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EIGHTY-FOURTH ANNUAL MEETING

February 20-21, 2020

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Biloxi, MS

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GENERAL SCHEDULE

MISSISSIPPI ACADEMY OF SCIENCES
Eighty Fourth Annual Meeting
February 19-21, 2020

WEDNESDAY, FEBRUARY 19, 2020

TIME	EVENT	LOCATION
3:00 PM to 6:00 PM	Registration	Lobby
5:30 PM to 9:00 PM	Board of Directors Meeting/Dinner	TBA

THURSDAY, FEBRUARY 20, 2020

Thursday	***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.	Oral Presentations D2	Oral Presentations D12	Oral Presentations Session I D6	Oral Presentations D3		
9:00 a.m.					Oral Presentations D5	Oral Presentation D11
10:00 a.m.		Oral Presentations D12	Oral Presentations D6			Population Health Symposium I D11
11:00 a.m.						
12:00 p.m.	General Session	General Session	General Session	General Session	General Session	General Session
1:00 p.m.	Divisional Poster Session Poster Area	Oral Presentations D12	Divisional Symposium D6		Guest Speaker D5	Workshop D11
2:00 p.m.		Workshop D1	Oral Presentations D6		Oral Presentations, Awards Ceremony D5	
3:00 p.m.						

THURSDAY, FEBRUARY 20, 2020

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.						Oral Presentations D4	
9:00 a.m.	Oral Presentations D10	Visit the Posters	Oral Presentations D8	Oral Presentations Session I & II D7	Oral Presentations D9		Poster Session
10:00 a.m.							
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.	Oral Presentations D10	Oral Presentations & Business Meeting D3	Workshop D8	Oral Presentations Session III D7	Oral Presentations D9	Workshop With Cell and Molecular D1	Oral Presentations D2
2:00 p.m.							
3:00 p.m.							

	Dodgen Lecture & Presentation of Awards
4:00 p.m.	
5:00 p.m.	Reception & Poster Session

Friday, February 21, 2020

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.		Oral Presentations D12	**Oral Presentations Session V**		Oral Presentations 8:00-12:00 p.m. & 1:00-2:00 p.m. D5	Oral Presentation Session IIA D11 Oral Presentation Session IIIB D9
9:00 a.m.	Symposia Awards Ceremony & Business Meeting D2	Awards Ceremony & Business Meeting D12				
10:00 a.m.		Oral Presentations D12	Oral Presentations Session VI *D6* Oral Presentations *Session VII* D7			Population Health Workshop D11
11:00 a.m.			Business Meeting & Awards D6	Field Trip		High School Poster Session

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.							
9:00 a.m.	Divisional Keynote Address D10		Oral Presentations D8			Oral Presentations D4	
10:00 a.m.	Oral Presentations D10						
11:00 a.m.	Businees Meeting at 12:45 D10					Mini Symposium D4	

12:00 p.m.	Plenary Speaker Sponsored by Millsaps and Mississippi INBRE
1:00 p.m.	Millsaps Undergraduate Symposium D8 Mississippi INBRE Graduate Symposium D12

Mississippi Gulf Coast Convention Center
Biloxi, MS 39531

DRIVING DIRECTIONS

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

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

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

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

Take exit 59 for US 98 E towards Lucedale/Mobile

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

Merge onto I-49 South

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

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

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

Take exit 29 A Onto I-12 East toward Slidell

Take Exit 38 toward MS 605

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

Continue on US 49 South toward Jackson, Hattiesburg, Gulfport

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If Coming from the Univeristy of Mississippi on MS 6 E/US-278E:
Take I- 55MS 7 in Grenada County South to Jackson

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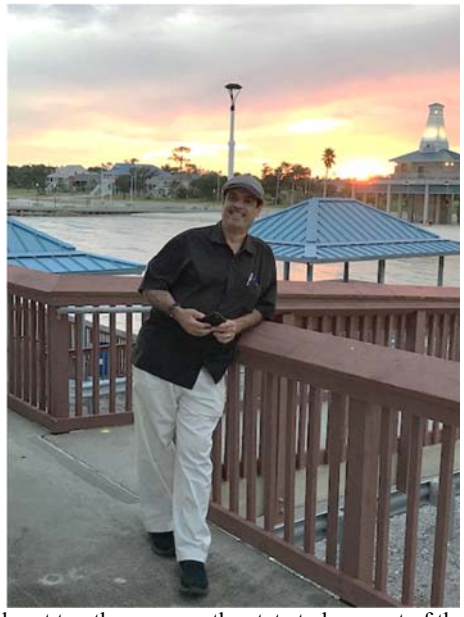
MISSISSIPPI STATE UNIVERSITY OFFICE OF RESEARCH AND ECONOMIC DEVELOPMENT

The Executive Director's Column

Ham Benghuzzi, Ph.D., FBSE, FAIMBE



This year marks our 84th Annual Meeting for the prestigious Mississippi Academy of Sciences (MAS). In preparation for the upcoming meeting, we have been watching the activities that occur on a daily basis, and I realized that most people take for granted all of the volunteer work that goes into making this event happen. The theme definitely is **TEAMWORK.** I believe that our team begins with each member, author, and each division organizers. Our organization has thirteen distinct divisions and our membership fluctuates between 600-1000 faculty, scientists and students. Ask yourself this question: "what is a team without outstanding and competent leadership?" I think we all know the answer to that….failure. The success of our academy can be seen at every level and we are growing our team. The exciting news is that our academy is progressing exponentially at all levels. That includes an increase in the number of projects to be presented, the quality of original research, the participation of world-renown speakers, the diversity and inclusive environment…to name just a few. The abstract submissions for this year exceeded the submissions of the last five years. I want to take time to thank all of Division Chairs, Co-Chairs and program committees for all of their exceptional efforts. Their tremendous role starts with a call for abstracts, acting on abstracts, developing division program and communicating with authors. At the end of their term, they are involved in recommending strong leader that MAS feel has the potential to think about what is needed for the division (workshops, invited speakers, areas that are hot and need debate) and are willing to start early to coordinate the events for next year and to reach out to others across the state to be a part of their team.

I want to recognize the council, board members, chairs of standing committees and staff whom they contribute hours of hard work throughout the year. Also, I wanted to extend our gratitude to the continued support that we received from our sponsors, symposia speakers, as well as exhibitors. Special thanks to our major sponsor, Mississippi-INBRE and its director Dr. Moe Elasri.

The MAS annual event is considered the largest gathering of active researchers among scientists, faculty, and students in the state. Traditionally, the achievements of its members are recognized at various categories (see awardees in Journal Issue/Msacad.org). I hope you will enjoy the annual meeting and once again, remember that it takes a team to fulfill our mission and let us all try to work together as one team to further increase the awareness of science and engineering research in our state.

2020 Division Chairs, Fall Board Meeting

MISSISSIPPI ACADEMY OF SCIENCES AWARD WINNERS 2020

Contribution to Science

K. Raja Reddy, PhD

Dr. K. Raja Reddy is a Research Professor in the Department of Plant and Soil Sciences at Mississippi State University. He is an accomplished researcher in the realm of agricultural science, a respected teacher and mentor to many, while also a leader among his peers.

Dr. Reddy was born in the southeastern region of India and grew up on a family farm where his father and brothers produced peanuts, rice, and sugarcane while also raising cattle, sheep, and goats in the semiarid environment. Being the first college graduate of seven siblings, Dr. Reddy wanted to become a role model for many students back home and from across the world. He selected Mississippi State as the best opportunity to advance professionally, where he quickly established a successful research program in plant physiology in the nation.

Dr. Reddy's research interests include the impact of anthropogenic climate change, remote sensing, and crop modeling applications on agricultural resource management through the lens of environmental plant physiology. He has over 30 years of research experience at Mississippi State and is responsible for and credited with many critical discoveries across multiple facets of agriculture. His research includes the impact of climate change on crop physiology, growth, and development of several food, fiber, and native grassland s and forage crops of global importance, cotton, soybean, rice, corn, sorghum, peppers, sweet potato, switchgrass, Bahia grass; remote sensing and stress physiology; and crop model applications.

Dr. Reddy is the author of over 300 publications, including two edited books, 30 book chapters, and 175-refereed journals with an i10 Index of 145. In addition to his research obligations, he developed a capstone graduate-level course, "environmental plant physiology," that interfaces research, teaching, and learning based on research work he conducted using state-of-the-art sunlit plant growth chamber facilities at Mississippi State. Dr. Reddy has received several recognitions and awards: Fellow of the Crop Science Society of America and the American Society of Agronomy; the Southeastern Conference Faculty Achievement Award, the Ralph E. Powe Award, the Highest Research Honor at Mississippi State University; and the Outstanding Research Award in Cotton Physiology, presented by the National Cotton Council of America. He has trained over 36 visiting and 15 postdoctoral scientists and 24 graduate students (15 Ph.D. and 9 MS) from across the world in multiple areas such as crop stress physiology, climate change, crop modeling, remote sensing, and global food security.

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

Dudley Peeler Award
Contribution to the Mississippi Academy of Sciences

Kenneth R. Butler, Jr., Ph.D.

Professor

Dr. Kenneth R. Butler, Jr., of Brandon, Mississippi, is a scientist and educator. He has been involved in multiple epidemiological research projects at the University of Mississippi Medical Center's Gertrude C. Ford Memory Impairment and Neurodegenerative Dementia (MIND) Research Center since 2004 and in training physician assistants in basic sciences and evidence based medicine at Mississippi College since 2012. His student trainees include over 300 students in medicine, pharmacy, and other clinical health sciences completing the Master of Science in medicine, master of clinical investigation, the MD/PhD, residencies and fellowships in pharmacy, and clinical health sciences.

Dr. Butler's research work has appeared in a variety of regional, national, and international journals. He has authored or co-authored 75 peer reviewed scientific papers and presented 120 abstracts at conferences and meetings around the country. Dr. Butler has also been an active member of both intramural and extramural grant review teams for both national and international organizations. Dr. Butler has served as a board member and officer in the Mississippi Academy of Sciences and the Rocky Mountain Bioengineering Symposium. In 2014, he was elected a fellow of the AHA in the Council on Epidemiology and Prevention.

Dr. Butler is a life member of MAS and has served as chair of the Awards and Resolutions Committee since 2004. He has served the Academy in a number of capacities including vice-chair and later chair of the Health Sciences division from 2008-2010. He was elected to service as a member of the MAS Board of Directors in 2010 and had the honor of serving as President of the Academy in 2017.

Horizon Lifetime Achievement Award

Elgenaid Hamadain, PhD

Professor and Biostatistian

Dr. Hamadain obtained both his MS and PhD degrees from Mississippi State University in the area of Entomology/Toxicology/Statistics. He has held faculty positions at Jackson State University (JSU) and at the University of Mississippi Medical Center (UMMC). During his tenure at JSU he established and was director of an NIH funded Biostatistical Support Unit. As Director of the Core he provided statistical advice to faculty and graduate students within the College of Science, Engineering, and Technology. Dr. Hamadain joined the UMMC faculty in 2006 and has been instrumental in the development and implementation of the biostatistical core courses in the Clinical Health Science graduate program. He has served as the major advisor for 15 students and has been on the advisory committee for over 70 graduate students. He provides statistical advice on all aspects of experimental design, including sample size determination, probability and hypothesis testing, regression and correlation analysis, parametric and non-parametric analysis He has significant experience with data analysis using SAS, MINITAB, STATA, SPSS, and the Comprehensive Meta- Analysis software with particular emphasis on experimental design, factorial analysis, Factor Analysis, ANCOVA, logistic and probit analysis, survival analysis, and analysis of risk factors associated with diseases. Dr. Hamadain has conducted biostatistical educational workshops and seminars at local and state level meetings. His interests and publications are in the areas of outcome, epidemiology, analysis of health surveys, and meta-analysis research.

Outstanding Contribution to Health Disaprity and Diversty Research

Dr. Mohamed O. Elasri
Associate Dean for Research and Graduate Affairs

Mohammed O. Elasri currently serves as the Associate Dean for Research and Graduate Affairs, College of Science and Technology. Through his position he provides leadership for the college in advancing its research and graduate education missions, and integrating those missions with the strategic goals of the college and the university. In addition, he is the principal investigator and director of the state-wide Mississippi INBRE network. Dr. Elasri is responsible for oversight of biomedical research and the training of faculty and students at Mississippi INBRE Partner Undergraduate Institutions. Dr. Elasri efforts over the years has made a significant impact on advancing diversity at the University of Southern Mississippi and in all other higher education institutions in Mississippi. Each year, he arranges for 133 students to have an opportunity to participate in two programs that are designed to train and prepare undergraduate students in Mississippi to pursue advanced degrees in biomedical fields and health-related careers. These two programs are the Mississippi INBRE Research Scholars (MIRS) and the Mississippi INBRE Service Scholars (MISS). In addition to training students, he also coordinates the mentoring of faculty at undergraduate institutions to develop self-sustaining research programs by assisting them in establishing and equipping laboratories, submitting grant proposals, and mentoring students. The programs are designed to expose Mississippi students to areas of interests that they may not otherwise consider and will lead to a more diverse biomedical workforce in the state. Dr. Elasri also developed a partnership with an African-American non-profit organization, My Brother's Keeper, to enhance community-based outreach and research to target the health needs of Mississippians. This partnership was created to reach into underserved communities and inform, educate, and positively impact their quality of health. Dr. Elasri believes that through technical training and career advice we are developing biomedical research that has diverse perspectives that are essential for the advancement of science in general and in addressing health disparities in particular.

2020 Dodgen Lecture

Thursday, February 20, 2020 (3:30 PM)

Cell Biomechanics: Unlocking Determinants of Human Health and Disease

Given by

Gilda A. Barabino, Ph.D.

Gilda A. Barabino is the Daniel and Frances Berg Professor and Dean of The Grove School of Engineering at The City College of New York (CCNY). She holds appointments the in the Departments of Biomedical Engineering and Chemical Engineering and the CUNY School of Medicine. Prior to joining CCNY, she served as Associate Chair for Graduate Studies and Professor in the Wallace H. Coulter Department of Biomedical Engineering at Georgia Tech and Emory. At Georgia Tech she also served as the inaugural Vice Provost for Academic Diversity. Prior to her appointments at Georgia Tech and Emory, she rose to the rank of Full Professor of Chemical Engineering and served as Vice Provost for Undergraduate Education at Northeastern University. She is a noted investigator in the areas of sickle cell disease, cellular and tissue engineering, and race/ethnicity and gender in science and engineering. Dr. Barabino received her B.S. degree in Chemistry from Xavier University of Louisiana and her Ph.D. in Chemical Engineering from Rice University.

She is an elected member of the National Academy of Engineering and an elected fellow of the American Association for the Advancement of Science (AAAS), the American Institute of Chemical Engineers (AIChE), the American Institute for Medical and Biological Engineering (AIMBE) and the Biomedical Engineering Society (BMES). She is Past-President of BMES and Past-President of AIMBE. Her many honors include an honorary degree from Xavier University of Louisiana, the Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring and the Pierre Galetti Award, AIMBE's highest honor.

Dr. Barabino is a member of the National Science Foundation's (NSF) Advisory Committee for Engineering, the congressionally mandated Committee on Equal Opportunities in Science and Engineering, the National Academies Committee on Addressing Sickle Cell Disease and the National Academies Committee on Women in Science, Engineering, and Medicine. She has served on the National Institutes of Health's (NIH) National Advisory Dental and Craniofacial Research Council and the National Academies Committee on the Impact of Sexual Harassment in Academia. Dr. Barabino consults nationally and internationally on STEM education and research, diversity in higher education, policy, workforce development and faculty development. She is the founder and Executive Director of the National Institute for Faculty Equity.

ABSTRACT

Biomechanical properties of cells are important determinants of cell behavior and organ function in normal and disease states. Understanding the link between cell biomechanics and the delicate balance between human health and disease holds great promise for predicting disease onset and progression and for developing effective therapies. In the context of sickle cell disease, this presentation addresses questions of how biological processes lead to structural changes in the cell that are accompanied by changes in mechanical characteristics, how those changes influence disease state, and how therapeutic strategies can be developed and evaluated. Probing cell biomechanics for insights into the pathophysiology of disease has important implications for the treatment of individuals with sickle cell disease and individuals with other diseases that have a biomechanical basis.

Plenary Speaker

Louis Stokes Mississippi Alliance for Minority Participation (LSMAMP) Symposium

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

Thursday, February 20, 2020 Noon-1:00 pm

Speaker: Dr. Howard Adams, H.G. Adams & Associates, Norfolk, VA

Theme: **Strategies and Actions for Forming Effective Mentorship Alliances**

Moderator: Mrs. Jacqueline Vinson. University of Mississippi

Dr. Howard Adams is the founder and president of H.G. Adams & Associates, Inc., based in Norfolk, VA. Dr. Adams is a leading expert on mentorship and internship programs. He has written many self-help guides and handbooks such as *Mastering the Ph.D. Process: Tips for Surviving and Excelling in a Doctoral Program (2002); The Internship Guide: A Blueprint for Successfully Managing the Internship Experience (2003)*; *Career Management 101: A Primer for Career and Life Goal Planning (2008).* Dr. Adams has served on the U.S. Congressional Task Force on Women, Minorities and the Handicapped in Science & Technology (1989), and he received the Presidential Award for Excellence in Science, Mathematics, Engineering and Mentoring in 1996. Dr. Adams served as Executive Director of the National Consortium for Graduate Degrees for Minorities in Engineering and Science, Inc. (GEM) from 1978 to 1994. Before joining GEM, Adams served as Vice President for Student Affairs at Norfolk State University.

1:15-2:00 (Closed Session- Room D9)

LSMAMP Executive Committee Meeting (Program Administrators, Site coordinators, and NSF Program Director).

Organizers: **Dr. Ikenga Mississippi Valley State University and Mrs. Sonia Eley Alcorn State University**

Plenary Speaker
Sponsored by Millsaps College and Mississippi INBRE

Friday, February 21, 2020
12:00 P.M. (Room D2)

RESEARCH FOR THE 21ST CENTURY AND BEYOND

Given by

David Shaw, PhD
Provost and Executive Vice President
Mississippi State University
Mississippi State, MS

David Shaw is the provost and executive vice president at Mississippi State University. As chief academic officer, he oversees all academic policies, the integrity of the academic mission, and academic operations of Mississippi's leading university and land-grant institution. He provides direct oversight for eight academic colleges and two campuses, as well as many academic and non-academic support units. A longtime faculty member and former vice president for research and economic development at MSU, he works with senior administrators to develop budgetary recommendations that affect the teaching, research and service mission of the 141-year-old institution.

During his tenure as the university's chief research officer, Mississippi State attained Carnegie Foundation R1-Very High Research Activity Doctoral University status and consistently ranked among the National Science Foundation's top 100 research institutions, including a national ranking of 9th in agriculture research and 17th in social sciences. The university's research expenditures totaled nearly $241 million in FY 2017, accounting for more than half of the total in research and development expenditures reported by all Mississippi institutions. He also worked closely with local, state, and regional economic development officials to recruit new companies to the state.

Dr. Shaw joined the Mississippi State faculty as an assistant professor in 1985, with a joint teaching and research appointment. In 1999, he was recognized as a William L. Giles Distinguished Professor, the university's highest honorary distinction.

84th Annual Mississippi Academy of Sciences Meeting

February 20-21, 2020
MS Coast Coliseum & Convention Center
2350 Beach Blvd. | Biloxi, MS 39531

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. Tim Ward | Millsaps College, Jackson, MS
Event Coordinator: Dr. Ramon Jackson | MAS Executive Assistant

This symposium, was originally established with support from the Howard Hughes Medical Institute (HHMI), it 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 their **top undergraduate student abstracts** to represent their division and present in the MAS sponsored lunch award symposium, "Honoring Excellence in Science in Mississippi," on Friday February 21st 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 genral poster session following the Dodgen Lecture. The student should attend the provided lunch abd talk 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. Mary Ann McCraney | 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.

