’s) and human activity and feedbacks.

O8.15

2:30 ASSOCIATION OF AIR QUALITY, AND METEOROLOGY FOR ASTHMA TRENDS OVER COUNTIES NEAR MISSISSIPPI GULF COAST

Francis Tuluri^{1,*}, A. K. Gorai², and Randy Smith³

¹*Department of Technology, Jackson State University, Jackson, Mississippi;* ²*Department of Mining Engineering, National Institute of Technology, Rourkela, Odisha, India,* ³*Student Contributor, Jackson State University, Jackson, Mississippi*

The mechanism of interplay between environmental factors and asthma is complex and is important to predict asthma prevalence for mitigation. The present study aims at finding association between asthma and environmental factors in regions of Gulfport, Pascagoula, and Waveland over Mississippi Gulf Coast. In particular, Poisson Regression Model is run using daily data of asthma admissions, Particulate Matter (PM_{2.5}), Ozone (O₃), Nitrogen dioxide (NO₂), temperature, and humidity for these regions during the period 2003 to 2011. For the Gulfport region, the effect of temperature on the asthma were statistically significant (p<0.05), while humidity on asthma was not uniform. The results also revealed that high numbers of asthma cases were associated with low values of ambient temperature. Overall, the results indicate a negative correlation of asthma with temperature and the effect was statistically significant (p < 0.05) in all the regions. The effects of PM_{2.5}, NO₂, and O₃ on asthma cases were not statistically significant (p>0.05) and not uniform in all cases. The trends are found to be not consistent in the regions, perhaps limited by the extent of availability of the data in all the regions.

2:45 Divisional Business Meeting



Thursday, February 21, 2019

EVENING

**3:30 Dodgen Lecture and Awards Ceremony TCC Theatre
General Poster Session**

Immediately Following Dodgen Lecture

TCC Ballrooms 3rd floor

P8.01

WISER: RESOURCES FOR EMERGENCY MANAGEMENT

*HuiRu Shih, Taneshia Davenport, Mia Griffin, Jelicia Smith
Jackson State University, Jackson, MS*

When a hazardous materials incident occurs, emergency responders will be the first on the scene and will be responsible for managing the incident until other assets arrive. To help with preparation, first responders need to know the technologies and their links for them to download and use for the incident planning and decision-making.

WISER (Wireless Information System for Emergency Responders) is an app developed by the National Library of Medicine (NLM). WISER provides a wide range of information on hazardous substances, thus it can serve as a comprehensive reference guide for professionals responding to hazardous materials incidents. WISER is a searchable database provider that can be used to quickly obtain response, treatment, and clean-up information for various chemical agents, radiological agents, biological agents, and weapons of mass destruction. WISER also contains the Chemical Hazards Emergency Medical Management (CHEMM) resource.

WISER is designed to be easy to use, intuitive to navigate, detailed in scope and able to provide first responders with accurate, trustworthy information so that they can make more informed decisions when it comes to hazardous materials incidents. Therefore, emergency personnel who handle hazardous materials or respond to hazardous materials accidents should download WISER.

WISER is available for download as a standalone application on Windows PC, iPhone, and Android devices. WISER download information can be found at www.wiser.nlm.nih.gov. WISER is not only for the first and emergency responders, but for the academic students for their research as well.

P8.02

**DETECTING WATER QUALITY
MEASURES FROM UNMANNED AERIAL
SYSTEMS**

Lee Hathcock

Mississippi State University, Starkville, Mississippi

Introduction: Mississippi State University has been conducting unmanned aerial system (UAS) flights to detect water quality near oyster reefs in the Bay of St. Louis using multispectral and hyperspectral payloads.

Methods: Data is collected using the MicaSense RedEdge multispectral and Headwall Photonics Nano-Hyperspec hyperspectral cameras. Using this imagery requires both geospatial and radiometric correction to be usable.

RedEdge imagery is corrected using reflectance panel images collected before and after each flight, or by the radiance values recorded by a downwelling light sensor (DLS). Image bands are aligned using TNTgis software. Since all flights occur over water, images must be georeferenced individually using a combination of

UAS flight logs and inertial measurement unit (IMU) measurements from the Nano-Hyperspec. This process is performed using OpenCV and Geospatial Data Abstraction Layer (GDAL). Nano-Hyperspec imagery is radiometrically corrected using a reference tarp. This camera is fully gimballed, and the payload has its own IMU to determine camera orientation during capture. The supplied software uses this orientation to georeference the pushbroom scanlines.

Results: Imagery has been collected and corrected for use with simultaneously collected water samples. The corrected imagery supplies spectral signatures that can be used to detect various water quality measures.

Discussion: Some challenges remain; early flights had issues with a blocked DLS sensor, leading to erroneous radiance readings. Correcting for changing lighting conditions will also prove a challenge, due to differing reflective vs. diffuse lighting depending on cloud cover.

P8.03

**THE INDEPENDENT AND INTERACTIVE EFFECTS
OF TBT AND HYPOXIA ON THE OYSTER,
CRASSOSTREA VIRGINICA**

*Ann Fairly Barnett, James Gledhill, Deborah J. Gochfeld,
Robert J. Griffitt, Kristine L. Willett, Jarrett Bell, Greg
Easson, Stephanie Otts, Marc Slattery
University of Mississippi, Oxford, MS*

Oyster reefs provide significant ecosystem services, including water quality improvement, shoreline stabilization, and nursery habitat for commercially important fisheries. In Mississippi, oyster yields have declined dramatically, from over 400,000 sacks in 2004 to under 30,000 in 2015. While overfishing has played a major role, stressors such as environmental contaminants, hypoxia and disease threaten oyster survival in the Gulf of Mexico (GoM). Tributyltin (TBT), once commonly used as an antifouling paint, increases molluscan susceptibility to calcification anomalies, disease and imposex. Although banned worldwide in 2003, enforcement is not universal, and TBT degrades slowly, potentially persisting for decades in sediment, where it risks resuspension. Additionally, the Northern GoM is subject to a recurring "dead zone" due to hypoxia caused by eutrophication from the Mississippi River. This study examined the effects of hypoxia and TBT on oyster physiology and gene expression. Oysters in replicate tanks were exposed to independent and combined hypoxia and TBT treatments in a factorial design: normoxic-control (>8 mg/L dissolved O₂), hypoxia (<2 mg/L dissolved O₂), and TBT (80 ng/L). Exposure time-dependent endpoints including clearance and respiration rates and expression of metallothionein, HSP-70, HIF-1 α and vitellogenin, will be compared with those from a field study of oysters deployed in the Mississippi Sound. The results of this study will identify independent and interactive effects of these stressors, to provide valuable insight for the restoration and recovery of oyster reefs in the Mississippi Sound.

P8.04

**CHARACTERIZING THE PLEISTOCENE
PALEODRAINAGE NETWORK OF THE WESTERN
MISSISSIPPI SOUND**

Daniel Adcock, and Adam Skarke

Mississippi State University, Starkville, Mississippi

The Mississippi Gulf Coast is underlain by late Pleistocene aged sediments of the Biloxi, Prairie, and Gulfport Formations topped by an erosional unconformity, which was an exposed land surface during the sea level low-stand of the last glacial period. During

that period, rivers and streams draining upland watersheds cut across the exposed coastal plain and incised a network of distributary fluvial channels. Subsequent sea level rise covered the drainage network with a relatively thin (10-20 m) layer of reworked Holocene aged sediments. Here, we analyze an extensive database of archived and newly collected seismic reflection profile data to map the Pleistocene paleodrainage network beneath the western Mississippi Sound. Approximately 250 km of new seismic data were acquired with a 2-16 kHz chirp sub-bottom profiling sonar and an additional 978 km of seismic data were accessed through a United States Geological Survey data archive. Results indicate a complex network of incised paleo-fluvial channels with relief ranging from 10-15 m and widths ranging from 0.3 – 2 km. Additionally, seismic reflection data indicates that larger paleochannels are partially infilled with geophysically distinct sediments, interpreted to be coarser grained channel lag deposits. Previous investigations indicate that higher permeability sediments in paleochannels result in enhanced hydraulic conductivity, which may create preferential pathways for transport of groundwater and nutrients from coastal aquifers into marine environments. The impact of submarine groundwater discharge from paleochannels on salinity and nutrient loading could hold important implications for water quality and the health of benthic species including oysters.

P8.05

ASSESSING SPONGE STRESS BY TISSUE CALORIC CONTENT AND BIOCHEMICAL COMPOSITION ACROSS THE CARIBBEAN

Amelia Clayshulte, Michael Cox, Amelia Mellor, Deborah Gochfeld, and Marc Slattery

The University of Mississippi, Oxford, Mississippi

Following a 30-year decline of calcifying corals, sponges, a diverse phyla of filter feeding invertebrates, have come to represent the dominant taxa on Caribbean reefs where they provide vital ecological services including nutrient cycling, reef stabilization, and habitat. Additionally, due to their vast array of secondary metabolites, sponges also represent a potentially valuable resource to the pharmaceutical industry. As reefs continue to face challenges such as overfishing; pollution; and climate change; it has become paramount to understand how critical taxa such as sponges respond to environmental changes. One insightful metric of response is tissue caloric content. Animals with higher tissue calorie content have more energy for life processes such as growth and reproduction. Here we examined tissue caloric content and biochemical composition in seven sponge species: *Agelas conifera/ tubulata*, *Aplysina cauliformis*, *Amphedon compressa*, *Niphates amorphia/ erecta* and *Xestospongia muta* across four countries in the Caribbean basin: Belize, Curacao, Grand Cayman, and St Croix. Though we found that total tissue caloric content and how those calories were allocated across biochemical constituents including carbohydrates, lipids, and insoluble and soluble protein, was species specific; it did vary significantly within species across sites. Also, we found universal trends among all species tested, such as higher total tissue caloric content and lipid content in individuals from Grand Cayman, whereas individuals across all species tested from Belize and St Croix had the lowest tissue caloric content indicating that the individuals from these sites may be the least and most stressed respectively.

P8.06

ASSESSMENT OF COLORED DISSOLVED ORGANIC MATTER USING UNMANNED AERIAL SYSTEMS OVER THE OYSTER REEFS IN THE WESTERN MISSISSIPPI SOUND

Sudeera Wickmarathna¹ Padmanava Dash¹, and Robert Moorhead²

¹Department of Geosciences, Mississippi State University, Mississippi State, MS, ²Geosystems Research Institute and Northern Gulf Institute, Mississippi State University, Mississippi State, MS

Productive oyster reefs in the Mississippi Sound depend on the salinity moderation provided by freshwater. Unfortunately, freshwater also brings in high amount of pollutants affecting the oysters negatively. Oyster diebacks happened as a result of hypoxia caused by excessive organic matter input to the Western Mississippi Sound (WMS) in spring 2017. Remote sensing can be helpful in mapping colored dissolved organic matter (CDOM). The main objective of this study was to develop remote sensing algorithms for quantifying CDOM using unmanned aerial systems (UAS) imagery. 45 water samples were collected in the months of March, May, June, and July 2018 from over the Henderson Point and Pass Christian Oyster Reefs in WMS. During water sample collection, UAS imagery was collected simultaneously using a 5-band sensor, RedEdge (Micasense, Inc.), and a hyperspectral sensor, Nano- Hyperspec (Headwall Photonics, Inc.) covering approximately 11.25 sq. mi. Water samples were analyzed for CDOM, total particulate, and non-algal particulate absorption coefficients, and suspended particulate matter, chlorophyll *a*, and phycocyanin concentrations. *In situ* remote sensing reflectance (*R_{rs}*) collected using a radiometer were converted to sensor specific *R_{rs}* by applying the spectral response function of the Micasense RedEdge sensor. Semi-analytical algorithms will be developed relating multispectral and hyperspectral imagery and co-incident water quality data. Use of UAS to quantify CDOM is an emerging technique and it can be used as a useful tool to monitor the coastal water quality with high spectral and spatial resolution to determine the potential impacts of organic matter on oysters.

P8.07

ESTIMATION OF SUSPENDED PARTICULATE MATTER OVER THE HENDERSON POINT AND PASS CHRISTIAN OYSTER REEFS, MISSISSIPPI USING UNMANNED AERIAL SYSTEMS IMAGERY

Beshah, W. T¹, Dash, P¹, and Moorhead, R. J²

¹Department of Geosciences, Mississippi State University, Starkville, Mississippi

²Geosystems Research Institute and Northern Gulf Institute, Mississippi State University, Starkville, Mississippi

The Oysters in the Mississippi Sound are depleting because of a range of environmental and anthropogenic stressors. While the biological particles in the suspended particulate matter (SPM) including detritus and phytoplankton can be helpful for oyster survival and growth, the suspended silts and clays can foul these suspension feeding animals. This can lead to death by smothering or hypoxia/anoxia, to reduced fitness and poor health. Oysters are also subjected to additional stress as a result of bio-availability of the contaminants associated with SPM. Runoff from adjacent watersheds and dredging activities increase SPM in the water column. Remote sensing is useful in mapping the spatio-temporal distribution of SPM. The overarching objective of this research is to develop remote sensing algorithms for mapping SPM using

Unmanned Aerial Systems (UAS) imagery, and integrate the mapped images to a visualization tool. UAS imagery was collected by 45 flights over the Henderson Point and Pass Christian Oyster Reefs, Mississippi, the largest oyster reef in the Mississippi Sound during four week-long trips in the months of March, May, June and July, 2018. Water samples and ancillary data were also collected from 45 locations during each flight. Semi-analytical algorithms will be developed for generating SPM maps using the UAS imagery and field data. The data will be visualized as maps and will be shared publicly on a web-based visualization tool. The potential impact of this endeavor will be significant as it informs water managers, the fishery industry, and other stakeholders on the current status of SPM.

P8.08

QUANTIFICATION OF OBSERVABLE BEHAVIORS INDUCED BY KAPPA AGONISTS IN RHESUS MONKEYS: EFFECTS OF SIGNALING BIAS

Morgan Brasfield,¹ Sally Huskinson¹, Donna Platt¹, Meagan Follett¹, Tom E. Prisinano², and Bruce E. Blouge²

¹University of Mississippi Medical Center, Jackson, MS, ²University of Kansas, Lawrence, KS, ³Research Triangle Institute, Research Triangle Park, NC

Introduction: Kappa-opioid agonists are antinociceptive, and evidence indicates that their side effects can be ameliorated through selective intracellular signaling (i.e., biased signaling). This study aimed to determine behavioral profiles for a mu agonist and several kappa agonists that vary in signaling bias. We predicted that kappa agonists would produce profiles distinct from a mu agonist and that biased kappa agonists would produce distinct profiles from traditional kappa agonists. **Methods:** Six adult male rhesus monkeys were administered oxycodone (OXY) or kappa agonists with varying degrees of signaling bias: U50,488 (U50), unbiased; salvinorin A (SVA), unbiased; nalfurafine (NF), biased; triazole 1.1 (TRZ), biased. Using behavioral observation techniques, species-typical and drug-induced behaviors were recorded by observers blinded to drug conditions. **Results:** All drugs decreased tactile/oral exploration (i.e., manipulation of the environment). Rest posture was induced by NF in one subject, U50 in four subjects, and SVA in five subjects. Scratching was increased by OXY but decreased by NF, U50, and SVA. Facial rubbing (purported to indicate gastrointestinal distress), was increased by OXY and SVA. Lip droop (purported to indicate muscle relaxation) was increased by U50 and SVA. TRZ had no effect on the behaviors scored. **Discussion:** All kappa agonists had distinct profiles from OXY; however, TRZ had a profile distinct from other kappa agonists apparent in a lack of sedation-like effects. These results suggest that nuances along the spectrum of bias, even within biased agonists, produce distinct effects relevant to behavioral profiles.

P8.09

WHETHER PIGMENTS OTHER THAN CHLOROPHYLL A AND PHYCOCYANIN SIGNIFICANTLY AFFECT REMOTE SENSING REFLECTANCE?

Mallory Price Hunt¹, Padmanava Dash¹, Sudeera Wickramaratna¹, and Robert J. Moorhead²

¹Department of Geosciences, Mississippi State University, Mississippi State, MS, ²Geosystems Research and Northern Gulf Institute, Mississippi State University, Mississippi State, MS

For assessing water quality parameters such as phytoplankton, suspended sediments, or colored dissolved organic matter concentrations using remote sensing, algorithms are developed by relating remotely sensed data and co-incident field data. Simplistic empirical algorithms produce reasonable estimates in case-1 waters, however, in case-2 optically complex waters semi-

analytical algorithms are developed by numerical simulations of underwater radiative transfer using inherent optical properties such as absorption (a) and backscattering coefficients (b_b). To account for the effects of phytoplankton on total remote sensing reflectance, absorption by phytoplankton (a_{ph}) is used in semi-analytical algorithms. When cyanobacteria is present, absorption by phycocyanin (a_{pc}) is used as an additional absorption term. Since a_{ph} includes a_{pc} , it is imperative to use absorption by the major pigment in phytoplankton, chlorophyll- a , a_{chl-a} instead of a_{ph} when a_{pc} is used. Use of a_{chl-a} instead of a_{ph} , necessitates the knowledge whether pigments other than chlorophyll- a and phycocyanin significantly affect remote sensing reflectance. To that end, a_{ph} was measured using 45 water samples collected from the western Mississippi Sound. a_{chl-a} will be calculated by multiplying the chlorophyll- a concentrations at the 45 sites with the specific absorption coefficients computed using chlorophyll- a standards. Similarly, a_{pc} will be calculated by multiplying the phycocyanin concentrations at the 45 sites with the specific absorption coefficients computed using phycocyanin standards. a_{ph} , a_{chl-a} , and a_{pc} will be compared to test the hypothesis whether pigments other than chlorophyll- a and phycocyanin significantly affect remote sensing reflectance. This study is important for improving the accuracy of semi-analytical algorithms in optically complex waters.

P8.10

AIR-SEA INTERACTIONS, HIGH WINDS AND PRECIPITATION VARIABILITY ASSOCIATED WITH LAND FALLING HURRICANES IDA AND NATE OVER THE GULF OF MEXICO USING RADAR AND SATELLITE DATA

Avaitonia Smith, and Remata Reddy
Jackson State University, Jackson, Mississippi

This research focuses on observational data of air-sea interactions and high winds of land falling hurricanes Ida and Nate over the Gulf of Mexico. RADAR, satellite, buoy, and ASOS data were used to compare air-sea interface and high winds in order to understand the structure and dynamics of hurricane activity and their impacts over the Gulf of Mexico. Hurricane Ida was the strongest land falling tropical cyclone and occurred between November 4-11, during the 2009. On November 8-11, 2009 Ida strengthened to a category 2 hurricane with peak winds of 105 mph and a minimum pressure of 979 mb. Ida made landfall and began to slowly dissipate on November 10, 2009 along the Alabama coast. Hurricane Nate resulted widespread destruction and casualties in Central America and also the costliest natural disaster in Costa Rican history. Nate strengthened to a category 2 with peak winds of 90 mph and minimum pressure of 981 mb. The storm made landfall over the central Gulf of Mexico coast including Louisiana and Mississippi. This research compares hurricanes Ida and Nate and suggests strong air-sea interface and heat fluxes occurred before landfall with high winds and low pressure. RADAR and Satellite data comparing Nate and Ida shows varying degrees of impact from tornadic activity, heavy precipitation and high winds of 90 mph compared to Ida with high winds of 105 mph. Hurricane Nate also produced a large amount of storm surge ranging from 6 to 9 feet over the Mississippi and Alabama coastlines when making landfall.



P8.11

AN INVESTIGATION OF AIR-SEA INTERACTIONS, LARGE-SCALE HEAT FLUXES, HIGH WINDS AND PRECIPITATION VARIABILITY ASSOCIATED WITH LAND-FALLING HURRICANE IDA OVER THE GULF OF MEXICO USING RADAR AND SATELLITE DATA

Vaibhavi Mahajan¹, and Remata Reddy²

¹Northwest Rankin High School, Flowood, MS and ²Jackson State University, Jackson, MS

The study investigates air-sea interactions, large-scale heat fluxes, high winds, and precipitation variability of land-falling Hurricane Ida over the Gulf of Mexico. We developed an empirical model to calculate the large-scale heat fluxes associated with Hurricane Ida. The RADAR, NOAA satellite, buoy, and ASOS data were used to compute air-sea interface, large-scale heat fluxes, high winds, and precipitation variability for understanding the structure and dynamics associated hurricane Ida activity and their impacts over the Gulf of Mexico. Hurricane Ida was the strongest land falling tropical cyclone, occurring through November 4-10 in 2009. On November 8, Ida reached category 2 with peak intensity and high winds of 105 mph, along with pressure of 975mb. Ida made landfall on November 10 over the Alabama coast. It attained category 2 with high winds of 90 mph and pressure of 981 mb. The storm made landfall over the central Gulf of Mexico coasts including Louisiana and Mississippi. The study for Hurricane Ida suggested strong air-sea interface and heat fluxes before landfall with high winds and low pressure. There is an inverse relationship between pressure and large-scale heat fluxes. The air-sea interface was highest at 6.6 degrees Celsius, and wind speed was highest at 58.1 m/s. Our results show that Ida's maximum large-scale heat fluxes were around 1084 j/s/m². Our model accurately predicts actual observations made from the hurricane. RADAR and satellite images of Hurricane Ida show a large impact of tornadic activity and heavy precipitation with high winds of 105 mph.

Friday, February 22, 2019

MORNING

10:15-11:30 Simulation Based Education in Mississippi: A Statewide Organizational Meeting
 10:00-1:00 Mississippi-INBRE Graduate Scholars Symposium)

AFTERNOON

12:00-1:00 Plenary Speaker
 1:00-3:00 Mississippi INBRE/ Millsaps HHMI Symposia

MATHEMATICS, COMPUTER SCIENCE AND STATISTICS

Chair: Jamil Ibrahim

University of Mississippi Medical Center

Vice-Chair: Ping Zhang

Alcorn State University

Vice-Chair: YuanYuan Duan

University of Mississippi Medical Center

Thursday, February 21, 2019

MORNING

Room TCC 229

09.01

8:30 IN SILICO TRIAL OF BAROREFLEX ACTIVATION THERAPY FOR THE TREATMENT OF RESISTANT HYPERTENSION

John S. Clemmer, W. Andrew Pruett, Robert L. Hester

University of Mississippi Medical Center, Jackson, MS

Approximately 10% of US patients have resistant hypertension (HTN), or uncontrolled blood pressure (systolic blood pressure, SBP > 140 mmHg) despite ≥3 antihypertensive drugs. Clinical trials evaluating the efficacy of chronic electrical stimulation of the carotid baroreflex in the treatment of resistant HTN are ongoing. However, the mechanisms that account for its sustained cardiovascular effects are still unclear. This lack of knowledge adds to the uncertainty as to which patients are most likely to benefit from this therapy. We used an established, integrative mathematical model of human physiology, HumMod, that is comprised of over 8000 variables and previously used to validate cardiovascular responses to baroreflex activation therapy (BAT). First, we generated 3000 unique models (virtual patients) by varying every variable in HumMod and simulating a 3 drug protocol for 1 month (thiazide, ACE inhibition, and calcium channel inhibition). Taking the virtual patients that didn't respond, we then calibrated the model to individual level data from African American males with resistant HTN and ran an *in silico* trial of BAT for 1 month. As compared to non-responders (<15 mmHg fall in SBP), responders to BAT (>30 mmHg fall in SBP) were associated with greater reductions in renal sympathetic nerve activity (RSNA) and angiotensin II as well as potentiated increases in atrial natriuretic peptide, all of which improved renal hemodynamic responses (Figure 1). These data suggests that the important factors that play a role in the response to BAT may be related to the extent of renal vasodilation through neurohormonal mechanisms.

09.02

8:50 DIFFERENTIAL-ALGEBRAIC EQUATIONS WITH STATE-DEPENDENT DELAY AND THEIR GLOBAL HOPF BIFURCATION

Qingwen Hu

Alcorn State University, Lorman, MS, USA

Differential equations with state-dependent delay are increasingly arising from population dynamics, mathematical biology, machining dynamics, physiology, internet traffic control and optical communications. This type of equations are characterized by the presence of a time delay which is dependent on the state of the process itself and which causes intrinsic nonlinearity and non-smoothness of

equation. In the recent decades, great attention and effort from mathematicians and engineers have been devoted to the investigation of differential equations with state-dependent delays.

We discuss differential-algebraic equations with the state-dependent delay governed by an algebraic equation and investigate the associated global Hopf bifurcation problems. In particular, we develop a global Hopf bifurcation theory for this type of differential equations with a state-dependent delay, using the theory of S^1 -equivariant degree. We apply the global Hopf bifurcation theory to a model of genetic regulatory dynamics with a degenerate threshold type state-dependent delays, for a description of the global continuation of the periodic oscillations in the product space of the state and the parameters.

09.03

9:10 ON COMPUTING WITH DIAGONALLY STRUCTURED MATRICES

Sardar Anisul Haque¹, Shahadat Hossain², Trond Steihaug³
Alcorn State University, Lorman, MS, University of Lethbridge, University of Bergen

We consider matrix-matrix multiplication of the form $C \rightarrow C + AB$ and $C \rightarrow C + (A^T)B$. It is common to store two-dimensional arrays in general purpose programming languages by rows (row-major) or by columns (column-major). FORTRAN and MATLAB use a column-major layout while C/C++ and JAVA use a row-major layout. Numerical computations arising in solving partial differential equations often give rise to structure. In a general banded matrix nonzero entries are confined to a small number of diagonals (not necessarily within a small band around the main diagonal) and therefore it is more efficient to store the nonzero entries and express computations by diagonals. The problem of computation by diagonals appears to have remained largely unexplored in spite of its potential for computational efficiency. Madsen et al. (1976) describe a matrix multiplication algorithm in terms of diagonals which can be used to multiply banded matrices.

We propose matrix multiplication by diagonals using a notation that simplifies the description of algorithms and has favorable computational features, especially the transpose of the matrix is readily obtained with the existing data structure.

09.04

9:30 RECOGNITION OF HANDWRITTEN CHARACTERS USING LOCAL CHARACTERISTICS AND TRAINING SET IMAGES.

Sajjal Neupane

Alcorn State University, Lorman, MS

A handwriting recognition technique implemented by extracting information from a large number of training set images. This is similar to optical character recognition (OCR) technique. Especially, this technique is useful for digitalizing alpha-numeric characters and mathematical symbol written in a whiteboard or in a piece of paper.

In this research, a large number of images (sized 16*16 pixels each) of handwritten text were used to create a training dataset and TESSERACT is used for image recognition. All images undergo through preprocessing where the original image is skewed and binarized. The final image is left with only two colors black and white. The pattern recognition approach can identify a character by analyzing and comparing rows of white pixels with rows of black pixels.

Next, it converts the image of the character into a binary matrix where white pixels are zeros and black pixels are ones. Then by using a distance formula, it calculates the distance from the center of the matrix to the farthest one. It then creates a circle of that radius and split it up into more granular sections.

At this point, the algorithm will compare every single subsection and send database of matrices representing characters with previously

trained images to find a character that statically has the most in common. Doing this for every character makes it easy to bring the handwritten text into the digital world.

9:50 Break

09.05

10:10 HARNESSING AUTOCAD

Indu Shukla

US Army ERDC, Vicksburg, MS

Since last few decades United States (U.S.) has engaged in numerous military operations. These recent operations require efficient base camp planning, design, construction and deconstruction and management of base camps. Resource requirement to build these base camps outside the US territory is ambiguous, which leads to higher costs and shorter life spans and increased requirements for maintenance. The key idea is to automate the process of base camp design and planning to support the operational mission in the most effective, efficient, and sustainable manner. We used AutoCAD .NET tool to automate the process of base camp development. Automation of Base camp planning ensures the appropriate personnel, resources, and processes are integrated into the larger operational plan.

09.06

10:30 DIMENSIONAL ANALYSIS OF STRUCTURAL RESPONSE IN BIO-INSPIRED STRUCTURAL SYSTEMS

Reena R. Patel,¹ Guillermo A. Riveros¹, Davis S. Thompson²

¹US Army Engineer Research and Development Center and ²Mississippi State University, Starkville, MS

The solution for many engineering problems is obtained by the integration of theoretical, numerical and experimental data. An important aim of carrying out experiments is to make the results as widely applicable as possible. In many instances, either the size or the cost constraints dominate the testing limits of full-scale articles. Dimensional analysis is used in this scenario wherein the observations made in the laboratory can be used to formulate the behavior of a similar system at production level by establishing a relationship between the model and prototype. Numerical experiments are carried out in the current study to develop and apply the laws of similitude to predict the performance of bio-inspired structural systems subjected to blast loads. The performances of the structural systems are analysis using stress and deformation metrics. This work will demonstrate that the structural deformation caused by blast impact can be represented in terms of dimensionless Pi terms by the application of Buckingham Pi theorem. The approach developed in this study can be employed to develop and apply similitude relations through the application of Buckingham Pi theorem.

09.07

10:50 THE IMPACT OF MODERN TECHNOLOGY ON STUDENT ENGAGEMENT IN COURSE ACTIVITIES

Jamil Ibrahim, SJ Ibrahim, DR Smith, IJ Ibrahim

University of Mississippi Medical Center, Jackson, MS, Univeristy of Jordan, Arab American University

Modern Technology devices usage is widespread among students today. There is no doubt that advances in technology continue to have a great impact on the way faculty, and other campus community stakeholders interact with learners. Opportunities and challenges are emerging for all of these groups and institutions from the increasing availability of low-cost mobile devices and associated infrastructures. The aim of this research was to measure how students perceive mobile usage in the classroom, the types of mobile devices they own or use,



and other educational activities. Also this study investigated whether students' perceptions are related to factors such as age, gender, race, and school affiliation. During the 2018-2019 academic year, a survey was administered online to students from a southern university using Qualtrics as a data collection tool. A total of 2400 questionnaires were sent to students. Of these, 1185 responses were received for an approximately 49 percent response rate. This paper reports the findings of this study and concludes with the pros and cons of using mobile technologies to support learning. It also offers recommendations on the best practices of incorporating mobile devices in learning environments.

11:15 Divisional Business Meeting

12:00 General Session

Thursday, February 21, 2019

AFTERNOON

Room TCC 210

Workshop/Symposium

1:00-2:30

PERFORMING STATISTICAL POWER, SAMPLE SIZE, CONFIDENCE INTERVAL AND EFFECT SIZE FOR A RESEARCH STUDY

Jamil Ibrahim and Elgenaid Hamadain

University of Mississippi Medical Center, Jackson, MS

The techniques of statistical power, sample size estimations and confidence intervals are the most important aspects of a research study. In research practice, the most common requests to statisticians from investigators are sample size calculations or sample size justifications. Determining sample size is one of the most important steps in designing a study. In order to have reliable and valid results, it is important to determine the right sample in combination with high quality data collection efforts. Sometimes, researchers have different opinions as to how sample size should be calculated. Statisticians usually choose from many available formulas that can be applied for different types of data and study designs. The aim of this presentation is to clarify this issue and to provide examples on how to calculate sample size. The components of sample size calculations will be discussed and what factors to consider in choosing the sample size. Other concepts related to this issue such as power analysis, confidence intervals, variability, type I error, type II error, and minimum effect size of interest will also be discussed. The presenter will demonstrate these concepts using different tools such as SAS, SPSS, and free on line applications.

Thursday, February 21, 2019

EVENING

3:30 Dodgen Lecture and Awards Ceremony TCC Theatre

General Poster Session

Immediately Following Dodgen Lecture

TCC Ballrooms 3rd floor

P9.01

SPECTRUM

Arian Williams¹ and Cheryl Seals²

¹Mississippi Valley State, Itta Bena, MS and ²Auburn University, Auburn, AL

In this project, we create animated web tutorials to train undergraduate pre-service teachers' in classroom management strategies with different kinds of students and situations. Our first step was to create the paper prototypes of the scenarios and based on these prototypes the animated tutorials are created. This project aims at creating Educational Teacher Training through Animated Case Studies. With Teacher training we have many teachers in colleges of education that teach classes on an individual basis how to address and react to classroom challenges. While creating the animated web tutorials, our main aim is to present a scenario which is simple, clear and easily understandable to the teachers and provide training to explore challenges in classroom management.

The Spectrum application is created with HTML5, CSS and PHP and animations are created in GoAnimate. A few years ago the customary practice was creating animations and web tutorials with Macromedia Adobe Flash and Adobe Photoshop. Flash was a popular software previously used in creating web pages, animation, for creating advertisements, integration of videos into web pages and rich internet applications. Now a popular software to create web-based animations is GoAnimate and we utilized this software because of its ease of use and ability to create great animated scenarios.

P9.02

VISUALIZATIONS OF FRENET FRAMES

Kizito Nwaka, Jarvis Riley, and Dr. Xiaoqin Wu

Mississippi Valley State University, Itta Bena, MS

The Frenet frames are unit tangent vector, principal unit normal vector, and binormal vector moving along 3D curves. They can be described as vector differential equations. Visualizing Frenet frames is a big issue in Calculus and Differential Geometry. In this project, we will use Wolfram Mathematica to visualize these frames moving along 3D curves.

P9.03

EVALUATING THE PERFORMANCE OF CS STUDENTS THAT USE LEARNING MOBILE APPLICATIONS

Kyanie Waters, La'A'Andrea Gates

Mississippi Valley State University, Itta Bena, MS

The use of mobile applications has been implemented in all of the areas of our life, and it is only natural that mobile applications are being used in education. Although the use of mobile applications is being used the effectiveness of the apps are not clearly defined from a quantitative perspective, especially in specific subjects. Much of the literature in this area is researching how students feel or think about the use of mobile applications or technology in education [1, 2]. Research has been done in the use of mobile learning with adults, which has shown that blended classes that use technology perform better than face-to-face and online [4]. The hypothesis of this research is, "Mobile applications improves students' grades on class assessments." This

research is examining a class of computer science students learning how to program mathematical operations. The class will be divided into two groups. Group 1, the control group, and Group 2, will be given access to the mobile application. A pre-survey will be given to both groups to determine current use and perspective on mobile learning applications. Group 2 will then be given access to the mobile application. The instructor will give the students assessments that are knowledge-based and technically based. A post-survey will be given to students in Group 2. The results of our research currently conclude that there is a positive perspective on mobile applications and technologies in education [3]. Future work includes executing the above methodology.

P8.04

ENCRYPTION AND DECRYPTION USING INVERTIBLE MATRICES

Jabria Huery

Mississippi Valley State University, Itta Bena, MS

Most information is accessible to the public written where everybody can read. To communicate with undisclosed information, one would want to use encryption. Encryption translates data into another form, or code, so that only people with access to a secret key, formally called a decryption key, or some password can read it. Encrypted data is commonly referred to as ciphertext, while decrypted data is called plaintext. Furthermore, the art of encryption and decryption is called cryptography. This study will address the problem of encryption and decryption using invertible matrices, creating a modular system, and inverse multiplication.

P8.05

AN ELECTRONIC DIGITAL FORENSICS GUIDE

La'Andrea Gates¹, Kevin Medina Santiago,² John Caldwell³

¹Mississippi Valley State University, Itta Bena, MS, ²Polytechnic University of Puerto Rico, and ³Fayetteville State University, Fayetteville, NC

Computer crimes are affected by a large number of variables which can lead to an immense amount of case possibilities. Digital Forensics Analysts are expected to either know how to handle every possibility or to research ways on how to solve them. During time sensitive investigations, spending too much of it researching useful information to aid in it is not an option. To remedy this, two NSU students, developed a program to provide relevant information that would aid skilled and novice forensic analysts. The information provided by the application were descriptions for a wide arrange of digital artifacts, location, links, among other things. Many errors and user convenience issues were reported from the testing phase. The goal of the group is to build on that idea, fix any previous errors, add information into the database, and create a mobile application, increasing the audience, convenience, and portability of the program. The information has been thoroughly examined for its legitimacy and added to a local database for immediate access even when there is no internet connection. The development of this application is being done on Visual Studio with Xamarin and C#. We are using SQLite for the database because of its compatibility with mobile apps, its low resource usage, and it can be used locally. This application will prove to be a useful asset to digital forensics cases, speeding up and streamlining helpful information. Additionally, the user may also add information that they desire into the applications database for future reference.

P8.06

INCREASING COMPUTER SCIENCE TRAINING TO SUPPORT FUTURE TECHNOLOGY WORKFORCE

Koran Wright and Cheryl Seals

¹Mississippi Valley State, Itta Bena, MS and ²Auburn University,

Auburn, AL

This project stems to replicate the actions of the English who in 2013 made a national change in the curriculum for its student to focus on programming skills to solve the skills gap in the technology industry. The state of Alabama has had its own standards for computer science for K-12 grade completed by the state of Alabama in 2009. It served to evaluate the Alabama Course of Study: Technology Education. With the aid of the International Society for Technology in Education (ISTE) the groups created the standards for students in 2016. Coincided a revised version of the Computer Science Teachers Association (CSTA) with the K-12 Computer Science Standards completed in 2017-18. Since the state currently only have standards defined but no course curriculum. AUCHIL is currently working alongside the Alabama Alliance for an Inclusive Middle Grades Computer Science Preparation through Makerspaces in the Alabama Black Belt Region. This alliance is composed of 18 other organization and academic institutions located across the state of Alabama. The objective is to create a curriculum for the state of Alabama. This will be completed by using practical teaching styles to educate students on basic programming methodology with the use of Micro bits.

P8.07

ASSESSING THE THRESHOLD BETWEEN AUTHENTICATION AND USABILITY

Shaniqwa Barber, Jarvis Riley

Mississippi Valley State, Itta Bena, MS

In application development, developers have to learn how to strike a balance between authentication and usability. Authentication being a security feature rarely provides the user with a more enjoyable experience when using an application. This research is assessing the relationship between authentication and usability. The research question that this research is trying to answer is, "How much authentication will start to effect the usability of the application. A learning mobile application is being developed to integrate a couple of different authentication levels. The methodology will be testing multi-factor authentication and different password lengths to see its effect on the user's perspective of usability. Currently, our research is showing that there is a need for further exploration on how to integrate security, such as authentication seamlessly to prevent a decrease in usability. This research will provide a deeper understand where the threshold when authentication becomes to invasive and undesirable.

Friday, February 22, 2019

MORNING

Room TCC 229

O9.07

8:30 LOCALIZED METHOD OF APPROXIMATE PARTICULAR SOLUTIONS WITH POLYNOMIAL BASIS FUNCTIONS

Xinxiang Li¹, Thir Dangal², Bin Lei³

¹Shanghai University, Shanghai, China, ²Alcorn State University, Lorman, MS and, ³Nanchang University, Jiangxi, China

The method of particular solutions (MPS) using polynomials as the basis functions has been successfully developed for solving a large class of partial differential equations. However, when a large number of collocation points are required, the above mentioned approach is not feasible since the resultant matrix is dense and ill-conditioned. This restriction is common for global methods. One of the alternative approaches is to employ the localized scheme in which only a small number of neighboring points are being used in the solution process. As a result, the resultant matrix of the localized

method is sparse and thus can be solved efficiently. In this work, the localized method has been employed to extend the recently developed MPS using polynomial basis functions for solving large-scale science and engineering problems. Overall, the proposed approach is stable and highly accurate. Four numerical examples are presented to validate the proposed numerical method.

09.08

9:00 IMPLEMENTATION OF AN E-COMMERCE WEBSITE USING THE COMPONENT-ORIENTED FEATURES OF REACTJS

Ramakalavathi Marapareddy and Abhishek Yadav Akkem

University of Southern Mississippi, Hattiesburg, PA

ReactJS is an open-source JavaScript library which is used for building user interfaces specifically for single page applications. It's used for handling view layer for web and mobile apps. ReactJS also allows us to create reusable UI components. ReactJS allows developers to create large web applications which can change data, without reloading the page. The main purpose of ReactJS is to be fast, scalable, and simple. It works only on user interfaces in application. It can be used with a combination of other JavaScript libraries or frameworks, such as AngularJS in MVC. In this work, we implement the shopping cart of an ecommerce website using the component-oriented features provided by the ReactJS. We also provide the filtering of the products depending on the various sizes of the products. We are using ReactJS for Redux - for application state management; NodeJS for Express CORS Middleware and Nodemon - for watching for server changes; Axios - for promise HTTP requests; Native local storage API - for product persistence in floating cart; CSS for BEM methodology and SASS.

09.08

9:30 ASSESSMENT OF MISSISSIPPI ACADEMY OF SCIENCE PERFORMANCE: A 20 YEARS EVALUATION

Elgenaid Hamadain

University of Mississippi Medical Center, Jackson, MS

The academy of Sciences in USA including the national academy of science are non-governmental organizations established to advise the nation or the state on science, technology, and engineering issues. The Mississippi Academy of Science (MAS) established in 1930 with the mission to foster communication among scientists, promote science education, and provide expertise to the wider state community. Researchers from across the state gathered to present their work through posters and talks. The MAS connect brilliant young students with one another and with professional role models around the states. It identifies and encourages promising young scientists early in their careers. There are thirteen divisions within the Academy, and each division elects chairs and vice chairs to solicit abstracts and to coordinate and organize division presentations, posters, workshops, and symposia at the annual meeting each year. The annual meeting provides an excellent forum for members to exchange ideas and information. MAS publishes abstracts of the presented papers as part of the meeting program and as a supplement to the annual Journal of the Mississippi Academy of Sciences. Many organizations that host annual meetings lack routine assessment and performance evaluation. Concise summary and evaluation of annual meetings performance is important for recognition of both participants and the status of the Academy. This presentation assesses and evaluate MAS performance during the last two decades (1998 to 2019). There was fluctuations on number of abstracts over the years. The divisions that had the highest number of abstracts are Chemistry and Chemical Engineering (12 times), Health Science (7 times), Cellular, Molecular, and Developmental

Biology (2 times) and psychology (one time). Total number of abstracts presented in 1998 were 288 compared 450 abstracts presented this current year (2019). More comprehensive assessment and evaluation of MAS performance broken by year and divisions, as well as participation of different institution during the specified period will be discussed in this presentation. The results is expected to provide a more accurate evaluation of model performance in simulating the attendance in each division, highlights the area that require improvement, and provide the leadership with key elements in establishing proper direction and to stimulate membership.

Friday, February 22, 2019

AFTERNOON

12:00-1:00 Plenary Speaker

1:00-3:00 Mississippi INBRE/ Millsaps HHMI Symposia

PHYSICS AND ENGINEERING

Chair: Shanti Bhushan

Mississippi State University

Vice-Chair: Shanti Bhushan

Mississippi State University

Thursday, February 21, 2019

MORNING

Room Union A

8:20 Welcome

Session I: Chair, Dr. S. Bhushan

Guest Lecture

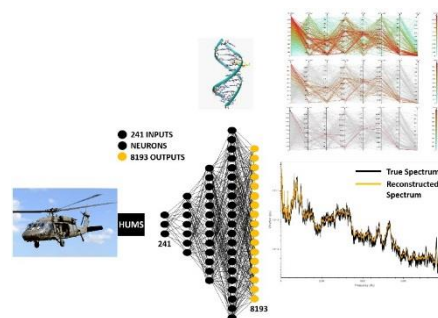
8:30 DEEP LEARNING FOR RECONSTRUCTING VIBRATION SPECTRA

Daniel Martinez and Dr. Wes Brewer

U.S. Army Engineer Research and Development Center (ERDC), Vicksburg Mississippi

A method for Deep Neural Network (DNN) hyperparameter search using

evolutionary optimization is proposed for nonlinear high-dimensional multivariate regression problems. Deep networks often lead to



extensive hyperparameter searches which can become an ambiguous process due to network complexity. Therefore, we propose a user-friendly method that integrates Dakota optimization library, TensorFlow, and Galaxy HPC workflow management tool to deploy massively parallel function evaluations in a Genetic Algorithm (GA). Deep Learning Evolutionary Optimization (DLEO) is the current GA implementation being presented. Compared with random generated and hand-tuned models, DLEO proved to be significantly faster and better searching for optimal architecture

hyperparameter configurations. Implementing DLEO allowed us to find models with higher validation accuracies at lower computational costs in less than 72 hours, as compared with weeks of random and manual search. Moreover, DLEO parallel coordinate plots provided valuable insights about network architecture designs and their regression capabilities of interest, and each formulation often requires specialized numerical methods. The Proteus toolkit is an open source software package for modeling and simulation designed to meet these challenges. The toolkit was developed both to enable research on new models of coastal and hydraulic processes and on new numerical methods for these models. It was developed specifically to target 3D multiscale, multiphase processes and parallel, adaptive numerics on complex geometric domains. The models considered to date include multiphase flow, shallow water flow, turbulent free surface flow, and various flow-driven processes. The numerical methods include continuous, discontinuous, and non-conforming finite elements on a variety of reference cell geometries in Eulerian and Arbitrary Lagrangian-Eulerian frames. In this presentation I will give an overview of the current release of Proteus as well as on-going research and development with the toolkit.

O10.01

9:00 STRUCTURAL MODELING OF DISORDERED MATERIALS: A DATA-DRIVEN APPROACH TO AMORPHOUS SILICON

Dil K. Limbu, Raymond Atta-Fynn², Parthapratim Biswas¹

¹University of Southern MS, and ²The University of Texas at Arlington

We present a data-driven inverse approach to produce realistic models of amorphous silicon by inverting experimental diffraction data in conjunction with a few structural constraints. Using geometrical, structural, and topological information from tetrahedral networks, we have shown that it is possible to generate structural configurations of amorphous silicon, which are superior than the models obtained from conventional reverse Monte Carlo methods involving structural constraints and total-energy optimization and traditional melt-quench molecular dynamics simulations. The efficacy of the approach is illustrated by choosing amorphous silicon as an example, which is particularly difficult to model using total-energy-based relaxation methods. A direct comparison of structural, electronic, vibrational, and thermodynamic properties of the models with those obtained from the Wooten-Winer-Weaire (WWW) approach is presented. We have shown that, together with the WWW models, our data-driven models of amorphous silicon represent one of the best atomistic models so far produced by total-energy-based Monte Carlo methods in conjunction with experimental diffraction data of amorphous silicon.

O10.02

9:20 GENERATE CAPTION FROM IMAGE USING NEURAL NETWORKS

Ramakalavathi Marapareddy and Rajarshi Syam

University of Southern Mississippi, Hattiesburg, MS

Technology is helping people around the world in many ways. For someone, who is blind, he/she can use text to speech technology to listen to a book which is available in text format. It will be great if we can create a program which can tell blind people what's going on television, their mobile screen and the picture they want to see. We will use deep learning to solve this problem to some extent. We will create a machine learning model, which will take a picture to generate a caption describing that picture. For creating this model, we are using Convolutional Neural Networks (CNN) and Recurrent Neural Networks (RNN). CNN is to encode the image and RNN is used to generate the text caption from the encoding of the image. In

our work, we are building a machine learning model which will take a picture as input to produce a caption describing that picture as its output.

O10.03

9:40 PREDICTING CONCRETE COMPRESSIVE STRENGTH AND ULTRASONIC PULSE VELOCITY USING ARTIFICIAL NEURAL NETWORK

Fatema Tuz Johora and Hakan Yasarer

University of Mississippi, Oxford, MS

Ultrasonic pulse velocity test method is expedient over conventional compression tests for assessing concrete compressive strength. This research exemplifies the reliability of Artificial Neural Network (ANN) to predict concrete compressive strength and ultrasonic pulse velocity (UPV) based on aggregate types and mix design parameters. Three separate models have been developed using experimental data. Model one has been developed to forecast concrete compressive strength based on the ultrasonic pulse velocity, aggregate types and mix design parameters. In model two mix design parameters and aggregate types have been used to predict both ultrasonic pulse velocity and concrete compressive strength. Model three predicts UPV using aggregate types and mix design parameters. The performances of the models have been assessed based on MARE, R2 and SSER. The results represented high accuracy in forecasting concrete compressive strength and ultrasonic pulse velocity. Finally sensitivity analysis has been done to validate the models and excel interface has also been developed with integrated three models.

O10.04

10:00 RECONSTRUCTION OF GLITCH-AFFECTED GRAVITATIONAL WAVE SIGNALS USING ARTIFICIAL NEURAL NETWORKS

Sumeet Kulkarni and Marco Cavaglia

University of Mississippi -- NCPA, Oxford, MS, USA

Real-time Gravitational Wave data streams at LIGO encounter numerous glitches arising from known and unknown sources of noise. In cases where they occur in conjunction with an incoming Gravitational Wave (GW) signal, they can seriously hinder signal detection and its consequent analysis. Current techniques to handle such scenarios include simply cutting the data segment which includes a glitch, and later carefully modelling the glitch to clean the data segment in question. Here, we explore the use of machine learning regression techniques to reconstruct the glitch-affected regions of a data stream whenever the glitch appears over a GW signal, using modeled waveforms from the adjacent parameter space. We present NNETFIX: A Multi-Layered Perceptron based Neural Network to fix such binary black hole signals in LIGO data affected by glitches. We demonstrate how our technique can recover the optimal signal-to-noise ratio as compared to clean data without a glitch present, and discuss applications to low-latency parameter estimation and obtaining better sky localization.

10:20

BREAK

Session II: Chair: Dr. Anant Singh

O10.05

10:40 SECURE DATA TRANSFER USING IMAGE STEGANOGRAPHY

Ramakalavathi Marapareddy and Krishna Chaitanya Nunna

University of Southern Mississippi, Hattiesburg, MS

Steganography is the technique of hiding private or sensitive

information within something that appears to be nothing be a usual image. Steganography involves hiding text, so it appears that to be a normal image or other file. If a person views that object which has hidden information inside, he or she will have no idea that there is any secret information. What steganography essentially does is exploit human perception, human senses are not trained to look for files that have information inside of them. What this system does is, it lets user to send text as secrete message inside an image file, user uploads the image and enters the text to send secretly, and gives a key or a pass word to lock the text, what this key does is it encrypts the text, so that even if it is hacked by hacker he will not be able to read the text. You will need the key to decrypt the hidden text. User then sends the image and key to the receiver and receiver first opens the image, and then he enters the key or password for decryption of text, he then press decrypt key to get secret text of the sender. By using this method, you can double ensure that your secret message is sent secretly without outside interference of hackers or crackers. If sender sends this image in public others will not know what it is, and it will be received by receiver.

O10.06

11:00 FINITE ELEMENT ANALYSIS OF THE DYNAMIC RESPONSE OF AN ICE/ALUMINUM COMPOSITE BEAM SUBJECT TO SINUSOIDAL STIMULUS.

Randa Bassou

Mississippi State University, Starkville, MS

In-flight icing negatively affects the aerodynamic characteristics of an aircraft. A critical parameter related to icing mitigation is the adhesive stress at the ice-substrate interface. This stress must be well understood to design effective and efficient anti-icing/de-icing systems. Several methods have been employed to measure ice adhesion over the years. One such method is the vibrating beam method in which a beam, upon which ice has been deposited, is excited at its resonant frequency and the strain on the beam measured at the time of ice-substrate delamination. This effort seeks to critically investigate the vibrating beam method in terms of the sensitivity of the estimated stress to variations in Young's modulus of the ice, the thickness of the ice, and the effects of stress concentrations. The present work focuses on the development of a finite element model to estimate the interfacial shear stress of an ice-aluminum composite beam. First, a static model simulates a cantilever beam on which a constant thickness of ice is accreted and on which a concentrated load is applied. This simplified representation of the vibrating beam method is used to obtain preliminary results to guide the second phase of the work – a more realistic dynamic simulation of the excited composite beam. A tied constraint is used between the ice-aluminum interface, assuming that the specimen behaves as a full composite material without possible separation at the interface, which will be addressed in future work.

O10.07

11:20 NUMERICAL INVESTIGATION OF HEAT TRANSFER BY LOW-PR FLUIDS UNDER BUOYANT FLOW CONDITIONS

Mohammed El Mellouki and Shanti Bhushan

Mississippi State University, Starkville, MS

Liquid metals, such as lead and sodium are used for heat removal from the nuclear reactor cores. Liquid metals have high thermal capacity and low specific heat, thus their flow involves slower fluid momentum diffusion than thermal diffusion, i.e., low Prandtl number (Pr) $\approx Pr \sim 0.002-0.03$. Because of the scale-gap in the

momentum and thermal turbulent diffusions and dissipation, the smallest relevant turbulent temperature scales are expected to be much larger than those of the velocity field. The objective of this study is to numerically investigate the effect of turbulence on thermal transport for low Pr flows, including an assessment of the effect of stable and unstable flow conditions. To achieve the objectives, high fidelity large eddy (LES) and direct numerical (DNS) simulations are performed for plane channel flow for $Re \approx 150$ and 640 for $Pr \approx 0.025$ and 0.71 , and with buoyancy effects with Grashoff number (Gr) $= 0, -1.3 \times 10^6, 4.4 \times 10^5$ and 9.6×10^5 using open source spectral element solver Nek5000. Results show that Pr does not affect momentum predictions, which is expected as temperature transport is a passive scalar. But significantly affects the temperature transport. For low- Pr flows, the thermal transport is primarily due to molecular diffusion, and the temperature field more closely resembles that for laminar flow. Unstable buoyant conditions enhance the near-wall turbulence resulting in an accumulation of both momentum and temperature away from the wall. Whereas, the stable buoyant conditions attenuate the near-wall turbulence resulting in sharper gradient in the momentum and temperature variations.

O10.08

11:40 ON THE BRIDGE OF A ROLLING SHIP AS A NON-INERTIAL REFERENCE FRAME

James Stephens

Southwest Mississippi Community College

The response of an inclinometer on the bridge of a rolling ship is treated by modeling the instrument as a kind of pendulum in a non-inertial frame of reference. The rolling motion is assumed to be harmonic, resulting in an acceleration which produces a periodic pseudo-gravity varying in magnitude and direction. A properly damped inclinometer that followed the apparent gravity in the rolling system (the vector sum of the gravitational acceleration and the inertial pseudo-gravity) would indicate higher roll amplitude than actual. A simple correction for the observed amplitude is provided based upon the approximation of a harmonic roll function. To understand the degree to which an inclinometer might be expected to accurately track the apparent gravity the behavior of an oscillator in the non-inertial reference frame with a range of damping parameters is examined.