84th 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: Mary Ann McCraney| Events and Public Relations Coordinator

University of Southern Mississippi, MS

Symposium Program: All posters have to be assembled by **Thursday 2/19/2020 no later than 12:00 PM** and dismantled after **after 3:00 PM on Friday 2/20/2020**. 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, C. La Shan Simpson; 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 Simpson**

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 monitory award will not be honored for no show by the student winners at the awards ceremony

84th Annual Mississippi Academy of Sciences Meeting

Millsaps Undergraduate Scholars Symposium – Honoring Excellence in Science in Mississippi

Symposium Chairman: Tim Ward, PhD
Millsaps College
Dr. Ramon Jackson: MAS Executive Assistant

Symposium Program: All posters have to be assembled by **Thursday 2/19/2020 no later than 12:00 PM** and dismantled after **after 3:00 PM on Friday 2/20/2020**. 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. Tim Ward; Symposium Chair
1:30-1:40 Past 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 Stephens
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

Friday, February 21, 2020

11:00-12:00 (Room D3)

LSMAMP Advisory Board Meeting

(Presidents/Provosts of Alliance Institutions and Program Administrators)

Moderator: **Dr. Glake Hill**

LSMAMP Symposium

(LSMAMP participants only)

1:00 PM-1:30 PM LSAMP IN MISSISSIPPI: A SUCCESS STORY

Moderators: **Anthony Wright and Brianna Ross (BD Students)**

Dr. William McHenry is the Executive Director of the Mississippi e-Center at Jackson State University. Dr. McHenry has held several administrative positions in higher education. He served as the Associate Dean of the Graduate School at Mississippi State University from 1988 to 1990. Assistant Commissioner for Academic and Student Affairs for the Mississippi Institutions of Higher Education from 1997 to 2004, and as Vice Chancellor for Academic and Student Affairs in the Executive Office of the Oklahoma State Regents for Higher Education from 2004 and 2005. Dr. McHenry was Program Officer of the LSAMP Program at the National Science Foundation (NSF) Program Officer from 1990-1996. He continues to work tirelessly to increase the number of African Americans in STEM disciplines and STEM careers.

1:35 PM- 2:20 PM THE LMAMP –PAST, PRESENT, AND THE FUTURE

Keynote Speaker: Dr. A. James Hicks

LSAMP Program, National Science Foundation

Moderators*:* Dr. Felix Okojie, Jackson State University

Dr. A. James Hicks is the Program Director of the Louis Stokes Alliances for Minority Participation (LSAMP) Program at the National Science Foundation (NSF). Dr. Hicks and his colleagues in the LSAMP program at NSF assist universities and colleges in diversifying our nation's science, technology, engineering and mathematics (STEM) workforce by increasing the number of baccalaureate and graduate degrees awarded to persons historically underrepresented in STEM. Dr. Hicks has served as Chair and Professor of Biology as well as Dean of the College of Arts and Sciences at North Carolina A&T University (1988-1997). Dr. Hicks has won numerous awards and honors including the Reginald H. Jones Distinguished Service Award from the National Action Council for Minorities in Engineering (2012), the Tougaloo College Alumni Hall of Fame (2005), White House Initiatives' Faculty Award for Excellence in Science and Technology (1988). Dr. Hicks holds a B.S. degree in Biology from Tougaloo College, a Ph.D. in Botany from the University of Illinois-Urbana, and a Doctor of Science honorary degree from Rutgers University-Newark.

2:20 PM–2:30 PM ……Break …… (Finger food)

2:35-3:05 PM **LSMAMP ALUMNI SPOTLIGHT**

TARGETING M2TUMOR ASSOCIATED MACROPHAGES TO OVERCOME TUMOR IMMUNITY IN METASTATIC CASTRATION-RESISTANT PROSTATE CANCER

Speaker: Dr. Jelani Zarif, Johns Hopkins University School of Medicine

Moderator: Brianna Ross, Jackson State University

Dr. Jelani Zarif is an Assistant Professor of Oncology at the Johns Hopkins School of Medicine - Sidney Kimmel Comprehensive Cancer Center. Dr. Zarif is also a member of the Bloomberg ~ Kimmel Institute for Cancer Immunotherapy. Dr. Zarif earned both his B.S. and M.S. degrees from Jackson State University. Dr. Zarif was supported by LSMAMP-Bridge to the Doctorate program while at Jackson State. Dr. Zarif received his Ph.D. in Cell and Molecular Biology from Michigan State University in 2014. His research focuses principally on prostate cancer immunology and identifying the molecular mechanisms by which host immune cells contribute to prostate cancer metastasis. He has received several awards, including the Prostate Cancer Foundation's Young Investigator award, The Patrick C. Walsh Prostate Cancer Research Fund, and the NIH/NCI K22 Career Transition award.

3:05--3:30 PM

MENTORING MINORITY GRADUATE STUDENTS: PERSPECTIVES FROM AN LSMAMP PARTNER

Speaker: Denise Yates, University of Illinois, Chicago

Moderator: Dr. Tanya McKinney, Delta State University

Ms. Denise Yates is the Director of the LSAMP Bridge to the Doctorate and Co-PI of the NSF International Center of Excellence in the Office of Graduate Diversity Programs at the University of Illinois, Chicago (UIC). Ms. Yates is a nationally certified counselor. She holds a Master of Arts Degree in Human Development Counseling from the University of Illinois at Springfield and has achieved excellence in recruiting graduate and professional students for the biomedical science programs at UIC. Ms. Yates provides graduate and professional school preparation as well as academic support programming to graduate students, especially students from groups that are historically underrepresented in STEM, at UIC's College of Medicine.

3:30PM–3:55 PM **LSMAMP Awards**

Moderators: Dr. Angela Clinkscales-Verdell, Mississippi State University
Jonathan Townes, Hinds Community College

Moderators: Jonathan Townes and Dr. Martha Tchounwou

4:05 PM **Closing Remarks: Dr. Martha Tchounwou,** Jackson State University

LSMAMP Conference Room Managers: Mrs. Caroline Iverson and Mrs. Jacqueline Vinson

DIVISIONAL SYMPOSIA AND WORKSHOPS
Thursday, February 20, 2020

ECOLOGY AND EVOLUTIONARY BIOLOGY
SYMPOSIA
8:00-8:45
Room D3

CONSERVATION THROUGH SCIENCE AND EDUCAITON

***Organizers*: Dr. AHM Ali Reza and Dr. Nina Baghai-Riding**
Delta State University

Tom Mohrman, Director of the Mississippi Marine Program of The Nature Conservancy (TNC).

Title: **'*The Role of Conservation Planning in Habitat and Species Protection*'**.

Conservation Action Planning is a versatile process to engage stakeholders in a strategizing around a specific conservation concern, typically a geographic area, habitat type, or species. Mr. Mohrman will discuss a recent effort by TNC to develop a plan for the Diamondback terrapin as an example and explore how this process can be used for other conservation targets.

Mr. Mohman has 20 years' experience in the conservation of coastal species and habitats. He earned his bachelor's degree in biology from Rowan University of New Jersey, and his master's degree in biology from the University of Southern Mississippi. He joined The Nature Conservancy in 2011 to establish a coastal program for the Mississippi Chapter, which he has been leading for the past nine years. Current program focus is primarily dedicated to oyster restoration and the conservation of diamondback terrapins and Alabama red-bellied turtles.

Joseph M. Lane, Ph.D, Assistant Professor of Geography and Sustainable Development and Assistant Director of the Center for Interdisciplinary Geospatial Information Technologies at Delta State University

Title: **'*Informal Science Education and Guided Educational Tourism in Bangladesh*'.**

Informal Science Education and Guided Educational Tourism are versatile processes that engage stakeholders in a strategizing around a specific concern, typically a geographic area, cultural region, or unique population. This presentation examines a unique field experience, regarding the topics of Tropical Field Biology and Geography in South Asia; more specifically, The People's Republic of Bangladesh.

Dr. Joseph Lane has served as Assistant Professor of Geography and Sustainable Development and Assistant Director of the Center for Interdisciplinary Geospatial Information Technologies at Delta State University since 2018. In this capacity, he acts as outreach coordinator and informal geographic education specialist, he reports directly to the center's Director. Dr. Lane teaches at the undergraduate and graduate levels, conducts research and development activities, and assists with the geographic education outreach.

HEALTH SCIENCES

8:45-9:00 AM **Population Health**

Room: D11

Announcement of the L.C. Dorsey Research Honor Society

The L.C. Dorsey Research Honor Society is a new multidisciplinary network of social, behavioral, health, and citizen scientists who have produced or contributed to the production of exceptional minority health and health disparities research. Dr. L. C. Dorsey was a fierce advocate and pioneer who worked tirelessly to improve the health and well-being of Mississippi's disadvantaged and disenfranchised populations.

This honor society will be comprised of graduate students, faculty, and citizen scientists who produce meritorious research that contributes to the effort to improve health among vulnerable populations. An invitation to join this society of scholars only comes through a nomination and rigorous selection process that evaluates scientific productivity and commitment to the ideals demonstrated by the society's namesake. Membership in this society requires one to honor the life and legacy of Dr. L. C. Dorsey through a pursuit of research excellence, a focus on marginalized populations, and a willingness to invest in the next generation of scientists.

10:30-12:15 PM **Symposium I**

TRAUMA INJURY AND SPORTS MEDICINE

Richard L. Summers, MD
Associate Vice Chancellor for Research
University of Mississippi Medical Center

Title: "Trauma Research in Silico"

Dr. Summers is Professor of Emergency Medicine, Professor of Physiology and Biophysics at the University of Mississippi Medical Center. He served as chair of the Department of Emergency Medicine before becoming associate vice chancellor for research.
Dr. Summers is a native of Gulfport and graduated from the University of Southern Mississippi *magna cum laude* in mathematics. He received his medical degree from the University of Mississippi, School of Medicine. He then entered the Residency Program in Internal Medicine at the University of Mississippi Medical Center (UMMC). He completed a research fellowship under the renowned Drs. Arthur C. Guyton and Thomas G. Coleman in UMMC's Department of Physiology and Biophysics. He is the Billy S. Guyton Professor of Emergency Medicine.
His research focus has been on the use of computer models for hypothesis formulation and systems analysis to answer biomedical questions. Previously he served as the lead scientist for the NASA Digital Astronaut Project. He has authored or co-authored more than 300 publications, abstracts, and book chapters and has received research awards from the American Heart Association and the Society for Academic Emergency Medicine. Dr. Summers is a Fellow of the American College of Emergency Physicians.

Mary Townsley, PhD
Senior Associate Dean College of Medicine
Professor of Physiology and Medicine
University of Southern Alabama

Title: "Understanding Acute Lung Injury: It Takes a Village"

Dr. Townsley earned her Ph.D. in Physiology from the University of California at Davis and completed postdoctoral studies at University of Southern Alabama. Her research interests focus on mechanisms that regulate the integrity of the alveolar septal barrier in the lung and the pathobiology that leads to the development of acute lung injury.

In 2011, Dr. Townsley honored by the American Heart Association's (AHA) Council, on Cardiopulmonary, Critical Care, Perioperative and Resuscitation with the Distinguished Achievement Award. In 2013, she received the Leadership Award from the Pulmonary Circulation Assembly of the American Thoracic Society (ATS). She was also a member of the 2000 Class of Fellows in the Hedwig van

Ameringen Executive Leadership in Academic Medicine Program for Women (ELAM), and named the Phi Kappa Phi Scholar of the Year at USA.

Dr. Townsley served on numerous peer- reviewed study sections for the National Institutes of Health and the Veteran's Administration, as well as other national committees for the American Physiological Society (AHA), ATS and the Microcirculatory Society. Currently serves on editorial boards of the journals Microvascular Research, Pulmonary Circulation and Frontiers in Physiology. She has chaired peer-review study sections for lung biology, the United Peer Review Steering Committee, and the Council on Cardiopulmonary, Critical Care, Perioperative and Resuscitation, all for the American Heart Association. She has authored or co-authored over 100 publications, and book chapters.

Raj K. Prabhu, PhD.
Associate Director for the Computational Engineering and Mechanics Center for Advanced Vehicular Systems
Mississippi State University

Title: " Minding the Brain: A Multiscale Modeling Approach for studying Brain Injuries"

Dr. Prabhu earned his doctoral degree in Mechanical Engineering from Mississippi State University, and his Bachelor's degree in Chemical Engineering from Indian Institute of Technology-Madras, Chennai, India. He also holds an Honorary Research position in the College of Engineering at Cardiff University, Cardiff, UK.

His research interest includes, Multiscale Modeling; Computational solid mechanics; Integrated Computational Materials Engineering; Finite element analysis, Constitutive Model Development; Molecular Dynamics; Injury biomechanics; Bio-inspired design; Human-centric vehicular design and development; Functionally graded materials; Additive manufacturing; Dynamic strain rate experimental mechanics; Chemistry-structure-property quantification; Mechanical properties characterization, model calibration, verification and validation for materials.
Dr. Prabhu's love for science and technology started from his preschool memories. He describes watching a millipede move across the play-ground. He studied how each set of its legs moved precisely in sync. He mentioned to his teacher about the continuous wavelike motion that millipedes made while walking, instead of each leg being independent of each other. His teacher praised him for being so observant, and from then on, he told people he wanted to become a scientist.

Dr. Prabhu left India in 2002 to come to the United States. In spite of multiple offers from different universities for graduate studies he decided on Mississippi State University because of the research opportunities.

He went on to get his master's and then a doctoral degree in mechanical engineering.
"What kept me here were the opportunities that were available through research projects, student mentoring and the team of researchers that I have had the privilege of working with," Prabhu said. He is member of multiple biomechanical, neurobiology and scientific societies. He has selectively over 100 publications.

CELLULAR AND MOLECULAR
Mississippi INBRE Microbiome Symposium
1:00 PM -3:00 PM
Room: D4

Microbiome Resilience- A New Frontier

Organizer: Dr. Shahid Karim,
The University of Southern Mississippi
(Shahid.Karim@usm.edu)

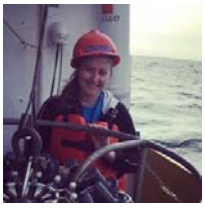
1:00-1:05: **Welcome remarks**

1:05-1:30 PM:
Physiological and genetic effects on the gut microbiome of rhesus macaques
Dr. Eric J. Vallender,
Department of Psychiatry and Human Behavior
University of Mississippi Medical Center, Jackson, Mississippi

1:30-1:50 PM:
Sex, gut microbiome, and cardiovascular network
Dr. Alex Razavi,
Tulane University School of Medicine and the School of Public Health & Tropical Medicine, New Orleans, Louisiana

1:50-2:10 PM:
Relationships between gut microbiomes, host phylogenies and environmental parameters: a study on freshwater mussels (Unionidae)
Dr. Mark McCauley, Department of Biology, University of Mississippi, Oxford, Mississippi

2:10-2:30 PM:
Marine microbiome research of deep gulf benthic habitats
Rachel Moseley and Rachel Mugge
Division of Coastal Sciences, University of Southern Mississippi, Ocean Spring, Mississippi



2:30-2:50 PM:
Gut and fecal bacterial communities as indicators of trophic interactions among anuran larvae
Steven Everman,
School of Biological, Environmental, and Earth Sciences, University of Southern Mississippi, Long Beach, Mississippi

2:50-3:10 PM:
Tick-Pathobiome interactions: collusion and cooperation within the tick host
Dr. Deepak Kumar
School of Biological, Environmental, and Earth Sciences, University of Southern Mississippi, Hattiesburg, Mississippi

3:10-3:15 PM: **Concluding remarks**

CELLULAR AND MOLECULAR
Co-Sponsor Science Education Division
Workshop
2:00 PM -3:15 PM
Room: D12

"INNOVATIVE WAYS OF INTRODUCING CELL BIOLOGY INTO A CLASSROOM USING THE FOLDSCOPE MICROSCOPE"

Brandy Burnett, MS and Donna M. Gordon, PhD

Mississippi State University, Mississippi State, MS

Cell Biology is one of the most diverse topics in the new 2018 Mississippi College and Career Readiness Standards for Science. Students are required to have a strong working knowledge of various cell types and organelle structures in order to understand how both simple and complex organisms work to maintain life. What better way for students to understand the importance of these structures than by having a chance to explore cells at the microscopic level. Forget textbooks and worksheets, the FoldScope is an easy to use, inexpensive way to give students an opportunity to be actively involved in their learning. This session will provide teachers a chance to become familiar with the capabilities of the 'paper-based' microscope and to create easy to view slides from readily available materials. Ideas on ways to include the FoldScope into your classroom will be discussed as they relate to the current curriculum standards. Empower your students to learn and explore by giving them an easy to use piece of scientific equipment that will boost their self-efficacy and academic confidence through independent learning.

The workshop will be lead by Brandy Burnett, a teacher at the Golden Triangle Early College High School along with Dr. Donna Gordon, an Associate Professor of Biological Sciences at Mississippi State University. As a teacher that integrates hands on student learning experiences into her science classroom, Ms. Burnett will share with the audience her experience using the FoldScope microscope and approaches to include topics related to cell biology into the school science curricula. At the end of the workshop, one high school teacher in attendance will be randomly selected to receive a FoldScope Basic Classroom kit as a door prize.

Chemistry and Chemical Engineering
1:00 PM-2:00 PM
Room: D6

Industrial Career Seminar

Moderator: Dr. Colleen Scott

Dr. Karthik Vangala
Senior Research Chemist, R&D
Southern Ionics
5123 South Frontage Rd
Columbus, MS

Dr. Hui Wang
Manager, Analytical Chemistry
CF Industries
4608 Hwy 49 East
Yazoo City, MS

Amber Russell
Branch Chief, Environmental
Processes Chemistry Environmental
Laboratory, ERDC
US Army Corps of Engineers

GEOLOGY
1:00 PM
Room: D5

Division Keynote

QUANTIFYING COASTAL CHANGE BY USE OF REMOTE SENSING, GPS, AND GIS
Dr. Greg Carter, USM Professor of Geography

Low-elevation ecosystems along the Gulf of Mexico coast are vulnerable to an accelerating sea level rise, increasing coastal population, and severe storms. Research results from Mississippi coastal wetlands and barrier islands demonstrate how remote sensing, Global Positioning System (GPS), and Geographic Information Systems (GIS) science and technology enable quantitative measurements of key ecosystem variables in response to environmental change. These include surface elevation, land and water areal extent, erosion, and vegetation characteristics such as land coverage, ecological community type, and biodiversity.

HEALTH SCIENCES
1:00 PM -3:00 PM
Room: D11

Division Workshop

LIVE CULINARY MEDICINE
(Registration by email or sign upat the registration desk)

Josie Bidwell, DNP
Department of Preventive Medicine
University of Mississippi Medical Center

Title: "Dietary strategies for reducing inflammation in chronic diseases"

Dr. Josie Bidwell, will discuss the concept of inflammation in chronic disease and dietary strategies for reducing inflammation during a live cooking demonstration.

Dr. Josie Bidwell, received her Doctor of Nursing Practice degree from UMMC SON in 2013.

She obtained her Bachelor of Science in Nursing in 2004, and Master of Science in Nursing, 2006 from the University of Mississippi Medical Center. She is currently practicing as a Lifestyle Medicine with over 13 years of experience in pediatrics, family medicine, and lifestyle medicine

Dr. Bidwell served as the Director of Clinical Services for UNACARE Family Health Clinic from 2016-2018. She currently practices at UMMC's Lifestyle Medicine Clinic, addressing nutrition, fitness, sleep, tobacco cessation, stress, and resiliency with clients 18 and older.

Dr. Bidwell served as the lead author for both the Southern Remedy Healthy Living adult and children's physical activity curriculum (Fitness Prescription). She is the host of Southern Remedy Health and Fit on MPB. She serves as a Community Health Advocate (CHA) Master Trainer to provide nutrition, physical activity, and healthy living training to laypersons and health professional students.

Drs. Bidwell and Penman in the School of Medicine, UMMC received funding from The Bower Foundation to establish a healthy "cooking teaching kitchen" in the midtown community of Jackson. This kitchen taught healthy food selection and preparation for people with high blood pressure and diabetes.

Dr. Bidwell is board certified Diplomate of the American College of Lifestyle Medicine and the International Board of Lifestyle Medicine.

She is also a licensed fitness instructor who regularly teaches both Zumba Fitness and Zumba Kids Jr. classes. Dr. Bidwell also serves as a member of the medical advisory committee for the University Wellness Center to promote and encourage medically-integrated fitness. Additionally, she is an active member of the UMMC Wellness Committee, which aimed at improving the overall health and wellness of the UMMC faculty, staff and students.

MATHEMATICS, COMPUTER SCIENCE, STATISTICS
SCIENCE EDUCATION
WORKSHOP
1:00 PM -2:30 PM
Room: D8

ILLUSTRATING SPECIFIC STATISTICAL TOOLS REQUIRED FOR DESIGNING RESEARCH STUDIES

Jamil Ibrahim
University of Mississippi Medical Center, Jackson, MS

Statistics is useful in almost all fields especially in research studies. Statisticians should be involved from the beginning of these studies. In research practice, the most common requests to statisticians from investigators are sample size calculations or sample size justifications. The techniques of statistical power, sample size estimations and confidence intervals are the most important aspects of a research study. 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.