12:00 Divisional Business Meeting

Thursday, February 21, 2019

AFTERNOON

Room Union A

Session III: 1:00 – 3:00 (Chair: Dr. Likun Zhang)

O10.09

1:00 CAVITY RINGDOWN SPECTROSCOPY IN NITROGEN/OXYGEN MIXTURES IN THE PRESENCE OF ALPHA RADIATION

Sidney Gautrau, Tyler Reese, Patrick Ables, Chris Winstead

University of Southern Mississippi, Hattiesburg, MS

Cavity Ringdown Spectroscopy (CRDS) was used to measure the concentration of chemical products created as a result of alpha radiation interactions in a controlled atmosphere. Experiments were performed in a stainless-steel vacuum chamber interfaced with a gas introduction system that controlled the initial atmospheric

composition. CRDS measurements were made for ozone production resulting from Polonium-210 alpha radiation interactions in nitrogen-oxygen mixtures. Using a pneumatic aluminum shield, the Polonium-210 alpha sources were cycled between being shielded and exposed.

The talk will briefly review ionizing radiation, ozone formation, CRDS, and the vacuum/optical system used for measurements. Results showing the rapid production of ozone following exposure of the alpha radiation to the controlled atmosphere will be presented. The results also show ozone concentrations rapidly decreasing when the source was re-shielded, but when the source was re-exposed, the ozone concentration started at the previous concentration and continued to increase. Future work to investigate this behavior, along with other related future works will be discussed. This work was supported by Defense Threat Reduction Agency grant number HDTRA1-14-1-0012.

O10.10

1:20 DEVELOPMENT AND IMPLEMENTATION OF A SYSTEM FOR CONDUCTING LASER INDUCED FLUORESCENCE MEASUREMENTS OF NITRIC OXIDE

Patrick Ables

University of Southern Mississippi, Hattiesburg, MS

This presentation documents steps taken toward the experimental validation of computational models for radiation-induced nitric oxide concentrations in the atmosphere. The model is used to predict the effects of radiation on the chemical composition of the atmosphere. Radiation-induced chemical products with higher than normal atmospheric concentrations can serve as indicators of the presence of radiation, potentially leading to the development of alternative detection methods capable of being implemented from a safe distance. The current model predicts the near instantaneous creation of highly reactive chemical products such as ozone and nitric oxide which react to produce more stable nitrogen oxides through slower reaction mechanisms. To date, validation of the computational model has been limited to measuring molecular number densities of species sensitive to cavity ring down spectroscopy (CRDS). Since absorption cross sections for nitric oxide are too small over the spectral range for which CRDS can be used, a spectroscopy method known as laser-induced fluorescence (LIF) was chosen for these measurements because of its sensitivity and selectivity in the deep UV where absorption cross sections for nitric oxide are highest. To facilitate the LIF measurements, modifications to the existing experimental system were necessary. A certified mix of nitric oxide was used to verify system sensitivity by comparing the resultant excitation spectra with the known spectrum. Spectra from the sensitivity tests are shown to be in good agreement with the known excitation spectrum.

*This work supported by Defense Threat Reduction Agency grant number HDTRA1-14-1-0012.

O10.11

1:40 LEVITATION AND ENERGY FLOW OF A DIPOLE NEAR AN ϵ -NEAR-ZERO MATERIAL

Zhangjin Xu and Henk F. Arnoldus

Mississippi State University, Starkville, MS

We have studied the electromagnetic force acting on a dipole, which is located near an ϵ -near-zero interface. This force is exerted on the dipole by its own reflected field at the interface. The force on the dipole is repulsive, and this may lead to levitation (balancing with gravity) under favorable circumstances. We have employed an angular spectrum representation of the incident and reflected waves, which include traveling and evanescent waves. We have also considered the energy flow of the dipole radiation into the ϵ -near-

zero material. We have found that for a dipole oscillating parallel to the interface, the radiation penetrates the medium, and the intensity decays exponentially away from the surface. For a dipole oscillating perpendicular to the interface, no radiation crosses into the medium at the boundary.

O10.12

2:00 A DETERMINISTIC APPROACH TO PREDICTING ELECTRON INTERACTIONS WITH MOLECULAR NITROGEN AT LOW ENERGIES

Tyler Reese

University of Southern Mississippi, Hattiesburg, MS

Transport models obtained via the Monte Carlo method are a vital part of being able to predict range and energy deposition for energetic particles such as those emitted by radioactive sources. However, in cases where a particle's energy is low enough that subsequent changes in its position are negligible, but high enough that interactions of interest still occur, traditional transport modeling predictions can become inefficient. This presentation will introduce a deterministic approach based on the averaged anticipated behavior of the energetic particle. This technique is implemented for electron interactions in molecular nitrogen, and the results from this approach are compared to those from a Monte Carlo based model. This work was supported by Defense Threat Reduction Agency grant number HDTRA1-14-1-0012.

O10.13

2:20 PROSPECTS FOR HADRON SPECTROSCOPY AT BELLE II

Anil Panta

University of Mississippi, Oxford, MS

The Belle II experiment is a major upgrade of the Belle detector and will operate at the SuperKEKB energy-asymmetric e^+e^- collider. The accelerator has successfully completed the second phase of commissioning with first collisions in April 2018. The design luminosity of SuperKEKB is a factor of 40 times greater than that of the KEKB accelerator and the Belle II experiment aims to record a factor of 50 times more data than the Belle experiment.

Due to the High Luminosity, there are various benefits for hadron spectroscopy at Belle II such as efficient reconstruction of neutral particle, reconstruction at single resonance, high resolution and so on. I will present some early results of hadron spectroscopy studies of real data from Phase II and simulation data.

O10.14

2:40 EXTENDED-RANGE OSCILLATIONS AND THE FIRST SHARP DIFFRACTION PEAK

Devival Dahal and *Parthapratim Biswas*

The University of Southern Mississippi, Hattiesburg, MS

The first sharp diffraction peak (FSDP) of amorphous silicon, which characterizes the static structure factor of many glassy systems near the wave vector of about $1-2 \text{ \AA}^{-1}$ has been observed to depend on the temperature, pressure and the degree of annealing of the system. The presence of the FSDP is indicative of the intermediate range order (IRO) in the system. In the present work, we study the role of the extended-range oscillations on the intensity, position, area and the full width at half maximum (FWHM) of the FSDP by using high-quality simulated models of amorphous silicon. The static structure factor was computed by choosing a range of cut-off values for the radial distance to minimize any artifacts near the small wave-vector region due to the numerical noise that exists in the pair-correlation function (PCF). A comparison of our results with the experimental data shows that the intensity, position, area as well as the FWHM of the FSDP are somewhat sensitive to the extended-

range of oscillations (i.e., the radial cut-off values of the PCF). The deviation observed in the computed values of intensity, position and area of the FSDP is noticeable in the case of models with box sizes up to 22 Å, which becomes consistent with the experimental data indicating the the distinct relationship of FSDP with the intermediate range order in amorphous silicon.

3:00 Break

Thursday, February 21, 2019

EVENING

**3:30 Dodgen Lecture and Awards Ceremony TCC Theatre
General Poster Session
Immediately Following Dodgen Lecture
TCC Ballrooms 3rd floor**

P10.01

USING COMPUTER GAMES FOR EMERGENCY MANAGEMENT TRAINING

HuiRu Shih, Taneshia L. Davenport, Mia A. Griffin and Aireyunna Mallett

Jackson State University

Emergencies and disasters can occur any time and without warning. No one is ever ready for an emergency but people can be prepared. Emergency management is a field dedicated to protecting resources and ensuring public safety in the event of a crisis or disaster. Jackson State University has established an “Emergency Management Technology” (EMT) program. The goal of EMT program is to train the future emergency management professionals to have the skills and knowledge to develop plans to help communities, organizations, and individuals avoid or recover from an emergency.

Unity is a game-development software also a game engine. Unity gives users the ability to create games in both 2D and 3D. Unity offer a wide range of possibilities. Start working on a small framework that would allow users to build a variety of games, fast, and without necessarily knowing about programming.

This study exposed EMT major students to game development, an area that is unfamiliar to them. The games created in this project can help people prepare for emergency and ensure everyone knows what to do in an emergency. This study investigated if people can reinforce the safety and preparedness messages by repeatedly playing those games. This study also investigated if disaster related video games can provide an effective avenue to spread the emergency preparedness message.

Computational thinking has been described as a universally applicable ability. This study also investigated if game design is a viable pedagogical tool for teaching students to think computationally as they engage in problem-solving tasks.

P10.02

ANALYSIS ON WATER LEVELS IN BIOLOGICAL TISSUES USING DUAL EXCITATION RAMAN SPECTROSCOPY

Chirantan Sen¹ and Shan Yang²

¹Mississippi State University, ²Jackson State University

Raman spectroscopic analysis was performed on dry and wet chicken and pork skin samples *ex vivo*. The goal was to determine the componential influences from protein and fat on the skin hydration. Dual excitation Raman spectroscopy was pertinent for

this study in order to achieve a greater range in wavelength, hence revealing the region where water could be detected in the enamel via -OH bonding. Fluorescence emitted from proteins is a common issue when probing biological tissues, however, the NIR illumination of Raman spectroscopy greatly reduces the auto-fluorescence of biological samples such as chicken and pork skin. Additionally, dual excitation will allow the detection of protein structure change from wet to dry skin. The patterns in the results reveal that a higher right shoulder in the C-H region of the skin is associated with a greater OH- intensity, meaning a larger content of unbound water. Furthermore, comparison between Raman spectra and FTIR spectra indicate Raman spectra is superior than FTIR in studying the componential and structural difference of skin at high wavenumber regions.

Acknowledgement: This work was supported by the National Institute of General Medical Sciences (NIGMS) and National Institute of Dental and Craniofacial Research (NIDCR) of the National Institutes of Health (NIH) under award number SC2DE027240, and the Mississippi INBRE, funded by an Institutional Development Award (IDeA) from the NIGMS of the NIH under grant number P20GM103476. The equipment was partially supported by the National Science Foundation (NSF) under award number 1332444.

P10.03

EFFECTS OF ANTI-FATIGUE MATS ON BALANCE, MUSCLE ACTIVITY AND DISCOMFORT/FATIGUE DURING PROLONGED STANDING IN SIT-STAND WORKSTATION USE

Joelle Dick¹ and Kari-Babski Reeves²

¹Delta State University, Cleveland, MS, and ²Mississippi State University, Starkville, MS

Sit-stand stations have been utilized in the workplace as a way of alleviating the work-related musculoskeletal disorders associated with prolonged bouts of sedentary work. To date, the mental and physical responses of the sit-stand station in the workplace have produced mixed results. This study utilized Electromyography (EMG), adjusted Borg CR-10 surveys, and the balance tracking system (BTrackS) to investigate fatigue by quantifying muscle activity, subjective discomfort/fatigue, and balance during a simulating office (mental, physical and computer-based) tasks at a sit-stand workstation. The purpose of this study was to determine whether the use of anti-fatigue mats could improve objective (muscle activity and balance) and subjective (feelings of fatigue/discomfort) measures of fatigue.

The data indicates that there is a temporal change in muscle activity, perceived fatigue, and balance. The analyzed results showed no significant difference at a 0.05 confidence level in muscle activity, perceived fatigue, and balance with or without the use of an anti-fatigue mat. These results indicate that the use of anti-fatigue mats does not improve objective and subjective fatigue/discomfort.

P10.04

4-MERECREPTO PHENYL BORONIC ACID MODIFIED GOLD NANOSTRUCTURE FOR GLUCOSE SENSING

Ashley Smith, Klavdija Bukovec, Kiera Bridges, Yolanda K Jones and Anant K Singh

Alcorn State University, Lorman, MS

The successful development of a noninvasive blood glucose sensor that can operate reliably over sustained periods of time has been a much sought after but elusive goal in diabetes management. Since diabetes has no well-established cure, control of elevated glucose levels is critical for avoiding severe secondary health complications

in multiple organs including the retina, kidney and vasculature. In this work we demonstrate that 3D modular gold nanostructure which are capable of producing enhanced plasmonic characters attached with 4-mercaptophenyl boronic acid platform are capable producing high finger print SERS signal that can be used to identify ultra-low level of glucose, which may help to elucidate biological mechanism of diabetes progression. The enhanced SERS from 4MPBA can be used as a fingerprint for the identification of glucose and its multiple derivatives after capturing from blood samples.

The surface of a gold 20nm gold nanostructure was modified with 4-mercaptophenylboronic acid (MPBA) mainlining the physiological ph to prepare sugar-sensitive platform. MPBA with gold nanostructure formed well-packed monomolecular layers on the Au surface through a sulfur–Au bond. SERS spectra was recorded using 638 nm laser customized Raman spectrometer coupled with 105 mm excitation and 300 mm collection fiber.

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

P10.05

NP/ZNS QUANTUM DOT FOR SELECTIVE IDENTIFICATION OF BLASTOMONAS NATATORIAL 2.1 - MICROCOCCUS LUTEUS 2.13 AGGREGATE

Ryki Vance, Ashley Smith, Yolanda Jones and Anant Singh

Harmful bacteria infection causes food and waterborne illnesses and often leads to bloody diarrhoea, and occasionally kidney failure. Quantum dot-gold nanoparticle systems have received increasing attention because both QDs and gold nanoparticles can be tailored in size, shape and morphology provides unprecedented probing flexibility to design a controlled biological sensor. In this work we demonstrate FRET based strategy to track *Blastomonas natatorial* (Sly) drug resistant bacteria resistant to bacitracin, roxithromycin by InP/ZnS – AuNP assembly. We immobilized cystamine dihydrochloride on InP/ZnS quantum dots and gold nanoparticle with open amine group as Zn-S ionic and Au-s covalent bond for improve recognition of bacteria strains. *Blastomonas natatoris* 2.1 with *micrococcus luteus* 2.13 cell were added in the solution to induce coaggregation process. Luminescence from InP/Zn were recorded using 488 nm laser excitation. Coaggregation of *Blastomonas natatoris* 2.1 and *micrococcus luteus* 2.13 monitored with respect to luminescence quenching of QD and gold nanostructure. These parameters were further probed for selectivity identification study of *Blastomonas natoria* 2.1 bacteria. Our study shows that *Blastomonas natoria* 2.1 bacteria cell maximally coagregate with *micrococcus luteus* 2.13 in mixture of other type of bacteria strain and can be used to identify up to 2 cfu/mL *Blastomonas natoria* 2.1 bacteria within the mixture. QD and nanoparticle synthesis and detailed experimental technique will be discussed in this presentation.

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

P10.06

IMPLEMENTATION OF AAPM TG-132 RECOMMENDATIONS IN THE TREATMENT WORKFLOW WITH THE GAMMA KNIFE ICON

Jemeria Bonds¹ and William Neil Duggar²

¹Alcorn State University, Lorman, MS and ²The University of Mississippi Medical Center, Jackson, MS

Purpose. Gamma Knife Radiosurgery is a precise form of

therapeutic radiation that is used to treat malignant and benign tumors with focused radiation beams. With the advent of the Gamma Knife Icon, treatment delivery is highly dependent on registration accuracy of multiple imaging modalities. AAPM TG 132 provides professional recommendations to quantify the accuracy of an image registration system including recommended quantitative tests: target registration error (TRE), mean distance-to-agreement (DTA), and DICE similarity coefficient. We hypothesized that all calculated (TRE) and mean DTA for the image study combinations of CT – MRI, CBCT – MRI, and CBCT – CT will be less than the maximum image voxel size involved in the specific registration and that the DICE would be greater than 0.8. **Methods.** TRE, Mean DTA, and DICE were used on two computer-generated phantoms – one geometric and anatomic; then, images for ten patients (IRB 2017-0266) were anonymized and analyzed with the same tests. Finally, descriptive and inferential statistics were performed such as mean, standard deviation, 95% confidence interval, median, and Student's t-test in order to further compare the image registration combinations. **Results.** The hypothesis related to TRE and mean DTA was confirmed, however, DICE was not consistently greater than 0.8 for all comparisons. CBCT registration to CT and T1 MRI was statistically significant with smaller TRE values than CT to T1 MRI. **Conclusion.** Improved registration results with CBCT may be due to smaller voxel size for those modalities though max voxel size of involved image modalities does not change.

P10.07

COMPUTATIONAL FLUID DYNAMICS SIMULATION/ANALYSIS OF A NEXT GENERATION LITHIUM ION BATTERY PACK

Gaurav Nag, Satish Muthu, Matthew Doude, Shanti Bhushan
Mississippi State University, Starkville, MS

The performance of an electric vehicle is primarily influenced by the battery pack which is main source of power. The lithium ion battery pack in the 'Halo Project', an all-electric, autonomous vehicle battery is efficient enough that it enables the vehicle to travel an estimated 230 miles on a single charge. However, the efficiency of a battery drops under the conditions of ultra-high and uneven temperature distribution outside the battery due to heat dissipation and could ultimately lead to failure of the battery itself which in turn will decrease the performance of the battery pack and hence the car. To improve the performance, reliability and safety of the battery, a fan is installed at the top of the battery pack to provide for air circulation towards cooling with a fin at the bottom of the battery pack serving as the main outlet for heat dissipation. The necessary thermal analysis will be undertaken using CFD. The presentation outlines the salient results from the CFD study. The flow geometry was cleaned up using SolidWorks 2018 for simplification of the working model to generate surface meshing and later a volume mesh using PointWise. Simulations will be performed using ANSYS Fluent, which will work as a solver for the approach. For the post processing images, tecplot 360 will be used to ensure the correct airflow around the battery pack and how much of the air is reused by flowing from the fan till the end of the battery pack and flows back to the fan.

P10.08

NUMERICAL ANALYSIS OF FREE SURFACE AROUND COMBATANT

Jonathan Roark, Oumnia El Fajri and Shanti Bhushan
Mississippi State University, Starkville, Mississippi, USA

Computational Fluid Dynamics (CFD) of free surface simulations surrounding ship hulls happens to be a well-established method for evaluating air-water interfaces in terms of cost and time in

comparison to equivalent experimental methods. Unlike these experiments, physical representation of the fluid and hull interfaces for simulation must be reproduced well for accurate results. Mesh generation represents this essential preprocessing step. OpenFOAM provides its own grid generation utility, SnappyHexMesh (SHM). SHM creates three dimensional, hexahedral meshes using geometry files. Furthermore, a comparable hull geometry used as a benchmark in CFD simulations, the Duisburg Test Case (DTC), is implemented for OpenFOAM tutorial cases. OpenFOAM simulations will be performed using the David Taylor Model Basin 5415 destroyer hull (DTMB5415). The objective of this research is to determine the capabilities of SHM in estimation of forces and moments experienced by ships while sailing on open water. For the purpose of this research, Unsteady Reynolds Averaged Navier – Stokes (URANS) computations will be performed in conjunction with the DTMB5415 and OpenFOAM. Once proven, SHM and OpenFOAM will help gain better understanding of vortex structures generated beneath the hull and the ensuing Kelvin wave patterns produced by the hull. These results will then be validated against available experimental data and previous CFD simulations.

P10.09**THREE DIMENSIONAL FEATURES OF SOUND CHANNEL AXIS IN THE GLOBAL OCEAN**

Mukunda Acharya and Likun Zhang

National Center for Physical Acoustics and Department of Physics and Astronomy, the University of Mississippi, Oxford, MS

Sound speed in the ocean depends on temperature, pressure, and salinity. Sound speed in the ocean has a minimum at a certain depth that forms a sound channel for the long-range sound propagation of the ocean. The poster describes the characterization of axial sound speed and depth along with longitude, latitude, and depth in the global ocean. We calculate more than 16,000 sound speed profiles of the global ocean using data from the world ocean circulation experiments. The calculated sound speed profiles were used to characterize the axial speed and depth in the world ocean. The maximum axial speed and depth were found in the tropical region of the Indian Ocean and subtropical region of the North Atlantic Ocean. In our work we were able to develop a formula for the dependence of the axial speed and depth on latitude using polynomial fits for the individual and global ocean. Our results can be used to model long-range and three-dimensional sound propagation in the global ocean, to monitor climate change, global warming, and seismic activities.

P10.10**ON THE TRAPPING FORCE ACTING ON A SMALL PARTICLE IN AN ACOUSTIC BEAM**

Xudong Fan and Likun Zhang

University of Mississippi, Oxford, MS

Acoustic radiation force on a small particle in the Rayleigh scattering regime has been considered since a seminal work by Gorkov, which can be used for acoustic traps with the applications of acoustic levitation and particle separation. We examine behaviors of trapping a small particle centered on the axis of axisymmetric and vortex beams. We find that an axisymmetric beam can trap a dense and stiff particle or even a rigid particle at the pressure maximum of the beam axis, in contrast to the repelling behavior found in previous studies by focused beams and by plane or orthogonal standing waves. Reversal of trapping when reducing the paraxiality parameter is found when the density contrast of the particle to the surrounding medium is large enough. These seemingly unusual behaviors are found to result from the contribution of axial velocity

to the force potential. Our findings and thorough insights suggest simplified schemes of using axisymmetric beams as acoustic tweezers to trap both elastic particles and droplets and as stable tractor beams to simultaneously trap and pull a particle in the Rayleigh regime.

BIOENGINEERING POSTERS**P10.11****SYNTHESIS AND CHARACTERIZATION OF NOVEL ELASTIN-LIKE POLYPEPTIDES**

Justin Coleman, Jared S. Cobb, Amol V. Janorkar

University of Mississippi Medical Center, Jackson, MS

Elastin-Like Polypeptides (ELP) are class of biopolymers that are composed of a repeating pentapeptide sequence that mimics mammalian elastin with the structure VPGXG. ELP has a Low Critical Solution Temperature (LCST) which enables it to dissolve in solution at lower temperatures and above the LCST the ELP aggregates into insoluble coacervates. This work makes use of robust chemistry to attach various biocompatible Lewis bases to the ELP molecules. This will allow the ELP to act as an electron donor to specific types of atoms that are electron deficient. These atoms will act as coordination centers for the ELP molecules and allow them to exhibit certain advantageous and tailorable properties. This work will explore how stereochemistry and different electron deficient molecules change the behavior of ELP and its transition temperature. Nanodrop UV vis will be used to explore how changing the electron deficient molecules effects the electrons in the ELP and thus the UV wavelength absorbance. FT-IR will demonstrate the change in functional groups after the reactions have occurred. Lastly, dynamic light scattering will be used to show a change in the transition temperature of the ELP when exposed to different variables.

P10.12**HIGH PHOSPHATE LEVELS IN AFRICAN- AMERICAN DIETS LEAD TO VASCULAR CALCIFICATION**

Eric D. Lucas Jr., and C. LaShan Simpson

Mississippi State University, Starkville, MS

One of the biggest health disparities affecting families across the United States, primarily African-Americans, is cardiovascular diseases and complications. The leading factor causing this phenomenon is the calcification of the vascular system. Studies have shown that phosphate found in everyday foods begins the downward cascade of cardiovascular health. Socioeconomic lines and health disparities are often two pathways that cross. Food Deserts (FD) are a common issue that effects low socioeconomic communities across the United States, more so African-American communities. FD's limit the access for people in the community to attain fresh food which often results to only fast food options. These processed foods from fast foods and grocery outlets are found to have high concentrations of inorganic phosphates. Phosphates are highly absorbed in digestion and lead to up-regulation of biomarkers of vascular calcification (VC) and other cardiovascular issues. The aim of this study is to establish how to effectively lower phosphate levels and intake. By successfully lowering phosphate levels/intake, this will decrease or even prevent VC. Positive outcomes such as lowering VC would have a huge impact on the cardiac health of millions.

P10.13**EVALUATION OF IMMUNE RESPONSE FOLLOWING ULTRASOUND TARGETED GENE THERAPY IN A MURINE MODEL OF PROSTATE CANCER**

Flavia De Carlo, Elliot T. Varney, Bell Brooke, Pier Paolo Claudio, and Candace M. Howard

University of Mississippi, University, MS, University Medical Center Cancer Institute, Jackson, MS, University of Mississippi Medical Center, Jackson MS

Human Adenoviruses (hAd) have been broadly used as gene delivery tool in preclinical and clinical studies of cancer gene therapy. The main challenges associated with systemic delivery of hAds are their high immunogenicity and host-specificity. We have developed a gene transfer method, which uses lipid-encapsulated perfluorocarbon microbubbles (MBs) and ultrasound (US) to protect the hAds from the immune system and to deliver them to a targeted tissue, bypassing the necessity for specific receptors.

We showed *in vitro* that murine TRAMP-C2 cells display an expression pattern of Ad- receptors comparable to human DU145 prostate cancer cells. We also demonstrated that both murine and human cells showed a dose-dependent increase in the percentage of cells transduced by Ad-GFP at 24 hours. Additionally, we showed that TRAMP-C2 cells efficiently express the GFP transgene at 48 and 72 hours post-transduction. To assess *in vivo* if our gene transfer method could effectively protect the Ads from both the innate and adaptive immunity, we injected C57BL/6 mice with the hAds-GFP/MBs complexes +/-US. Notably, we did not observe activation of either innate (secretion of TNF- and IL-6 cytokines) or acquired immunity (neutralizing antibodies and the presence of adenovirus-specific CD8+ T cells producing INF- γ).

Our data provide evidence that the TRAMP-C2 syngeneic model of prostate cancer is a suitable system to study in immunocompetent mice the ability of MBs/US to protect the Adenoviruses from the immune system while delivering them to a targeted site bypassing the requirement of specific receptors.

P10.14

THREE-DIMENSIONAL VASCULAR SCAFFOLD

Alex Gonzalez, Nancy Nguyen, and C. LaShan Simpson

Mississippi State University, Starkville, MS

P10.15

EFFECTS OF STRUCTURAL PARAMETERS ON COMPRESSIVE MODULUS OF 3D PRINTED POLYLACTIDE SCAFFOLDS

Jaunna Bryson, Weitong Chen, Frank Brinkley, and Lauren B. Priddy

Mississippi INBRE Scholar, Mississippi State University (Department of Agricultural and Biological Engineering), Mississippi State University (Department of Mechanical Engineering), Starkville, MS

Research on polymeric materials has led to the development of biodegradable materials for orthopedic applications. Polylactide polymer was chosen due to its biodegradable and biocompatible properties. The purpose of this study was to determine the mechanical properties of 3D printed polylactide scaffolds as a function of pore size (560 μm or 700 μm), number of layers (1 or 2), and number of struts (5 or 6). Our hypothesis was that the Young's modulus would be greater for scaffolds with smaller pores, and that no differences as a function of number of layers or number of struts would be observed. Eight scaffold models were designed using CAD (SolidWorks) and fabricated via 3D printing (Makerbot Replicator Z18, n=5). Compression tests (MTI-2K) were run at a displacement rate of 1 mm/min. Force data was normalized to the cross-sectional area of the columns that form the scaffold. Differences among the groups were evaluated by three-way ANOVA with post hoc Tukey analysis (SAS 9.4). As expected, Young's modulus was significantly greater for 560 μm pore scaffolds compared to the 700 μm pore scaffolds ($p < 0.0001$), and no effect of number of struts was observed. Contrary to our hypothesis, the number of layers had a significant effect on Young's modulus, as two-layer scaffolds had a higher modulus than one-layer scaffolds ($p < 0.0001$). Current work includes finite element

modeling of the scaffold geometries to determine load distribution and for comparison of theoretical and measured effective elastic moduli of these scaffolds.