DIVISIONAL SYMPOSIA AND WORKSHOPS
Friday, February 22, 2019

AGRICULTURE AND PLANT SCIENCES
FRIDAY (8:30-10:00)

SYMPOSIA ON THE FUTURE OF FOOD AND AGRICULTURE

***Organizers*:** Dr. Te-Ming (Paul) Tseng, Mississippi State University
and Dr. Yan Meng, Alcorn State University
8:30-10:00 am (Room D2)

Ryan Kurtz, Director, Agriculture and Environment Research, Cotton Incorporated.

Title: '*How will integrated pest management change with advances in technology?*'

Ryan Kurtz is the Director of Agricultural & Environmental Research at Cotton Incorporated. In this role, Ryan develops and administers an entomology research program aimed at improving production efficiency and profitability as well as reducing cotton's environmental impact. Prior to joining Cotton Incorporated, Ryan worked for Syngenta as the Lead for Traits Insect Resistance Management (IRM). In this role, Ryan provided IRM expertise primarily in support of research and development projects, product registrations, new active ingredient discovery, as well as stewardship for Syngenta's transgenic insecticidal traits. He holds a B.S. in Agricultural Pest Management from Mississippi State University and a Ph.D. in Entomology from North Carolina State University.

Girish Panicker, Director, Center for Conservation Research, School of Agriculture and Applied Sciences, Alcorn State University

Title: '*Organic and no-till farming methods for small farmers to improve the quality and quantity of horticultural produce while conserving soil and water*.'

Dr. Girish K. Panicker, an authority on C-factor (cover and management) research and an internationally renowned agricultural scientist, is the director of Conservation Research at Alcorn State University, Mississippi. An alumnus of the university of agricultural science, Kerala, India, Alcorn State University, and Mississippi State University, he has been a Certified Professional Agronomist (CPAg), Certified Crop Adviser (CCA), and horticulturist, and has worked largely in conservation field on three continents, Asia, Africa, and North America. His federally funded research center has the world's largest C-factor data bank on horticultural crops, with work done on over 40 crops at an investment of more than $6.5 million. He has developed organic farming techniques to raise blueberries on heavy soils and to increase Vitamin C and anthocyanin content in fruits. His research methodologies for a healthier environment are being podcasted globally by the ASHS, ISHS, USDA, eOrganic, and eXtension. In recognition of the outstanding research outcome, his organic muscadine vineyard has been selected by the USDA/NRCS and Cornell University for Soil Health Studies. He is a life member of MAS and also a member of several national and international agricultural societies. He has been chairman of several committees of the ASHS and chairman of the division of Agriculture of MAS. Currently, he serves as director board member of the Mississippi Sustainable Agriculture Network (MSAN), International Women's Think Tank (IWTT), The Organic Center, Washington, D.C., Southern Cover Crops Council, Member, National Sustainable Agriculture Coalition (NSAC), Washington, D.C., and Vice-Chair for the Indian American International Chamber of Commerce, Washington, D.C. In collaboration with the U.S. Army scientists, Dr. Panicker has produced a new organic compost, which reduces the ammonia air pollution and prevents groundwater pollution. He was honored with the Pride of India 2011 award during India's annual event for its international diaspora.

Chunquan Zhang, Associate Professor, Department of Agriculture, School of Agriculture and Applied Sciences, Alcorn State University

Title: '*Southern Mississippi plant viral diseases and development of plant viral functional genetics platforms*.'

Dr. Zhang received his M.S. degree in 1996 from Northeast Agricultural University, China. Following his M.S. graduate work on soybean disease, he worked as an extension plant pathologist for three years before joining the University of Kentucky for his Ph.D. in 2005. After completing his Ph.D., he joined Iowa State University as a research scientist on model plants and row crops functional genomics. Dr. Zhang is now an associate professor at Alcorn State University. His current research focuses on plant functional genomics and biotechnological applications for crop improvement.

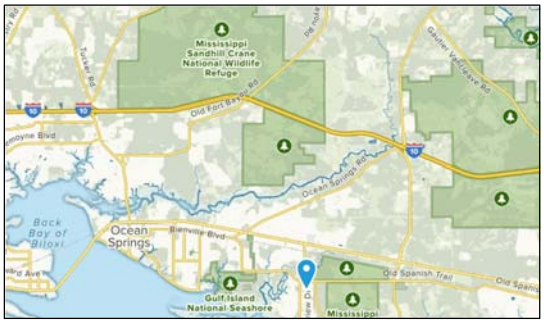
ECOLOGY AND EVOLUTIONARY BIOLOGY
Field Trip
10:30-1:00
Please sign up at the registration desk (limited space)

FIELD TRIP TO THE SANDHILL CRANE NATIONAL WILDLIFE REFUGE

***Organizers*: Dr. AHM Ali Reza** and **Dr. Nina Baghai-Riding**, Delta State University
In collaboration with: **Angela Dedrickson**, Wildlife Biologist, Mississippi Sandhill Crane National Wildlife Refuge, US Fish and Wildlife Service

Mississippi Sandhill Crane National Wildlife Refuge

The Mississippi Sandhill Crane National Wildlife Refuge is located in Jackson County in extreme southeast Mississippi, less than 10 miles from the Gulf Coast. It is part of the Gulf Coast Refuge Complex which includes Grand Bay and Bon Secour National Wildlife Refuges located on the coasts of Mississippi and Alabama. The refuge is managed and run by the US Fish and Wildlife Service. The crane population, at that time only 30-35 birds, is currently at approximately 110 birds. Through captive rearing and reintroduction to the area as well as wild birds nesting in the savannas, the crane population continues to grow.



The Mississippi Sandhill Crane National Wildlife Refuge was established in 1975 to protect and preserve the Mississippi sandhill crane and its critical wet pine savanna habitat. The refuge consists of approximately 19,300 acres in three main units that include savanna, coastal prairie, cypress swamp strands, pine flatwoods, and brackish marsh. The refuge is the only home of this endangered non-migratory subspecies of sandhill crane and provides valuable habitat for the endangered dusky gopher frog and several declining grassland birds like the Henslow's sparrow, yellow rail, sedge wren, and numerous species of unique and rare plants.

The Field Trip

The field trip to the Sandhill Crane National Wildlife Refuge will involve a drive and walk through wet pine savannah, a mixed hardwood seepage area, and a tour of the refuge visitor center at the refuge headquarters.

- A sign up sheet to participate in the field trip will be provided on Thursday morning.
- We will have early lunch at the site. Please bring your own packet lunch with you. There is no restaurant or food place at the refuge.
- Free transportation will be provided by the organizers.
- We recommend all participants to have comfortable walking shoes and a bottle of drinking water.

HEALTH SCIENCES
Symposium II
10:30-11:50 AM
Room D11
Theme: "Medicine, Immunity, Infection"

Nita Maihle, PhD,
Professor of Cell Biology
Associate Director Cancer Center
UMMC Cancer Center & Research Institute

Title: "PRECISION MEDICINE, WOMEN'S HEALTH AND THE UMMC CANCER CENTER"

Dr. Maihle received her M.S., PhD. in Biomedical Sciences, from Albert Einstein College of Medicine, Bronx, NY.

Her Postdoctoral training in Molecular Biology was at Cold Spring harbor and NCI, Frederick, MD, then in Tumor Virology at Case Western School of Medicine, Cleveland, OH.

Dr. Maihle has directed a translation-oriented research program at the Mayo Clinic (Rochester, MN) for 15 years, at Yale University School of Medicine (10 years), at the Georgia Cancer Center (5 years), and at the UMMC Cancer Center where she relocated her research program in fall, 2018.

Dr. Maihle is a biomedical research scientist who is expert in the study of the molecular basis of cancer. Her particular focus is the study of women's cancers – breast, ovarian, and endometrial cancer.

She currently serves as Director for Basic Research of the Cancer Institute at the University of Mississippi Medical Center. She directs a virtual national training program for early career faculty studying ovarian cancer, with support from the Department of Defense (http://www.ovariancanceracademy.org).

Her research laboratory studies the early detection of cancer. How can we use what is known about the biology of cancer to develop cost effective, noninvasive blood tests to detect this disease during its earliest stages, when it is most responsive to existing treatments? She also studies ways to bring new drugs into the clinic for the treatment of cancer, i.e., 'biologically targeted' drugs – that are 'side effect sparing,' because they specifically target tumor cells.

Dr. Maihle's studies contribute to our growing use of 'Precision Medicine': treating the right cancer patient at the right time, with the right drug, by using our growing understanding of the molecular basis of cancer.

She is an inventor on 10 issued U.S. patents, and recently completed a sabbatical year of study working with Professor Clayton Christensen (Harvard Business School) on 'disruptive innovation and precision medicine' as it relates to companion diagnostics for biologically targeted cancer therapeutics, such as traztusumab. Dr. Maihle is member of Cell Biology Society, American Cancer Society and many other scientific societies. She has selectively over 170 publications and Book Chapters.

For her Complete List of Published Work go to My Bibliography:
http://www.ncbi.nlm.nih.gov/sites/myncbi/nita.maihle.1.bibliography/43485437/publi/?sort=date&direction=ascending

Dr. Fengwei Bai, PhD

Associate Professor
School of Biological, Environmental and Earth Sciences
University of Southern Mississippi

Title: " HOST IMMUNITY TO VIRAL INFECTIONS: WHAT IS IL-17?"

Dr. Bai received his PhD in Genetics from Fudan University, China and then his postdoctoral training at Yale University School of Medicine. Dr. Bai's research interests are to understand how viruses recognized by the host's innate immune system and how innate immunity initiates and generates protective adaptive immunity. His areas of expertise includes: Virology, Immunology, West Nile virus, Zika virus, dengue virus, chikungunya virus, innate immunity

Dr. Bai's long-term research goal is to use this knowledge in rational design of effective vaccines or therapeutics for the prevention of transmission of viral pathogens. Dr. Bai's research funded by the NIH and various research foundations.

Dr. Bai's research group is currently recruiting self-motived and hard-working PhD students. Qualified applicants must have a Bachelor's or a Master's degree in the related disciplines with some research experience. He is member of American Society of Microbiology, American Heart Association,The American Association of Immunologist. He has selectively over 50 publications.

For detailed publications please visit: https://www.ncbi.nlm.nih.gov/myncbi/fengwei.bai.1/bibliography/public/

SCIENCE EDUCATION
Mini-Symposium
10:00 AM -11:50 AM
Room: D4

"THE HISTORY AND FUTURE OF BASE PAIR – A MODEL FOR HIGH SCHOOL RESEARCH MENTORSHIP"

Organizer: Rob Rockhold, PhD., Deputy Chief, University of Mississippi Medical Center

Goals: This mini-symposium will provide an assessment of the 27 years of the Base Pair biomedical research mentorship program offered by the University of Mississippi Medical Center (UMMC) for high school students and teachers. The program will feature the Lead Teacher for the Base Pair program at Murrah High School who will provide key highlights of the curriculum structure and teaching methodology used to prepare high school students for in-depth authentic research experiences in an academic health sciences center. It will also bring together key faculty from several Mississippi Institutions of Higher Learning for a panel discussion to explore educational opportunities for the expansion to higher education institutions other than UMMC**.**

10:00 Welcome and Introduction
Rob Rockhold, PhD

10:05 Base Pair: Program Structure and Key Outcomes
Rob Rockhold, PhD

10:20 Inside Base Pair Looking Out: "The Student's Perspective"
Jeffrey Caliedo and Evan Morrisey

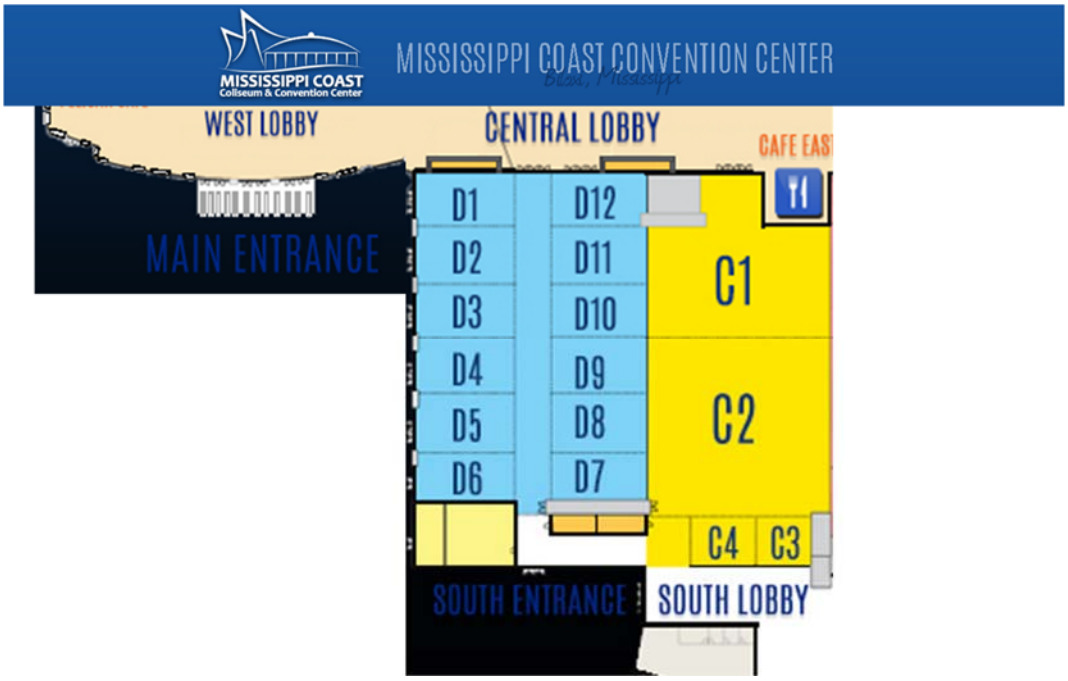
10:40 Preparation of High School Students for Research Experiences-A Teacher's Guide
Jeff Stokes

11:00 Hosting a High School Student in your Lab: Faculty Realities and Rewards
Lir-Wan Fan, PhD, Stephen Stray, PhD, Donna Sullivan, PhD, Parminder Vig, PhD, and Jan Williams, PhD

11:20 Statewide Expansion of Base Pair: An Instutional SWOT Analysis
Marie Barnard, PhD, Janet Donaldson, PhD, George (Trey) Howell III, PhD, Kevin McKone, PhD, and Tim Ward, PhD

11:50 Audience Questions and Summary
Rob Rockhold,PhD

Mississippi Coast Coliseum and Convention Center Floor Plan



NOTES

Key to Abbreviations

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

1	**Agriculture and Plant Science**
2	**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 SCIENCES

Chair: Te Ming Paul Tseng

Mississippi State University

Vice-Chair: Yan Meng

Alcorn State University

Thursday, February 20, 2020

MORNING

Room D2

O1.01

8:30 ANTIFEEDANT EFFECT OF SICKLEPOD (*Senna obtusifolia*) EXTRACT ON SOYBEAN LOOPER *Chrysodeixis includens* (LEPIDOPTERA: NOCTUIDAE)

Ziming Yue

Mississippi State University, Mississippi State, MS

Soybean is one of the major crops in the midsouth of the United States, it is also the only major crop that suffers from heavy insect defoliation in this region, leading to significant economic loss. Soybean looper is one of the top three insect pests in soybean production in this region. Synthetic insecticides are often used in insect management. However, their environmental concern and insect tolerance development are getting more and more attention. This study proposed and tested sicklepod extract as an insecticide, and results were compared to the commercial synthetic insecticide bifen, and neem oil, a natural plant product. Sicklepod extract showed similar antifeedant effect as bifen, the leaf discs were fed 1.4% for sicklepod extract treated and 2% for bifen treated. Mortality experiments showed the antifeedant effect of sicklepod extract did not function on body epithelium of the soybean loopers, indirect supporting that it functioned on epithelium of the digestive tract of the loopers. The performance of sicklepod extract as an antifeedant to protect soybean was better than neem oil, also as a plant product, it is safe for operators and environment to apply on soybean plants.

O1.02

8:45 COMPOSITIONAL VARIATIONS OF THE HINDGUT MICROBIOME IN HOLSTEIN AND JERSEY COWS.

Vanessa Michelle De La Guardia Hidrogo, Henry Paz

Mississippi State University, Animal and Dairy Science Department, Mississippi State, MS

The hindgut microbiome has important roles in the host health and nutrition. However, our understanding of the compositional fluctuations of the hindgut microbiome in cattle is limited. The objective of this study was to assess diurnal and biweekly variations of the bacteriome in Holstein and Jersey cows under the same management and dietary conditions. Five multiparous cows from both Holstein and Jersey breeds were fed twice daily a diet comprised of 55% forage and 45% concentrate for 28 d using the Calan gate system. Fecal grab samples were collected on 0 (pre-period), 14, and 28 days and within each day, samples were collected at 0 (pre-feeding), 6, 12, 18, and 24 h. Bacteriome composition was determined through 16S rRNA gene sequencing of the V4 region using the Illumina MiSeq and raw sequences were processed using the QIIME2 pipeline. Fecal bacteriome composition differed between Holstein and Jersey cows (PERMANOVA, P = 0.001). Members of the families Peptococcaceae, Ruminococcaceae, and Spirochaetaceae were more abundant in Holstein cows, whereas members of the families Anaeroplasmataceae, Bifidobacteriaceae, Erysipelotrichaceae, F16, and Streptococcaceae were more abundant in Jersey cows (Wilcoxon Rank Sum test, q < 0.05). Fecal bacteriome composition differed throughout collection days in both Holstein and Jersey cows (PERMANOVA, P = 0.001), but was similar across collection times within day (PERMANOVA, P ≥ 0.93). These results indicate that the longitudinal variation of the fecal bacteriome is a factor to consider when studying the hindgut microbiome.

O1.03

9:00 GENOME-WIDE ASSOCIATION STUDY OF ABIOTIC TRAITS IN WEEDY RICE (*Oryza sativa*)

Shandrea Stallworth

Mississippi State University, Mississippi State, MS

As global temperatures continue to rise and fluctuate, it is imperative that crop-breeding programs continue to evolve. In rice (*Oryza sativa*), it has been demonstrated that temperatures higher than 34^0C can cause spikelet infertility resulting in a yield reduction of up to 60%. In cold stress situations, temperatures below 17^0C can result in poor germination, seedling injury and reduced yield. In areas where flash flooding is unpredictable, submergence stress in rice fields can lead to a 10 – 100% yield loss. As climate change continues to impact rice production, there is a need to identify new genetic traits that can aid in survival against stress as well as feed the growing population. Currently, rice breeding programs lack genetic diversity and suffer from a loss in traits through domestication. To combat these shortcomings, it has been suggested that weedy rice (*Oryza sativa*), a noxious subspecies of rice with increased competition within rice fields, can be used to discover new genes related to abiotic stress tolerance. In this study, a genome-wide association study (GWAS) was used to understand the genomic variation underlying stress-tolerant traits within a diverse weedy rice population. Phenotypic studies in abiotic stress tolerance of a population have identified that more than 20% of the weedy rice population is tolerant to at least one of three stresses (cold, heat, and submergence), while a study accessing the genetic variation present within the same population is greater than 40% compared to just 24% within current rice cultivars.

O1.04

9:15 VIRUS-FREE SWEETPOTATO: FROM MERISTEM-TIP CULTURE TO STORAGE ROOTS PRODUCTION

[1]Emmanuella Nnuji-John, [1]Chimaka Udedibor, [2]Yan Meng, [2]Chunquan Zhang, [2]Victor Njiti

[1]Department of Chemistry, Alcorn State University, Lorman, MS, 39096, [2]Department of Agriculture, Alcorn State University, Lorman, MS 39096-7500

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. 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, totally 15 lines of sweetpotato have been collected and processed for virus removal. Virus-free planting material were then propagated in experimental field at Alcorn State University for performance evaluation. The plants were examined with the re-infection of five of the most prevalent viruses in Mississippi by using nucleic acid-based polymerase chain reaction (PCR) and reverse-transcription PCR (RT-PCR), to achieve higher sensitivity and confirmation at the genomic level of viral species and strains. Primers targeting to conserved regions of the know sweetpotato viruses were used for this nucleic acid based detection. The re-infection of SPLCV observed in this study suggested that management of whitefly population should be a critical factor for controlling this virus. The meristem-tip culture and virus detection protocols optimized in this study will be discussed and the application of this technique will work for the purpose of eradicating viruses from elite sweetpotato lines in Mississippi.