Friday, February 22, 2019

MORNING

Room Union A

Session IV Chair: Dr. S. Bhushan

8:20 Welcome

Guest Speaker

8:30 DESIGNING AND BUILDING AN OFF-ROAD AUTONOMOUS VEHICLE

Matthew Doude

Center for Advanced Vehicular Systems, Mississippi State University, Starkville, MS

Autonomous vehicles operating on the road rely heavily on existing infrastructure markings (roadway stripes, signage, etc.) to recognize and follow the rules of the road. Yet less than one percent of Earth is paved, and even many paved roads have incomplete or inconsistent markings. For autonomous vehicles to become proficient in a wider variety of operational design domains (ODDs), system robustness must be



improved by increasing tolerance for reduced/limited infrastructure. A concept vehicle has been developed to research autonomous systems operating at the extreme boundary of potential ODDs; that is, zero infrastructure, no prior environmental knowledge, and wide environmental variation. Technologies required include using machine learning for segmentation of broad classes instead of individual objects (i.e. seeing the forest, not the trees), advanced environmental simulations, and estimation of ground traversability using lidar. The vehicle is powered by a next-generation lithium nickel-manganese-cobalt 90 kWh battery pack and true all-wheel-drive provided by four independent electric motors totaling over 10,000 Nm of wheel torque. This vehicle was developed by the Center for Advanced Vehicular Systems (CAVS) at Mississippi State University using the Center's research expertise in design optimization, materials science, advanced powertrains, and sensors and algorithms for autonomous vehicles. The powertrain and driveline were designed and optimized using high-performance computing-aided methods including finite element analysis and computational fluid dynamics, while the suspension was partially built using steel designed, melted, cast and rolled in-house in the CAVS Steel Research Center. The resulting vehicle is a high-end technology demonstrator and development platform. This paper will present validation results of vehicle performance, including terrain mobility, autonomous system capability, and powertrain performance. The autonomous system capability is evaluated on Mississippi State University's dedicated off-road autonomous vehicle test track, which features rugged terrain and a wide range of obstacles such as rocks and vegetation.

O10.15

9:00 DESIGN AND DEVELOPMENT OF A SPHERICAL AERIAL AND GROUND AUTONOMOUS SYSTEM

Kyle Ryker, Kereikhan Bakhytkhanuly and Donghoon Kim

Mississippi State University, Starkville, MS

Control surfaces, such as the moving parts on the surface of an airplane wing, have limited the design of aerial vehicles for over 100 years by increasing the complexity of internal controls and other hydraulic systems. The proposed spherical aerial and ground vehicle will combine principles of a spherical rolling robot and a UAV, creating a versatile SUAV. This SUAV manipulates the torque generated by its counter-rotating motors as well as displacement of its center of gravity through its mass-shifting mechanism for control. This research will employ an expansive design process through the application of software design and analysis over multiple platforms, such as ANSYS, Creo Parametric, and Catia in order to conceive a design structurally sufficient as well as aerodynamic. Previously, a similar SUAV was manufactured with a pendulum and mass system for actuation. The previous model relied on one motor and quickly the disadvantages of counter torque were discovered as the vehicle yawed uncontrollably. This model with a planar actuator as a mass-shifting mechanism relies on two counter-rotating motors for yaw stability, operating each independently but in coordination. The ability for an aerial system to self-correct its attitude as well as operate while grounded increases its applicability within less controlled environments it may see, expanding the range of its operable conditions. By eliminating the need for control surfaces while exploring the actuating abilities of mass-shifting mechanisms, this SUAV will demonstrate the capacity of dual-purpose vehicles as well as increase the realm of creativity within aerial and ground systems.

O10.16

9:20 SIMULATION AND ANALYSIS OF A MASS-DRIVEN SPHERICAL AERIAL AND GROUND AUTONOMOUS SYSTEM

Kerekhan Bakhykhanuly, Kyle Ryker and Donghoon Kim

Mississippi State University, Starkville, MS

As observed in current spherical unmanned aerial vehicles (SUAVs), the benefit of a spherical shell is to protect electric parts from damage by environmental obstacles. The proposed SUAV, however, will also have a feature of operating on the ground. The design of a proposed spherical aerial and ground platform will combine principles of a spherical rolling robot and a UAV. With this in mind, this system is capable of replacing the two by being more versatile, hence, cost-efficient. The rolling motion on the ground as well as maneuvering in the air will be performed by internally changing the center of gravity (CG), which will produce momentum to drive the vehicle's omnidirectional motion. An actuator (mass shifting mechanism) will be considered to conduct CG variation. The proposed vehicle design is supported by MATLAB numerical simulations allowing its behavior to be predicted and analyzed. As noted before, the platform proposed can replace the need for both capabilities of ground and aerial vehicles. Having functionality both on the ground and in the air, this vehicle is capable of completing several tasks on complex missions more efficiently.

O10.17

9:40 GEANT4 SIMULATIONS FOR ASTRONAUT RISK CALCULATIONS

William Rogers

The University of Southern Mississippi, Hattiesburg, MS

Exposure to galactic cosmic rays (GCR) and solar particle events (SPE) on long duration space missions outside of Earth's magnetosphere poses a significant threat to astronaut longevity due to an increased risk of cancer. However, much of what is known about cancer risk due to radiation exposure originates with data collected since the bombing of Hiroshima, and a better understanding of the risk of radiation exposure induced death

(REID) is desired. For determination of risk via Monte Carlo radiation transport calculations, a slab model was constructed using Geant4 to approximate a one-dimensional human phantom and shielding commonly found in space vehicles. Space radiation conditions were simulated by bombarding the slab normal to the shield using models based on GCR and SPE spectra. Energy deposition was measured throughout the human phantom in order to determine absorbed dose and equivalent dose as a function of depth. Using a human body model consisting of points in relevant tissues and organs throughout the body, the equivalent dose was applied to each point, and tissue weights corresponding to ICRP recommendations were applied to each organ to determine effective dose. Using a NASA model, REID was then calculated as a function of effective dose. The slab model will be used in conjunction with Geant4-DNA to determine DNA strand breakage, free radical, and free radical precursor formation and to correlate DNA damage with REID. Acknowledgement: This work is supported by NASA EPSCoR grant #: NNX15AM50A.

O10.18

10:00 METAL TO INSULATOR PHASE TRANSITION IN 2D LAYERED SEMICONDUCTORS

Nihar R

Jackson State University, Jackson, MS

A metal to insulator transition (MIT) in two dimensional (2D) layered system is one of the fascinating and debatable topic in condensed matter physics. Despite significant study in Si-MOSFET and other two-dimensional electron-hole system, the nature of phase transition is still enigmatic. In this presentation we will discuss the recently observed MIT of 2D layered semiconductors, transition metal dichalcogenides (ReS₂ and MoS₂) field-effect transistors via electrostatic gating. FETs of few atomic layers materials were fabricated on the Si/SiO₂ substrate with highly doped Si used as gate. The measured conductivity as a function of temperature follows fermi-liquid behavior from room temperature to the low temperature (2K). Through a scaling analysis of the conductivity as a function of temperature and carrier density, we find that the metallic state results from a second-order metal-to-insulator transition driven by electronic correlations. This gate-induced metallic state offers an alternative to phase engineering for producing ohmic contacts and provide application for future cryogenic optoelectronic devices. Phase change materials, particularly semiconductor at cryogenic temperature have potential application in electro-optic devices where high speed data transfer is required.

O10.19

9:40 ON DESIGNING A SAFE HEAT SOURCE SYSTEM BASED ON AN EXPERIMENTAL MODEL OF TEMPERATURE DISTRIBUTION AROUND IT

Daryl Jones, Patresa Cox and Mohammad Ashraf Khan

Jackson State University, Jackson, MS

The extreme change in temperature due to accident or design fault can cause structural damage. Initial focus of the study is to explore temperature ranges around heat sources. The temperature distribution, gradient and peak values have been explored by IR detectors. We utilized grid points to identify the temperature distribution in a normal condition of the source. In an accident, the temperature distribution will be altered which can be used to trigger a circuit to control the energy supply to the source. In normal condition, the temperature around the source compared to that of the source itself is drastically dropped, as found from the study, due to the non-conducting air. However, in the case of an accident, the

differential values of temperatures at points of interest with respect to the ambient temperature will be significant. Traditional detector systems may work in most cases; however, the energy delivered to the source may not be stopped that would exacerbate the situation. The final goal is to find favorable locations for detectors. The distribution of temperature around the source can dictate the possible location of the detectors that can ensure safety. The optimum locations for detectors will reduce the number of detectors which will monitor a catastrophic change in temperature. The array can be used to generate signals, for which an electronic circuit has been designed, to control the heat sources. As a result of the detection of temperature deviation and control, a safer heat energy source can potentially be ensured.

10:40 BREAK

Session V: Chair: Dr. Qilin Dai

O10.20

11:00 DYNAMICS FOR DISCRETIZED GRAVITY IN THE CAUSAL SET APPROACH

BB Pilgrim

University of Mississippi, Oxford, MS

In the causal set approach to gravity, Lorentzian manifolds are replaced with a discrete set of points and a partial order detailing the causal relations of the points; using this approach, the Einstein-Hilbert action is reproduced for causal sets embedded in small two-dimensional compact sections of Lorentzian manifolds and then varied with respect to a set of variables which contain the information of the partial order. This generates the bulk term in a field equation for causal sets which meet this criterion; further work must be done to determine the boundary term and complete the field equation. Sources of the field are also explored, and the action for massless, minimally coupled scalar fields on causal sets is derived.

O10.21

11:00 BAYESIAN ANALYSIS OF EFFECTIVE FIELD THEORY PARAMETERS

Pradeepa Premaratna and Gautam Rupak Lan Tai Moong

Mississippi State University, Starkville, MS

In this work we use Bayesian analysis to estimate the parameters of radiative capture of ^3He on ^4He and radiative capture of ^3H on ^4He using effective field theory (EFT). EFT provides a model independent framework to describe physical systems as an expansion of low momentum scale over a high momentum scale. The leading order contribution of the capture amplitude comes from the initial s-wave short-range interaction, Coulomb interaction and two body currents. Contributions from s-wave shape parameter and d-wave initial state interactions are added as the next-to-leading order corrections.

Here we consider two models, one model with the two body currents and the other without the two body currents. The models have nine and seven parameters respectively. We estimate the parameters for the two models using most recent capture data and scattering data. Then we use Bayesian analysis to do the model selection. We also calculate the cross sections for both $^3\text{He}-^4\text{He}$ and $^3\text{H}-^4\text{He}$ systems using the estimated parameters. Our calculated cross sections for both the systems are consistent with the experimental data.

O10.22

11:20 MEASUREMENT OF THE CHANGE IN VOID CHARACTERISTIC PROPERTIES DUE TO HYDROGEN DISTRIBUTION IN HYDROGENATED AMORPHOUS SILICON: AB INITIO STUDY

Durga Paudel¹, Raymond Atta-Fynn² and Parthapratim Biswas¹

¹The University of Southern Mississippi, Hattiesburg, MS, and ²The University of Texas at Arlington

We present an ab initio study on the shape and size of the voids and the dynamics of hydrogen atoms inside the voids in hydrogenated amorphous silicon (a-Si: H). By using ultra-large models of a-Si, obtained from classical molecular dynamics simulations and with the aid of realistic void concentration 0.2% of known shape, the dynamics of silicon (Si) and hydrogen (H) atoms on the void interface and their effect in restructuring the void surface are studied using first-principles density-functional calculations. The resulting changes from the ab initio calculations are compared with the corresponding size and shape change obtained from total-energy relaxation using the Stillinger-Weber potential. The size and shape of the voids are analyzed by examining the three-dimensional distributions of Si/H atoms at the interface of the voids using the convex-hull approximation of the void regions and computing the radius of gyration and bounded volume of the corresponding convex-hull regions. The computed radius of gyration is compared with those obtained from the small-angle x-ray scattering (SAXS) measurements of a-Si: H in the Guinier approximation. The correlated void characteristics properties with different concentrations of non-bonded H are discussed.

O10.23

11:40 BIOCHAR FUNCTIONALIZATION WITH MAGNETIC AND PHOTOLUMINESCENCE NANOPARTICLES AND THEIR APPLICATIONS IN ENVIRONMENT

Ying Zhang and Qilin Dai

Jackson State University, Jackson, MS

Biochar is the produce of modern pyrolysis of biomass in absence of oxygen, and it shows the advantage of limited CO_2 and plays the positive role during the global carbon cycle. In recent years, with the properties of low cost, large surface area and functional surface groups, biochar is one of most promising material as the candidate for wastewater treatment and energy storage, and its functionalization is one of the hottest research topics. In this project, our group first take advantage of the photoluminescence property of CaWO_4 nanoparticle, synthesized the CaWO_4 -biochar nanocomposites by co-precipitation method with calcium chloride and sodium tungstate in the presence of commercial biochar. The prepared CaWO_4 -biochar nanocomposites combine the adsorption effect from biochar and photodecoloration of dyes from CaWO_4 nanoparticles, and showed improved organic dye removal compared with bare biochar. In addition, magnetic biochar composed of magnetic medium and biochar is used to extract the biochar by an external magnetic field, and one major application is the waste water treatment. Our group developed a chemical solution based method to synthesize NiFe_2O_4 (NFO) nanoparticles with different sizes and structures by organic ligands. The NFO-biochar nanocomposites were successfully synthesized by this method, and showed good removal efficiency for Rhodamine B from water.

Friday, February 22, 2019

AFTERNOON

12:00-1:00 Plenary Speaker

1:00-3:00 Mississippi INBRE/ Millsaps HHMI Symposia

**PSYCHOLOGY AND SOCIAL SCIENCES****Chair: Mehrun Laiju**

Tougaloo College

Vice-Chair: Gary Chong

Tougaloo College

Vice-Chair: Frederick Hunter

Tougaloo College

Thursday, February 21, 2019

MORNING

Room TCC 227

O11.01

9:00 INCORPORATING MODERN DAY SLAVERY INTO THE ACADEMIC CURRICULUM*Stephen Rozman**Tougaloo College, Tougaloo, MS*

The study of contemporary slavery is important, given the fact that an estimated 45 million people around the world are enslaved or are in conditions tantamount to slavery. Under a grant from the Andrew W. Mellon Foundation, we have been collaborating with two other historically black institutions (HBCUs), Morehouse and Bennett Colleges, and have created an Institute for the Study of Modern Day Slavery here at Tougaloo College. In addition to developing faculty-mentored research projects, Tougaloo College has incorporated modules on contemporary slavery in courses in the following disciplines: political science, sociology, psychology, economics, education, art, English, religious studies, biology, and physics. The students and faculty in the project have met periodically to discuss their respective projects, and an annual conference has been held at Tougaloo College in which faculty and students from Tougaloo, Morehouse, and Bennett have given presentations on their respective research and curriculum development projects. My presentation at the MAS conference will focus on the nature of the modern slavery modules that have been incorporated into Tougaloo College classes.

O11.02

9:15 SEATING ARRANGEMENTS AND ACADEMIC PERFORMANCE*Megan Besecker and Meherun Laiju**Tougaloo College, Tougaloo, MS*

This paper presented the results of a survey examining if students' seating preferences in a class has any relation to their academic performance. Previous research on seating preferences and its effect on academic performance mostly focused on large classrooms in larger Universities. Data for the current study has been collected from a small liberal arts Historically Black University (HBCU) and Predominately White Institutions (PWI), where the classrooms are small. David McClelland's Achievement theory was used as a framework. The theory explains how humans have a need for achievement, affiliation, and power. The hypotheses for this study are: 1) Participant's seating preference in a classroom has an association with their academic performance; 2) Participant's gender has an association with their seating preferences in a class. A survey was conducted to test the above hypotheses. Eighty College

students (forty male and forty female) participated in the survey. The questionnaire consisted of 10 items, which included background information and questions related to seating preferences in a classroom. Results are pending.

O11.03

9:30 HOMELESSNESS AND HEALTH: EXAMINING 10 COMPREHENSIVE PLANS FOR POLICY IMPLICATIONS*Frederick L. Hunter Jr.**Tougaloo College, Tougaloo, MS*

Homelessness is evolving into a national and international problem. Domestically, for many cities, the rates are growing exponentially, as wages have not kept up with increasing housing costs. The alarming increase in the homeless population impacts all of us, whether or not we experience it ourselves. According to US Department of Housing and Urban Development report using 2017 point-in-time estimates, there were 553,742 people experiencing homelessness in the United States on a single night, which accounts for a 1% increase from the previous year (2017). In the same study, it was reported that 184,661 homeless individuals identified as families with children who were experiencing homelessness. Studies on housing deficits point to the adverse outcomes that arise for individuals, families, children, and society when there are barriers to housing access. Notably, the increasing high health expenditures are due to emergency department visits and inpatient hospital. This study seeks to analyze the comprehensive plans of the top ten cities experiencing homelessness, to evaluate: (1) the steps that top cities are taking toward addressing homelessness as a housing policy issue; (2) how these cities are addressing aspects of the four pathways (housing stability, housing quality and safety, affordability, and neighborhood) which link housing to health, with an intentional mission to reduce adverse outcomes for both the individual and larger society; and (3) compare and contrasts the varying differences in the approaches toward the four pathways of each of the cities.

O11.04

9:45 THE INFLUENCE OF IMPULSIVITY AND CUMULATIVE LIFE STRESS ON DRUG USE IN AT-RISK ADOLESCENTS*Margaret Bullerjahn, Nora E. Charles, and Chris Barry**University of Southern Mississippi, Hattiesburg, MS*

Background: Facets of trait impulsivity have been found to relate to substance use (Magid & Colder, 2007). Experiencing stressful life events has also been shown to contribute to substance use (Charles et al., 2015). There is little research using impulsivity and stressors as predictors of substance use within the same model. It was hypothesized that both impulsivity and exposure to stressors would significantly predict substance use in adolescents. **Methods:** 123 adolescents (Mage=16.79 years) from a military-style facility located in the southeastern United States. The majority of participants were male (71.8%) and Caucasian (55.5%). Participants completed the following self-report scales as part of a larger study; the UPPS-P (Lynam, Smith, Whiteside, & Cyders, 2006), the Personality Assessment Inventory-Adolescents (PAI-A; Morey, 2007) and Stressful Life Events Schedule (SLES; Williamson, 2003). A two-block multiple regression was used to assess the associations of impulsivity and stress exposure PAI-A DRG scale scores. **Results:** Results from the multiple regression indicated the model was significant in both blocks (block-one; $R^2 = .159$, $F(5, 117) = 4.42$, $p = .01$; block-two; $R^2 = .192$, $F(6, 116) = 4.58$, $p < .001$). Overall the model explained 19.2% of the variance. Negative Urgency predicted DRG scores in block-one ($\beta = 9.03$, $p = .026$).



When stress exposure was added to the model it significantly improved model fit (.033, $F(1,116) = 4.663$, $p=.033$), and became the only significant predictor ($\beta = .242$, $p = .033$). **Conclusions:** Results indicate that impulsivity and, in particular, stress exposure are important factors when examining drug use in at-risk adolescents.

10:00 BREAK

O11.05

10:15 A COMPARATIVE ANALYSIS OF LEADERSHIP EFFECTIVENESS AMONG MANAGERS IN JACKSON METROPOLITAN AREA

Shailla Khan

Tougaloo College, Tougaloo, MS

Leadership effectiveness among managers from Jackson metropolitan area were investigated. Five questionnaire were administered to 22 managers (7 males, and 15 females). These include: Leadership Assessment Exercise (LAE), Styles of Conflict (SOC) Exercise, Delegation Diagnosis (DD) Exercise, Leader's Performance Pyramids (LPP) Exercise, and Emotional Intelligence (EI) Questionnaire. LAE includes 20 practices cluster into four distinct areas (e.g. getting the facts, creating a vision, motivating people, and empowering others).SOC is a 15 item questionnaire which measures how participants behave in five different Conflict situation (e.g. Domination, Collaboration, compromise, avoidance, and accommodation).DD is a 25 item questionnaire with "YES" and "NO" responses to determine effectiveness delegation and weakness as a leader. LPP is a 15 item questionnaire which has four statements and the participant will have to choose one to determine their Statesmanship, Entrepreneurship and Innovation. Elis is a 25 item questionnaire which represent aspects of emotional intelligence using a scale from 1 to 4. In addition a demographic questionnaire were also given. A positive correlation was found between leadership effectiveness and collaboration ($r=.513$, $p=.015$), compromise ($r=.485$, $p=.022$)and emotional intelligence ($r=.531$, $p=.011$). Emotional intelligence was also positively correlated with collaboration ($r=.452$, $p=.035$), and accommodation ($r=.607$, $p=.003$). Statesmanship was positively correlated with delegation diagnosis ($r=.434$, $p=.043$), and negatively correlated with avoidance ($r= -.480$, $p=.024$),entrepreneurship was negatively correlated with domination ($r= -.465$, $p=.029$).T tests results also found a gender difference between leadership effectiveness ($t=3.60$ (20), $p= .002$) and between emotional intelligence ($t=3.55$ (20), $p= .002$) and accommodation ($t=2.77$ (20), $p= .012$).

O11.06

10:45 PORNOGRAPHY AND RELATIONSHIP SATISFACTION

Abigail Muni, and Meherun Laiju

Tougaloo College, Tougaloo, MS

This paper presented the results of a survey, which examined the relationship between pornography use and relationship satisfaction within couples. Previous research has been done to better understand the role pornography has within relationships. The majority of research conducted has been done to show the correlation between pornography use and relationship satisfaction for couples. George Herbert Mead's theory on symbolic interaction was used as the theoretical framework for this study. The hypotheses for this study were 1) There is an association between the frequency of watching pornography and relationship satisfaction; 2) Men who watch pornography are more likely to have less relationship satisfaction; 3) Women who watch pornography do not experience a change in their relationship satisfaction; 4) There is an association between couples who watch pornography together and relationship satisfaction. A

survey was conducted to test the proposed hypotheses. Eighty residents residing in Jackson, Mississippi participated in the study. The questionnaire consisted of fifteen items which included demographic and the level of frequency for pornography use. Previous research has not yet examined the effect pornography has on couples within such a conservative state. Results are expected to support the hypotheses listed above.

11: 00 PANEL DISCUSSION

LET'S GET HONEST: HEALTH DISPARITIES IN UNDERSERVED COMMUNITIES AND APPROACHES TOWARDS EDUCATION

Moderator: Frederick L. Hunter Jr.

Tougaloo College, Tougaloo, MS

This panel is composed of individuals that work in various domains of health education and research. Each speaker was asked the question, "What do we currently know concerning health disparities?", "What do we still need to learn about reducing health disparities?", "What have you done to assist in reducing health disparities?" and "What can everyday people do to positively impact their lives and those of their family members health, in order to reduce health disparities?" Each panelist brings a unique perspective to the conversation concerning health disparities in underserved communities and particular modes of positively impacting the various aspects influencing social determinants of health.

12:00 General Session

Thursday, February 21, 2019

AFTERNOON

Room TCC 227

O11.07

1:00 THE EFFECTS OF MUSIC ON COLLEGE STUDENTS MATH ABILITY

Wisdom Randle, Dr. Shailla Khan

Tougaloo College, Tougaloo, MS

Some students like listening to music while performing a task. Doing this can cause a distraction or be motivating and helpful. The purpose of the study was to investigate if listening to music interferes with mathematical test ability. There were 40 participants (20 males and 20 females) within the age of 18-25 years who were chosen from a historical black college. They anonymously completed a demographic form and were given a college level mathematical test. The mathematical test had 15 problems. The research design being used in this experiment was random block design. One block of conditions were ABCD (A=Jazz, B=Hip-hop, C=Gospel, D=Rock) and one random order of conditions were CAEB. There were 10 blocks and each block there were four participants. Each participants were given to listen to music based on the random order given and perform the mathematical task. The t test results showed that there was a significant difference between the score on the math test by listening to gospel music and rock music ($t = 2.201$ (18), $p+.041$).The mean score of the math test while listening to Gospel music was higher (mean=87.90, SD =11.38) compared to the mean score listening to rock music (mean=71.60, SD -20.3).The results also showed a significance between the level of math course taken and their mathematical performance. F tests showed significant between participants taking four level of college math courses and their mathematical test performance ($f= 4.70293,36$) (18), $p+.007$). There was no gender differences found in math performances.



O11.08

1:15 A FRAMEWORK: ADDRESS VULNERABILITY OF CHILDREN AND CURRENT POLICY OF DISASTER

Dr. Meherun Laiju

Tougaloo College, Tougaloo MS

Children are most vulnerable when a country is engaged in conflict/war, during a natural disaster, and in post disaster situations. Natural disasters and war usually create an immediate disruption of state and civil society. The chaotic environment attracts criminals that prey on vulnerable victims, especially children. The first few weeks of any disaster are critical in terms of putting children at risk to abuse, exploitation, and child trafficking. The present study describes two conceptual frameworks to address the vulnerability of children and the current policy of disaster preparedness and rescue. One framework is developed to understand the link between war/conflict and natural disaster related catastrophes and the vulnerability of children in terms of sexual exploitation, child labor, bonded labor, illegal adoption, child marriage, forced marriage, child trafficking, drug trafficking, and armed conflict. Another framework analyzes the lack of child-centric plans and follow-up action plans within the existing disaster preparedness and rescue policy, increasing children vulnerability after a large scale disaster.

O11.09

1:30 RELATIONSHIP BETWEEN ALCOHOL, STRESS, ALCOHOL EXPECTANCY, AND RELIGIOUS ORIENTATION

Courtney Hill and Shaila Khan

Tougaloo College, Tougaloo, MS

Alcohol use among college students occurs in specific social environments characterized by independent living, reduced parental control, increased social homogeneity, wide availability of alcohol-related social activities such as pre-partying and student folklore we need to better understand upstream factors that shape drinking at college. The process of transitioning to college life is already a time of increased stress and emotional liability, during which time students must form support systems outside of the family. During this time students tend to adopt peer groups as a means of coping with the transition, relying less on guidance from parents and family members. Also due to college environment students often become influenced by the actual or perceived behaviors of their peer groups and may start drinking. The present research investigated how alcohol use, stress, alcohol expectancy, and religion are factors attribute to the drinking behavior of college students. A survey consisting of 41 questions including demographic information were given to eighty college students. Correlation between alcohol and alcohol expectancy was found significant($r=.351, p=.013$) and correlation between alcohol and stress was also found significant, ($r=.528, p=.001$). No significant different was found between religious orientation during childhood and religious orientation at present for alcohol use, stress, and alcohol expectancy. No gender difference was found and no significant difference was found between the intensity of going to church, alcohol use, stress, alcohol expectancy. It may be concluded that though religion does not play a role in drinking alcohol but alcohol expectancy and stress does.