O1.05

9:30 UNRAVELLING 2,4-D RESISTANCE IN INTERSPECIFIC CHROMOSOME SUBSTITUTION LINES OF COTTON, *Gossypium hirsutum* L.

[1]Loida M. Perez, [2]Isabel Werle, [3]Sukumar Saha, [3]Johnie Jenkins, [4]David M. Stelly, [1]Jeffrey FD. Dean, [1]Te-Ming Paul Tseng

[1]Mississippi State University, Mississippi State, MS, [2]University of Arkansas, Fayetteville, AR, [3]USDA-ARS, Crop Science Research Lab, Genetics and Sustainable Agriculture Research Unit, [4]Texas A&M University

The widespread adoption of glyphosate-resistant crops caused the evolution of numerous herbicide-resistant weeds. Given that most glyphosate-resistant weeds can be controlled with 2,4-dichlorophenoxyacetic acid (2,4-D), we have screened cotton germplasm to identify novel herbicide resistance genes effective against 2,4-D. Previous studies have identified wild cotton species as a reservoir of novel genetic variations. In this study, we used chromosome substitutions (CS) lines developed by introgressing interspecific germplasm into an Upland cotton genetic background. We report the discovery of cotton germplasm as potential sources of gene(s) for 2,4-D tolerance by screening Upland CS lines to discover novel variants. A total of 47 CS lines of *G. barbadense* L. (CS-B), *G. tomentosum* Nuttal ex Seeman (CS-T), and *G. mustelinum* Meers ex Watt (CS-M), in the genetic background of *G. hirsutum* L. Texas Marker-1 (TM-1) were screened for resistance to a field-recommended rate (1.12 kg ai ha^{-1}) of 2,4-D in a completely randomized design with sub-sampling (*r=3*). Injury from 2,4-D applied at 2 weeks after seedling emergence (WAE) ranged from 25-100% at 21-28 days after treatment. Seven CS lines including CS-T04-15, CS-B12, CS-B15sh, CS-T04, CS-B22sh, CS-T07, and CS-B04-15 exhibited lowest injury, possibly indicating the presence of 2,4-D tolerance gene(s). Two lines, CS-T04-15 and CS-T07 showed lowest injury from 2,4-D at 4 and 7 WAE. Molecular analyses are underway to find markers possibly associated with tolerance to 2,4-D in cotton. Findings from this study could help discover novel 2,4-D tolerant cotton germplasm that can be used for breeding and genetic improvement in Upland cotton.

O1.06

9:45 GENETICALLY ENGINEERED SWEETPOTATO: A NOVEL APPROACH TO IMPROVE SWEET POTATO VIRAL RESISTANCE

[1]Aundrea Coleman, [2]Toni-Ann Nelson, [1]Chunquan Zhang, [1]Victor Njiti, [1]Yan Meng

[1]Department of Agriculture, Alcorn State University, Lorman, MS, 39096, [2]Department of Biology, Alcorn State University, Lorman, MS

Sweet potato (*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 leaf curl virus* (SPLCV) and *Sweet potato feathery mottle virus* (SPFMV) are two of the most prevalent sweetpotato viruses that cause devastating diseases and yield reductions in Mississippi. The approach for sweetpotato viral disease management in our study is to develop transgenic sweetpotato plants with virus resistance to these two viruses. Conserved genetic sequences of SPFMV and SPLCV were used for RNA silencing based virus resistance engineering. The SPFMV and SPLCV dual resistance genetic segments were introduced into a binary vector for expression to induce gene silencing in transgenic sweetpotato. Expression of transgenes has been achieved by using *Agrobacterium*-mediated transformation system. Plants regenerated from leaf and petiole cells showed transgene's insertion into sweetpotato genome by using Polymerase chain reaction. Plant transformation and regeneration protocols were optimized for the production of value-added sweetpotato lines using popular production lines. The transgenic plants' resistance to SPFMV and SPLCV infection is under investigation in controlled greenhouse conditions. The examination results will be evaluated and further discussed.

O1.07

10:00 DEVELOPMENT OF EFFICIENT PLANT REGENERATION PROTOCOLS FROM DIVERSE GENOTYPES OF SWEETPOTATO (*Ipomoea batatas* (L.) Lam)

T. Nelson, A. Coleman, Y. Meng

Department of Agriculture, Alcorn State University, Lorman, MS, 3

The purpose of this investigation was to develop efficient callus induction and plant regeneration protocols for four sweetpotato (*Ipomoea batatas* (L.) Lam) lines collected in our laboratory. For Elite line O'Henry, the effect of different hormone combinations and type of explants on shoot regeneration was thoroughly evaluated to optimize the regeneration protocol. The explants used in this study were stem, petiole and leaves disc. They were first placed on callus inducing media M1 (Murashige and Skoog (MS) + 2,4,5-T) and M2 (MS + IAA) for 6 days. The explants were then cultured on MS media supplemented with 4 combinations of 6-benzylaminopurine (BAP), CCC and zeatin. The highest percentage of shoot regeneration was obtained when petioles and stem explants were cultivated on MS supplemented with 3.0 mg/L BAP and 500 mg/L of CCC. On the contrary, the leaf disc explants did not regenerate in shoot induction medium (SIM). The shoots also formed roots on root induction medium (MS + 0.5 mg/L IAA). The regenerated plants showed 100% survival rate when transferred to soil. Three other sweetpotato lines, PI318846, PI566638 and PI566648 were also conducted regeneration tests and the regeneration media components and culture conditions had been optimized. As such, the regeneration protocol described in this study will be used in a plant transformation protocol to produce transgenic sweetpotato plants. Besides the above research, we also analyzed the effect of PPM™ (Plant Preservative Mixture) on prevention or reduction of microbial contamination in plant tissue culture.

10:15 Break

O1.08

10:30 SCREENING OF CHROMOSOME SUBSTITUTION (CS) COTTON LINES FOR WEED-SUPPRESSING POTENTIAL

Mary Gracen Fuller

Mississippi State University, Mississippi State, MS

Palmer amaranth (Amaranthus palmeri) is a problematic weed species, especially for cotton producing states. With the advent of chemical control, Palmer amaranth populations have developed resistance to commonly used herbicides and insecticides, most notably glyphosate. It is imperative for the development of alternative weed control methods to be developed to slow the evolution of herbicide-resistant weed populations due to selection pressure imposed by a reliance on chemical weed control. Eleven cotton lines (CS) previously screened for weed-suppressing abilities were utilized in this study. The cotton lines were tested using a Stair Step Structure, which eliminates competition and allows for the observance of CS lines' weed-suppressing ability.

O1.09

10:45 SWEET POTATO POLYPHENOL OXIDASE MOLECULAR STUDY AND ITS POTENTIAL AS CRISPR/CAS9 TARGET FOR GENOME EDITING APPLICATION

Myshawn Smith, Daniela F. Adjaye, Yan Meng, Victor Njiti, Chunquan Zhang

Alcorn State University, Lorman, MS

Sweet potato (*Ipomoea batatas*) is an important food crop worldwide. Sweet potato storage roots can be used for fresh cooking, processed pulp or dry product, animal feeds, biodegradable plastics and bioethanol. Among the many factors limiting sweet potato consumption and product manufacturing, browning plays a major role in reducing sweet potato' value as food or industrial materials. Sweet potato browning is the result of an enzymatic reaction when phenolic compounds are leaked out of cells. The brownish discoloration due to phenolic compound oxidation is the results of enzymatic actions of a group of enzymes called polyphenol oxidases (PPO). Due to the importance of PPO genes for their roles in enzymatic browning, PPO genes in many other important crops have been well studied. The PPO genetic and biochemical knowledge and information have been critical for developing novel germlines using genome editing technology. While the PPO genes on other important plants have been well documented, sweet potato PPO genes are not systemically studied. In this study, we established a collection of important elite production cultivars and breeding lines for sweet potato PPO gene molecular study. Sweet potato genomic DNAs have been extracted from the wide collections and PCR amplified using primers targeting various regions of multiple potential sweet potato PPO genes identified from bioinformatics research. Phylogenic analysis of the identified sweet potato PPO genes will be presented and potential targets for sweet potato PPO gene using CRISPR (Clustered Regulatory Interspaced Short Palindromic Repeats)/Cas9 system will be discussed.

O1.10

11:00 ACCESSING ROOT SYSTEM ARCHITECTURAL TRAITS ASSOCIATED WITH ALLELOPATHY IN WEEDY RICE (*Oryza sativa*)

[1]Brooklyn Schumaker

[1]Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS,

Weedy rice (WR) being of the same species as rice (*Oryza sativa*) has potential as a breeding gene pool to improve competitive traits in cultivated rice. WR is very competitive in the field and possesses an ability to release secondary metabolites through its roots that can inhibit the growth of species around it. This process is defined as allelopathy. Some WR biotypes are able to inhibit the growth of barnyardgrass (*Echinocloa crus-galli*) one of the most troublesome weeds in southern rice production. Weed competition is a limiting factor in rice production systems; therefore, it is critical to identify specific allelopathic WR accessions to determine the genetic pathways and mechanisms associated with allelopathy to be used in breeding programs. Due to the complex nature of the production of allelopathic chemicals and the lack in knowledge of the mechanisms surrounding allelopathy in WR phenotypic traits can be used to overcome this limitation and serve as target characteristics for breeding weed suppressive rice varieties. Eleven WR accessions and five rice lines were selected for this study. Samples were selected based on their ability to suppress barnyardgrass seedlings. These accessions were propagated in germination bags for four weeks. Once each week, the bags were scanned, and images of the roots were collected and uploaded into SmartRoot(Draye 2010) for analysis. Comparisons between allelopathic and non-allelopathic WR root structures were obtained. This knowledge will be helpful for marker assisted breeding, and further understanding the physiological mechanisms associated with allelopathy in WR for rice crop improvement.

O1.11

11:15 SOIL HEALTH AND CROP PRODUCTION UNDER ALLEY CROPPING SYSTEM

Lee D. Jones, L. Kibet, G. Panicker, J. McComb and F. Mrema

Alcorn State University, Lorman, MS

There is a global concern about the overall decline in soil productivity and environmental quality. The decline in soil and environmental quality has increased the cost of agricultural production. Hence, the objectives of this experiment are: 1) to assess the effect of poultry litter, compost manure and urea fertilizer on soil health under an alley cropping system; 2). to assess the impact of poultry litter, compost manure and urea fertilizer on crop yields under an alley cropping system. The study area is located in Alcorn State University, Lorman, MS and the soil is classified as Memphis silt loam. The plots measure 10x15ft. and are separated by alleys of 10 ft. in length. The experiment has three treatments (compost manure, poultry litter, and urea prill) and unamended control under a randomized complete block design. Treatments were surface applied and incorporated at a rate of 130 lbs N/acre. Sweet Corn (*Zea Mays*) seeds were planted research plots at a spacing of 1.5 ft. between plants and 3 ft. between the rows. Preliminary results did not show any significant differences on soil health properties in the first season. However, cabbage yields were significantly higher under the urea prill treatment compared to the poultry litter treatment, but no differences were observed among control, compost manure, and poultry litter. We hypothesize that soil health properties will improve significantly in plots amended with organic manures compared to urea prill and control after 3-yrs of treatment application.

Thursday, February 20, 2020

AFTERNOON

DIVISIONAL POSTER SESSION

1:00-3:00

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

P1.01

SICKLEPOD EXTRACT PREPARATION, ANALYSIS, AND APPLICATIONS

Ziming Yue

Mississippi State University, Mississippi State, MS

Sicklepod (*Senna obtusifolia*) is one of the top ten troublesome weed in the southern US. Sicklepod belongs to the Leguminosae, and its seeds are famous for high anthraquinone derivative contents and often used in herbal medicine to treat constipation. Sicklepod fruits were dried at 30°C for one week, and then ground in a Wiley Mill to less than 1 mm. Fifty grams of the meal was weighted into a pot with 1 L of distilled water and heated to boil for 5 minutes and blended with 100 mL methanol for 10 minutes. The paste was centrifuged in 50 mL tubes and vacuum filtered. The extraction was repeated three times. The combined filtrate was concentrated on a hotplate to one tenth in volume to get the spray extract. One mL of the extract was hydrolyzed with 200 mL of 6 N sulfuric acid at 95°C for two hours. The mixture was centrifuged at 13200 rpm for 3 minutes to get rid of the supernatant, and the pellet was freeze dried. One mL of methanol was added to the dried pellet to dissolve the anthraquinone derivatives. Then the sample was filtered through 0.2 mm for HPLC analysis. The results showed that the active ingredients of the extract contained orantio-obtusin (115 ppm), emodin (19 ppm), chrysophanol (18 ppm) physcion (7 ppm), aloe-emodin (6 ppm), and rhein (4 ppm). The total anthraquinone derivative was determined to be 169 ppm. Field and lab experiments showed the sicklepod extract had deer repelling and insecticidal effects.

P1.02

EVALUATION OF GRAFTED WATERMELONS (CITRUS LANATUS) GROWN ON A HEAVY SOIL WITH ORGANIC TREATMENTS FOR THEIR QUALITY, YIELD, BIOMASS, AND ADAPTABILITY IN MISSISSIPPI

[1]Dana D Gaines, [1]Kelsey Henry, [1]Girish K.S. Panicker, [1]Kibet Leonard, [1]Willie Mims, [2]P. Nimmakayala, [2]U. Reddy, [2]Y.Tomason

[1]Alcorn State University, [2]West Virginia State University

The demand for organic products is increasing all over the world due to environmental and health issues. Vegetable crops exposed to various environmental factors severely affect crop growth and productivity. One way to avoid or reduce losses in production caused by adverse environmental conditions is to graft them into rootstocks capable of reducing the effect of external stresses on the shoot. It is reported that grafted plants grown under adverse soil chemical conditions often exhibited greater growth and yield. As a part of the conservation research being carried out by Alcorn State University on horticultural crops for erosion prediction and nutrient management, grafted exotic watermelons were raised on Memphis silt loam soil (Typic Hapludalf, silty, mixed, thermic) in southwest region of Mississippi in a randomized complete block design. These melons received nutrients from composted cow manure. Two scions, Facination and Super poll, and two root stocks, Citron and Lagenaria, have been analyzed for their stem diameter, fruit quality, yield, biomass, and adaptability. Fascination was higher in yield and TSS than other varieties, and it was highly adapted to this region without any problems from pests and diseases. Since Facination responded well to the organic manure and was highly adapted to this region, we strongly recommend this variety, farming system, and grafting technology.

P1.03

AN INVESTIGATION OF THE EFFECTS OF *Brassica oleracea* AND *Brassica rapa* ON THE GROWTH OF *Amaranthus palmeri*

Monteco Peavy, Jermyron Rice, Montavia Pearson, Nikolas Shanklin, Jennifer Laifa

Mississippi Valley State University, Itta Bena, MS

Amaranthus palmeri is an invasive weed. *A. palmeri* grows fast and produce many seeds. It affects the growth of cotton and soybean by inhibiting the yield. *Brassica oleracea* includes cabbage and *Brassica rapa* includes the turnip. The hypothesis of the study was that compounds from *Brassica oleracea* and *Brassica rapa* would inhibit the growth and development of *Amaranthus palmeri*. The seeds of *A. palmeri* were planted in soils containing *B. oleracea* and *B. rapa*. The shoot heights, root lengths and the biomass of shoots and roots were measured from the *A. palmeri* which was growing from the soils mixed with *B. oleracea* and *B. rapa*. The results revealed that *B. rapa* decreased shoot heights, root lengths and the biomass of *A. palmeri*. *B. oleracea* did not have an effect on the growth of *A. palmeri*. The results are an indication that *B. rapa* can inhibit the growth and development of *A. palmeri*.

P1.04

AN INVESTIGATION OF THE GROWTH OF BACILLUS SUBTILIS IN THE PRESENCE OF THE EXTRACTS FROM *Bidens pilosa*

Lovely Anderson, Jennifer Laifa

Mississippi Valley State University, Itta Bena, MS

Bacillus subtilis is a Gram-positive endospore-forming bacterium. It is non-pathogenic but the spores can survive heat. The survival of spores from heat can cause *B. subtilis* to cause food poisoning. The study was based on the understanding of the growth of *B. subtilis* in the presence of *Bidens pilosa*. The hypothesis of the study was that the growth of *B. subtilis* would be inhibited in the presence of extracts from *B. pilosa*. The seeds of *B. pilosa* were purchased from the seed company. The seeds were dried, ground and shaken in acetone, ethanol, methanol, and water for 72 hours. Solvents were evaporated and the crude extracts were screened for antibacterial activities using a modified Kirby-Bauer disk method. The results revealed that the growth of *B. subtilis* was inhibited by the extracts using acetone and methanol. The zones of inhibition were 16 mm. The extracts using ethanol and water were not effective in inhibiting the growth of *B. subtilis*. *B. pilosa* that is extracted using acetone and methanol can inhibit the growth of *B. subtilis*.

P1.05

EFFECT OF CUTTING SUBMERSION DURATION AND AUXIN CONCENTRATION ON FLORIDA AZALEA SURVIVABILITY AND ROOT RESPONSE

[1]Jenny B. Ryals, [1]Patricia R. Knight, [2]Daryl R. Chastain, [3]Lloyd E. Ryals, III, [4]Christine E. H. Coker, [4]Gary R. Bachman, [4]Jim M. DelPrince, [5]Patricia R. Drackett, [1]Anthony T. Bowden

[1]Coastal Research and Extension Center, Poplarville, MS, [2]Delta Research and Extension Center, Stoneville, MS, [3]MDAC-Bureau of Plant Industry, Mississippi State, MS, [4]Coastal Research and Extension Center, Biloxi, MS, [5]The Crosby Arboretum, Picayune, MS,

Florida azalea (*Rhododendron austrinum)* is a deciduous azalea native to northern Florida, coastal Alabama, southern Georgia, and southeastern Mississippi. To provide growers with relevant cutting propagation recommendations, the objective of this research was to determine optimal commercial auxin concentration and submersion timing on very soft stem cuttings. Auxin source was Hortus IBA Water Soluble Salts™ (Hortus IBA) at 0, 1000, 2500, 5000, 7500, or 10000 ppm IBA. Submersion durations were 0, 1, 6, 12, or 24 hours with 0 receiving a 5 sec basal quick-dip. Duration of submersion effected root percentage ($P<.0001$), number of roots ($P=0.0101$), and average length of the three longest roots ($P=0.0415$). There was an interaction between auxin concentration and submersion duration for root quality ($P=0.0056$), cutting quality ($P<.0001$) and growth indices ($P<.0001$). Results indicate that very soft Florida azalea cuttings had a better rooting response when treated with a 5 sec basal quick-dip and auxin concentration was 2500.

P1.06

EFFECTS OF 2,4-D IN INTERSPECIFIC CHROMOSOME SUBSTITUTION LINES OF UPLAND COTTON, *Gossypium hirsutum* L.

[1]Loida M. Perez, [2]Isabel Werle, [3]Sukumar Saha, [3]Johnie Jenkins, [4]David M. Stelly, [1]Jeffrey FD. Dean, [1]Te-Ming Paul Tseng

[1]Mississippi State University, Mississippi State, MS, [2]University of Arkansas, Fayetteville, AR, [3]USDA-ARS, [4]Texas A&M University, College Station, TX

Cotton is a natural source of fiber and major row crop in the US with an estimated $ 6.7 billion total production in 2018. However, weeds greatly reduce cotton growth, yield, harvest-ability and fiber quality, so their management is crucial to cotton production. Weed management strategies often rely on herbicides, due to their simplicity, ease of application, and effectiveness. Due to widespread adoption of glyphosate-resistant crops, numerous herbicide-resistant weeds have evolved. With glyphosate rendered ineffective, growers and companies have searched for novel herbicide resistance genes. Previously, we have screened interspecific chromosome substitution (CS) lines of Upland cotton in the genetic background of *G. hirsutum* L. for tolerance to 2,4-D to find novel variants as potential source of herbicide resistance genes. Here, we report the effects of 2,4-D treatment on selected CS lines under field conditions. Seven CS lines, CS-T04-15, CS-B12, CS-B15sh, CS-T04, CS-B22sh, CS-T07, and CS-B04-15 were screened for resistance to a field-recommended rate (1.12 kg ai ha^{-1}) of 2,4-D at 4 and 7 weeks after seedling emergence (WAE) using a two-factorial split plot design ($r=4$) and 2 locations, Starkville and Pontotoc, MS. Injury caused by 2,4-D applied at 4 WAE ranged from 6.6% to 91.6% after 14-21 days while 4.9% to 87.2% at 7 WAE. Three lines, CS-T04-15, CS-B15sh, and CS-T07 showed lowest injury in both locations indicating some degree of tolerance to 2,4-D in cotton seedlings at 4 and 7 WAE. Findings can be used for a dose-response experiment to identify potential sources of herbicide resistance in cotton.