O11.10

1:45 RELATIONSHIP BETWEEN PERCEIVED ETHNIC DISCRIMINATION AND GROUP MEMBERSHIP

Julisia Sanders and Shaila Khan

Tougaloo College, Tougaloo, MS

2:00 Business Meeting

Thursday, February 21, 2019

EVENING

**3:30 Dodgen Lecture and Awards Ceremony TCC Theatre
General Poster Session**

**Immediately Following Dodgen Lecture
TCC Ballrooms 3rd floor**

P11.01

TOUGALOO COMMUNITY PREPAREDNESS FOR HOMEOWNERS

Jonnette Long, Shantwana Rose, Alex Jwainat, Frederick Hunter MSW

Tougaloo College, Tougaloo, MS

Community Preparedness is the ability of communities to prepare for and recover from short- and long-term public health incidents. Community preparedness helps engage public and private organizations in -preparedness activities that represent the functional needs of at-risk individuals in the community. Many households are poorly prepared for such emergency situations, and little about psychological aspects of household emergency preparedness. The process of planning is a continuous sequence of plan development, and the acquisition by individuals and teams of performance skills achieved through training, drills, and exercises. This study focuses on homeowners in Tougaloo community, located in Tougaloo Ms. This community is centrally located north of Jackson, MS and on the borders of Hinds and Madison county. Although this community is small, it has a rich historical narrative to the system of slavery. This community is unique because it is a predominately African American community. Tougaloo has a population of 2,111, and only 9.3% of the community owns their home, even though the houses are affordable in the community, there are more rental options. This study is threefold and seeks to understand the following: (1) To assess the knowledge and attitudes of homeowners towards disaster preparedness; (2) To assess homeowners views or ideas of potential disasters planning; (3) To make recommendations for a disaster preparedness workshop in the community focused on homeowners.

P11.02

CRIME AND PUNISHMENTS? THE MENTAL HEALTH OUTCOMES OF FEMALE RAPE SURVIVORS OF SINGLE RAPIST

Dakota Conway

Delta State University, MS,

Previous literature on rape has discussed the mental health of rape survivors and the criminal punishment of rapists, but little to no research has been conducted on the effect of a rapist's being criminally punished on the rape survivor. The purpose of the research was to investigate whether rapists' being criminally punished better or worsens the mental health of the survivors. Participants were given a link to an online survey that asked them questions regarding the general nature of the rape committed against them, the criminal aspect of the rape committed against them, and the severity at which they suffered from select mental health symptoms on the DSM-5 Self-Rated Level 1 Cross-Cutting Symptom Measure—Adult. The results showed that a rapist's being criminally punished had a positive and significant correlation with feeling that someone could hear one's thoughts, or that one could hear what another person was thinking ($r(57)=.305, p<.05$) and a positive correlation with drinking more than four alcoholic drinks in a single day($r(57)=.322, p<.01$). These results could have mixed interpretations. The biggest indicator of more mental health problems, however, was the age at which participants were raped and also their current age. Participants who were younger now and

at the time of their rape were more likely to suffer from select mental health problems. These results suggest that much should be done to help younger women that have been raped.

P11.02

MODULATING FACTORS IN THE PERCEPTION OF EMOTIONAL FACES REFLECT DANGER ASSESSMENT

Nicolas Brunet, Laurel Stringer

Millsaps College, Jackson, MS

Perceiving threat from a negative emotional face might warn the observer for impending danger. We hypothesized that an alarm signal, triggered by a fearful or angry face, would be stronger if an individual would be confronted with more than one face conveying negative feelings. To test this hypothesis, we designed a visual paradigm where faces expressing different emotions are randomly displayed, one after the other, in a continuous fashion. Participants were asked to appraise the effect of each face. We found that participants perceived the expression of an angry or scared looking face as more negative when the face displayed before was also respectively angry or scared looking, suggesting that danger signaled from two different sources is interpreted by the brain as more likely to be true. This effect was particularly strong for full face stimuli, where the direction of gaze is perceived as directed towards the participant. Interestingly, the effect was weakened significantly for faces shown in half profile – with apparent gaze directed away from the participant – for angry, but not for fearful looking faces. The parsimonious explanation is that we perceive faces conveying anger and hate as the source of the danger itself and feel alarmed only when those negative emotions seem to be directed at us. The danger signaled by a fearful face, on the other hand, is likely caused by an outside source (such as the proximity of a predator or a person holding a gun) and thus unrelated to the direction of gaze.

P11.03

IMPULSIVITY IN COPING BEHAVIORS AMONG AT RISK YOUTH

Lydia Sigurdson, Nora Charles, and Chris Bary

The University of Southern Mississippi, Hattiesburg, MS

Washington University

Introduction: Impulsivity is a multi-faceted construct used to understand maladaptive behaviors, including risky behavior in adolescence. Facets of impulsivity have implications for a wide range of psychopathologies and risky behaviors (Berg, Latzman, Bliwise, & Lilienfeld, 2015). In particular, Negative Urgency, defined as impulsivity in reaction to experiencing negative affect, has been related to problematic alcohol use and compulsive shopping (Cyders & Smith, 2008). Given these negative associations, it is important to understand how facets of impulsivity relate to both positive and negative coping behaviors. This exploratory study is meant to understand the relationship between impulsivity factors of the UPPS-P and coping styles. **Methods:** 71 adolescents in a residential military-style program completed self-report questionnaires on coping habits and factors of impulsivity. **Results:** Negative and Positive Urgency were both positively correlated with multiple coping behaviors. Sensation Seeking was associated with using substances to cope. The regression analyses found that Lack of Premeditation (but not Sensation Seeking) significantly predicts using substances to cope, and Negative Urgency significantly predicts the use of self-distraction, denial, emotional support, venting, positive reframe, and self-blame. In contrast to the results seen from the correlations, Positive Urgency did not significantly predict any coping behaviors. **Conclusion:** Negative Urgency most strongly predicts the use of coping mechanisms, with the exception of Lack of Premeditation predicting substance use. Youths with greater levels of negative urgency might benefit from interventions

aimed at learning better coping skills. Future research should look at the mediating role of coping behaviors in the impulsivity-negative outcomes association.

P11.04

USING GIS TO STUDY DISPROPORTIONATE DISASTER IMPACT ON VULNERABLE MISSISSIPPI POPULATION

DaChawn Kinkaid, Ze'ronte Bates, Houston Sneed, Santanu Banerjee

Tougaloo College, Tougaloo, MS

Recent major natural disaster events in the form of hurricanes (Katrina, 2005, Harvey 2017, Maria 2017), flood (Mississippi River, 2011), wildfires (Tennessee, 2016, California 2018), tornadoes (Missouri, 2011) shows an increase in frequency and intensity of such events, causing considerable losses to life and property. Using Geographical Information System, utilizing industry standard ArcGIS software to study natural disasters is the focus of this research project. In addition to mapping numerous disaster events in United States, the project also emphasizes on the differential impact of various natural disasters on vulnerable population in the state of Mississippi. The varying impact can be observed by studying the availability of healthcare and shelter facilities in the natural disaster prone areas and comparing the disproportionate impact on vulnerable demography of the hazard regions. This study can provide important information necessary to make public policy decisions for mitigating disaster related contingency plans and designing disaster resiliency programs. This work is supported by the interdisciplinary minor, Disaster Coastal Studies, funded by the Homeland Security Center of Excellence.

P11.05

ASSOCIATION BETWEEN SOCIAL COMPETENCE AND DEPRESSIVE IN PEDIATRIC OBESITY

Sallie Lin, Shanda Sandridge, Krista King, Whitney Herring, Sophie Lanciers, Crystal S. Lim

University of Mississippi Medical Center, Jackson, MS USA

Tulane University, New Orleans, LA USA

Introduction: Children who are obese are at risk for internalizing psychological symptoms. Often, children with obesity face peer victimization, weight stigmatization, and lower social functioning. The purpose of this project was to examine associations between social competence and depressive symptoms in youth with obesity. **Methods:** Participants included 198 children 6 to 18 years of age (Mage=12.13years; 65.2% African American; 52.5% female) who were obese (MBMI-Z=2.58) and completed a psychological evaluation while receiving care in a multidisciplinary outpatient pediatric obesity clinic. Children completed the Children's Depression Inventory (CDI). Parents completed the Child Behavior Checklist (CBCL). **Results:** More than 20% of youth reported clinically significant depressive symptoms on the CDI. Pearson bivariate correlations revealed parent-report of lower child CBCL social competence was associated with child-report of higher CDI total depressive symptoms ($r(97)=-.28, p<.01$), as well as CDI emotional problems ($r(97)=-.26, p<.05$) and CDI functional problems ($r(97)=-.29, p<.01$) subscales. Child BMI z-score was significantly associated with CBCL social competence ($r(143)=-.172, p<.05$). Participants were categorized into Clinical (n=36) and Non-Clinical (n=61) groups based on CBCL social competence T-scores to examine group differences in depressive symptoms. T-tests revealed significant group differences between the Clinical and non-Clinical social competence groups on the CDI total ($t(95)=-2.01, p<.05$) and CDI emotional problems subscale ($t(95)=-2.08, p<.05$), where youth in the social competence clinical group reported higher depressive symptoms. **Discussion:** Some children attending outpatient pediatric obesity clinics experience low social competence, which is associated with increased depressive

symptoms. More research is needed to examine how social issues and depressive symptoms impact engagement in weight management treatment.

P11.06

RACIAL DISPARITIES IN MENTAL HEALTH CARE: CONSIDERING DIFFERENCES IN EXPECTATIONS AND PREFERENCES FOR PSYCHOTHERAPY

Taylor R. Rodriguez, Joye C. Anestis, Nora E. Charles, Margaret R. Bullerjahn, Latisha Swygert, LaQuitta Simpson, Jacob A. Finn

University of Southern Mississippi, Hattiesburg, MS

Minneapolis Veterans Affairs Health Care System

Introduction: African Americans are less likely to initiate mental health care than Whites (Diala, Muntaner, Walrath, Nickerson, LaVeist, & Leaf, 2000). Literature suggests that African Americans experience mental health treatment differently than Whites (Diala et al., 2000) and have varying perspectives regarding mental health which may affect help-seeking behavior (Masuda et al., 2012; Thompson, Bazile, & Akbar, 2004). The present study explored controllable aspects of treatment (e.g., therapist characteristics, approach) that may be utilized to address gaps in mental health care.

Methods: Undergraduates ($n=370$; 54% White, 38% African American) completed an online questionnaire regarding expectations, preferences, and attitudes about mental health (partially adapted from Therapy Experiences Survey; Butcher, Rouse, & Perry, 1998). Mann-Whitney U tests were used to examine differences between racial groups across variables.

Results: Whites reported more willingness to engage in help-seeking and more interest and experience in help-seeking, relative to African Americans. African Americans and Whites endorsed different causes of mental health problems (e.g., willpower, bad habits). Groups had differing perspectives of therapeutic success (e.g., problem-solving skills), differing rankings of important therapy outcomes (e.g., coping skills), and differing preferences for therapy mode (e.g., group, family) and activities (e.g., venting, psychoeducation). Additionally, there were different expectations of therapist characteristics (e.g., heterosexual male) and style (e.g., assertive/dominant, self-disclosing). **Discussion:** While African Americans demonstrated less willingness to seek mental health care, they have distinct expectations and preferences which can inform outreach and treatment. Clients are more likely to continue treatment when their preferences are accommodated (Swift, Callahan, & Vollmer, 2011).

P11.07

COMPARING WHITES COGNITIVE, EMOTIONAL AND BEHAVIORAL RESPONSES TO POLICE SHOOTING, SLAVERY AND NON-RACIAL INJUSTICES

Jinhao Chi

University of Southern Mississippi, Hattiesburg, MS

We compared Whites' cognitive, emotional and behavioral responses to non-racial (e.g., gulf oil spill) and racial events of slavery and police shooting of unarmed Black men (referred as police shooting below). We hypothesized that Whites will report stronger reactions to racial injustice events than non-racial injustice events due to collective guilt. Participants read 10 vignettes, 9 of which described historical non-racial injustices and one vignette which either described slavery or police shooting. We asked participants how negatively they viewed the events, how much guilt and shame they felt, and their willingness to donate to charities for these causes (e.g., Black Lives Matter). Results show that participants reported more negative views and emotions about racial injustices than non-racial injustices, especially so after reading the slavery vignette. However, more donations were intended for non-racial charities than racial charities. The results suggest that

collective guilt may have caused more negative responses toward racial than non-racial injustices and the negative responses to slavery are stronger than those to police shooting, probably because the perceived illegitimacy is less ambiguous for slavery. The results also indicate that police shooting may still be considered as illegitimate racial injustice as evidenced by more negative views and feelings of shame about shooting than non-racial injustices. However, the feelings of guilt did not significantly differ between shooting and non-racial injustices which may explain why so many Whites do not express sympathy toward victims of police shooting or protest against it.

P11.08

AGGRESSION, NEGATIVE URGENCY, AND INSTITUTIONAL MISCONDUCT AMONG AT-RISK ADOLESCENTS

Paula N. Floyd, Nora E. Charles, Christopher T. Barry

University of Southern Mississippi, Hattiesburg, MS

Washington State University

Self-reported aggression has been associated with institutional misconduct among adult offenders (Gardner et al., 2015). However, studies examining the link between aggression and institutional misconduct among adolescents have yielded mixed findings (Herrington et al., 2014; Stafford & Cornell, 2003). In a recent study, Scott and colleagues (2015) found that negative urgency (i.e., the tendency to act impulsively when experiencing unpleasant emotions) is strongly associated with aggressive attitudes and behaviors. Given that aggression and negative urgency are related, the current study hypothesized that the two factors may interact to predict institutional misconduct. Participants were 149 male and female youths ($Age = 16.7$ years) in a military-style residential facility. All participants completed the Personality Assessment Inventory-Adolescent (PAI-A; Morey, 2007) and the UPPS-P Impulsive Behavior Scale (Lynam et al., 2006). A negative binomial regression was performed with institutional misconduct (as measured by the number of infractions received during the program) as the dependent variable. Gender, ethnicity, aggression, and negative urgency were entered into the model as independent variables. Consistent with the hypothesis, there was a significant interactive effect between aggression and negative urgency in predicting institutional misconduct ($\beta = .964, p < .05$). Significant main effects were also found for gender ($\beta = 1.760, p < .05$), ethnicity ($\beta = .389, p < .01$), aggression ($\beta = 1.116, p < .01$), and negative urgency ($\beta = 15.177, p < .01$). Results suggest that negative urgency may be an important construct to target in an effort to reduce institutional misconduct among aggressive adolescents.

P11.09

THE RELATIONSHIP BETWEEN EMOTIONAL INTELLIGENCE AND LEADERSHIP EFFECTIVENESS AMONG AFRICAN AMERICAN COLLEGE STUDENTS

Zarius Holliman and Shaila Khan

Tougaloo College, Tougaloo, MS

Emotional intelligence is the capacity to be aware of control, express one's emotions and to handle interpersonal relationships judiciously and empathetically. Leadership consists of nine styles: transformational leadership, transactional leadership, Servant leadership, autocratic leadership, democratic leadership, bureaucratic leadership, situational leadership, natural leadership style and laissez-faire leadership. Wider areas of intelligence enable how successful we are. Emotional intelligence are very relevant to important work-related outcomes such as individual performance, organizational productivity, developing people and overall leadership effectiveness. The present research investigated the relationship between emotional intelligence and leadership

effectiveness among African American college students who were chosen across the state of Mississippi from several colleges. There were eighty participants (40 males and 40 females) with three different age ranges (17-19), (20-22), (23-25). The questionnaire on emotional intelligence, leadership styles and demographic information (e.g. gender, age, classification, and major) were distributed to all the participants. It was hypothesized that the higher the emotional intelligence the more efficient will be the leadership styles. The correlation showed a positive correlation between leadership effectiveness and overall emotional intelligence ($r=.526, p=.000$). Three subscales of emotional intelligence showed also showed positive correlations among leadership effectiveness which includes: motivation ($r=.665, p=.000$); empathy ($r=.665, p=.000$) and relationship management ($r=.526, p=.000$). No significant correlation was found with the sub scale of self-management. No gender and age difference found in leadership effectiveness and emotional intelligence. From the results we may conclude that being aware of once thinking pattern is a very important trait to be an effective leader.

P11.10

RELATIONSHIP BETWEEN SELF-ESTEEM AND LIFE SATISFACTION AMONG AFRICAN AMERICAN COLLEGE STUDENTS

Carolyn Edwards and Shaila Khan

Tougaloo College, Tougaloo, MS

The purpose of the present research was to determine the relationship between self-esteem and life satisfaction among African American college students. Self-esteem is one's overall sense of self-worth or personal value. College is a crucial time in most students' lives, it's when they start to develop their sense of identity. They are figuring out what college life is really about; prioritizing and responsibility are brought to a new. This is the time when self-esteem is very much needed. High self-esteem is feeling good about whom we are, low self-esteem is when we feel badly about ourselves, and who we are. Having low self-esteem can have intense emotional effects on an individual and little confidence or control over our life. Low self-esteem can also lead to low life satisfaction. Life satisfaction is a measure of one's well-being assessed in moods, satisfaction in relationships, achieved goals, and self-perceived ability to cope with one's daily life. In this study 80 participants (52 females and 28 males) were given a demographic information and a self-esteem and a life satisfaction questionnaire. It was hypothesized that there would be a positive correlation between the two and that females will have higher self-esteem and life satisfaction than the males. A positive correlation was found between self-esteem and life satisfaction ($r=.594, p=.000$). But there were no gender difference found in self-esteem and Life satisfaction. This study will help to understand how college students can work hard to increase their self-esteem and be satisfied with their life.

P12.11

IMPACT OF SOCIAL MEDIA ON BODY IMAGING AMONG AFRICAN AMERICAN COLLEGE STUDENTS

Alexandria Thomas and Shaila Khan

Tougaloo College, Tougaloo, MS

There is an abundance of ways social media can impact African American college students, some negatively and some positively. Extreme dissatisfaction with body image can lead to depression, social isolation, eating disorders. Positive body image may lead to high self esteem and increase use of social media. In this research it was investigated whether there is any impact of social media on body imaging. Eighty Participants were conveniently selected from a historically black college. All of them were given to fill some demographic information and The 19 - Item - Body -Image Questionnaire and 14 -Item- the Social Media Questionnaires. It

was hypothesized that a positive body image will lead to increase use of social media. It was also hypothesized that females will have more positive body image and will be using social media more than males. The ANOVA results showed significant positive relation between body image and the type of social media used ($f=2.307 (4,75), p=.006$), between body image and hours of time spend in social media ($f=3.398 (4,75), p=.01$), between body image and main purpose for using social media ($f=2.903 (3,76), p=.04$), between body image and intensity of posting face in social media ($f=3.32 (3,76), p=.024$), and between body image and intensity of posting full body picture in social media ($f=2.2766 (3,76), p=.037$). No gender differences were found in body image and use of social media. This research can help to understand the impact of body image and the vast use of social media and create a social awareness.

P11.12

DISASTER PREPAREDNESS: HOW PREPARED ARE THEY? AN ASSESSMENT OF RENTERS IN TOUGALOO MISSISSIPPI

Tia Jones, Shalen Robinson, Deja Boler, Frederick Hunter

Tougaloo College, Tougaloo, MS

Community preparedness is the ability to prepare for, withstand, and recover from public health incidents by engaging and coordinating with emergency management, and healthcare. Preparedness is always a team endeavor and requires interdepartmental, interagency and intercommunity collaboration with emergency management, healthcare organizations (private and community-based), mental/behavioral health providers, and community and faith-based partners. This type of preparedness is essential for residential dwellers due to the lack of effective coordination that can happen during a natural disaster. For renters, this is important due to their temporary resident status and the lack of awareness. However, like homeowners, renters face many of the same experiences that come along with recovering from a natural disaster and need to be prepared for these occurrences. This study focuses on renters in the Tougaloo community, located in Tougaloo, MS. This community is centrally located north of Jackson, MS on the borders of Hinds and Madison County. It is a small community with a rich historical narrative to the system of slavery. The community is approximately 96% African-American (ACS 2016). This study is three-fold and seeks to assess the following: (1) the knowledge and attitudes of renters toward disaster preparedness; (2) renter's ideals of potential disaster preparedness planning; and (3) to make recommendations for a disaster preparedness workshop in the community focused on renters. The study will interview renters within the community in order to make the appropriate recommendations for a potential community disaster preparedness workshop that will better engage the community in the process.

P11.13

SPIRITUALITY AND ATTITUDES TOWARDS HOMOSEXUALS AMONG AFRICAN AMERICAN COLLEGE STUDENTS

Kawanna Gilkey and Gary Chong

Tougaloo College, Tougaloo, MS

This study focused on the attitudes towards homosexuals among African American college students. Over the past 20 years, previous studies have revealed that there has been a remarkable increase in the acceptance of homosexuality. Homosexual rights and behaviors have become more accepted in some countries. In the United States, for example, the acceptance of same-sex marriage increased from 11% in 1988 to 48% in 2012. The purpose of this study was to examine spirituality and the attitudes of African American college students towards homosexuals. It was hypothesized that those who are more spiritual would have more negative attitudes towards gay and lesbians, compared to those who are less spiritual. It was also

hypothesized that females will have more negative attitudes towards gay and lesbians compared to males. The dependent variable was attitudes towards homosexuals and the independent variables were spirituality and gender. The questionnaires that were used for this study were the "Homosexuality Attitude Scale" and the "Spirituality Connection Questionnaire: SCQ-48". Research participants were 80 African American college students, 40 male and 40 females, from a Historically Black College or University (HBCU) in the Jackson metropolitan area. A Pearson correlation analysis indicated a significant negative relationship between spirituality and attitude towards homosexuality, $r = -.271$, $n = 80$, $p = 0.15$. A t-test found no gender difference on attitude towards homosexuality.

P11.14

THE RELATIONSHIP BETWEEN PERCEIVED LIFE SATISFACTION AND DRUG ABUSE AMONG COLLEGE STUDENTS

Shekyah Patterson and Gary Chong

Tougaloo College, Tougaloo, MS

This study focused on the relationship between perceived life satisfaction and drug abuse among college students. Drug use among youth and college students has been a worldwide issue and can be stemmed from underlying psychological issues. Previous studies have revealed that there are links between adolescent life satisfaction and use of alcohol, cigarettes and marijuana. Trends found that gender moderated the relationship between life satisfaction and one type of substance use. This study added to literature by examining the correlation between drug abuse, perceived life satisfaction, classifications and major divisions. It was hypothesized that Participants who score higher on the Life Satisfaction Questionnaire would have lower scores on the Drug Abuse Questionnaire. It is also hypothesized that men and women would differ on the Life Satisfaction Scale. Research participants for this study were 80 African American College students from the Tougaloo Campus. There were 39 males and 41 females. All of each were randomly selected by division, classification and age. Statistical analysis of the data was conducted using a Pearson Correlation. There was a significant negative correlation between the Life Satisfaction scale and the Drug Abuse scale ($r = -.266$, $n = 80$, $p < .017$). A t-test indicated no significant difference between males and females on the measure of life satisfaction

P12.15

RESIDENCY STATUS AND STRESS AMONG TOUGALOO COLLEGE STUDENTS

Tia Jones and Meherun Laiju

Tougaloo College, Tougaloo, MS

This study presents the results of a survey that examined if student's residency status (in-state vs out of state) had any relation with stress among students attending Historically Black Colleges and University's (HBCU). Previous studies focused on the relationship between stress and academic performances, self-esteem, self-control etc. Herbert Blumer's theory on symbolic interactionism was used as the theoretical framework for this study. The hypotheses for this study were 1) There is an association between college student's residency and stress; 2) Students attending college from in state are less likely to experience stress; 3) Students attending college from out of state are more likely to experience stress. To test these hypotheses, a survey was conducted. Eighty HBCU students participated in the study. The questionnaire consisted of sixteen items including demographical and stress scaled questions. The results are pending

P11.16

MEDIA PERCEPTION OF RAPE CULTURE AMONG COLLEGE STUDENTS IN JACKSON, MS

Jonnette Long and Meherun Laiju

Tougaloo College, Tougaloo, MS

This paper presented the results of a survey, which examined relationship between viewing certain television media and the perception of rape culture among college students currently attending colleges at central Mississippi. Previous research has been done to better understand the entire concept of rape culture and the presence of feminists' and misogynists' views in social media. The majority of research conducted has been to explain the way people express themselves via social media. George Gerbner's, cultivation theory was used as the theoretical framework for this study. The hypotheses for this study were 1) Students who have a greater media intake are more likely to be aware of rape culture; 2) Students who have a greater media intake are less likely to blame the victim; 3) Female participants are more likely to sympathize with the victim than male participants. A survey was conducted to test the proposed hypotheses. One hundred and twenty students who attend school in Jackson, Mississippi participated in the study. The questionnaire consisted of twenty items which included demographic, media intake scale, and attitudes toward rape myth acceptance questions. Results pending.

P11.17

PERSONALITY, PSYCHOPATHOLOGY, & SUBSTANCE USE: AN ANALYSIS OF AT-RISK YOUTH PROFILES

Lauren C. Burns and Nora Charles

University of Southern Mississippi, Hattiesburg, MS

INTRODUCTION: The co-occurrence of substance use and psychopathology has been well cited throughout research. Many nuances of this relationship remain unexplored. The purpose of this study was to expand on such research by exploring how marijuana and alcohol use relate to personality and psychopathology, as measured by the Personality Assessment Inventory-Adolescent (PAI-A; Morey, 2007), in at-risk adolescents.

METHODS: The sample included 166 adolescents from a military-style residential program for at-risk youths. Participants completed the Youth Risk Behavior Surveillance Survey (CDC, 2015), which posed questions about their substance use history, including degree of use and perceived consequences of use, and the PAI-A. Participants were deemed "frequent" alcohol/marijuana users if they engaged in use more than once/week. Multiple one-way ANOVAs were conducted to analyze the results.

RESULTS: Youths in both the heavier alcohol and heavier marijuana-using groups demonstrated significantly higher scores, relative to youths with lighter substance use histories, on PAI-A antisocial traits and aggression scales. Frequent marijuana use was not associated with any additional elevations on the PAI-A clinical scales. However, youths who frequently consumed alcohol had significantly higher scores across the following PAI-A domains: somatic complaints, depression, paranoia, and borderline personality features.

DISCUSSION/CONCLUSION: The results of this study help further elucidate the co-occurrence of substance use and psychopathology among adolescents, which could inform prevention and intervention efforts. Limitations include the "at-risk" status of the sample, as well as the relatively low number of females.