P1.07

EFFECT OF RENLON, RENBARB1, AND RENBARB2 GENE COMBINATIONS ON RESISTANCE TO RENIFORM NEMATODE AND AGRONOMIC TRAITS IN UPLAND COTTON

[1]Burcin Celik, [1]Ted Wallace, [2]Jodi Scheffler, [2]Sally Stetina

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

Upland cotton (*Gossypium hirsutum*L.) is the most important fiber crop in the world. All cultivars currently grown are considered susceptible to reniform nematode (*Rotylenchulus reniformis*), a parasitic worm-like organism that feeds and reproduces on cotton roots. Methods for reducing losses are limited to use of toxic nematicides and crop rotation. Development and use of cultivars with genetic resistance would provide an effective and economical method of control. Two sources of resistance became available when genes were transferred into upland cotton from the wild relative species *G. longicalyx*(*Ren^{lon}*) and from *G. barbadense*(*Ren^{barb}*), a sea island cotton. A high level of resistance is provided by *Ren^{lon}*and *Ren^{barb}*, however, resistance provided by *Ren^{lon}*has been associated with plant stunting. Although *Ren^{lon}*provides a high level of resistance, it is not being used to develop new cultivars due to stunting. Proposed research will (1) develop a family of full-sib genotypes to represent all combinations of *Ren^{lon}*with *Ren^{barb1}*and *Ren^{barb2}*and a null genotype, (2) compare the genotypes for resistance (Rf) to reniform nematode when grown in a reniform infested field, (3) determine if any combination of *Ren^{lon}*and *Ren^{barb}*resistance genes alters the problem of stunting associated with *Ren^{lon}*, and (4) determine the effect of resistance gene combinations on the yield and fiber quality of cotton grown in a reniform infested soil.

P1.08

EFFECTS OF WATER-SAVING IRRIGATION ON MIGRATION AND TRANSFORMATION OF CADMIUM IN PADDY SOIL PLANT SYSTEM

[1]Yajun Luan, [2]Fuyu Guo, [2]Hanrui Wang, [2]Qinku Zhang, [2]Jing Nie, [2]Fengxiang Han

[1]Hohai University, University in Nanjing, China, [2]Jackson Stat, University, Jackson, MS

Identifying the occurrence, migration and bioavailability of heavy metals in soils significant for evaluating soil pollution, and providing theoretical bases for developing remediation technology. Rice is one of the most important staple food in China. To deal with challenges of uncertain water supply and the likelihood of less water available for rice production, Non-flooded controlled irrigation (CI), triggered irrigation with the ratio of soil moisture to the saturated one as a water deficit indicator, and is widely used in rice paddies. The characteristics of binding from and variation of cadmium (Cd) in paddy soil, and accumulation of Cd of rice were analyzed based on field experiment and laboratory analysis. The relationship between parts of the physical and chemical factors and binding forms of Cd, distribution and enrichment characteristics of Cd and its influencing factors in soil-plant system were investigated. Effects of CI on migration and transformation of Cd in paddy soil were studied. Results have important scientific significance for providing a theoretical basis to determine the reasonable water-saving irrigation mode and fully revealing the environmental effects of paddy fields under water-saving irrigation.

P1.09

SCREENING WEEDY RICE (*Oryza sativa* spp.) GERMPLASM FOR TOLERANCE TO VARIOUS ABIOTIC STRESSES

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

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Rice (Oryza sativa) is a 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. 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 (Oryza sativa spp.), a noxious weed with increased competition when compared to cultivated rice and of the same genus and species as rice, to discover genes related to cold (18C), heat (38C), and complete submergence stress tolerance. In this study, a population of 54 weedy rice accessions was screened for tolerance to the above stresses and characterized based on height and biomass reduction when compared to the untreated control. These screenings demonstrated that approximately 20% of the weedy rice population outperformed the untreated control, rice breeding lines, and rice cultivars with less than 20% height reduction and less than 40% biomass reduction. One WR line showed increased tolerance to two or more stress, accession 9, and will be intensely tested to uncover mechanisms of tolerance.

P1.10

MICROSATELLITE MARKERS ASSOCIATED WITH ALLELOPATHY IN WEEDY RICE (*Oryza sativa*)

Brooklyn Schumaker

Mississippi State University, Mississippi State, MS

Rice provides up to 50% of the dietary caloric supply for an estimated 520 million people worldwide. In order to meet the demand of a growing global population increasing productivity of rice production is paramount. The most significant yield-limiting factor in rice production is weed competition. Weedy rice is a wild relative of cultivated rice and one of the most common rice weeds, exhibiting characteristics that suggest vast germplasm of potential traits for rice crop improvement. One such trait exhibited in weedy rice is allelopathy. Allelopathy is defined as any detrimental effect by one plant on another through the production of chemical compounds that escape into the environment. The genetic diversity weeds possess allows them to adapt and thrive in various stressful environments and outcompete their neighboring crops. Genetic markers have been used to assess the genetic diversity among weedy rice with regards to stressors such as heat tolerance, cold tolerance, and submergence tolerance. The objective of this study is to associate allelopathic characteristics from weedy rice to the genetic controls through simple sequence repeat (SSR) markers. Allelopathic weedy rice accessions and allelopathic rice (RONDO, PI312777) were analyzed using 30 SSR markers. Identifying markers correlated with allelopathic genes in weedy rice can enhance selective breeding efforts to develop weed suppressive rice varieties.

P1.11

BREAKING THE BARRIERS TO FRUIT AND VEGETABLE ACCEPTANCE IN SCHOOL AGE CHILDREN IN SOUTHWEST MISSISSIPPI

Edith Ezekwe, Alicia Cox

Alcorn State University, Lorman, MS

The Center for Disease Control and Prevention estimates that only 5% to 6% of adolescents meet the recommendations for fruit and vegetable (FV) intake. The purpose of this study was to access the preference of FV intake in the form of a smoothie and daily consumption of fruit and vegetables among 4th and 5th grade students, using nutrition questionnaires. Cross sectional study design was used to obtain data from 126 students within the Jefferson, Mississippi School District. After sampling a FV smoothie, short survey questionnaires were filled out by students. Variables such as height, weight, age, BMI were collected. Questions specific to knowledge of daily FV consumption, dietary guidelines, and relationship of risk factors for chronic diseases and diet were ascertained. Data showed

that 39.8 % males and 60.2% females enjoyed the FV smoothie. Forty-seven percent of males and 53.3% of females did not eat fruits in their daily meals, while 31.6% males and 68.4% females did not eat vegetables daily. Both females (69.4%) and males (30.6%) stated they could eat 2 servings of fruits daily ($P<0.005$). The study demonstrated that majority of the children liked the smoothie taste, which could potentially increase their overall daily FV consumption and decrease risk factors for obesity-related chronic diseases in adulthood. Current data indicates that an adoption of FV smoothie within the school system could potentially inform policies to decrease or eliminate calorie-dense, artificially sweetened beverages within the school district menus.

P1.12

MOLECULAR MARKERS ASSOCIATED WITH WEED-SUPPRESSING ABILITIES IN CHROMOSOME SUBSTITUTION (CS) COTTON LINES

Mary Gracen Fuller

Mississippi State University, Mississippi State, MS

Cotton is a very important crop cultivated around the world. While there are many species in the Gossypium genus, there are only four cultivated germplasms. Of these four species, Gossypium hirsutum, or Upland Cotton, is the most heavily cultivated. Increased refinement and cultivation of Upland Cotton has led to a homogenous genome with little genetic variation. Chromosome Substitution (CS) Lines of Upland Cotton created using interspecific introgression provide variation in the Upland Cotton genome rooted in more heterogenous Gossypium germplasms that have elucidated valuable characteristics. In previous screenings, selected CS lines were determined to exhibit weed-suppressing characteristics. It is expected for CS Lines of interest to maintain anomalies in specific genetic regions associated with weed suppression traits. It is also expected for the selected CS lines of interest to produce chemical exudates that can be isolated and identified. Extracts of these selected lines were prepared using various methods and were loaded onto chromatography columns for analysis. Quantitative trait loci (QTL) analyses was also utilized to determine the genetic differences between the allelopathic CS lines of interest and traditionally grown cultivars. Identification and quantification of genes involved in allelopathic chemical production implies heritability of allelopathic ability, which can be utilized in future breeding programs.

P1.13

PROXIMATE COMPOSITION, MICRONUTRIENT NUTRIENTS AND ACCEPTABILITY OF CRACKERS FROM THE FLOUR BLENDS OF WHEAT, MAIZE-AFRICAN YAM BEAN SEED AND CASSAVA CORTEX

Okoye Ebele C

Alcorn State University, Lorman, MS

The study explored the potentials of substituting cassava cortex into a composite flour comprising of wheat, maize and African yam bean seed to produce crackers. Flour was produced from maize and African yam bean seed in the ratio 70:30, respectively. The maize-African yam bean seed flour (MAF) composite was blended with wheat flour (WF) at 100: 0, 90: 10, 80: 20, 70: 30 and 60: 40, WF to MAF ratios respectively, and were used to produce crackers samples. The samples were evaluated for sensory evaluation and sample from 70:30 was the most preferred by the panelists based on the overall acceptability. The 70: 30 composites of WF: MAF was further blended with cassava cortex flour at 5, 10, 15 and 20 % while substituting the levels of wheat flour. All the flour samples were then used to produce crackers and analyzed for proximate composition, micronutrients and sensory qualities. Results show a significant ($p > 0.05$) decrease in the protein content (9.33-4.41 %) with an increase in the ash (2.05-2.55 %) and crude fiber (1.55-2.14 %) content of the samples as the inclusion of the level of cassava cortex increased. There was a significant ($p < 0.05$) increase in the calcium and the vitamin contents of the blended samples. The sensory scores showed that sample WC (control sample) had the highest scores among all the samples in terms of flavor, taste, texture, and color, and was also the most preferred by the panelists based on the overall acceptability.

P1.14

VIRUS ELIMINATION IN SWEETPOTATO THROUGH MERISTEM TIP CULTURE AND THERMOTHERAPY

[1]Chimaka Udedibor, [1]Emmanella Nnuji-John, [2]Yan Meng

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Sweetpotato (*Ipomoea batatas* L.) belongs to the Convolvulaceae family and is an important crop for food security. Sweetpotato is subject to a wide range of pathogen infections. Among them, viral diseases are the major constraints in sweetpotato productions, as viruses could be accumulated and transferred from one generation to the next through the use of infected vegetative propagated sweetpotato materials, aka “seeds”. There are over 30 viruses worldwide that are known to infect sweetpotato and many of them have been reported at the major sweetpotato growing region in the United States. To realize the full potential of this crop, a combination of thermotherapy followed by meristem-tip culture technique was adopted for virus removal on 24 sweetpotato lines collected from different resources, including Plant Resources Conservation Unit of USDA (Griffin, Georgia, USA), Mississippi State University, Research Stations of Alcorn State University at Preston, MS and Mount Bayou, MS et. al. PCR and RT-PCR were used to detect the existence of five of the most prevalent viruses in Mississippi. The results suggested 10 lines of sweetpotao are free of virus detection. In this study, meristem-tip culture and virus detection protocols have been optimized for the purposes of eradicating viruses from elite sweetpotato lines in Mississippi. For a long run, the application of this technique will boost the life quality and living environment for the underserved limited resource farmers and the communities.

P1.15

CHARACTERIZATION OF AN INFECTIOUS POPLAR MOSAIC VIRUS cDNA CLONE

Andreya L. Dupree, Daniela F. Adjaye, Yan Meng, Victor Njiti, Chunquan Zhang

Alcorn State University, Lorman, MS

Poplar, cottonwood and aspen trees are all members of the *Populus* genus that has about 25-35 species of deciduous flowering plants in the family *Salicaceae*. Many species within the genus are important for paper industry, construction, packaging and other industrial applications. The western balsam poplar (*Popular trichocarpa*) was the first tree whose whole genome is sequenced making it a model for tree genomics studies. *Poplar mosaic virus* (PopMV), is known to naturally infect species within the genus *Populus* causing foliar mosaic, vein necrosis, leaf petiole deformation or stem lesions. PopMV distributes world widely where susceptible poplar species occurs. PopMV belongs to the genus *Carlavirus* with a typicalsingle stranded positive sense RNA genome about 8.7kb in length. In this study, we cloned and placed PopMV genomic cDNA under control of CaMV 35s promoter and NOS terminator. One infectious PopMV cDNA clone, upon biolistic inoculation of *Nicotiana megalosiphon* plants, showed typical yellow necrosis spot lesions similar to those induced by wild type PopMV infections. It was previously reported that PopMV has a wide host range including many economically important plants. We thus conducted a host range test by using the leaf saps collected from infected *N. megalosiphon* plants. Results shows the great potential of this newly developed infectious PopMV cDNA clone to be used as viral gene expression and silencing vectors for functional genomics studies of many important plants.

P1.16

IDENTIFYING SECONDARY METABOLITES PRODUCED BY CHARCOAL ROT DISEASE FUNGUS, *Macrophomina phaseolina*, AND THEIR ROLE IN PATHOGENESIS.

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[1]Mississippi State University, Mississippi State, MS, [2]US Department of Agriculture-Agricultural Research Service, [3]University of Minnesota, Minneapolis, MN

Charcoal rot disease fungus, *Macrophomina phaseolina*, is consistently one of the leading contributors to soybean crop yield loss in the Mid-South US and worldwide infects over 500 species commercially-important plants, including row crops, trees, vegetables, and ornamentals. *M. phaseolina* has been reported to produce a range of secondary metabolites and toxins, including asperlin, phomalactone, phaseolinone, patulin, and (-)-botryodiplodin. Due to the ability to produce toxins, *M. phaseolina* is suspected to infect plants from the soil reservoir through a toxin-mediated process. Before investigating the toxin-mediated infection process, toxins produced by *M. phaseolina* must first be identified. An in-culture colorimetric assay for the detection of (-)-botryodiplodin was used to identify (-)-botryodiplodin-producing *M. phaseolina* isolates. Non-botryodiplodin-producing isolates (20-25%) were cultured in Czapek-Dox broth media for 10 days. Medium filtrates were sterilized by vacuum filtration through 0.45 µm pore size membrane filters, and tested for phytoxicity using a hydroponic soybean seedling bioassay at 1:1 and 2:1 hydroponic medium:filtrate ratios. After 72 hours, 50% of the isolates exhibited phytotoxic responses ranging from mild chlorosis to complete seedling death at both concentrations. Selected phytotoxic *M. phaseolina* isolates were further examined by bioassay-guided fractionation, LC/MS, and GC/MS analyses to identify phytotoxic secondary metabolites. Chemical analysis revealed the first report of mellein production by select *M. phaseolina* isolates. Further tests will be conducted to determine the phytotoxicity and role of the compound.

P1.17

IMPACT OF ORGANIC AND INORGANIC NITROGEN SOURCES ON SOIL PROPERTIES

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Alcorn State University, Lorman, MS

Soil properties play a vital role in determining the overall soil health as well as crop production. Soil properties affects soil processes related to soil health such as nutrients cycling, movement of air and water through soil, conditions affecting germination and root growth, and soil erosion. Both organic and inorganic manures contribute to changes in a soil's properties, and knowledge of these specific changes is essential for decision making in soil management. A good understanding of these concepts can lead to increased crop yield and improved soil health. Hence, the objective of this experiment is to assess the effect of poultry litter, compost manure, and urea prill fertilizer on soil properties 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 as 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 at a rate of 130lbs N/acre. Sweet corn (Zea Mays) seeds were planted into the tilled experiment site at a spacing of 1/2 ft. between plants and 3 ft. between the rows. Preliminary data on water stable aggregates showed no treatment effect after one growing season. Data collection on soil nutrients, water infiltration, bulk density, EC and pH are ongoing and complete results will be presented at the meeting.

P1.18

INFLUENCE OF HARVEST-AIDS ON SEED NUTRITION IN SOYBEAN UNDER MIDSOUTH USA CONDITIONS

Nacer Bellaloui

USDA, Agriculture Research Service, Crop Genetics Research Unit, Stoneville, Mississippi

Harvest-aids (defoliants or crop desiccants) such as paraquat, carfentrazone-ethyl, and sodium chlorate have become increasingly important to assure producer profit and maintain seed quality. Information on the effects of defoliants on seed composition (protein, oil, fatty acids, sugars, amino acids) in soybean, however, is very limited. Therefore, the objective of this research was to investigate the influence of defoliants on seed protein, oil, fatty acids, sugars, and amino acids. Field experiments were conducted in 2012 and 2013 under Mid-South USA environmental conditions in which defoliants were applied at R6 (seed-fill) and R7 (yellow pods) growth stages. Treatments applied included an untreated control, 0.28 kg ai ha^{-1} of paraquat, 0.28 kg ai ha^{-1} of paraquat + 1.015 kg ai ha^{-1} of carfentrazone-ethyl (AIM) 24g l^{-1}; 6.72 kg ai ha^{-1} sodium chlorate, 0.015 kg ai ha^{-1} carfentrazone-ethyl 24g l^{-1}; and 2.0 kg ae ha^{-1} glyphosate. Results showed that application of defoliants at either R6 or R7 resulted in alteration in some seed compositions such as protein, oil, oleic acid, fructose, and some amino acids. Defoliants affected seed composition constituents differently, depending on the growth stage. This research demonstrated possible alteration of nutrients by defoliants, although there were no effects on yield. This research helps growers and scientists to advance the understanding and management of defoliants and investigate possible effects of defoliants on seed nutrition.

P1.19

EFFECTS OF COVER CROP AND FERTILITY MANAGEMENT ON SOIL BIOLOGICAL PROPERTIES IN DRYLAND SOYBEAN SYSTEMS

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Farming practices such as cover crops, tillage, and fertilizer application are key determinants of microbial community structure and function in soil. Among the critical functions of soil microbiomes to dryland crop production is that of contributing to improved soil structure via aggregation. Soil structure is critical to both drainage and storage of soil moisture in the rooting zone. A study has been conducted at the Pontotoc Branch Experiment Station for the past two years to determine the relationship of microbial activity and biological indicators to soil aggregation as influenced by cover crop species, cover crop growth period and fertility management in no-till, dryland soybean production. Five fall cover crops (cereal rye, wheat, vetch, native vegetation, and a mustard-cereal rye mixture) in combination with three fertility practices (mineral fertilizer based on soil test recommendations, poultry litter at a rate based on nutrient analysis and crop requirements, and a no-fertilizer control) were studied. The duration of cover crop growth was controlled by soybean planting, which were either May or June each year. Soil samples, collected at the termination of cover crops, i.e., at soybean planting, included: pH, total C and N, available P, micronutrients, glomalin-like proteins, and percent water-stable aggregates. Additionally, percent cover crop cover, cover crop biomass, and soybean yield were also determined. The results provide a better understanding of the rates of change to soil characteristics that are critical in dryland soybean systems.

Thursday, February 20, 2020

EVENING

3:30 Dodgen Lecture and Awards Ceremony

General Poster Session (Immediately Following Dodgen Lecture)

Friday, February 21, 2020

MORNING

Room

8:20 Welcome

Symposia on the Future of Food and Agriculture

8:30 Divisional Keynote Speaker
Ryan Kurtz, Director,
Agriculture and Environment Research
Cotton Incorporated

9:00 Divisional Keynote Speaker
Girish Panicker, Director,
Center for Conservation Research
School of Agriculture and Applied Sciences
Alcorn State University

9:30 Divisional Keynote Speaker
Chunquan Zhang, Associate Professor
Department of Agriculture
School of Agriculture and Applied Sciences
Alcorn State University

10:00 **Divisional Awards Ceremony**

10:30 Divisional Business Meeting

Friday, February 21, 2020

AFTERNOON

12:00-1:00 Plenary Speaker

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

CELLULAR, MOLECULAR, DEVELOPMENTAL BIOLOGY

Chair: Donna M. Gordon
Mississippi State University
Chair: James A. Stewart, Jr.
University of Mississippi Medical Center

Thursday, February 20, 2020

MORNING

Room D12

Oral Presentation Session I

Moderators: Drs. Donna M. Gordon and James A. Stewart, Jr.