P11.18**NIGHTMARE TREATMENT: CLINICIAN VERSUS SMARTPHONE***Jessica Crevitt**Mississippi State University, Starkville, MS*

Sleep plays a vital role in human functioning. Unfortunately, sleep deficits are very common in military and veteran communities, with approximately half of veterans returning from deployment suffering from nightmares. Frequent sleeping difficulties are associated with posttraumatic stress disorder and suicide. Accessibility of evidenced-based treatments is limited, but use of smartphone applications (SPA) may be a viable way to extend the reach of nightmare therapies. However, the acceptability, feasibility, and effectiveness of using SPA for nightmare treatment has not been explored. This study examined the effectiveness, acceptability, and adherence of smartphone administered imagery rehearsal therapy (SPA) and in-person imagery rehearsal therapy (IRT) in a sample of veterans. Participants (N = 13) were veterans endorsing at least one nightmares a week and were randomly assigned to one of the active treatment conditions. Participants were assessed at baseline, 1-week post treatment, and 4-weeks post treatment. Surveys and clinician administered interviews were collected at each time point, in addition to daily surveys regarding sleep and substance use. There were no significant differences between the in-person therapy group and the SPA group. The Dream EZ app did result in significant reduction in nightmares ($p=.02$), insomnia ($p=.02$), and PTSD ($p=.01$) symptoms, whereas there were no significant improvements in the group receiving in-person IRT. This study was an initial step to demonstrate the effectiveness of the Dream EZ app and shows the potential of the app to increase availability of nightmare treatment.

Friday, February 22, 2019**AFTERNOON**

12:00-1:00-

Plenary Speaker

1:00-3:00

Mississippi INBRE/ Millsaps HHMI Symposia

SCIENCE EDUCATION**Chair: Shana Lee**

Mississippi State University

Vice-Chair: Sarah Lanier

Mississippi State University

Thursday, February 21, 2019**MORNING****Room TC 210****O12.01****8:15 BAFA BAFA: AN INTERACTIVE CULTURAL SENSITIVITY TRAINING TO IMPROVE CONTEXTS OF CARE***Carolina E. Compretta**University of Mississippi Medical Center, Jackson MS, USA*

Social and cultural characteristics of individuals and populations such as socioeconomic status, education, race, and gender are critical determinants of health and health care outcomes. While health care trainees receive substantial clinical experiences, experiential learning opportunities devoted to examining social and cultural factors that affect care are limited. In an effort to teach students in the health care professions about the social and

contextual features of care and how these features impact experiences of illness and injury, an interactive simulation has been conducted with medical, dental, dental hygiene, and nursing students at the University of Mississippi Medical Center. The Bafa Bafa Cultural Simulation promotes both self-reflection and awareness regarding a range of cultural diversity and inclusion issues. During the activity, participants are required to learn new cultural norms, cooperate within their group according to these new norms, and interact with "cultural others" from a different group. The experience specifically addresses the impact of implicit bias on health care and health outcomes. Participants are encouraged to identify the cultural experiences that influence their treatment in addition to recognizing the socioeconomic and cultural factors affecting patients' lives. Overall, the simulation helps participants recognize the ways stereotypes develop and are incorporated into everyday practice, appreciate difference, and fosters self-assessment. Participants learn valuable tools needed to work in multidisciplinary health care teams and in culturally rich medical environments. Review of this simulation across trainee groups and disciplines suggest that it is a value-added learning experience for students in health care professions.

O12.02**8:30 THE EVOLUTION OF MEDICAL ILLUSTRATION AT UNIVERSITY OF MISSISSIPPI MEDICAL CENTER (UMMC), 1955-2018.***Joella Lambert, Alexander Knight, Ralph Didlake**University of Mississippi Medical Center, Jackson MS, USA*

Biomedical illustration and photography are critical resources for an academic health science center allowing clinicians to document care, researchers to communicate findings, and educators to teach students. This presentation recounts the dramatic evolution of medical illustration techniques and practices over the past 70 years by reviewing the history of medical illustration at UMMC from its founding (1955) to the present day. Although, the medium in which the images were transferred changed from glass to plastic to paper, the essential process of sketching and finalizing a hand-rendered image has remained the same. In contrast, production of modern computer-based images requires very different skill sets. An additional major change in illustration technology came in the late 1990's with the advent of digital cameras and scanning technology. Originally, the UMMC illustration department was located in the hospital's basement near the morgue, but ultimately developed into its own entity in the Learning Resource Center. This historical review has been strongly informed by interviews of current and retired UMMC illustrators and photographers as well as examination of extensive archival collections of films, illustrations, and photographs maintained by the UMMC Rowland Medical Library. This investigation effectively documents the progression of biomedical illustration and its associated art and technology, identifies important education and research innovations, and reveals significant features of UMMC history.

O12.03**8:45 A NEW COLLABORATIVE RESOURCE TO AID INNOVATIVE CURRICULUM DEVELOPMENT BY STEM TEACHERS***Rob Rockhold¹, Marie Barnard², Caroline Compretta¹, Erin Dehon¹, Xiaoshan Z. Gordy¹, Caroline Iverson³, Edgar Meyer¹, Andrew Notebaert¹, Stephen Stray¹, Juanyce Taylor¹, Shelley Thompson¹, Donna Sullivan¹, Mohamed Elasmri³*¹ *University of Mississippi Medical Center, Jackson MS, USA*² *University of Mississippi, Oxford, MS, USA*³ *University of Southern Mississippi, Hattiesburg, MS, USA*



High school STEM teachers are underresourced for efforts to create classroom real curriculum innovation. Two STEM education programs funded by the National Institute for General Medical Sciences (NIGMS) collaboratively offer small grants (\$2,500/year) to teachers for STEM curriculum development. The Mississippi IDeA state Network for Biomedical Research Excellence (INBRE) provides resources to improve the research capability of Mississippi undergraduate faculty and extend the pipeline for students into STEM research training. The Science Teaching Excites Medical Interest (STEMI) project at UMMC is funded by the NIGMS Science Education Partnership Award (SEPA) program. STEMI engages Mississippi STEM teachers in development of expertise in flipped classroom pedagogy. Alignment of the educational objectives of SEPA and INBRE projects has been given a high priority by NIGMS. STEMI uses tested techniques during intensive summer training for high school STEM teachers to develop competitive proposals for external funding along with individual teacher consultations. Mississippi INBRE permits teachers to apply for funding to support development of innovative STEM curricula. This partnership significantly elevates high school teacher professional development, fosters implementation of cutting-edge STEM pedagogy models, and substantially extends the educational pipeline for biomedical career training into secondary schools. Supported by SEPA grant 8 R2 5GM129212-03 from the NIGMS and by the Mississippi INBRE, funded by an Institutional Development Award (IDeA) from the NIGMS of the National Institutes of Health (NIH) under grant number P20GM103476. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIGMS or NIH.

9:00 Break

O12.04

9:15 THE USE OF DISCREPANT EVENTS TO ENGAGE SCIENCE STUDENTS

Johnny L. Mattox

Blue Mountain College, Blue Mountain, MS, USA

Discrepant events offer an element of surprise for students, capturing their interest and curiosity about scientific phenomena. Discrepant events can be used effectively in introducing or closing science lessons, as demonstrations, as points of discussion, and as hands-on, minds-on activities. These events can be used effectively to enhance critical thinking skills and increase student engagement along with improve student dispositions in the classroom and laboratory. Students in a Science Methods class, who had previously presented discrepant events in class, were administered a questionnaire which asked for ways that they could use these events to enhance student understanding and engagement. These students noted that critical thinking and problem-solving skills, cognitive gains, improved dispositions, and memorable learning experiences could be some of the benefits of using discrepant events in the science class.

O12.05

9:30 QUALITY PROFESSIONAL DEVELOPMENT OF INSTRUCTORS AND STUDENT PERFORMANCE IN STEM COURSES

Abu O Khan

Jackson State University, Jackson MS, USA

Professional development training of instructors in upgraded pedagogy, effective use of available technology, and monitoring

student learning are believed to improve student performance in science courses by enhancing their understanding of concepts and critical thinking ability. One of the major goals of the Institutional Change through Faculty Advancement in Instruction and Mentoring (ICFAIM) program at Jackson State University is to implement and evaluate the effectiveness of such practices. Starting from the spring semester of 2014 (baseline), two-week training workshops by nationally recognized experts were arranged in every summer. Effectiveness of training was evaluated through self-reported perceptions of participating instructors, and student performance. Students of all sections of 5 gatekeeper courses (taught by 18 different instructors over time) were given pre and post tests on course contents, and Critical Thinking Assessment Test (CAT). Performance data were collected for 3949 students of which 2910 could be used for pair-wise comparison. Test scores were compared for all sections, courses, and instructors. Instructor performance was evaluated by comparing semester data with baseline data, and by multiple comparison of semester data. Post-test scores were found to be significantly higher than the pre-test scores for all subjects: PHY 201 ($t= 14.5, p<0.001, df = 709$), PHY 202 ($t= 4.5, p<0.001, df=540$), PHY 212 ($t=14.75, p<0.001, df=570$), PHY 212 ($t=2.74, p<0.01, df=466$), and SCI 201 ($t=10.4, p<0.001, df=620$). Significant difference between instructors of different sections of the same course was found. Comparison with baseline data showed that performance of all instructors either improved or remained the same.

O12.06

9:45 TEACHING HIGHER EDUCATION STEM CLASSES USING A DIFFERENTIATED FRAMEWORK OVERLAYED WITH A CRITICAL THINKING CONTINUUM

Brenda Hutton-Prager

University of Mississippi, Oxford, MS, USA

A differentiation framework for both teaching and learning is well-known in the K-12 education sector. However, its adaptation to the higher education sector, and particularly in STEM education, is relatively new. Engineering education has made giant leaps forward in recent years by promoting active learning, problem-based learning, and many other student-centered methods for enhancing student engagement and learning. A differentiation framework can incorporate many of these tasks, in addition to providing order and structure to the overall learning progression from lower to higher order thinking processes (Bloom's taxonomy). A critical thinking dimension can be overlaid on this framework, which maps out characteristics of students' thinking capabilities at different levels during their overall development towards becoming independent, critical thinkers. This continuum loosely follows Piaget's and post-Piagetian capabilities.

Using this framework, an educator can construct classes that are 'tailor-made' for the class, incorporating activities over a range of different thinking capabilities, and always ensuring that the each differentiated task progressively challenges the student's learning to the next level. This presentation will describe the differentiation framework and provide some examples of its use within a 'typical' class; a module of work; and experimental activities.

10:00 Break

10:15 Science Education Division Business Meeting

**O12.07****10:45 IMPACTS OF UNDERGRADUATE RESEARCH EXPERIENCES ON STUDENTS***Isabella Durham**Mississippi State University, Mississippi State, MS*

For the past five years, Mississippi State University has been offering research experiences for undergraduates through formal programs which pair high-performing students in collaborative research with faculty mentors. The purpose of these programs is to provide students with the opportunity to enhance scholarly activity, participate in the discovery of new knowledge, and become an integral part of the scientific community. We tested the hypotheses that undergraduate research improves student participants' educational experience (including personal and professional development), enhances retention of talented students in science careers, and leads to discovery of new information that contributes to the larger body of knowledge. A survey was emailed to past and current participants of these formal research programs to determine the variety of research topics conducted within STEM fields, the number of projects conducted per individual (if multiple were conducted), any products of these projects (posters, talks, journal articles, etc.), and how these experiences have influenced the professional careers of these students. Preliminary data indicate improved discipline-specific knowledge, greater understanding of the scientific process, and enhanced interest in graduate education in STEM fields. Results also indicate undergraduate students are significant contributors to the larger body of scientific knowledge, including participating in meaningful research activities, serving as co-authors on peer-reviewed papers, and presenting research at local, state, national, and international levels. These outcomes suggest guided undergraduate research programs are an effective mechanism for increasing scientific literacy among college students and recruiting new scientists to STEM career fields.

O12.08**11:00 USING GEOSCIENCE EDUCATION TO FOSTER PERSONAL MEANING AND DEVELOP BIG PICTURE UNDERSTANDING OF THE NATURE OF SCIENCE***Caleb Carlton**Mississippi State University, Mississippi State, MS, USA*

Meaningful, immersive experiences in the sciences can aid in developing self-efficacy and personal relevance when attempting to build an understanding of the nature of science-- scientific thought, study, and application. The geosciences provide a context from which to explore the personal relevance of science by connecting everyday lived reality to the big picture understanding of our planet. Allowing humans to explore the cultural, historical, and practical connections between their lives and various aspects of geoscience, connects intangible concepts to accessible human relevance.

The LeaderSTATE STEM program at Mississippi State University hosts six 5-day residential camps on the university campus each summer for JROTC students (N = 360) from MS, AL, and LA. We designed the geosciences STEM activities to be culturally relevant, personally meaningful experiences that build a general understanding of the nature of science, as well as offer first-hand exposure to a spectrum of careers and areas of study within the geosciences. Analyses of pre and post-program surveys demonstrate significant positive changes to comprehension and perception of who scientists are, their work, and academic and career opportunities available in STEM fields, as well as self-efficacy in applying scientific principles and methods. An understanding of the nature of science, as well as a perception of the personal relevance of scientific advancements and endeavors, will help all students to

appreciate the connections between their lives, cultures, and the applications of science. This is personal meaning in science, for all students.

O12.09**11:15 LEVERAGING CREATIVITY IN A GEOSCIENCES STEM INTRODUCTION AMONG JACKSON, MISSISSIPPI JROTC STUDENTS: A STEAM APPROACH FOR SUCCESS***Renee M. Clary¹, Caleb Carlton¹, Ryan Walker¹, Cade Smith², Camren Wilder¹*¹*Mississippi State University, Mississippi State, MS, USA*²*University of Mississippi, Oxford, MS, USA*

In Fall 2018, JROTC students at Jackson, MS schools were tasked to research Geosciences careers as part of a follow-on activity from the leaderSTATE STEM program. LeaderSTATE STEM provides a three-pronged approach of fitness, leadership, and STEM introduction within one-week summer residential camps on Mississippi State University's campus. Six camps are offered each summer, providing college and geosciences STEM experiences to cadets in Mississippi, Alabama, and Louisiana. JROTC students in Jackson, MS schools have a follow-on science investigation in Fall semesters. Participating Jackson schools (N = 7) were charged to investigate geosciences careers. Student groups chose the geoscientist that most interested them, and interviewed a Mississippi geoscientist who was employed in that career. In addition to collecting data, students developed a creative presentation that summarized their research results. Groups presented their final presentation to the Geosciences instructor, and winning teams within each school were selected to participate in MSU STEM Day. Next, winning teams presented their project research to guest judges at Mississippi State. In this presentation, we discuss the results from the leaderSTATE follow-on activity. The winning JROTC team will also creatively present their research to Mississippi Academy of Science attendees.

O12.10**11:45 EXPLORING GEOSCIENCE EDUCATION AND CAREER PATHWAYS IN JACKSON, MISSISSIPPI PUBLIC HIGH SCHOOLS***Elizabeth Hawkins, Sanna Hill, Matthew Jackson, Crystal Lopez
Murrah High School, Jackson, MS, USA*

The geosciences offer opportunities for meaningful and rewarding careers with high wages. Geoscience professions, like many STEM fields, lack in diverse representation. The LeaderSTATE STEM program, a joint effort between Mississippi State University, the United States Army, and Jackson Public Schools, is designed to provide equitable access to geoscience and STEM career exposure and exploration for all high school students. The LeaderSTATE STEM program at Mississippi State University hosts six 5-day residential camps on the university campus each summer for JROTC students (N = 360) from MS, AL, and LA. The follow-on activity for Jackson, MS Public School participating students (N=140) involves a 6-week, small group project exploring geoscience career opportunities and their relevance to society. Groups present their project findings to their peers and representatives from Mississippi State University. A selection of the presenting groups are nominated to attend further STEM career exploration day at Mississippi State University, where students again present their projects to a selection of MSU faculty. One group is then chosen as the overall project representatives, and will attend and seek to present their project at the Mississippi Academy of Sciences gathering. The project results in approximately 20-25 student presentations that focus on the communication of scientific information, and incorporate individual



and team creativity through a diverse spectrum of presentation methods, such as skit performance, video production, and songwriting. The presenting team has been chosen as the overall representative from Jackson Public Schools to present their project at the Mississippi Academy of Sciences.

12:00 General Session

Thursday, February 21, 2019

AFTERNOON

Room TCC 210

1:30 – 2:30 WORKSHOP Co-sponsored with Mathematics, Statistics, and Computer Science

PERFORMING STATISTICAL POWER, SAMPLE SIZE, CONFIDENCE INTERVAL AND EFFECT SIZE FOR A RESEARCH STUDY

Jamil Ibrahim and Elgenaid Hamadain

University of Mississippi Medical Center, Jackson, MS

Thursday, February 21, 2019

EVENING

3:30 Dodgen Lecture and Awards Ceremony TCC Theatre

General Poster Session

Immediately Following Dodgen Lecture

TCC Ballrooms 3rd floor

P12.01

EXPLORING GEOSCIENCE EDUCATION AND CAREER PATHWAYS IN JACKSON, MISSISSIPPI PUBLIC HIGH SCHOOLS

Caleb Carlton, High School Student

P12.02

ACTIVE LEARNING NEUROSCIENCE LESSON IMPROVES STUDENTS' KNOWLEDGE OF HEALTH DISPARITIES REGARDING MEMORY LOSS AND STROKE

Edgar R. Meyer¹, Kathy McKone², Marie Barnard³, Caroline Compretta¹, Erin Dehon¹,

Xiaoshan Z. Gordy¹, Andrew Notebaert¹, Stephen Stray¹, Juanyce Taylor¹, Shelley Thompson¹, Donna Sullivan¹, Rob Rockhold¹

¹*University of Mississippi Medical Center, Jackson MS, USA,*

²*Mississippi School of the Arts, Brookhaven, MS, USA,*

³*University of Mississippi Medical Center, Jackson MS, USA*

P12.03

GULF COAST RESEARCH LABORATORY PUBLICATIONS AND AQUILA: A SUCCESSFUL PARTNERSHIP

Joyce M. Shaw

Gulf Coast Research Laboratory, Ocean Springs, MS, USA

Friday, February 22, 2019

MORNING

Room TCC 210

O12.11

8:00 ACCESSIBLE GEOLOGY: EDUCATION AS OUTREACH THROUGH EXPLORATION USING MULTIPLE MEDIAS

Kelly Truax

Mississippi State University, Mississippi State, MS, USA

Geology is a multifaceted field of study which incorporates science, mathematics, problem solving, and hands-on experience to build a more complete understanding of the Earth. Due to its foundation of physical exploration, Geology can largely be limiting and inaccessible to a number of individuals. Instead of spending resources attempting to take only a few students into the field, multiple media sources could be utilized to make the field, and its resources, come to a larger audience. 3D modeling and virtualization of the site of interest, "Choose Your Own Adventure" styled exploration, and hands on comparison of some specimen (rock, mineral, fossil, etc.) are the media methods of primary focus. The goal is to build a complete experience that enhances understanding of geology and geological methods to help individuals of all ages learn how to think like a geologist. Particular interest has been pointed to the 16th section land located in Oktibbeha County that contains the Osborne Prairie. Owned by the Starkville Consolidated School District (SCSD), Osborn is leased by the Friends of the Black Belt Prairie and is a unique site for geology and ecology in Mississippi. As a resource in our backyard, there are few individuals that know of its existence and rarity. Extension of outreach to the community and the local schools would help build awareness of the site, help with conservation, and provide a geologic understanding of its importance.

O12.12

8:15 ASSESSMENT OF VIRTUAL ROCK SPECIMENS IN A TRADITIONAL INTRODUCTORY GEOLOGY LAB

Youngwoo Cho, Renee M. Clary

Mississippi State University, Mississippi State, MS, USA

The Department of Geosciences (Mississippi State University) have operated several sections for the introductory geology lab course over years. Students taking that course have often experienced difficulties in accessing specimens out of the classroom when they wanted to have the extra time to study or to make up the lab due to their absences in normal class hours. Some of the distance learning students who are outside of the US were limited in accessing the physical specimens as well. We researched whether virtual specimens will be useful in helping them learn without physical specimens in such cases. In this study, we have tested a few 3D virtual rock specimens to assess their effectiveness and to study their possibility to replace physical specimens in traditional lab learning. In the Fall of 2018, we grouped twelve sections of the introductory geology lab course into an experimental group of seven sections and a control group of five sections. Each section is composed of approximately thirty students. After having feedback from students and instructors, we found that virtual specimens are quite useful and students have enjoyed them. However, their feedback to the virtual models revealed their satisfaction varied depending on the quality of 3D models. Most of the students have also pointed out that they can't have the physical feelings from virtual specimens. However, they think virtual specimens will be very useful if they will be used with physical specimens in the face-to-face and distance learning classes.

**O12.13****8:30 INTEGRATION OF 3D VIRTUAL ROCKS & MINERALS IN EDUCATION THROUGH VIRTUAL REALITY**

Youngwoo Cho, Jessica Leesburg, Kelly Truax, Madison Meyer, Austin Funkhouser

Mississippi State University, Mississippi State, MS, USA

In the Fall of 2018, 3D virtual rocks were introduced as a supplemental instruction tool for the introductory geology laboratory at Mississippi State University. Students accessed the virtual rocks through a collection hosted by Sketchfab, an online 3D platform, with their own smartphones and laptops. The provided virtual rocks work in tandem with physical specimens to aid in identification while students observe their visual characteristics. Due to positive feedback from students concerning the use of virtual technology in the classroom, the collection of virtual rock specimens will be further expanded by extensively scanning more samples of rocks and minerals used in the introductory lab. To reduce the amount of time taken for scanning specimens, a rock scanning facility was constructed with a 4-axis motion control and lightbox. The motion control equipment includes two sliders, a specimen-lifting platform, and a motorized turntable. The lightbox was assembled by using an LED light source placed in a reflecting box and a few project boards set up to diffuse the light. To deal with potential glossy surfaces, we have set up linear polarizing films around the turntable and mounted a circular polarizer on the camera lens. Moving forward, students will continue to use the expanded virtual collection of rocks and minerals in the Spring of 2019 to aid in the initial identification of samples and as a study tool. In addition, a virtual reality headset will be added along with their smartphones and laptops to inspect the virtual specimens.

O12.14**8:45 A CLASSROOM ACTIVITY SIMULATING POPULATION-LEVEL EVOLUTION BY HAND**

Travis Hagey¹, Alexa Warwick², Louise Mead²

¹*Mississippi University for Women, Columbus, MS, USA*

²*Michigan State University, East Lansing MI, USA*

We have developed a scalable classroom activity that illustrates how evolution occurs at the population level, specifically the inheritance and variation of a trait with and without natural selection. The Next Generation Science Standards cite inheritance and variation of traits, natural selection, and evolution as disciplinary core ideas (NGSS LS3/LS4). Our activity was designed to align with these goals. The simplest version of our activity, designed for introductory biology students (middle school to undergraduate), introduces participants to drift, selection, fitness, and tree thinking. We have also built advanced versions of our activity for undergraduates incorporating higher-level concepts (heritability, the breeder's equation, divergent selection/speciation, and stabilizing selection). Our activity considers bird color, but the patterns illustrated are general to all of evolution. Students model the evolution of bird color in a population through time. Using a board-game type spinner, students assign phenotypes (plumage color) and differential reproduction to individual, asexual, birds across a population, over successive discrete generations. At the completion of the activity, students have created a pedigree of individuals, showing how plumage color has changed over time and its relationship to surviving clades. Students' results illustrate population-level processes that generate morphological diversity. This activity has been implemented in a wide range of educational settings including as an elementary school science fair activity, middle and high school classroom activity, as well as introductory and advanced undergraduate lab activities. Based on written and oral assessments from students, students have

found this activity intuitive and informative.

9:00 Break**O12.14****9:15 ACTIVE LEARNING IN THE SCIENCE CLASSROOM**

Elizabeth Prewitt

University of Mississippi, Oxford, MS, USA

Team-Based Learning is an instructional strategy used to incorporate active learning in the science classroom. A qualitative study was conducted in an undergraduate general biology course to analyze student perceptions of the method of Team-Based Learning. This presentation will discuss the results of that study and plans for a future study which combines this instructional strategy along with other active learning techniques.

O12.15**9:30 STUDENTS UNDERSTANDING CHEMISTRY CONCEPTS TO ENHANCE STEM SKILLS- SUCCESS AT JSU**

Barbara Howard, Timothy Turner, Barbara Graham, Naomi Campbell, Ashton Hamme, Solomon Garner

Jackson State University, Jackson MS, USA

Biology is the largest major in the science college at Jackson State University (JSU). While the department has over 900 majors, data suggests that less than 23% will graduate with a bachelors within six years of entry. This Exploration and Design Tier for Engaged Student Learning is called "Students Understanding Chemistry Concepts to Enhance STEM Skills (SUCCESS)" because data shows that the first four chemistry courses are barriers for many biology majors at JSU. The primary goal of the SUCCESS Program is to reduce the DFW rates for biology majors in each of these chemistry courses to 25% or less by the end of the funding period.

SUCCESS used a mixed-methods approach for evaluation. We used pre- and post-test, surveys, focus groups, and end of course grades. DFW rates were calculated and a 3-year average DFW rate for each class over the baseline periods will be obtained.

In the initial Gen. Chem. I course offered, only 25% of the twelve students earned a failing grade, 19% dropped with no grade, and 56% earned a passing grade. Each of the students who were administered a pre- and post-assessment showed an increase of 4 points or more in the post-examination and there were no decreases in scores. SUCCESS has implemented a Chemistry I course specifically designated as POGIL instruction. If POGIL proves successful it will impact students who enroll in these chemistry courses over the three years of the project and those who come later due to commitments to sustain this effort.

O12.16**9:45 FACILITATING "BIG PICTURE" UNDERSTANDING: COMMUNITY ENGAGED LEARNING IN COLLEGE PALEOECOLOGY COURSES**

Renee M. Clary

Mississippi State University, Mississippi State, MS, USA

Paleontology courses typically require students to collect fossils, and analyze these fossils to determine the paleoenvironments in which the organisms lived. In Fall 2018, a paleoecology course's goals were extended to include a comparison of the collecting site's modern biodiversity with the Cretaceous marine environment. The course focused upon Osborn Prairie, a Black Belt Prairie remnant in



Oktibbeha County, which is leased to the Friends of the Black Belt Prairie by the Starkville Oktibbeha Consolidated School District (SOCSD). Students learned not only about the ancient biodiversity of the site through fossils, but also explored how paleoenvironments determined modern biodiversity. Guest lecturers and field leaders included paleontologists, entomologists, and foresters who spoke to the importance of the Osborn Prairie site for their respective disciplines. The SOCSD also provided its site perspective. In addition to their Cretaceous paleoecology reports and fossil collections, students analyzed the sustainability of the Osborn Prairie site and explored long term solutions, including preservation, protection, or development. Critical reflections were required after guest presentations, site visit(s), and project reading assignments. For the final examination, students presented their solutions to their colleagues, guest lecturers, and community partners. Through the community-engaged learning, students made broader connections to the local community and current issues. Their solutions for Osborn Prairie also resulted in further site and solution exploration beyond the paleoecology course.

O12.17

10:00 THE USE OF CROP FUNCTIONAL DEVELOPMENTAL GENOMICS TO ENHANCE UNDERGRADUATE EDUCATION

Vincent Klink

Mississippi State University, Mississippi State, MS, USA

The enhancement of undergraduate education using crop functional developmental genomics has been explored. Over 100 undergraduate students have worked over a period of 20 semesters, examining plant resistance mechanisms to important pathogens that affect major crops grown in Mississippi. Soybean (*Glycine max*) has been used to identify candidate resistance genes that are actively expressed at root sites that are infected by various pathogens by employing laser microdissection and transcriptomic analyses, procedures commonly used in the medical and agricultural research fields. Soybean has been genetically engineered to increase or decrease the expression of the identified candidate resistance genes. The effect that the expressed candidate resistance genes have on pathogen success or demise have been enumerated, leading to the determination of whether the gene actually functions in resistance. The undergraduates have been involved in the analysis of over 200 candidate pathogen resistance genes, resulting in the identification of genes that actually function in resistance. The work has led to the identification of actual resistance genes while at the same time providing valuable educational and research experiences that have aided in students achieving their professional goals. While providing a valuable educational experience that has included teamwork and publishing experiences for the students, an additional result has been the development of a laboratory manual to aid in teaching new students. Consequently, the program has been building on itself since its inception.

10:15 – 10:30 Break

O12.18

10:30 A STUDY OF THE TEACHING BELIEFS OF GLOBE TEACHERS

Laila Ali, Sherry Herron

University of Southern Mississippi, Hattiesburg, MS, USA

We investigated the teaching beliefs and practices of teachers trained in GLOBE (Global Learning and Observations to Benefit the

Environment; www.globe.gov) protocols from across the U.S. GLOBE teachers are trained to enable their students to collect scientifically valid environmental data and participate in inquiry-based hands-on science in a global community of scientists and students. The teachers responded to two online questionnaires via Qualtrics: the BARSTL (Belief about the Reformed Science Teaching and Learning) and the TGTQ (Teaching After GLOBE Training). Of the 72 teachers who participated, 93% were found to hold constructivist rather than traditional teaching beliefs; 90% believed that teaching with GLOBE had impacted their students' learning; 96% thought that all students (accelerated and regular) learned better with GLOBE investigations; 61% reported changing their teaching strategies to incorporate more hands-on inquiry-based activities after learning GLOBE protocols; 82% planned to continue teaching with GLOBE activities and protocols; and only 28% had stopped using GLOBE in their classroom. Lack of administrative support, time constraints, lack of equipment, and lack of computers/poor internet connection were common barriers for uploading data on GLOBE website. The results tell us that teachers believed that involvement with GLOBE had influenced their teaching skills and had improved their science teaching and learning. An example response reveals the influence: "Part of the scientific method includes data collection. Any hands-on investigations are going to help with retention of scientific concepts. There's something about 'doing' science that helps students feel they, too, can be part of the scientific community."

O12.19

10:45 A MIXED METHOD APPROACH TO STUDY A CHILDREN'S SUMMER PROGRAM ABOUT NATURE

Kendrick Buford, Sherry Herron

University of Southern Mississippi, Hattiesburg, MS, USA

Recognizing that African Americans are not well represented in STEM careers in general, and disconnect with nature exists in this population, we sought to address these social justice issues by developing and conducting research on a program for children. The research examined the complex issue of African-American children's perception of nature and the impact that this has on youth aged six through ten in both comfort and career selection. Comfort in nature and career aspirations assessments were developed and used as pre and post instruments. Children attending a city summer camp spent time listening to storybooks and exploring the outdoors each morning four weeks to five weeks; were taught by living role models (African American undergraduate and graduate students); and learned about virtual role models (scientists and engineers currently working in careers related to nature). The treatment was analyzed using a convergent-parallel mixed method design. A paired-samples t-test was conducted to compare the participants' comfort in nature before and after the program. There was an increase in comfort in nature though not significant ($p = 0.087$). There was an increase in nature-oriented career selections though not significant ($p = 0.183$). The children appeared to perceive more about their surroundings as the program continued and this could be seen from the increased complexity and realism in the artwork. The college students and campers expressed enjoyment and appreciation. Memory books were created and will help remind the children of their experience and career options.

O12.20

11:00 EXPERIENTIAL LEARNING IN OUTDOOR SPACES: A SHIFT IN TEACHER PERCEPTIONS

Shana Lee, Ryan Walker

Mississippi State University, Mississippi State, MS, USA

The Great Smoky Mountains Institute at Tremont provides high quality Experiential Education to educators in a way that translates

into environmental stewardship that is personal, local, and relevant to students' lives and the community. This presentation will provide detailed descriptions of a Tremont Institute led professional development program with focus on subsequent outcomes of an embedded assessment. Possible implications for adaptation to locations outside of the GSMIT will be described along with the barriers and challenges associated with teacher perceptions. During the professional development, teachers considered how students learn outdoors, while actively participating in outdoor activities. A central component of the professional development was an embedded assessment known as the site inventory. Participant teachers were asked to evaluate the outdoor learning space at their school by drawing a site map before the workshops began. The site map was used during collaborative discussion and teachers were encouraged to revise their site map. Researchers critically evaluated the implementation of this embedded assessment in a review of individual school maps, field notes of collaborative discussions and interviews of participants. Teachers were hesitant to take their students outside because of perceived space and time limitations. Many of the teachers reportedly had little to no training in outdoor education. Participant teachers also admitted they were not confident in managing outdoor classroom activities during the allotted class time. These initial perceptions laid a foundation for researchers to describe the paradigm shift in perceptions of experiential learning and teaching in the outdoors.

O12.21

11:15 GRADUATE TEACHING ASSISTANTS' PERCEPTIONS ON TRAINING

Sarah L. Lanier

Mississippi State University, Mississippi State, MS, USA

To ease the burdens placed on faculty for teaching, many graduate students become graduate teaching assistants (GTA's). They are often trained quickly, just prior to teaching. This qualitative study seeks to determine how biology GTA's at a land-grant university in rural Mississippi are trained. Furthermore, this study endeavors to identify whether faculty feel the training is enough for the GTA's they work with while teaching an introductory biology course. GTA's also provide their thoughts on the confidence of their biology teaching through a modified version of the STEBI Part B. Interviews were conducted to determine the parts of training that the GTA's felt were beneficial and what additional training they wish they had. Also, during the interviews, GTA's discuss their backgrounds and what training they had prior to entering their current degree program which may have impacted their teaching styles. Documentation from a university wide graduate training seminar as well as the training from the biology departmental orientation seminar were analyzed to back up GTA training experiences. The goal of this study is to make suggestions to improve GTA training experiences and perceptions among GTA's who may not have educational pedagogical foundations. Further research projects are also suggested.

ZOOLOGY

Chair: Alex Acholonu

Alcorn State University

Vice-Chair: Julius Ikenga

Mississippi Valley State University

Thursday, February 21, 2019

MORNING

Room TC 228

8:50 Welcome

O13.01

9:00 THE USE OF BIOPLASTIC FORMULATIONS TO ADVANCE BIOCONTROL METHODS FOR ADDRESSING AGRICULTURAL PROBLEMS

Hamed K. Abbas

USDA-ARS

Food quality and quantity serve as the basis for cycling of key chemical elements in trophic interactions, yet the role of nutrient stoichiometry in shaping host-parasite interactions is under-appreciated. Most of the emergent mosquito-borne viruses affecting human health are transmitted by mosquitoes that inhabit container systems during their immature stages, where allochthonous input of detritus serves as the basal nutrients. Quantity and type of detritus (animal and plant) was manipulated in microcosms containing newly hatched *Aedes aegypti* mosquito larvae. Adult mosquitoes derived from these microcosms were allowed to ingest Zika virus infected blood and then tested for disseminated infection, transmission, and total nutrient (%C, %N, C:N) analysis. Treatments lacking high quality animal (insect) detritus significantly delayed development, and survivorship to adulthood was closely associated with the amount of insect detritus present. Insect detritus was positively correlated with %N, which affected Zika virus infection. Disseminated infection and transmission decreased with increasing insect detritus and %N. Here, we provide the first definitive evidence linking nutrient stoichiometry to arbovirus infection and transmission in a mosquito using a model system of invasive *Ae. aegypti* and emergent Zika virus.

O13.02

9:15 VERNONIA AMYGDALINA EXTRACTS INHIBIT CANCER CELL GROWTH BY DISRUPTING MICROTUBULE ASSEMBLY

Daniel Oyugi

Mississippi Valley State University

Vernonia amygdalina (VA), one of the medicinally-important plants of Africa is the most used plant in the genus *Vernonia*. Previously we reported the in-vitro growth inhibition and anti-proliferative activities of VA extracts on cancer cells. In the present study, we examined whether VA elicits the aforementioned effects by disrupting microtubule network. Using immunocytochemical analyses, we probed the effects of VA fractions on microtubule assembly, disassembly and apoptosis in DU-145 and MCF-7 cancer cell lines. Cell viability was tested using Calcein-AM Red Orange. Apoptosis was measured using Hoechst 33342 and Propidium Iodide. Our results indicate that organic and aqueous fractions of VA extracts abrogated the steady state-microtubule pattern into a disassembled form in DU-145. In MCF-7 cells, the fractions caused retraction, condensation and clustering of tubulin protofilaments into aggregates within the cytoplasm. Cell structure and morphological analyses revealed marked cell shrinkage, nuclear fragmentation,

chromatin condensation, DNA fragmentation and formation of membrane blebs and apoptotic bodies. Analysis of cell death by fluorescence staining indicated condensed chromatin, confirming an apoptotic death, with greater quantities of apoptotic phenotypes observed in MCF-7 than in DU-145. Viability assay showed dose-dependent reduction in viable cells, with petroleum ether and aqueous fractions exhibiting a higher reduction effect (IC₅₀ 61.02 µg/mL; 65.82 µg/mL) than methanol fraction (IC₅₀ 80.77 µg/mL) in MCF-7 cells. In DU-145 cells, methanol fraction exerted highest viability reduction (IC₅₀ 44.21 µg/mL) than aqueous (IC₅₀ 131.7 µg/mL) and petroleum ether fractions (IC₅₀ 130.5 µg/mL). VA fractions induce microtubule disassembly in a fashion similar to Nocodazole but different to Taxol.

O13.03

9:30 TITLE: URBANIZATION AND CONTAINER PHYSIOCHEMISTRY ON Aedes Aegypti AND Aedes Mediovittatus Larvae in Puerto Rico

Limarie J. Reyes-Torres, Daniela Sweet-Coll, Donald Yee

School of Biological, Environmental, and Earth Sciences, University of Southern Mississippi, Department of Earth and Environmental Sciences, Wesleyan University, School of Biological, Environmental, and Earth Sciences, University of Southern Mississippi

Aedes aegypti is a vector of dengue, Zika, and chikungunya viruses in Puerto Rico. *Aedes mediovittatus* (Caribbean treehole mosquito) is also a vector of dengue in the island. The physiochemistry of container water is important for these species as their larval stage breeds in water and urbanization has been shown to influence water physiochemistry. The objectives of this study were to assess how urbanization and water physiochemistry influence abundance of *Aedes aegypti* and *Aedes mediovittatus*, and to evaluate the effect of elevation and canopy cover on *Ae. mediovittatus* oviposition in a rural environment. Larvae were collected from containers along a rural-urban gradient, and species abundance was analyzed in relation to container water physiochemistry and urbanization factors. Data showed a significant positive relationship between *Ae. aegypti* abundance and water conductivity and temperature. A pattern of higher *Ae. mediovittatus* abundance with higher water volume was observed. The correlation between urbanization-associated factors, with *Ae. aegypti* abundance supports the conclusion that *Ae. aegypti* is adapted to the impact that urbanization has on container water physiochemistry (e.g. high temperature and high conductivity). The abundance of *Ae. mediovittatus* in Patillas, a region of moderate urbanization, and its absence in rural Rio Grande could point to a preference for human targets despite the tendency of the species to breed where vegetation and shade dominate.

O13.04

9:45 REPORT ON FREE MEDICAL MISSION AND HIV/AIDS SCREENING CONDUCTED AT AWAKA IN OWERRI NORTH LOCAL GOVERNMENT AREA (LGA) IMO STATE, NIGERIA ON APRIL 2, 2018: A HEALTHCARE DISPARITY ACTIVITY

Alex D. W. Acholonu

Professor Emeritus - Alcorn State University

This is a free medical mission conducted at Awaka in Owerri North, Imo State, Nigeria on April 2, 2018. The purpose was to show compassion for the needy in this developing country, Nigeria; to give hope to the hopeless; to contribute in the effort to eradicate HIV/AIDS in Nigeria with main focus on the rural areas. It was also to improve the healthcare disparity in the area. The activities conducted included consulting, counseling, distribution of health literatures and testing, that included malaria, blood pressure, blood sugar, eye tests and HIV/AIDS screening. Those who came were clinically examined by medical doctors and prescribed medicines

were given to them free of charge. About 500 people were treated. Of those who volunteered to be screened for HIV/AIDS (131) none was positive. Of the 151 that were screened for Malaria 82 were positive (53.4%). Of those tested for blood sugar (105) 23 (22%) exceeded the threshold. Many people expressed profound gratitude for the conduction of the free medical mission and free screening for HIV/AIDS that gave many people a new lease on life. This work was supported by the Willy-Esther Foundation, a nonprofit, non-Government organization (NGO), Awaka Go Forward International Center for Youth Development (NGO) and Handover Heals Foundation (NGO).

10:00 Break

O13.05

10:30 HONEY PLANTS OF MISSISSIPPI

Elena Kostyleva, Nikolay Dobrynin

Alcorn State University, Voronezh State Agricultural University

Honey plants of Mississippi include over 180 species of 99 genera of 41 families. The most numerous families are: Asteraceae - over 39 species; Fabaceae - over 20 species; Rosaceae - 18 species. The majority (68%) are aboriginal species, 29% - introduced, 3% - spread worldwide. Almost half of the species (49%) are herbaceous, 28% - woody, 23% - shrubby; 14% are annual, 86% - biennial and perennial plants. The majority of species (55%) are distributed throughout the territory, 14% - only in the northern part, 20% - southern, 4% - central, 5% - eastern, and 2% - in the western part. The regional honey flora is characterized by high endemism. Many endemics are rare, endangered, or recognized as a protected part of the region's wetlands. The largest number of species (>37%) are forest land honey plants, 24% - forest belts, ornamental and plants for greening, 9% - field and forage plants, 24% - plants of meadows, pastures and wetlands, 4% - plants of gardens and berry plots, and 2% - plants of vegetable and melon plots. In total, more than 87 species of honey plants are cultivated, but the majority of species (> 60%) are wild. Most (63%) honey plants in the region bloom in spring and early summer. The basis of the regional beekeeping forage is composed of more than 25 species: 36% are trees, 28% - shrubs and vines, 36% - herbaceous plants. The majority (80%) are aboriginal, spread throughout the study area.

O13.06

10:45 DO MOSQUITO PESTICIDES HARM THEIR NATURAL ENEMIES? ECOLOGICAL CONSEQUENCES AND NON-TARGET EFFECTS OF LARVICIDES ON MOSQUITO PREDATORS

Joseph Nelsen

University of Southern Mississippi

Many human diseases are vectored by anthropophilic mosquitoes. To minimize outbreaks of vector-borne diseases, the reduction of biting adult mosquitoes in urban areas is important. Targeting the aquatic larval stage of mosquitoes is one of the most effective methods used by pest control specialists. Larvicidal chemicals are commonly applied to habitats where mosquito larvae are found. However, these chemicals may have a lasting negative effect on non-target organisms that prey on mosquito larvae. This study aims to assess the effects that larvicides have on aquatic invertebrate predators of mosquitoes. I sampled aquatic roadside habitats before and after larvicidal treatment to assess changes in aquatic insect communities. In addition to these field observations, I ran laboratory toxicity experiments on predaceous diving beetles and Odonate nymphs: two abundant mosquito predator groups from my field samples. These toxicity experiments were conducted to determine



lethal and sublethal behavioral effects of two common larvicides: surface films and growth regulators. I also plan to run field experiments to determine whether the sublethal effects of these chemicals on mosquito predators have a negative impact on mosquito control by reducing their predatory capacity.

O13.07**11:00 DISTRIBUTION OF POLLUTANTS IN THE MISSISSIPPI RIVER NEAR GRAND GULF MILITARY PARK, PORT GIBSON, MS, DURING THE SUMMER OF 2017**

Sharkiesha Jackson, Alex D. W. Acholonu, Ashley Bonds

Alcorn State University, Professor Emeritus - Alcorn State University, Alcorn State University

Water quality is associated with the environment and the use of the land surrounding the water. It can be altered and affected by numerous factors such as people, industrial uses, community uses, agricultural uses, and transportation uses. In 1965, the Water Quality Act forced states to issue water quality standards for interstate waters. The Clean Water Act (CWA) was passed by congress in 1972 which was designed to reduce direct pollutant discharges into waterways. The purpose of this study was to find out the pollutants in the Mississippi River in the area of Port Gibson and see if the River met the Mississippi Water Quality Criteria (MSWQC) for fresh water bodies during the summer of 2017. The samples were taken to the laboratory and tested with the LaMotte Pollution Detection Kits supplied by the LaMotte Company. The results were tabulated and compared with MSWQC. The study showed that the river met the MSWQC with the exception of the alkalinity, carbon dioxide, and phosphate concentrations. It is recommended that this kind of seasonal study be continually done in order to monitor the level of pollutants in the Mississippi River, and if and when they exceed the threshold, control it for the benefit of its users (the biological organisms among other things).

O13.08**11:15 MILLENIALS AND STEM: TECHNOLOGY IN THE COLLEGIATE CLASSROOM**

Voletta P. Williams

Alcorn State University

The twenty-first century is marked by technology ranging from boom boxes to smart boards. Technology has emerged from simply existing to making a significant impact in the classrooms setting. This is an expository study to identify the impact of technology in the collegiate classroom. This study is inclusive of data from the PEW study (2010) of collegiate use of technology. Data are secured from various resources.

O13.09**11:30 SPECIES DISTRIBUTION MODELING USING HUMAN FACTORS FOR AEDES AEGYPTI, THE YELLOWFEVER MISQUITO**

Nicole Mackey, Donald Yee

University of Southern Mississippi, University of Southern Mississippi

Aedes aegypti, the primary mosquito vector of the yellow fever virus, threatens global health by also being an efficient vector of viruses such as Zika, dengue, and chikungunya. Its efficiency in transmission comes from its tendency to live in urbanized areas and be anthropophilic. Understanding the factors that affect the distribution of this vector is important for employing efficient control practices. The Centers for Disease Control (CDC) predicted the distribution of *Ae. aegypti* using historical records, annual precipitation, and temperature data. The use of these factors exclusively has led to inaccuracies due to a lack of including factors related to human practices. I hypothesize that human population data and socioeconomic data are better able to explain the distribution of

Ae. aegypti compared to current approaches, and this will create a more accurate *Ae. aegypti* distribution map. I will use populations of *Ae. aegypti* identified within the last ten years and map them in the U.S. using a geographic information system approach. I will incorporate human population factors including density, socioeconomic indicators (e.g., average income and dwelling abandonment), and climate data that have been shown to effect *Ae. aegypti*. Lastly, I will use Maximum Entropy Modeling to build a more accurate model for the presence of *Ae. aegypti*. As climate change may introduce this mosquito and the diseases it vectors, like yellow fever, to different populations, a more accurate map of *Ae. aegypti* will have an important effect on how the pest is controlled and the spread of disease is eliminated.

12:00 General Session

Thursday, February 21, 2019

AFTERNOON

Room TC 228

O13.10**1:00 CHARACTERIZATION OF FUNGAL ISOLATES FROM LOBLOLLY PINE (PINUS TAEDA) TREES GROWING IN SOUTHERN MISSISSIPPI**

Frank Mrema, Vanessa Valentine, Franklin Chukwuma, Leonard Kibet, Alex D. W. Acholonu

Alcorn State University

Characterization of fungal isolates obtained from five (5) year old loblolly pine trees was conducted in this study to better understand the pathogenic fungi that cause pine forest decline in southern Mississippi. Fungal isolates with different morphological variations were tested for extra-cellular enzyme (laccase, ligninolytic and cellulase) production. Comparative pathogenicity tests using juvenile *P. taeda* seedlings as host were conducted by root inoculation with two of the isolates (ASP1 and ASD18). The control seedlings were mock inoculated with sterile water. To study the fungi infection process, the first (1st) and second (2nd) 10mm root tips were cut from inoculated and un-inoculated (control) seedlings, 3, 6, 10, 15 days post inoculation. Collected specimens were fixed, stained and thin sections observed under light microscopy. Of the 19 fungal strains isolated from symptomatic *P. taeda*, 21% showed a positive Bavendamm reaction, indicating the ability to produce phenol oxidase, and depletion polysaccharide and lignin components in wood. ASP1 and ASD18 fungal strains showed strong enzyme reaction, 36%, and 38% respectively. Both tested fungal isolates caused browning tissues in the roots from 3 days post inoculation. Observations on day 15 post-inoculation, showed severe browning of the root tissues in both root regions (1st and 2nd mm regions) challenged with ASP1 when compared to similar regions of ASD18 and the controls, indicating that the necrotic cells could not prevent the fungal colonization in loblolly pine seedlings. Field studies are proposed to establish the pathogenic capability of ASP1 and ASD18 fungal strains on field loblolly pines seedlings.

O13.11**1:15 INFLUENCE OF LARVAL ENVIRONMENT ON VECTOR COMPETENCE FOR ZIKA VIRUS IN AEDES AEGYPTI**

Catherine Dean, Andrew Paige, Shawna Bellamy, and Donald Yee

The University of Southern Mississippi

Food quality and quantity serve as the basis for cycling of key chemical elements in trophic interactions, yet the role of nutrient stoichiometry in shaping host-parasite interactions is under-appreciated. Most of the emergent mosquito-borne viruses affecting

human health are transmitted by mosquitoes that inhabit container systems during their immature stages, where allochthonous input of detritus serves as the basal nutrients. Quantity and type of detritus (animal and plant) was manipulated in microcosms containing newly hatched *Aedes aegypti* mosquito larvae. Adult mosquitoes derived from these microcosms were allowed to ingest Zika virus infected blood and then tested for disseminated infection, transmission, and total nutrient (%C, %N, C:N) analysis. Treatments lacking high quality animal (insect) detritus significantly delayed development, and survivorship to adulthood was closely associated with the amount of insect detritus present. Insect detritus was positively correlated with %N, which affected Zika virus infection. Disseminated infection and transmission decreased with increasing insect detritus and %N. Here, we provide the first definitive evidence linking nutrient stoichiometry to arbovirus infection and transmission in a mosquito using a model system of invasive *Ae. aegypti* and emergent Zika virus.

O13.12

1:30 SOIL ACTIVE CARBON AND RELATED PROPERTIES RESPONSE TO APPLICATION OF ANIMAL MANURES

E. Smith, L. Kibet, G. Panicker, J. McComb and F. Mrema

School of Agriculture and Applied Sciences, Alcorn State University, Lorman, MS

Soil carbon and related properties play a vital role in improving soil productivity and environmental quality. Agricultural practices may affect soil's capacity to maintain its functions and may lead to ecosystem degradation and loss of productivity in the long term. Therefore, there is a need to evaluate soil management systems to find early indicators of soil degradation. Alfisols, particularly those of the Mississippi River Delta region and other areas throughout the southern US, may have a greater potential for C sequestration compared to other soil orders. The study area is located in Alcorn State University, Lorman, MS (31°53'44.8"N 91°09'14.4"W) and the soil is largely classified as Natchez silt loams, 8 to 12 percent slopes as well as 0.3% Memphis silt loam, 5 to 8 percent slopes. The experiment has three treatments replicated four times under randomized complete blocks design. This study measured changes in soil active carbon and related soil properties of an alfisol (silty clay loam) under three animal manure treatments (cow manure, poultry litter and cow + poultry manures). Soil samples were collected, processed and are being analyzed for soil active carbon, aggregate stability, bulk density, and pH. Water infiltration will be conducted after harvest in the fall. Complete results of the study will be presented at the meeting.

O13.13

1:45 DENSITY DEPENDENCE IN CULEX QUINQUEFASCIATUS AND AEADES AEGYPTI LARVAE

Jaelyn Everly, Donald A. Yee

The University of Southern Mississippi

Aedes aegypti and *Culex quinquefasciatus* are two container-breeding species of mosquitoes that are of large medical importance in the United States. *Aedes aegypti* is the vector of diseases including Zika, chikungunya, and dengue, while *Culex quinquefasciatus* is the vector of West Nile virus and St. Louis encephalitis. In the hopes of contributing knowledge that might help control the population sizes of these medically detrimental mosquitoes, I conducted an experiment to explore the link between larval density and mosquito success, which was measured using development time, survival rate, and mass of adult mosquitoes. I hypothesized that *Culex quinquefasciatus* would experience high levels of success in higher densities while *Aedes aegypti* would experience high levels of success in lower densities. The results of

this experiment will expand our understanding on the factors that affect mosquito development and will hopefully pave the way to finding better methods of controlling the population sizes of medically important mosquitoes in the future.

O13.14

2:00 OPTIMIZING CELL CULTURE CONDITIONS FOR THE ISOLATION OF INFLUENZA D VIRUS (IDV)

Makayla Wiley, Suresh Kuchipudi, Archie C. Taylor

Department of Veterinary and Biomedical Sciences, Pennsylvania State University, University Park, PA., Department of Biological Science, Alcorn State University

Abstract: Influenza D virus (IDV) is a newly found member of the Orthomyxoviridae family. The virus was first discovered and isolated from a clinically ill pig in 2011. It has been identified in other species including cattle, goats, and sheep. A standardized laboratory method has not been established for isolation and cultivation of IDV. The aim of this research is to establish a cell culture system to cultivate IDV which will be useful to isolate IDV and to obtain optimum titer of IDV for further downstream experiments involving the virus. Five different cell lines including ST, MDCK, HRT-18G, MDBK, and A549 were evaluated for optimum IDV replication. Virus replication was assessed by quantifying IDV PB1 gene in cell culture supernatants by qRT-PCR. After determining the top cell lines with optimum IDV growth, six different media types were studied to determine which media and reagents would provide optimum growth of IDV. HRT-18, MDCK, and ST cells were the top cell lines that displayed high viral production. HRT-18G and MDCK cells reached the maximum viral growth after three days, but IDV grew slower in MDCK cells. After media comparison, there was still slow viral growth in MDCK. In medias DI, DIT, UC, and UCT, majority of the ST cells were dead after Day 5 post-infection. Viral production of 1.3×10^7 was reached in HRT-18G cells in DFT media after only three days post-infection.