8:30 WELCOME

O2.01

8:45 MOUSE TROPHOBLASTS CAN PROVIDE ANTIVIRAL INNATE IMMUNITY TO EMBRYONIC STEM CELLS THAT ARE DEFICIENT IN PRODUCING TYPE I INTERFERONS (Grad)

Mona Fendereski, Yan-Lin Guo

University of Southern Mississippi, Hattiesburg, MS, USA

The blastocyst is the preimplantation embryo that consists of two major components: the inner cell mass (ICM) and the trophectoderm, which give rise to the fetus and placenta, respectively. We have previously reported that embryonic stem cells (ESCs), the major component of the ICM of blastocyst, do not express type I interferons (IFNs) and lack response to inflammatory cytokines. Surprisingly, our recent data suggest that ESCs are less susceptible to immunological cytotoxicity and are not hypersensitive to viral infection. These findings led to our hypothesis that the lack of antiviral responses could be a protective mechanism that allows ESCs to avoid the negative impact of immune responses, but how ESCs deal with pathogen infection and immunological challenges is not known. In this study, we investigated IFN-based antiviral innate immunity of trophectoderm by using mouse trophoblast stem cells (TSCs) and their *in vitro* differentiated trophoblasts (TSC-TBs). Our preliminary data indicated that both TSCs and TSCTBs have a functional IFN system. They are able to express IFNs and respond to viral stimuli. We further show that conditioned medium from TSCs and TSC-FBs stimulated with polyinosinic:polycytidylic acid (poly I:C), a synthetic viral RNA analog, contains antiviral activity that could inhibit infection of ESCs by Chikungunya and Zika virus. The antiviral activity in the conditioned medium is largely attributed to IFNs secreted by TSCs and TSC-FBs. These findings indicate that though ESCs are deficient in producing IFNs, they can gain IFN antiviral protection from the trophectoderm via a paracrine signaling mechanism in the blastocyst.

O2.02

9:00 TICK-BORNE PATHOGEN INFECTION MODULATES THE NATIVE MICROBIAL COMPOSITION WITH THE TICK VECTORS (Grad)

Abdulsalam Adegoke[1], Deepak Kumar[1], Muhammad Imran Rashid[2], Aneela Zameer Durrani[3], Muhammad Sohail Sajid[4], Shaid Karim[1]

[1]Center for Molecular and Cellular Biosciences, The University of Southern Mississippi, Hattiesburg, MS, USA, [2]Department Parasitology, University of Veterinary and Animal Sciences, Lahore, Pakistan, [3]Department Clinical Medicine and Surgery, University of Veterinary and Animal Sciences, Lahore, Pakistan, [4]Department of Parasitology, University of Agriculture, Faisalabad, Pakistan

Ticks harbor a diverse community of microbes linked with their biological success in hematophagy and vector competence. Little is known of the interaction that exists between bacterial and protozoan pathogens of livestock and domestic animals. In lieu of this, we conducted this study to determine the microbial composition of uninfected and pathogen-infected Hyalomma anatolicum anatolicum and Rhipicephalus microplus tick species. We used a PCR based assay and metagenomic sequencing of the 16S rRNA gene V1-V3 hypervariable regions using a MiSeq Illumina platform. Species differences exist in the microbiome composition of uninfected male and female H. anatolicum anatolicum ticks. While both males and females had Propionibacterium acnes and Francisella sp in abundance, Ehrlichia sp and Candidatus Midichloria mitochondrii were additionally detected in the female ticks. Our results also showed that the microbiome of uninfected R. microplus ticks had a more diverse bacteria species compared to H. anatolicum anatolicum ticks. Species composition in uninfected and A. marginale infected R. microplus remains constant, but we observed a possible Theileria-associated dysbiosis in Theileria infected R. microplus ticks. An unexpected finding was the detection of the protozoan pathogen Plasmodium falciparum and Hepatozoon americanum in the microbiome of H. anatolicum anatolicum ticks, and interestingly, the abundance of P. falciparum increased with Theileria infection within the same tick. This study adds to existing knowledge on the microbial diversity in two important tick species from Pakistan and revealed the presence of Theileria, A. marginale and other pathogenic bacteria of public health significance.

O2.03

9:15 DIABETES-MEDIATED VASCULAR CALCIFICATION IS RAGE-DEPENDENT

Amber M. Kennon, James A. Stewart

University of Mississippi School of Pharmacy, University, MS, USA

Type II diabetes mellitus (DM) is characterized by chronic hyperglycemia, and medial vascular calcification is a common cardiovascular complication of DM. Advanced Glycation End-Products (AGEs)/Receptor for AGEs (RAGE) signaling cascade has been implicated as a potentiator of diabetes-mediated vascular calcification, but it is not well understood. AGE/RAGE signaling influences both cellular and systemic responses to increase bone matrix proteins in hyperglycemic and calcification conditions. This causes a phenotypic switch of vascular smooth muscle cells (VSMCs) to osteoblast-like cells and the hypothesized activation of adventitial fibroblasts (AFBs) to a myofibroblast phenotype. This research seeks to understand AGE/RAGE mediated vascular calcification as a complication of DM. Calcification was induced in primary mouse VSMCs and AFBs of non-diabetic, diabetic, non-diabetic RAGE knockout (RKO), and diabetic RKO, and then treated with AGEs to activate RAGE. Intracellular calcium levels were quantified and normalized to cell number. Pronounced calcification was observed in diabetic VSMCs and RKO resulted in significantly decreased calcification. AFBs were exposed to the same experimental conditions as the VSMCs and calcification was unchanged with AGE treatment or RKO. These data demonstrated that diabetes-mediated vascular calcification was RAGE-dependent in VSMCs but may not be AGE-mediated in AFBs. Literature has cited the VSMC as the primary mediator for vascular calcification, but we have shown that the AFBs have the ability to calcify and this may not be an AGE-mediated response. Understanding the role of AGE/RAGE signaling in diabetes-mediated vascular calcification will allow for possible targets for pharmacological intervention.

O2.04

9:30 INHIBITION OF MORPHOLOGICAL SWITCHING OF *CANDIDA* SPECIES FOLLOWING OCCIDIOFUNGIN EXPOSURE (Grad)

Rabina Kumpakha, Donna M. Gordon

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

Candida albicans is an opportunistic pathogen that colonizes the mouth, gut, and genitals of healthy individuals. *C. albicans* grows as yeasts but under certain conditions, can switch to a true hypha form which is considered a major virulence factor for this fungus. In many cases this morphological plasticity can result in minor mucosal infections, but for some individuals, it can lead to life-threatening systemic infections. Prior work has shown that the antifungal compound, occidiofungin, prevents hyphal switching in *C. albicans*. To determine whether occidiofungin was broadly effective at inhibiting morphological switching, we tested its ability to inhibit the filamentation process when N-acetylglucosamine was used as the switching inducer. Although N-acetylglucosamine was less efficient at promoting filament formation, occidiofungin completely blocked hyphae. In addition, MIC analysis of morphologically switching cells found them to be more sensitive to occidiofungin exposure than their non-switching counterparts. To extend these studies, we assayed the inhibitory activity of occidiofungin on the filament forming non-albicans *Candida* species (NAC), *C. tropicalis*. Similar to *C. albicans*, occidiofungin prevented filamentation of *C. tropicalis*. To determine whether there was a window of susceptibility, we measured the impact of occidiofungin exposure when added post switching. Our results suggest that complete inhibition of filamentation was possible when occidiofungin was added within a small time 'window' indicating that it targets initiation and/or elongation. The fact that occidiofungin targets filamentation and is effective against *C. albicans* and NAC species, suggests that this compound may be a strong candidate for the treatment of *Candida* infections.

O2.05

9:45 GENETICALLY MODIFIED CROPS TO ADDRESS WORLD POPULATION EXPLOSION (Grad)

Tolulope Eyitayo Asala

Jackson State University, Clinton, MS, USA

Introduction: This review article addresses recent status of genetically modified (GM) crops and their potential benefits to tackle the needs of population explosions. Genetically modified crops are altered for disease resistance and herbicides tolerance leading to higher yields. Methods to modify them could be transgenic, cisgenic or intragenic. There has been a steady adoption of GM crops to accommodate ever increasing global population, which is expected to reach 11 billion by 2100. Methods: Data for this review article were collected from published peer reviewed literature and various international organizations monitoring crop productions. Global area of GM crops vary widely between developed and developing countries lead by theUS with 75.0 million hectares followed by Brazil with 50.2 million hectares showing a continuous rise since, 2015. Results: Perceived allerginicity of GM crops is a major obstacle towards their acceptance. Proteins are considered to be the primary instigators of

many allergic reactions leading to speculations that with the increase in protein contents in GM crops, such allergic reactions could increase substantially. These concerns however, have been debunked although long term quantitative data are required to develop analytical models that determine the association and causality between GM-proteins and allerginicity. Brief Discussion: Other factors affecting the perceptions of GM crops include gene displacement and the vested interests of giant multinational corporations that control these modified germ plants prohibiting their free access to poor farmers leading substantial numbers of suicides in developing countries like India. Key words: GM crops, Proteins, Allergic reactions, World population

10:00-10:15 BREAK

Oral Presentation Session II

Moderators: Dr. Donna M. Gordon and Robyn Payton

O2.06

10:15 INVESTIGATIONS OF NANOTOXICITY IN A *CHLAMYDOMONAS REINHARDTII* ALGAL SPECIES MODEL AS IT RELATES TO OXIDATIVE STRESS (UG)

Jhah Cook[1], Dr. Mark A Dugo[2]

[1]Mississippi Valley State University, Biology and Chemistry, Itta Bena, MS, USA, [2]Mississippi Valley State University, Environmental Health, Itta Bena, MS, USA

The production of nanoparticles (NPs) (particles <100nm in any one direction) has steadily increased over the past several decades. Metal NPs such as titanium oxide, copper oxide, and silver are some of the most abundantly produced NPs. Applications range from their use as antibiotics, to agents of bioremediation and wastewater treatment. While nanotechnology holds great promise for a variety of applications, there remains significant question regarding the impacts of nanoparticles accumulating in the environment. We are conducting experiential based laboratory training using a *Chlamydomonas reinhardtii* algal species model to investigate toxicological responses with emphasis on oxidative stress and the production of reactive oxygen species (ROS). The accumulation of free radicals can lead to degenerative diseases, cell death and cancer. Antioxidants can reduce the effects of free radicals. Maintaining an equilibrium between ROS and antioxidants is necessary because one extreme is damaging to the cell. The relationships between DNA-mRNA-proteins is central to study, and the analysis of gene expression through real-time qPCR in conjunction with measurements of cell viability are the primary analytical approaches to assess toxicological response to NP exposures. For our studies, we are focused on MN-superoxide dismutase (MSD1) and thioredoxin dependent peroxidase (PRX6) as molecular components of biological antioxidant response systems. Phylogenetic reconstruction of homologous MSD1 and PRX6 gene trees demonstrate broad taxonomic occurrence of these genes from multiple domains of life and provide justification for our use of an algal species model for this study. Funding: Department of Education and MS-INBRE

O2.07

10:30 ALPHA-GAL SYNDROME: MOLECULAR CHARACTERIZATION OF α-D-GALACTOSIDASE IN LONE-STAR TICK α-GAL METABOLISM AND ONSET OF RED MEAT ALLERGY (UG)

Ahmed Mohamed, Gary Crispell, Surendra Raj Sharma, Faizan Tahir, Shahid Karim

The University of Southern Mississippi, Hattiesburg, MS, USA

Tick-borne red meat allergy is an IgE-mediated delayed hypersensitivity reaction, 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 α-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 α-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 tick galactose metabolism pathway. Western Blotting and N-glycan analysis revealed that AGS-silenced ticks ultimately expressed less α-gal epitopes due to the reduction of available UDP-galactose. We are currently conducting additional western blotting and basophil-activation experiments in order to further elucidate the role of α-D-galactosidase in tick-host interactions and the possible involvement in the emergent "Red Meat Allergy".

O2.08

10:45 AN INVESTIGATION ON MICROORGANISMS GROWING IN PUBLIC PLACES (UG)

Arlencia Barnes, Jennifer Laifa

Mississippi Valley State University, Itta Bena, MS, USA

Microorganisms are found in an infinite amount of places. This led to questions of how people continuously touch things in public places without a second thought. Microorganisms may be beneficial or detrimental, but they are inevitable to come into contact with. Many people touch microbe infested objects daily without hesitation. Afterwards, they do not even consider washing their hands because it has become normal to touch these objects without thinking of the possible microbes that they are touching or passing from person-to-person indirectly. For the present study, an investigation of microorganisms growing in public places was done. The hypothesis for the study was that different microorganisms would be discovered from various public places. Sterile swabs were used on three gas stations and three stores to collect samples from the randomly selected gas pumps and baskets. The samples collected were plated on agar and incubated for maximum growth. A Gram-stain procedure was performed to determine whether the microorganisms were Gram-positive, Gram-negative, cocci, or rod-shaped. The results indicated that there were more Gram-positive bacteria than Gram-negative bacteria present in the collected samples. In conclusion, sanitizing basket handles and washing hands after pumping gas should reduce the amount of microbes being passed.

O2.09

11:00 INVOLVEMENT OF RDRP IN AMPHIOXUS RNAI PATHWAY IS ASSOCIATED WITH MALE BIOLOGY

Jacob O. Peter[1], Mosharof Mondal[2], Alex S. Flynt[1]

[1]The University of Southern Mississippi Hattiesburg, MS, USA and [2]University of Arizona, Tucson, AZ, USA

RNA interference (RNAi) play a key role in controlling gene expression as well as genome surveillance. Even though the protein, RNA-dependent RNA polymerases (RdRp) are known to contribute to RNAi in numerous clades, the role of the protein in the chordate phylum is yet to be determined. In this study, we seek to understand the role of RdRp in the RNAi pathway of *Branchiostoma floridae*, a modern survival of the basal chordate sub-phylum, *Cephalochordata*. Through bioinformatics analysis of small RNA sequencing datasets, we recovered a population of siRNAs believed to be associated with RdRp activity. Our analysis revealed that amphioxus RdRp show gender bias, contributing to RNAi in male species by generating long dsRNA, possibly in a by-directional manner from certain mRNA transcripts. We uncovered three male specific siRNA producing loci generating siRNAs that appeared to have their origins at regions that produce male gamete associated genes. siRNAs produced at one of the observed loci appeared to target small ubiquitin modifier (SUMO) isopeptidase gene which is implicated in desumolyation processes. When these small RNA reads were traced to other locations in the genome, the testis-expressing transcription factor, Tbx1, often implicated in gonad differentiation was identified to be a target in male species. With this evidences, we believe that it is highly likely that maintenance of gonad-associated genes by RdRp in this clade was the last role for the protein before it was lost, paving way for genome modifications that might have resulted in divergence of advanced chordate lineages.

O2.10

11:15 A FUNCTIONAL ANALYSIS OF MATRIX METALLOPROTEINASES AS THERAPEUTIC TARGETS IN NEURODEGENERATIVE DISEASES

Scoty Hearst[1], Desiree Mills[1], Kennadi Johnson[1], Cendonia Thomas[1], Natraj Krishnan[2]

[1]Department of Biology, Tougaloo College, Tougaloo MS, [2]Department of Biochemistry, Molecular Biology, Entomology and Plant Pathology, Mississippi State University, Mississippi State, MS

Matrix metalloproteases (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. The exact mechanisms of MMPs in neurodegeneration are poorly understood and further complicated by the large number of MMPs 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 central hypothesis is that MMPs are an excellent therapeutic target in the progression of neurodegenerative diseases. To test our hypothesis, we will use cell culture and drosophila models of the Spinocerebellar Ataxia Type 1 (SCA1) neurodegenerative disease to assess the neurodegenerative roles of MMPs. 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. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of General Medical Sciences or the National Institutes of Health.

O2.11

11:30 APPLICATION OF FAST PHOTOCHEMICAL OXIDATION OF PROTEINS IN DETERMINING THE CONFORMATION CHANGES IN THE CATION-INDEPENDENT MANNOSE-6-PHOSPHATE RECEPTOR (Faculty)

Sandeep K Misra[1], Linda J. Olson[2], Nancy M. Dahms[2], Joshua S. Sharp[1]

[1]Department of Biomolecular Sciences, University of Mississippi, University, MS, USA, [2]Medical College of Wisconsin, Milwaukee, WI, USA

Introduction: Cation-independent mannose 6-phosphate receptor (CI-MPR) plays a central role in autophagy, development, and tumor suppression. The CI-MPR binds to this ligand at higher pH and dissociation occurs at acidic pH. We performed fast photochemical oxidation of proteins experiments to map the site(s) of ligand binding and binding-induced conformation changes, as well as at acidic pH.

Methods: CI-MPR containing domains 1-5 was incubated in the presence or absence of the Man6P-glycosylated palmitoyl-protein thioesterase 1. This FPOP mixture contained adenine; glutamine and hydrogen peroxide was added immediately prior to laser irradiation. After illumination, the sample was quenched and digested with trypsin. Peptides were loaded onto C18 nanocolumn connected to Orbitrap Fusion mass spectrometer.

Results: The sequence coverage of CI-MPR Byonic was 85%. Five peptides, 91-101, 370-391, 478-486, 621-648, 649-662 show a significant decrease in oxidation in the presence of PPT1. Protections upon PPT1 binding is indicative of shielding at the binding pocket or an allosteric "collapse" of dynamic structure. The protected sites include both a high-affinity site in domain 3 along with the domain 1 interface and a lower affinity-binding site in domain 5. Two peptides in domain 4 exhibited increased solvent exposure upon PPT1 binding.

The pH shift from 6.5 to 4.5 for CI-MPR showed widespread conformational change across the entire protein. A total of 12 peptides showed protection and five peptides showed exposure to solvent. This indicates a widespread conformational change upon acidification, illuminating the mechanism of CI-MPR release of its cargo as the endosome acidifies.

12:00 - 1:00 GENERAL SESSIONS

Thursday, February 20, 2020

AFTERNOON

Room D12

Oral Presentation Session III

Moderators: Dr. James A. Stewart, Jr. and Stephanie D. Bur

O2.12

Invited Lecture

1:00 PROTEINS WITH BUILT-IN TIMERS: ARE THEY REAL AND HOW DO THEY WORK?

Robert Waltzer

Belhaven University, Jackson, MS, USA

Proteins act as computational devices, summing up inputs and producing an output (Principles of Neural Design: Sterling and Laughlin, 2015). Often proteins are components within signaling systems that require time to produce and transmit a signal. It seems possible that some proteins, apart from the systems in which they are embedded, have built- in timers. Four possible types of protein timers will be considered here. First, some proteins become inactivated and unresponsive for a period of time, as seen in voltage-gated Na^+ channels in action potentials. Second, some ligand-gated channels go

from an open to a closed state while the ligand is still bound. Third, some proteins have delayed or slow catalysis after substrates are bound. This is seen in the alpha-subunit of trimeric G-proteins. Fourth, some proteins may have a delay in the onset of response to a stimulus, as observed in the voltage-gated K^+ channel in action potentials. This study is a literature search to address a series of questions. 1) Is the idea of a protein acting as a timer coherent or meaningful? 2) If timing is a coherent concept, are there clearly observable and measurable mechanisms and motifs in the structure of these proteins? 3) Might such timing be more common and widespread among proteins than previously considered. The presenter hopes to generate questions, stimulate thinking, and produce insights that might serve as the basis for experimentation.

O2.13

1:30 THE UNFOLDED PROTEIN RESPONSE IN IXODES SCAPULARIS ISE6 CELLS DURING BORRELIA INFECTION

Latoyia Downs, Shahid Karim

Center for Cellular and Molecular Biosciences, The University of Southern Mississippi, Hattiesburg, MS, USA

Tick-borne diseases are a public health issue and affect people every day. *Borrelia burgdorferi*, the causative agent of Lyme Disease, affects over 30,000 people each year and there is currently no cure or vaccine. A new emerging tick-borne pathogen, *Borrelia miyamotoi*, is a relapsing fever spirochete that is distantly related to the Lyme Disease agent and has recently been found to cause disease in humans. *B. miyamotoi* and *B. burgdorferi* cause symptoms such as fatigue, fever, and other flu-like symptoms, and can cause more severe illnesses, such as arthritis and meningoencephalitis. These pathogens are vectored by Ixodid ticks such as *Ixodes Ricinus* and *Ixodes scapularis*. There is very little to no research on *B. miyamotoi* and *B. burgdorferi* infection within the tick vector that contribute to the understanding of its molecular mechanism to survive within the tick vector before transmission to the mammalian host. To study the molecular determinants of *Borrelia* infection in *Ixodes scapularis*, we used an *Ixodes scapularis* embryonic cell line (ISE6) to study the differential gene expression of select genes involved in mediating endoplasmic reticulum stress. Our results show that *Borrelia miyamotoi* and *Borrelia burgdorferi* infection causes an upregulation of up to a 100-fold of endoplasmic reticulum-associated degradation (ERAD) and unfolded protein response (UPR) genes that play crucial roles in maintaining ER homeostasis.

O2.14

1:45 PROTEOMIC ANALYSIS OF CHLOROPLAST PROTEINS OF SOYBEAN PLANTS IN RESPONSE TO SILICON APPLICATION (Grad)

Amandeep Kaur, Jiaxu Li

Mississippi State University, Mississippi State, MS

Drought is a major environmental factor limiting crop productivity. Considering a significant area of crop production under water-limited rain-fed conditions, there is a great need to develop production systems to sustain yield potentials under water deficit stress. Silicon has recently been recognized as an important element in plant nutrition. We have shown that supplying soybean with soluble silicon in the soil could improve vegetative growth and biomass production under water limiting conditions. However, the mechanism how silicon alleviates water deficit stress is not understood. In this study, we examined the effects of silicon application on the expression of chloroplast proteins. Soybean plants were grown in soil-containing pots supplied with 3 millimolar solution of sodium silicate. To cancel the effect of sodium, same amount of sodium chloride was used along with control plants. Intact chloroplasts were isolated from the leaves of silicon-treated and control plants subjected to water deficit stress. Proteins were then prepared from isolated chloroplasts. Two-dimensional gel electrophoresis and mass spectrometry approaches were used to identify differential chloroplast proteins in response to silicon application under water deficit stress. Proteins that shown differential expression in response to silicon application include photosynthetic proteins and enzymes. These results suggest that silicon application could affect enzymes important for photosynthesis and stabilize photosynthetic proteins and enzymes under water deficit stress.

Thursday, February 20, 2020

AFTERNOON

Room D12

2:00-3:15 FoldScope Workshop, co-hosted with the Science Education division

Workshop

"INNOVATIVE WAYS OF INTRODUCING CELL BIOLOGY INTO A CLASSROOM USING THE FOLDSCOPE MICROSCOPE"

Brandy Burnett, MS and Donna M. Gordon, PhD

Mississippi State University, Mississippi State, MS

Cell Biology is one of the most diverse topics in the new 2018 Mississippi College and Career Readiness Standards for Science. Students are required to have a strong working knowledge of various cell types and organelle structures in order to understand how both simple and complex organisms work to maintain life. What better way for students to understand the importance of these structures than by having a chance to explore cells at the microscopic level. Forget textbooks and worksheets, the FoldScope is an easy to use, inexpensive way to give students an opportunity to be actively involved in their learning. This session will provide teachers a chance to become familiar with the capabilities of the 'paper-based' microscope and to create easy to view slides from readily available materials. Ideas on ways to include the FoldScope into your classroom will be discussed as they relate to the current curriculum standards. Empower your students to learn and explore by giving them an easy to use piece of scientific equipment that will boost their self-efficacy and academic confidence through independent learning.

The workshop will be lead by Brandy Burnett, a teacher at the Golden Triangle Early College High School along with Dr. Donna Gordon, an Associate Professor of Biological Sciences at Mississippi State University. As a teacher that integrates hands on student learning experiences into her science classroom, Ms. Burnett will share with the audience her experience using the FoldScope microscope and approaches to include topics related to cell biology into the school science curricula. At the end of the workshop, one high school teacher in attendance will be randomly selected to receive a FoldScope Basic Classroom kit as a door prize.

Thursday, February 20, 2020

EVENING

3:30 Dodgen Lecture and Awards Ceremony

General Poster Session

Immediately Following Dodgen Lecture

P2.01

SUBCLONING GENES VAMP2 AND VAMP 3 INTO EXPRESSION VECTORS EMGFP-4 AND PLVX-IB-MUNC18A

Isaiah Adkins, Hao Xu, Pratikshya Adhikari

University of Southern Mississippi, Hattiesburg, MS, USA

Mast cells are known to play a role in many different immune responses in the body, and this is due to several chemical mediates that reside in cytoplasmic granules (histamine, serotonin, TNF-α, etc.). It is known that the binding of SNARE proteins, which are the membrane proteins located on mast cell plasma membrane and granule membrane, mediate the fusion of granular and plasma membrane, which leads to the release of the granules in response to allergic and inflammatory reactions. It is not known if these SNARE proteins are specific to which mediator is released, and this study involves the process of answering this question. I am focusing on two R-SNARE proteins in particular, VAMP2 and VAMP3. To determine if VAMP2 and VAMP3 (SNARE proteins present on granule membranes) have a specific effect on mediator release, these genes have first been knocked out in RBL-2H3 (rat Basophilic Leukemia) mast cell line. The VAMP2 and VAMP3 genes were first amplified via PCR, using self-designed primers. Following digestion of vector and insert, the two products were ligated together. PLVX-IB-VAMP2 was then grown on selective media, and these colonies were inoculated, isolated, and digested. The digested product was then used for sequencing, to confirm successful transformation. To conclude, once these bacterial cells are shown to grow with the correct construct, they can be amplified, verified by DNA sequencing, and then re-introduced to mammalian mast cell line and are hypothesized to recover the wild type phenotype and rescue any loss of mediator release.

P2.02

PHOSPHODIESTERASE D IS INVOLVED IN BILE RESISTANCE IN LISTERIA MONOCYTOGENES

Sophia Ali[1], Damayanti Chakravarty[1], Hossam Abdelhamed[2], Janet R. Donaldson[1]

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

Listeria monocytogenes is a deadly foodborne pathogenic bacterium that is responsible for almost 20% of food related deaths in the United States. *Listeria monocytogenes* contaminates ready-to-eat products such as cheese and ice cream. Once ingested, it invades the intestinal lining and can enter the bloodstream, causing listeriosis. There is a gap in the knowledge of the pathogenesis of *L. monocytogenes* and how it is able to survive in the gastrointestinal tract in the presence of bile, which has bactericidal properties. Previous studies have suggested that the second messenger cyclic-di-GMP may be involved in the regulation of virulence factors of this bacteria. This nucleotide is produced by diguanylate cyclase and degraded by phosphodiesterase D (PdeD). The purpose of this investigation is to determine how the PdeD mutant survives in the presence of bile under aerobic and anaerobic conditions in neutral and acidic pH. Survival of the wild-type strain and a *pdeD* mutant was analyzed in aerobic and anaerobic conditions in neutral and acidic pH with and without 1% bile to mimic locations within the body where bile would be present (i.e. duodenum and gall bladder). Results show that the *pdeD* mutant is more sensitive to bile in anaerobic and acidic conditions than the wild type. In order to better understand the relationship between PdeD and bile, future directions include studying the gene expression of bile resistance genes, such as BilE and BSH, using timepoints based on the data from this study.

P2.03

DISSECTING THE NUCLEAR FUNCTION OF SCUBE3 PROTEIN IN THE PRESENCE OF DOXORUBICIN TREATMENT

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Signal Peptide CUB-EGF like domain-containing protein 3 (SCUBE3) is a member of a newly identified secreted and membrane-associated SCUBE family. Increasing evidence is demonstrating that SCUBE3 promotes growth, metastasis, and angiogenesis in cancer. The elevation of SCUBE3 protein is associated with poor treatment outcomes in cancer patients. Using an unbiased high throughput loss of functional genomic screen, we identified the SCUBE3 gene as a gene that sensitizes breast cancer cells to doxorubicin treatment. Silencing of SCUBE3 expression acts as a potent suppressor of cell viability, tumor cells growth, metastasis, invasion, and improves doxorubicin outcome in a pre-clinical mouse model compared to control. Interestingly, we observed a dose-dependent nuclear translocation of SCUBE3 protein in doxorubicin treated-cells compared to control. This result suggests that the nuclear translocation of SCUBE3 is a key event important for mediating cellular response in the presence of doxorubicin treatment. Furthermore, our results demonstrated that SCUBE3 regulates the MAP-Kinase pathway and as well DNA damage repair pathway including RAD51 and FOXM1. Using interaction studies, we demonstrated that SCUBE3 is a ligand of EGFR. These findings highlight the importance of SCUBE3 as a potent therapeutic target for treating and predicting treatment outcomes in breast cancer patients.

P2.04

THE SYNERGISTIC EFFECTS OF VERNONIA AMYGDALINA AND CISPLATIN ON CERVICAL CANCER (HELA) CELLS

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Cancer is the second leading cause of death in the United States. Cervical cancer is the second leading cause of deaths in the United States for women after breast cancer. Estimates for the US for 2019 are about 13,170 new cases of invasive cervical cancer will be diagnosed and about 32 percent of those women will die from cervical cancer. Based on previous studies with prostate, breast, and colon cancer *Vernonia amygdalina* extracts (V.A.) is a beneficial novel treatment aside from traditional treatments. V.A. is a common edible vegetable from Cameroon that has been used as a traditional medicine for some human diseases. V.A. is mostly used to decrease illnesses like diabetes, hypertension, and prevent cancer. Our objective is to discover if V.A. is a healthier alternative treatment for cervical cancer alongside or outside of the primary treatments. The current standard of care for cervical cancer is radiation and chemotherapy with cisplatin. Cisplatin damages tumors via induction of apoptosis, mediated by the activation of various signal transduction pathways,

including calcium signaling, death receptor signaling, and activation of mitochondrial pathways. We hypothesized that V.A. extracts will decrease cervical cancer growth in synergy with cisplatin. To achieve this, HeLa NR1 cell culture assays will be treated with varying doses of cisplatin, V.A. extracts alone, and cisplatin with varying doses of V.A. extracts for 72 hours. We plan to determine which molecular pathway V.A. extracts work with alternate the proliferation of cervical cancer cells and best triggers cell apoptosis.

P2.05

EXPRESSION OF METALLOPROTEINASES AND RELATED PROTEINS IN C2BBE-1 COLON ADENOCARCINOMA CELLS UNDER OXIDATIVE STRES

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Human colorectal adenocarcinoma cells are known to exhibit great oxidative stress due to the heavy metabolic usage and rapid division of the intestinal epithelium. It has previously been shown that tumor cells normally generate a great number of reactive oxygen species (ROS), and colon cancer cells can tolerate extreme ROS levels. In fact, increased oxidative stress leads to increased proliferation and metastasis in colon cancer. Metalloproteinases play a role in metastasis by degrading the extracellular matrix. Our lab has previously concluded that *Pseudognaphalium obtusifolium*, a member of the Asteraceae family, produces flavonoid phytochemicals having significantly more radical scavenging activity than ascorbic acid (Vitamin C). Numerous studies have shown that flavonoids have both anti-carcinogenic and antioxidant behavior. To determine if these phytochemicals may have significant therapeutic effects, we stressed the cell line using hydrogen peroxide. Cytokine expression was determined using antibody arrays for cells treated with or without hydrogen peroxide in addition to treatment with or without flavonoids. Specifically, analysis was performed for IFN-Gamma, VEGF, TIMP-1, TIMP-2, MIF, TNFalpha, TGFb2, TGFb3 and IL6 metalloproteinases and related proteins. Expression was decreased for most proteins under oxidative stress except TIMP2 was greatly increased and IL6 was slightly increased. Tissue Inhibitor of Metalloproteinase 2 (TIMP2) is a natural matrix metalloproteinase inhibitor. Treatment with flavonoids under oxidative stress conditions had the opposite effect expected, decreasing the expression of TIMP2 and increasing expression of the other proteins. Future experiments will continue to explore the roles of these and other proteins in colon cancer metastasis.

P2.06

WOLBACHIA SHAPES THE NATIVE MICROBIOME WITHIN THE TICK VECTOR

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Wolbachia endosymbionts are obligate intracellular bacteria in the phylum alpha-proteobacteria that naturally infect arthropods, insects and nematodes. These bacteria manipulate arthropod biology through a series of mechanisms which include; feminization of male progeny, parthenogenesis, male killing, and cytoplasmic incompatibility. Microbiome studies within the tick vector have revealed synergistic and antagonistic interactions between tick endosymbionts and tick transmitted pathogens. This study was conducted to determine the presence of *Wolbachia* species and how they shape the microbiome within tick vector. In this study, a total of 300 *Hyalomma anatolicum anatolicum* and *Rhipicephalus microplus* ticks were screened using a PCR assay to detect the *Wolbachia* 16S RNA gene. PCR positive samples were confirmed using amplicon sequencing and sequence homology search on the NCBI database. Metagenomics analysis of selected negative and PCR positive tick samples was done by sequencing the V1-V3 hypervariable region of the bacterial 16S rRNA gene using a MiSeq Illumina platform. This study will add to already existing knowledge on the diversity of the microbial communities within the *H. anatolicum anatolicum* and *R. microplus* ticks. In addition, it will open up additional questions on how individual microbial species can be used to manipulate the biology of the tick vector. The results of Wolbachia-microbiome interaction will be presented.

P2.07

MSAABCR OPERON AND TCA CYCLE GENES FORM PERSISTER CELLS IN ATP DEPENDENT MANNER IN *STAPHYLOCOCCUS AUREUS*

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Persister cell formation is a significant virulence factor to overcome when treating bacterial infections. Without going through genetic modification, this sub-group of the bacterial population shows extreme antibiotic resistance. The presence of persister cells during *Staphylococcus aureus* infection contributes to treatment failures by becoming dormant under environmental stress, making antibiotic treatment ineffective against them. When the stress is removed, they resume growth, causing recurring infections. Previously, we showed msaABCR operon regulation of virulence factors such as biofilm formation, capsule production, and persister cell formation against antibiotic stress in *S. aureus*. Furthermore, we found msaABCR mutant defective in persister formation in gentamycin stress. We observed that ATP content is higher in msaABCR mutant cells as compared to wild type USA300 LAC in stationary growth phase. In this study, we attempt to study the role of TCA cycle genes in formation of persister cells. We measured the growth pattern of mutants of TCA cycle genes with wild-type USA300 LAC strain and found similar growth patterns in tryptic-soy-broth medium. On inactivation of TCA cycle genes, we observed increased persister formation in the presence of gentamycin. Since persister cell formation is associated with the depletion of ATP, we further plan to study whether ATP content plays a role in persister formation in TCA genes mutants and the role of msaABCR in TCA cycle activity in persister formation.

P2.08

ESTABLISHMENT OF HUMAN DCLK1 ISOFORM 2 ISOGENIC CELLS USING HCT116 CELLS

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DoubleCortin-like Kinase (1) (DCLK1) is a cancer stem cell (CSC) marker that is over-expressed in many cancers. Due to its expression in the therapy-resistant subpopulation in cancer tissue, DCLK1 plays critical roles in cell proliferation, tumorigenesis, tumor metastasis, and recurrence of cancer. Further evidence showed that inhibition of DCLK1 directly caused a decrease in cancer succession and reduced the possibility of relapse. However, DCLK1 has five isoforms. Association of each isoform with human colorectal cancer (hCRC) remains unknown. The aim of this project is to establish the DCLK1 isoform 2 (DCLK1-S) isogenic cell clone to further investigate the effects of DCLK1-S upon the tumorigenesis of hCRC. To fulfill this aim, we transfected Myc-DDK-tagged human DCLK1-S cDNA into the HCT116 cells. With neomycin drug selection for two weeks, we

plated the neomycin-resistant cells into 96-well plate with 1 cell per well to establish the isogenic cell clone. Afterwards, Western Blot was used to confirm DCLK1-S expression. Our results demonstrated that of the 30 neomycin-resistant isogenic cell clones, DCLK1-S expression was significantly increased in 3 of them. Effects of DCLK1-S on the cell proliferation were determined using these three clones, and they will be used to further evaluate effect of DCLK1-S on the stemness and chemoresistance of hCRC.

P2.09

EXPRESSION AND PURIFICATION OF HEPATITIS B CAPSID PROTEINS FOR CANCER THERAPEUTICS

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Glioblastoma (GB) is a very common, aggressive malignant brain tumor that arises from astrocytes found in the adult brain. Although there are many types of treatment that are effective in the short term, the long-term prognosis still remains problematic. Since cancer cells arise from normal cells in the body, there needs to be a way of differentiating cancer cells from normal cells. Hepatitis B virus (HBV) capsid proteins (Cp) are capable of self-assembly, and have previously been shown to be able to bind cargo such as metal ions (SJ Stray, P Ceres, and A Zlotnick, *Biochemistry* 43: 9989-98), and thus have the potential to allow them to become a type of "shipping envelope" by assembling a virus-like particle (VLP) that can be used to package toxic particles to deliver them to GB cells. There are two forms of the HBV Cp that are under study: the 149 amino acid assembly domain (Cp149), and the 183 amino acid full-length sequence that includes the assembly domain and the sequences responsible for the interaction with RNA (Cp183). We have introduced the RGD peptide sequence into both Cp!49 and Cp183 in the hope that this will allow more specific targetting of GB cells. Both sequences are expected to be able to self-assemble and be able to deliver toxic cargo, such as platinum (Cp149) or RNA encoding toxic products (Cp183). We will evaluate different methods for expressing and purifying these Cp proteins.

P2.10

THE NEUROTOXIC HIV-1 TAT PROTEIN POTENTIATES MORPHINE'S PSYCHOMOTOR EFFECTS WHICH CAN BE AMELIORATED BY THE NEUROPROTECTIVE STEROID, 3α-DIOL

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Human immunodeficiency virus (HIV) and opioid abuse are intertwined epidemics. Injection drug use, the majority if which involves opioids, increases the risk of HIV infection and opioid exposure can worsen HIV-pathology. One mechanism of opioid/HIV interaction may involve the

HIV regulatory protein, trans-activator of transcription (Tat), which exerts excitotoxicity to neurons that can be exacerbated by opioids in cell culture, but the functional effects on drug-related behaviors are not known. We hypothesized that transgenic expression of HIV Tat in male mice would potentiate the behavioral sensitizing effects and withdrawal symptoms associated with morphine exposure. Further, we anticipated that pretreatment with an inhibitory neurosteroid, 3α-androstanediol (3α-diol), would ameliorate these effects, perhaps by attenuating neuronal excitotoxicity. Expression of HIV Tat in mice significantly increased the psychomotor response to acute morphine (30 mg/kg) and these effects were further potentiated following an escalated morphine paradigm (5-30 mg/g BID for 3d). Pretreatment with inhibitory 3α-diol (1 mg/kg, but not 0.5 mg/kg) significantly attenuated Tat's potentiating effects. Intriguingly, Tat did not alter naloxone-precipitated morphine-withdrawal symptoms, suggesting that behavioral potentiation was not due to changes in morphine kinetics; albeit, 3α-diol (1 mg/kg) significantly ameliorated withdrawal symptoms. To test the hypothesis that 3α-diol's ameliorative effects involves neuroprotection, murine medium spiny striatal neurons were exposed to vehicle, Tat (100 nM), morphine (500 nM), and/or 3α-diol (10 or 100 nM). Irrespective of morphine exposure, Tat significantly increased cell death and 3α-diol (10 or 100 nM) significantly attenuated this effect. These data support the notion that inhibitory neurosteroid-based therapeutics may be efficacious against neurotoxic HIV proteins and may ameliorate related interactions with opioids. FUNDER ACKNOWLEDGMENTS: This work was supported by the University of Mississippi and the National Institutes of Health: R00 DA039791 to JJP, P30 GM122733 (PI: SoumyaJit Majumdar) pilot project to JJP

P2.11

INVESTIGATING THE IMPACT OF AGE/RAGE SIGNALING ON OXIDATIVE STRESS UNDER DIABETIC CONDITIONS IN CARDIAC FIBROBLASTS

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Diabetes is a major health concern in the United States with 1.5 million new cases a year. Those who suffer from diabetes have an increased risk for developing heart failure, a form of cardiovascular disease. Heart failure has been shown to be a result of increased left ventricle stiffness, brought on by increased remodeling of the extracellular matrix (ECM). This increase in ECM remolding is a result of increased AGE/RAGE signaling. Where studies have shown that diabetics have elevated levels of AGEs (Advanced Glycated End-Products) which contribute to the increased AGE/RAGE signaling. In addition to impacting ECM remodeling, AGE/RAGE signaling has been demonstrated to play a role in oxidative stress. Recently research in our lab has identified a small GTPase, Rap1a, that may bisect the AGE/RAGE signaling pathway and contribute to the downstream outcomes. Due to this new data, we are interested in determining the role of Rap1a on the AGE/RAGE driven oxidative stress response. To accomplish this, we isolated cardiac fibroblasts from non-diabetic and diabetic mice hearts, and treated the fibroblasts with pharmacological modifiers (AGE, EPAC, and Rap1a siRNA) in order to alter the AGE/RAGE signaling cascade. After treatment, proteins were isolated to assess changes in oxidative stress markers via western blot analysis. Examining the impact Rap1a has on oxidative stress induced by AGE/RAGE signaling will provide more insight into the specifics of this pathway. In addition, it will offer new information that could be useful in developing therapeutics that aim to treat diabetic complications.