2:15 Divisional Meeting

Thursday, February 21, 2019

EVENING

3:30 **Dodgen Lecture and Awards Ceremony TCC Theatre**
General Poster Session
Immediately Following Dodgen Lecture
TCC Ballrooms 3rd floor

P13.01

INCORPORATION OF METALS IN TERMITE MANDIBLES IN THE NEW WORLD

C.B. Smithhart, A.R. Spiers, J.W. Dean, C.B. Manor, L.F. Rapisarda, N.M. Schiff, and E.S. Green

Delta State University, Cleveland, MS

To facilitate feeding on hard woods, it has been observed that some termites, largely from Asia and Australia, reinforce the cutting-edge of their mandibles with metals. In this study, we describe the same phenomenon in New World taxa. We analyzed primary X-ray emissions using a JEOL JSM-6010Plus/LA Scanning Electron Microscope (SEM) equipped with a silicon-drift (SD) chamber Dry EDS detector to compare metal content found at the cutting edge of the mandibles versus more central regions. We examined over 20 species of New World termites and found that some species did incorporate metals (zinc and manganese primarily) at the cutting-edge and that these species were restricted to the family Kalotermitidae, commonly known as the drywood termites. These

results are consistent with the Old World observations. Kalotermitid species feed on extremely dry, hard wood where the presence of reinforced mandibles would be beneficial.

P13.02

A PRELIMINARY STUDY ON IMPACT OF HYBRID BIOLOGICAL LABORATORIES ON COLLEGE STUDENTS' ACHIEVEMENTS, APTITUDES AND ATTITUDES

Shavonda McDaniel

Alcorn State University

Online courses operate differently than traditional courses, thus they require teaching techniques and assessment techniques specifically geared for this educational experience. Because distance-education and internet-based learning are no longer novel concepts in the science field, many biology programs have designed courses to be taken online or hybrid. A number of empirical studies have been highly influential regarding the impact and effects of educational technology in regard to virtual laboratories. However, very few studies focus on the impact of hybrid laboratories on student achievement or measure students' satisfaction of biology hybrid labs. The focus of this study is to begin the process of providing an objective and subjective analysis of findings of the impact of biological hybrid laboratories on student learning at the collegiate level. With the increase in number of colleges and universities offering hybrid courses, it is important to conduct research on the effectiveness of hybrid laboratory courses before a widespread of adoption occurs. Students' course averages will be used to measure achievement, pre-test and post-test scores will be used to measure aptitudes, and in-person interviews will be used to measure degrees of attitude. The information acquired will help determine the feasibility of replacing traditional and virtual labs with the new and emerging hybrid biological lab.

P13.03

WATERSHED CHARACTERIZATION OF THE PEARL RIVER BASIN OF THE EASTERN GULF COASTAL PLAIN, SOUTHEASTERN UNITED STATES

Ameer Baker, Antonio Williams, Mark A. Dugo

Mississippi Valley State University - Biology

Mississippi Valley State University - Environmental Health

The Pearl River drainage is a relatively large river basin draining into the Gulf of Mexico. The Pearl River comprises the third largest basin in Mississippi and encompasses approximately 22610.6 square kilometers that span 23/24 Mississippi counties and three Louisiana parishes. In 2015, the American Rivers advocacy group listed the Pearl River as the 10th most endangered river system in the continental United States. To aid prospective Ecosystem Based Integrated Strategies and Integrated Watershed Management strategies for the Pearl River, we characterized the entire basin according to the Clean Water Act's 303(d) and Total Maximum Daily Load (TMDL) framework. Data sources for our analysis included the EnviroAtlas web GIS mapping tool and Google Earth mapping of 303(d) shape files. The 303(d) and TMDL system provides a point of reference for managing impaired waterways. The most extensive reaches of impaired waterbodies in the Pearl River Basin include the Strong River, the lower Pearl River near Bogalusa and the Bogue Chitto River. The Pearl River is within the native range for multiple threatened and endangered aquatic species including, freshwater mussels (i.e. the Delicate spike and the Inflated heelsplitter), fishes (i.e. Gulf sturgeon, Alabama shad, Ironcolor shiner, Frecklebelly madtom, Crystal darter, and the Pearl darter) and an aquatic turtle (the Ringed Map turtle), whose status' collectively range from extirpated to rare to locally common. The characterization that we present should aid advocacy efforts that prioritize the equitable and sustainable delivery of ecosystem

services within the Pearl River.

P13.04

CYTOTOXIC ACTIVITIES OF METHYL LINOLATE IN HCT-116 CELL LINE

Charity Davis, Daniel Oyugi

Mississippi Valley State University

Colorectal cancer is the third leading cause of cancer-related deaths among men and women in the United States. It is estimated that over 140, 250 new cases will be diagnosed in 2018. Although numerous drugs and other treatment options have been directed to cure the cancer, these treatments are normally accompanied by serious side effects. Therefore, new treatment options are necessary. In this study, cytotoxic activities and apoptotic induction of Methyl linolate, a secondary metabolite in *Vernonia amygdalina* (VA) was investigated in colorectal cancer cell line HCT-116, in vitro. Cell viability was tested using MTT assay. Apoptosis was measured using Vybrant Apoptosis Assay Kit. Further, examination of expression levels of pro-apoptotic proteins were conducted using Immunoblotting. Our results show that Methyl linolate inhibits cell viability in a dose-dependent manner, with higher concentrations (1mM-10mM) eliciting greater inhibition (83-94 %) relative to control, compared to lower doses (0.001mM-0.1mM) that showed a 29-52% inhibition. Apoptosis assay revealed marked nuclear fragmentation, chromatin condensation and DNA fragmentation. Expression of pro-apoptotic proteins suggested DNA damage. These results suggest that Methyl Linolate inhibits growth and proliferation of HCT-116 cells by causing DNA thereby inducing apoptosis. Although further work is necessary, these results demonstrate the therapeutic potential of Methyl linolate in colorectal cancer.

P13.05

INHIBITORY EFFECTS OF ERGOSTEROL ON MULTI-DRUG RESISTANT PROTEINS IN HT-29 CANCER CELLS

Kayanna Burks, Daniel Oyugi

Mississippi Valley State University

Colorectal cancer is the third leading cause of cancer-related deaths among men and women in the United States. It is estimated that over 140, 250 new cases will be diagnosed in 2018. Although numerous drugs and other treatment options have been directed to cure the cancer, these treatments are normally accompanied by serious side effects. Therefore, new treatment options are necessary. In this study, inhibition of multidrug-resistant proteins by Ergosterol, a secondary metabolite in an edible herbal plant, *Vernonia amygdalina* (VA), was investigated in colorectal cancer cell line (HT-29), in vitro. Suppression of Multi Drug Resistant Proteins (MRPs), ATP-Binding Cassette (ABC), P-glycoprotein (P-gp) and Breast Cancer Resistant Proteins (BCRP) in HT-29 cells. P-glycoprotein, ATP-binding Cassette, and BCRP were examined using Real-time polymerase chain reaction (RT-PCR), gel electrophoresis and immunoblotting. Our results show that Ergosterol inhibits expression of drug-efflux transporters in a concentration-dependent fashion. Compared to control, Ergosterol treated cells showed faint or no protein bands of ATP-Binding Cassette (ABC), P-glycoprotein (P-gp) and Breast Cancer Resistant Proteins (BCRPs). These results show the potential role of Ergosterol as bioavailability-promoting drug in colorectal cancers.

P13.06

THERMODERMIC LACTOCOCCUS LACTIS SS LACTIS FROM CAMEL MILK

Eurielle Njofang Nkamssi, Jim Yen, John Piletz

Mississippi College

Introduction: Camel milk is known to have medicinal qualities. One of its qualities is related to a complex oligosaccharide, indigestible

by human enzymes, a pentasaccharide known as medalose (Gangwar et al, 2018). It has been thought that only bacterial β -glucuronidase activity coming uniquely from enteric *Escherichia coli* and closely related to Enterobacteriaceae can metabolize these carbohydrates and lead to their beneficial actions. Pasteurized camel milk in comparison to cow's milk had many more thermotolerant surviving colonies, which we analyzed. Methods: Fresh raw unpasteurized milk was collected and transported on ice from a camel dairy in Pelahatchie, MS, and from a cow dairy in Philadelphia, MS. Milk was vortexed and treated aseptically; half pasteurized for 30 minutes at 72° and half remained unpasteurized. Serial dilutions were performed with broth that cultures lactose metabolizers (MRS broth) and plated on MRS agar plates. Single colonies were isolated by repeated streaking and re-plating on BUG agar. Four identical colonies were analyzed, two from pasteurized and two from raw milk, in IF-A media overnight using the 96-well plate Gen III 2_6_1_08.15G system (Biolog). Results: No bacterial colonies grew from pasteurized cow milk, but there arose a consistent white colony thermotolerant from pasteurized camel milk. Such were identified with 0.76 probability as *Lactococcus lactis* ss *lactis*, however differing from all known milk members of this species by ability to metabolize glucuronide and gluconate. Discussion: It is suggested camels possess a unique thermotolerant *Lactococcus* that may correspond with their unique oligosaccharides and adapted to hot climates.

P13.07

METABOLIC DISORDERS AND CANCER DISPARITY AMONG AFRICAN-AMERICAN POPULATION IN THE UNITED STATES

Sofia Ievleva, Callie Steward, Cardarius Lloyd, Azad R Bhuiyan, Archie Taylor, Voletta Williams, Debarshi Roy

Alcorn State University

Health disparities in different ethnicities in the United States are associated with various factors including high-calorie diet, lack of access to health insurance, lack of health education and genetic diversity. Cancer disparities are also evident among different ethnic groups. Recent studies suggest that metabolic alterations could trigger oncogenic pathways and promote tumorigenesis. Diabetes and obesity are two metabolic conditions which affect the glucose metabolism, lipid metabolism and immunological responses. Cancer epidemiological data reflects that the African-American population suffers from a higher incidence rate (~1.2 fold, ACS, 2017) and mortality rate (~1.4 fold, ACS, 2017) of colorectal cancer (CRC) compared to Caucasian population. African-American population is also experiencing a 1.8 fold higher incidence rate of diabetes (American Diabetes Association, 2018) and 1.4 fold higher incidence rate of obesity (CDC, 2017) compared to the white population. South-eastern states in the USA including Mississippi, Louisiana and Alabama has a higher African-American population (37%, 32% and 25% respectively, ACS) compared to overall US statistics (12.1%); these states have an elevated incidence and mortality rate of CRC with an increased number of diabetic and obese population. These data indicate a possible association between cancer and metabolic diseases in African-Americans. The future goal of our group is to unravel the complicated mechanisms by which this altered metabolism is interconnected to cancer development in an in vitro and in vivo model. The proposed work will help us to identify novel drug targets for cancer therapeutics which will further minimize the health disparities in the US.

P13.08

A STUDY OF METABOLIC RATES OF *CARASSIUS AURATUS* (GOLDFISH) AND *MOENKHAUSIA SANCTAEFILOMENAE* (REDEYE TETRA) AT ROOM TEMPERATURE

Kenyotta White and Julius O. Ikenga

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All living organisms perform several chemical processes at cellular level that enable them to survive in their environments. In this research, we used two species of fish to study the rates of metabolism at room temperature, using the indirect respirometry. *Carassius auratus* (goldfish) is a freshwater carp native to East Asia where it has been selectively bred for more than a thousand years in China. *Moenkhausia sanctaeofilomenae* (redeye tetra) is a tropical and subtropical freshwater fish native to South America. Both fish species are commercially marketed for aquarium display in homes, commercial and public establishments. Each fish species used in this research had a body volume of one milliliter. End-point titration data generated were adjusted with control data and used to calculate fish metabolic rates (mRs) in $\mu\text{M CO}_2/\text{mL/hr}$. *C. auratus* at 72° and 73° F showed mRs that ranged from 5.5 to 12.5 $\mu\text{M CO}_2/\text{mL/hr}$ while *M. sanctaeofilomenae* recorded 4.5 to 8.5 $\mu\text{M CO}_2/\text{mL/hr}$ at the same temperatures. Mean mRs at 72 and 73° F were 8.92 $\mu\text{M CO}_2/\text{mL/hr}$ and 6.75 $\mu\text{M CO}_2/\text{mL/hr}$ for *C. auratus* and *M. sanctaeofilomenae*, respectively. A similar study at different temperatures is recommended.

P13.9

EFFECT OF SELENIUM ON HONEY BEE GENE REGULATION AND SURVIVORSHIP

Kristina Smith, Mohamed Alburaki, and Shahid Karim

University of Southern Mississippi, Hattiesburg, MS

The honey bee *Apis mellifera* L. is a major pollinator indispensable for agriculture production and the ecosystems. Bee populations are currently in decline due to factors that affect their health and survival. Honey bees provide products which have beneficial medical applications such as honey, venom and propolis that provide a source of anti-inflammatory agents, antioxidant, and stimulates immunity. Selenium (Se) is a metalloid easily found in the soil and flowers of the environment. Although this element is considered a micronutrient, higher concentrations can be toxic and induce harmful behavioral and physiological effects to honey bees. In this study, we tested the effect of Se-enriched diets on honey bee behavior, determined lethal concentrations of Se for honey bees, and examine the transcriptional expression of antioxidant genes in honey bee. One-day old bees were fed varying concentrations of Se through tainted sugar syrup for 8 days. Syrup consumption and bee mortality were recorded for each concentration. Samplings of ten bees were collected every two days during experimentation. RNA extractions were performed on those samples at different tissue levels, and antioxidant genes were studied using qRT-PCR. Our results showed that selenate is more toxic to bees than selenite at similar concentrations. Selenate concentrations (60, 600) $\mu\text{g/mL}$ are lethal and killed all bees within 24 hours, while bees survived (6, 0.6) $\mu\text{g/mL}$ concentrations during experimentation. Catalase was down-regulated in bee heads at day 2 of exposure to Selenate, and up-regulated in their thorax only at day 8. Analysis of other genes are still ongoing.

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Hathcock, Lee	Murphy, Nickolas	Smith, Avaionia
Hendon, Jill M.	Ottis, Stephanie	Smith, Randy
Hiroji, Anand	Phillips, Nicole M.	Tuluri, Francis
Hode, Laura Elizabeth	Poulakis, Gregg R.	Wickrmarathna, Sudeera
Hunt, Mallory Price	Rakocinski, Chet	Wiggert, Jerry
Lehman, Ryan N.	Reddy, Remata	Willett, Kristine L.
Lu, Yuehan	Sasidharan, Sankar Manalilkada	Zhang, Likun

MATHEMATICS, COMPUTER SCIENCE AND STATISTICS

Akkem, Abhishek Yadav	Huery, Jabria	Santiago, Kevin Medina
Barber, Shaniqwa	Joy, Jerrion	Seals, Cheryl
Bassy, Robertson	Lei, Bin	Shukla, Indu
Caldwell, John	Li, Xinxiang	Steihaug, Trond
Clemmer, John S.	Marapareddy, Ramakalavathi	Thompson, Davis S.
Dangal, Thir	Neupane, Sajjal	Waters, Kyanie
Gates, La'Andrea	Nwaka, Kizito	Williams, Arian
Haque, Sardar Anisul	Patel, Reena R.	Wright, Koran
Hester, Robert L.	Pruett, W. Andrew	Wu, Xiaoqin
Hossain, Shahadat	Riley, Jarvis	
Hu, Qingwen	Riveros, Guillermo A.	

PHYSICS AND ENGINEERING

	Claudio, Pier Paolo	Johora, Fatema Tuz
Ables, Patrick	Cobb, Jared S.	Jones, Yolanda K
Acharya, Mukunda	Coleman, Justin	Jones, Yolanda
Arnoldus, Henk F.	Cox, Patresa	Jones, Daryl
Atta-Fynn, Raymond	Dai, Qilin	Khan, Mohammad Ashraf
Bakhytkhanuly, Kereikhan	Davenport, Taneshia L.	Kim, Donghoon
Bassou, Randa	De Carlo, Flavia	Kulkarni, Sumeet
Biswas, Parthapratim	Dick, Joelle	Limbu, Dil K.
Bonds, Jemeria	Duggar, William Neil	Lucas Jr., Eric D.
Bridges, Kiera	El Mellouki, Mohammed	Mallett, Aireyunna
Brinkley, Frank	Fan, Xudong	Marapareddy, Ramakalavathi
Brooke, Bell	Gautrau, Sidney	Moong, Lan Tai
Bryson, Jaunna	Gonzalez, Alex	Nag, Gaurav
Bukovec, Klavdija	Griffin, Mia A.	Nguyen, Nancy
Cavaglia, Marco	Howard, Candace M.	Nunna, Krishna Chaitanya
Chen, Weitong	Janorkar, Amol V.	Panta, Anil



Paudel, Durga	Rupak, Gautam	Varney, Elliot T.
Pilgrim, BB	Ryker, Kyle	Winstead, Chris
Pradhan, Nihar	Sen, Chirantan	Xu, Zhangjin
Premarathna, Pradeepa	Shih, Hui Ru	Yang, Shan
Priddy, Lauren B.	Simpson, C. LaShan	Yasarer, Hakan
Reese, Tyler	Singh, Anant K	Zhang, Likun
Reeves, Kari-Babski	Smith, Ashley	Zhang, Ying
Roark, Jonathan	Syam, Rajarshi	
Rogers, William	Vance, Ryki	

PSYCHOLOGY AND SOCIAL SCIENCES

Anestis, Joye C.	Finn, Jacob A.	Long, Jonnette
Banerjee, Santanu	Floyd, Paula N.	Munir, Abigail
Barry, Chris	Gilkey, Kawanna	Patterson, Shekyah
Barry, Christopher T.	Herring, Whitney	Randle, Wisdom
Bates, Ze'ronte	Hill, Courtney	Robinson, Shalen
Besecker, Megan	Holliman, Zarius	Rodriguez, Taylor R.
Boler, Deja	Hunter, Fredrick	Rose, Shantwana
Brunet, Nicolas	Jones, Tia	Rozman, Stephen
Bullerjahn, Margaret R.	Jwainat, Alex	Sanders, Julisia
Burns, Lauren C.	Khan, Shaila	Sandridge, Shanda
Charles, Nora E.	King, Krista	Sigurdson, Lydia
Chi, Jinhao	Kinkaid, DaChawn	Simpson, LaQuitta
Chong, Gary	Laiju, Meherun	Sneed, Houston
Conway, Dakota	Lanciers, Sophie	Stringer, Laurel
Crevitt, Jessica	Lim, Crystal S.	Swygert, Latisha
Edwards, Carolyn	Lin, Sallie	Thomas, Alexandria

SCIENCE EDUCATION

Ali, Laila	Fadavi, Mehri	Lambert, Joella
Barnard, Marie	Funkhouser, Austin	Lanier, Sarah L.
Buford, Kendrick	Gordy, Xiaoshan Z	Lee, Shana
Carlton, Caleb	Hagey, Travis	Leesburg, Jessica
Cho, Youngwoo	Herron, Sherry	Mattox, Johnny L.
Clary, Renee M.	Howard, Barbara L.	McKone, Kathy
Compretta, Caroline E.	Hutton-Prager, Brenda	Mead, Louise
Cook, Jhah	Iverson, Caroline	Meyer, Edgar R.
Dehon, Erin	Jackson, Toni	Meyer, Madison
Didlake, Ralph	Johnson, Miracle	Notebaert, Andrew
Dugo, Mark A.	Khan, Abu O	Prewitt, Elizabeth
Durham, Isabella	Klink, Vincent	Rockhold, Rob
Elasri, Mohamed	Knight, Alexander	Shaw, Joyce M.



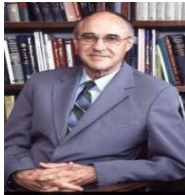
Smith, M. Cade	Thompson, Shelley	Warwick, Alexa
Stray, Stephen	Truax, Kelly	Wilder, Carmen
Sullivan, Donna	Walker, Imani	
Taylor, Juanyce	Walker, Ryan	

ZOOLOGY AND ENTOMOLOGY

Abbas, Hamed K.	Ievleva, Sofia	Shift, NM
Acholonu, Alex D. W.	Ikenga, Julius O.	Smith, Kristina
Alburaki, Mohamed	Ikenga, Angela	Smithhart, Charles B.
Alto, Barry	Jackson, Sharkiesha	Spiers, AR
Baker, Ameer	Karim, Shahid	Steward, Callie
Bellamy, Shawna	Kibet, Leonard	Sweet-Coll, Daniela
Bhuiyan, Azad R	Kostyleva, Elena	Taylor, Archie
Bonds, Ashley	Lloyd, Cardarius	Valentine, Vennessa
Burks, Kayanna	Mackey, Nicole	White, Kenyotta
Chukwuma, Franklin	Manor, CG	Williams, Antonio
Davis, Charity	Mrema, Frank	Williams, Voletta P.
Dean, Catherine L	Nelsen, Joseph	Yee, Donald A.
Dean, JW	Nkamssi, Eurielle Njofang	Yen, Jim
Dobrynin, Nikolay	Oyugi, Daniel	
Dugo, Mark A.	Paige, Andrew	
Everly, Jaclyn	Piletz, John	
Green, ES	Rapisarde, LF	
Heard, Sarah Elizabeth	Reyes-Torres, Limarie J.	
Hunter Jr., Frederick L.	Roy, Debarshi	

MAS Past President's Corner

32nd MAS President Dr. Arthur Guyton (1968) inducted into the Mississippi Hall of Fame



Dr. Arthur Clifton Guyton, was a native of Oxford, Mississippi, and graduated from the University of Mississippi, and completed his medical degree at Harvard Medical School. Dr. Guyton served as chair of physiology at the University of Mississippi Medical Center for 41 years and was the author and publisher of the first edition of a Textbook on Medical Physiology. The textbook is now in its 13th edition and has been translated into 22 languages and is still widely used. He was the inventor of the first motorized wheelchair controlled by a joystick. He was an active member of MAS, and he and his students were regular contributors to the Academy program. In addition to having served on various committees of the Academy, he served six years on the MAS Board of Directors and one term as President in 1968. Fifteen years after his death he was honored for his achievements by the Mississippi Department of Archives and History.



75th MAS President Dr. Mohamed Elasri (2011) receives \$19 Million from NIH for Mississippi INBRE

The renewal of a \$19 million grant for the next five years from the National Institute of General Medical Sciences (NIGMS) will allow Mississippi researchers and students to continue to enhance biomedical research in the state through the Mississippi INBRE program. Mississippi IDeA Network of Biomedical Research Excellence (INBRE), housed at The University of Southern Mississippi has brought in more than \$70.6 million since its inception in 2001



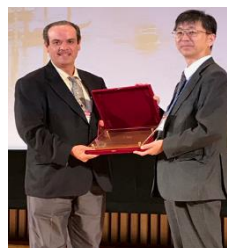
81st MAS President Dr. Sukumar Saha (2017) discovers (Patented) RNAi-Phytochrome- a cotton line with early flowering, high yield, and superior fiber qualities.

Dr. Sukumar Saha is currently working as a Research Geneticist with the Genetics and Sustainable Research Unit, USDA/ARS, Mississippi State, MS. He is internationally recognized as an authority in cotton genomics and cytogenetics. He has developed genetic resources used by the scientists all over in the world.



68th MAS President Dr. Ham Benghuzzi (2004) Elected President of ISCM

Dr. Benghuzzi is a Professor at the *University of MS* Medical Center and current MAS executive director. He is known nationally and internationally as a pioneer in Ceramic Drug Delivery Systems. He is a fellow of the American Institute for Medical and Biological Engineering (AIMBE) as well as an International Fellow of Biomaterials Science and Engineering (FBSE). He was elected president of the International Society of Ceramics in Medicine (ISCM/Bioceramics).



Dr. Chikara OHTSUKI transfers ISCM Presidency to Dr. Ham Benghuzzi during Annual convention in Nagoya, Japan (October-2018)

In Memoria



MAS/Health Science Division extends condolences to the Family, Friends and Colleagues of Dr. Raymond John Grill, Neuroscientist, who died of heart attack on May 30, 2018 at the age of 52. Ray was an Associate Professor in the Department of Neurobiology and Anatomical Science, at the University of Mississippi Medical Center, Jackson, Mississippi. Ray served as a Co-Vice and then Co-Chair for the Health Science Division from 2016-2018.

Ray a native of Ohio, received his PhD. in Anatomy and Cell Biology from the University of Cincinnati in 1995, then post-doctoral training from University of California, San Diego, 1995-1999, in the laboratory of Dr. Mark Tuszynski, where he carried out some of the earliest studies on trophic effects of neurotrophin-3 (NT-3) on corticospinal tract regeneration. In 1999, he accepted a faculty position at the University of Texas Health Sciences Center, Houston, where he remained for sixteen years. In 2015, he moved to the University of Mississippi Medical Center (UMMC), and settled in quickly as an educator and researcher. Ray's studies focused on determining the evolution of the acute-to-long term mechanisms that shape the environment of the spinal cord following trauma. Specifically, he was exploring the question of what makes the injured spinal cord so resistant to the development of effective treatments. His studies have suggested that spinal cord injury creates an environment that mimics chemotherapeutic resistance observed in many forms of cancer. In addition, his laboratory was also focused on a similar pathological mechanisms that may influence both traumatic brain injury (TBI), as well as amyotrophic lateral sclerosis (ALS). He was an incredibly hard worker, and because of his passion for ALS research, he got involved with ALS fundraising campaigns with the ALS Association.

Through many collaboration, he hoped to create a novel translational research group at UMMC to tackle issues associated with CNS trauma and disease from basic bench work through pre-clinical assessment all the way to clinical trials. He hoped to establish research program to explore whole body responses to CNS trauma including fertility, metabolic dysfunction, gastrointestinal damage and neuropathic pain.

In addition to maintaining an active research program, Ray was an outstanding mentor to his students and post-doctoral fellows. Sydney Vita, PhD student in Ray's laboratory, wrote: *"Ray had a long-time habit of spending hours in the lab chatting about papers, his experiences at study sections, which enabled us to absorb a tremendous amount of knowledge about science and how to be effective academic scientists"*. Sydney quoted: *"We knew about indirect costs, who our program officers were, and how to (and how not to) write an effective grant"*.

Since 2001, Ray's research was funded by multiple institutions and agencies including, NIH, Department of Defense, the Veterans Administration, the Muscular Dystrophy Association, the Craig H. Neilson Foundation, Wings for Life, the Amyotrophic Lateral Sclerosis Foundation, the Paralyzed Veterans of American Research Foundation, the TIRR Foundation, and the Christopher Reeves Paralysis Foundation. Ray received numerous distinguished awards throughout his sadly cut short academic career. He was member of Mississippi Academy of Sciences, Society for Neuroscience and National Neuro-trauma Society.

Ray was gifted with a profound humor. This humor helped him cope with his ALS perhaps the same way he had approached life with a joyful attitude.

Those wishing to honor Ray's legacy, please consider making a donation to ALS Association-Louisiana-Mississippi Chapter.