P2.12

ASSOCIATION OF DCLK1 WITH MIGRATION AND INVASION OF COLORECTAL CANCER CELLS

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Colorectal cancer (CRC) is the third most diagnosed cancer in women and men and is the second leading cause of cancer deaths. Treatment includes the use of chemotherapy; however, some patients are unresponsive while approximately 50% relapse after surgery and die due to metastatic activity. Cancer stem cells (CSC), which make up 0.5%-1% of cancer tumors, are identified to have the ability to survive under harsh conditions and differentiate into a variety of cancer

cells. Double Cortin-like Kinase (DCLK1) is a cancer stem cell marker that is overexpressed in CRC stem cells. It can enhance epithelial mesenchymal transition and it might be associated with increased migration and invasion capability of CRC cells. The aim of this research is to investigate how DCLK1 isoform 1 affects the migration and invasion of HCT116 cells. In order to achieve our goal, isogenic cells with over-expression of DCLK1 isoform 1 were established using HCT116 cells. Wound-healing assay was carried out to determine the migration of cells and quantitative real-time PCR was applied to evaluate gene expression of specific migration/invasion molecular markers. Our preliminary results demonstrated that DCLK1 isoform 1 over-expression affects the migration capability of the CRC cells and it modifies the expression of several migration/invasion molecular markers as well.

P2.13

SEX DIFFERENCES IN THE ROLE OF ESTRADIOL ON RECOVERY AFTER CEREBELLAR LESION IN THE ZEBRA FINCH

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The cerebellum (CB) has traditionally been associated with motor coordination. However, recent studies show it plays a key role in spatial learning. And, unlike the traditional view of the CB as relatively static, discoveries show estradiol (E2) and Arom related neuroplasticity in the CB. Sex differences in neuroplasticity may result from sex differences in hormone levels or local synthesis of estradiol (E2) from testosterone (T) might equalize neurorepair. However, female zebra finches also have greater Arom upregulation than males after CB damage. Thus, sex differences in E2 related neuroprotection were examined by comparing CB lesion-induced spatial deficits in Escape Maze in zebra finches with or without local Arom inhibition at the lesion site. No baseline sex differences in spatial learning and no influence of sex on lesion-induced deficits even with Arom inhibition were found. As in previous studies, Arom inhibition was necessary to reveal lesion induced deficits in spatial learning.

P2.14

CATHEPSIN B LOCALIZATION IN ZEBRAFISH DURING EARLY DEVELOPMENT

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Early zebrafish development requires maternal gene expression during embryogenesis to establish and pattern the dorsoventral axis. Mutant embryos deficient in Cathepsin B exhibit incomplete dorsal convergence and delayed epiboly progression. In order to determine when and where Cathepsin B is localized in the embryo, we performed whole mount antibody staining on early stage zebrafish embryos at 30% epiboly, shield stage and 75% epiboly. We identified the precise timing and location of Cathepsin B in zebrafish embryos.

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P2.15

***IN VITRO* EVOLUTION OF INFLUENZA B VIRUS UNDER SELECTION WITH HUMAN ANTIBODIES**

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Each year, the human population is significantly affected by a major human respiratory pathogen, Influenza virus. Influenza types: A and B both cause seasonal epidemics, but Influenza A is more common and has been more extensively studied. We have previously shown that neutralizing anti-influenza B antibodies were common among a collection of discarded, de-identified patient sera obtained from the UMMC Hematology Lab (Mariah Prather, LMS, and SJS, unpublished). We hypothesize that, the antibodies will allow us to select variant influenza B strains. We will serially passage an influenza B virus strain in the presence of four different human antisera and monitor for outgrowth of antibody-resistant isolates. We will then amplify and sequence the eight segments of the influenza B virus genome previously-described using primers (E Hoffmann, et al., *Proc Nat'l Acad Sci USA* 99: 11411-6, 2002). In contrast to previous findings, which showed rapid adaptation of influenza A virus to growth in the presence of a neutralizing polyclonal chicken antiserum (RR Thangavel, et al., *Virol J*. 18:8, 2011), our data for part 1 suggests minimal virus growth in the presence of each of the 4 antisera tested. Our preliminary sequencing data for part 2 suggests that there is a mixture of sequences in both the HA and NA gene sequences of the input virus stock. All eight gene segments will be sequenced after five passages of selection to determine what adaptations, if any, have occurred.

P2.16

RECOMBINANT EXPRESSION AND PURIFICATION OF α-SYNUCLEIN

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Parkinson disease (PD) is a neurologically progressive disease that affects one's movements. α-synuclein (αS) is a neuronal protein that is linked to the disease. This protein is made by the instructions of the SCNA gene and is commonly found in the heart, various muscles and several tissues. They are also found throughout nerve cells in presynaptic terminals, which release neurotransmitters from synaptic vesicles. Concerning PD, the αS protein forms toxic aggerates due to misfolding, which eliminates brain cells during the process. This lab has focused on the purification of the αS protein through a set of instructions and methods developed by previous researchers. Through size exclusion chromatography, larger protein molecules were eluted quickly as smaller αS molecules flowed leisurely through the sepharose beads. The protein binds to a tag know as a chitin affinity column, separating it from the rest of the cell, allowing recombinant protein expression to occur before the protein purification analysis. The results lead to a pure sample of α-synuclein, which can be used in other protein-based experiments. The purification not only sets a standard when it comes to producing the pure form of the protein, but also a more efficient way of keeping doing so.

P2.17

INTRANASAL INSULIN AMELIORATES LIPPOPOLYSACCHARIDE-INDUCED INFLAMMATION, LIPID PEROXIDATION AND NEUROBEHAVIORAL DEFICITS IN NEONATAL RATS

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Inflammation and oxidative stress play important roles in brain damage in neonatal human and animal models. Our previous studies have shown that systemic administration of lipopolysaccharide (LPS) induces brain damage and neurobehavioral dysfunction in neonatal rats, which is associated with the production of pro-inflammatory cytokines and oxidative stress. Recent studies suggest that intranasal insulin treatment could be a neuroprotective agent in adults. The objective of the current study was to determine whether intranasal insulin treatment reduces LPS-induced neurobehavioral dysfunction, brain inflammation and oxidative stress in neonatal rats. Intraperitoneal (i.p.) injections of LPS (2 mg/kg) or sterile saline were performed in postnatal day 5 (P5) SD rat pups, and human insulin (25 μg) or vehicle was administered in each nare 5 min after LPS injection. Sensorimotor behavioral tests were carried out 24 hours after LPS exposure and brain tissues were collected to determine pro-inflammatory cytokine interleukin-1β (IL-1β) and lipid peroxidation on P6. Our results showed that the intranasal insulin reduced LPS-induced sensorimotor behavioral disturbances as seen in righting reflex, negative geotaxis, wire hanging, and hind limb suspension tests at P6. Intranasal insulin also reduced LPS-induced brain inflammation as evidenced by the increase in IL-1β levels, and brain oxidative stress, as evidenced by the increase in thiobarbituric acid reactive substances (TBARS) contents. These data suggest that intranasal insulin provides a protective effect against the neonatal LPS exposure-induced sensorimotor dysfunction, brain inflammation and oxidative stress in neonatal rats, which may be associated with the neuroprotective effect of insulin.

P2.18

STUDYING THE ROLE OF IGF2BP1 IN BASAL CELL CARCINOMA DEVELOPMENT

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Basal Cell Carcinoma (BCC) the most frequently occurring form of all cancers. BCC begins in the basal cells, a type of cell within the skin that produces new skin cells as old ones die off. The Hedgehog (Hh) signaling pathway mediated by Gli1 transcription factor is the driving pathway of BCC development. Gli1 expression was shown to be regulated not only by the upstream signal of the Hh pathway but also by the Wnt/β-Catenin signaling. The insulin-like growth factor 2 mRNA binding protein 1 (IGF2BP1), a direct target of the Wnt/β-Catenin signaling pathway was shown to bind to GLI1 mRNA and regulate its expression and activity. The regulation of Gli1 by both the Hh and Wnt signaling was found to be IGF2BP1-dependent. Therefore, we hypothesized that we can control both the Hh and Wnt/β-Catenin signaling by inhibiting IGF2BP1. In this study we utilized various genetic and molecular approaches to induce skin specific IGF2BP1 knockout in the mouse model for BCC to study the role of IGF2BP1 in the pathology of BCC. Additionally, we used human BCC cells depleted of IGF2BP1 to study the effect of IGF2BP1 on tumor growth in a xenograft mouse model. We observed that inhibition of IGF2BP1 significantly reduces tumor growth in our xenograft studies. This suggests that IGF2BP1 could represent a novel target in BCC treatment.

P2.19

INVESTIGATING THE ROLE OF RAP1A IN VASCULAR CALCIFICATION

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Cardiovascular disease is the leading cause of death in the U.S. with one of the major causes being vascular calcification, characterized by the deposition of calcium-phosphate hydroxyapatite. Once thought to be a passive process due to aging, medial vascular calcification is becoming understood as a tightly regulated, cell-mediated process. Vascular smooth muscle cells (VSMCs) within the medial arterial layer respond to inflammation, oxidative stress, and changes in pyrophosphate levels, which induce differentiation into osteoblast-like cells. Fibroblasts within the adventitial layer (AFBs) also alter their function in response to vascular calcification, although this is largely understudied. The AGE/RAGE signaling cascade has been implicated in vascular calcification. We hypothesize that the small GTPase, Rap1A, contributes to AGE/RAGE signaling, resulting in vascular calcification. In vitro studies were conducted using wild-type (WT) and Rap1A knockout (KO) VSMCs and AFBs to further investigate the possible role of Rap1A in vascular calcification. Colorimetric calcium assays were used to quantify intracellular calcium in the presence of 3 mM inorganic phosphate, simulating physiological calcification conditions. Expression of proteins such as RAGE, α-Smooth Muscle Actin, and osteopontin were quantified via western blotting. WT VSMCs presented with significantly more calcification compared to KO, suggesting that Rap1A is important in VSMC calcification independent of AGEs. However, there was no difference in calcification between the WT and KO AFBs. Therefore, we conclude that AFBs and VSMCs differ in their mechanisms of calcification formation and that further research is necessary to understand the role of AGE/RAGE and Rap1A.

P2.20

INHIBITION OF ZNF493 BY S100P/RAGE/MIR155 SIGNALING PROMOTES COLON CANCER GROWTH AND PROGRESSION

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The ZNF493 is a member of the zinc finger (ZNF) protein family, which is one of the largest families of transcription factors humans. The ZNF proteins are involved in the regulation of various biological responses and diseases, such as cancer. However, their functions remain unexplored. Here, we report a decreased expression of ZNF493 in colon cancer tissue specimens compared to normal colon tissue specimens. Also, we demonstrated that the ZNF493 expression is negatively regulated by S100P/RAGE signaling through miR-155. Previously, we demonstrated that S100P/RAGE receptor signaling induced the expression of miR-155 via the AP-1 transcription factor. The ectopic expression of S100P or miR-155 significantly decreased the level of ZNF493 protein in colon cancer cells. Using bioinformatics analysis, we identified a predicted miR-155 seed sequence on the ZNF493 3'untranslate region (UTR). Interestingly, the overexpression of ZNF493 suppresses colon cancer cell growth and migration. These data provide new insights into the modulation

of ZNF493 expression at the post-transcriptional level by miR-155 and suggest that the therapeutic strategies improving ZNF493 expression in colon cancer may be warranted.

P2.21

FLAVONOIDS UNEXPECTEDLY INCREASE EXPRESSION OF EOTAXIN-2 AND OTHER PRO-METASTATIC β-CHEMOKINES IN C2BBE1 COLORECTAL CANCER CELLS SUBJECTED TO OXIDATIVE STRESS

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Several studies have established that colorectal cancer cells exhibit increased growth and metastasis with oxidative stress. Free-radical scavenging flavonoids have been shown to reduce oxidative stress and proliferation in a variety of cancer cell types. β-chemokines are a class of signaling proteins generally associated with cancer cell metastasis and infiltration. We hypothesized that colorectal cancer cells under oxidative stress would express higher levels of pro-cancer and pro-metastatic β-chemokines compared to neutral conditions. Additionally, we expected reduced β-chemokine expression for these cells following flavonoid treatment. C2BBE-1 colorectal cells were treated for 24 hours in vitro with four different treatments: a flavonoid extract with and without hydrogen peroxide (source of oxidative stress) and a DMSO-based control, also with and without hydrogen peroxide. Antibody arrays were utilized to determine changes in cytokine expression for each experimental condition. 16 β-chemokines were analyzed. Oxidative stress alone caused increased expression for most β-chemokines, especially PARC, MDC, MIP-3-alpha, and MCP-2 and there was little decrease with addition of flavonoids. However, addition of flavonoids slightly changed expression of several β-chemokines. The most significant change was an almost 6-fold increase observed for Eotaxin-2, a chemoattractant that plays a role in cell migration and metastasis. Also decreased proliferation was not observed. It is possible that flavonoids actually increase radical formation and drive metastasis. These unexpected results indicate that while flavonoids are radical scavengers that may reduce proliferation in some cancer types, these compounds may not be effective in colorectal cancer cells that thrive in extreme oxidative stress conditions.

P2.22

DEVELOPMENT OF A DROSOPHILA MODEL OF SPINOCEREBELLAR ATAXIA TYPE 1 (SCA1) DISEASE

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Spinocerebellar ataxia type 1 (SCA-1) is a condition characterized by progressive problems with movement. Patients affected by SCA-1 develop an adult-onset devastating pathology characterized by peripheral axonal motor, sensory neuropathy, distal muscular atrophy, pes cavus, and steppage gait. The main goal of this summer research experience program was the development of a powerful genetic model to investigate the pathogenesis of SCA-1 disease. The fruit fly, *Drosophila melanogaster*, is an organism extremely useful for studies on human biology, health and a wide range of pathologies including neurodegenerative diseases. This is because Drosophila genes controlling fundamental cellular functions, such as cell growth and death, are quite identical to those found in human cells. In this work, we developed a Drosophila model of SCA- 1 disease by applying a well-known genetic approach. This focuses on the screening of several fly lines with UAS constructs for expression of abnormal polyglutamine repeats. The selected fly line which exhibits normal growth and development is then crossed to a Glass-multiple repeats (GMR) Gal4 line to start the expression of an abnormal ataxin gene encoding for polyglutamine repeats. This approach would create a fruit fly model that mimics the human pathological condition. Subsequently, genome-wide transcriptome analysis of this SCA-1 fly model will get insight into the mechanism of the disease. The identification of the steps of the SCA-1 pathological cascade, in turn, will help the development of therapies targeting key molecules acting in these steps.

P2.23 IDENTIFICATION OF HYDROGEN PEROXIDE SENSITIVE FACTORS IN STREPTOCOCCUS PNEUMONIAE

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Streptococcus pneumoniae (pneumococcus), a -Gram-positive bacteria that colonizes nasopharynx of humans, can cause serious illnesses, including bacteremia, pneumonia, meningitis, and otitis media in young children. Hydrogen peroxide (H_2O_2) impacts pneumococcus in two important ways. First, *S. pneumoniae* possesses pyruvate oxidase which produces millimolar concentrations of H_2O_2 under aerobic conditions. Secondly, phagocytes use reactive oxygen species including H_2O_2 to neutralize the bacterium following phagocytosis. However, it is unknown specifically what pneumococcal factors render it susceptible to H_2O_2. We hypothesized that transposon-mutagenesis can identify pneumococcal factors that make the bacterium sensitive to H_2O_2. Therefore, transposon-mediated inactivation of such factors would lead to resistance to H_2O_2. A Tn-seq mutant library of strain D39 was exposed to 100mM H_2O_2 for 45 mins and then plated to identify potential mutants surviving peroxide exposure. Five pneumococcal mutants were isolated from two separate experiments and named Peroxide Resistant Pneumococci (PRP) strains 1-5. Wild-type D39 and PRP strains 1-5 were cultured with and without H_2O_2 (25mM) for 1 hr and surviving pneumococci were quantitated by plating on TSA blood agar plates. PRP strain 1 and 2 were found to be the most resistant, however all 5 mutants were significantly more resistant than D39. Chromosomal DNA from PRP1-5 was isolated, digested, and ligated to a DNA adapter. PCR primers specific for the transposon and the adapter were used to amplify a 120bp product that was sequenced to identify the genes containing the transposon insertion. These findings will identify new targets for novel antimicrobials against the important human pathogen.

P2.23

THE STUDY OF PIGMENT PRODUCTION BY A YEAST (SACCHAROMYCES CEREVISIAE) VARIANT

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The search for natural sources of pigments is gaining momentum because of their potential use for making safe paints, ink, and food coloring materials. A major attraction is their non-toxic nature, compared to their more prevalent, petroleum-derived counterparts. Also, the isolation of natural pigments does not leave toxic or environmentally hazardous waste products. The strain A364A genotype MATα ade1 ade2 ura1 his7 lys2 tyr1 gal1 SUC mal, when grown in YEPD plates at 30^0C, over 48hours formed mostly white colonies, with some bright red colonies scattered among them. The clear and pigmented cells consistently formed clear and red colonies, respectively, when cultured repeatedly. In order to ascertain the relationship between the clear and pigmented cells, DNA barcoding

using 1370bp sequences and BLAST was done. The report showed the two to be identical; *Saccharomyces cerevisiae* strain YSR128. Pigment production peaked late during the exponential phase of growth. Compared to other strategies, the hydrolysis of cells in 1N HCL at 60^0C was more effective at isolating the pigment. The absorption spectrum of the yeast pigment had a peak absorbance at 380nm, which is significantly different from the 455nm absorption peak for beta carotene. Pigment identity, factors influencing pigment production, pigment stability, and antimicrobial properties, if any, are under investigation.

P2.24

BIOGENESIS AND FUNCTION OF A 3'-TAILED MIRTRO

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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 a class of non-canonical microRNAs produced via splicing that generates a lariat intermediate, debranched by lariat debranching enzyme and subsequently processed by dicer and then loaded onto RISC complex. Although a large collection of mirtrons has been identified within the mammalian genome, their functionality remains to be elucidated. Here we study the biological significance of the miR-1017, a 3' tailed mirtron, which is highly expressed and conserved in *Drosophila*, and what key elements contribute to their high expression. We found that miR-1017 targets acetylcholine receptors Da5 and Da2. Ectopic expression of miR-1017 within Alzheimer's disease fly model improved neurological function and extended lifespan of the flies. Further, various deletion and branch point mutants were generated through site-directed mutagenesis, and the effects of the mutations on the miR-1017 were observed by northern blot. We observed that the mutated branch point construct elevate expression of mature mirtrons while removing the adenine residues and polypyrimidine tract completely abolished the mirtron expression. Together, the results suggest that the sequence within the tail is critical to mirtron biogenesis and prolong the life span by modulating acetylcholine receptors in *Drosophila*. Further, we will be generating the mutants using CRISPR/Cas9 and observe if they have aberrant receptor expression pattern, and subsequent lifespan defects.

P2.25

GENERAL CHEMISTRY 101 HONORS PROJECT ABSTRACT: CLONING OF THIC GENE IN SULFOLOBUS TOKODAII

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This project was conducted for General Chemistry 101 in order to fulfill the requirement for honors credit. In this experiment, the 1.3 kb *thi*C gene in archaebacteria *S. tokodaii* was cloned. This gene encodes for the protein ThiC found in the thiamin biosynthetic pathway of prokaryotes responsible for making the hydroxymethyl pyrimidine moiety of the cofactor. Template DNA for S. tokodaii was purchased from the Nation Institute of Technology and Evaluation in Japan. Primers were designed using the *S. tokodaii* gene sequence from the National Center for Biotechnology Information website. Bio-Rad 2x master mix was used with the primers and template DNA to generate a 1.3 kb amplicon and then confirmed using 1% agarose gel electrophoresis and SybrSafe® DNA dye. Ligation was carried out using TA-TOPO from Invitrogen, which uses a linear vector capped with topoisomerase on each end that recognizes T and A overhangs on the PCR product. The ligation step was immediately followed by transformation into Top10 *E. coli* cells that were plated on LB agar with kanamycin to grow overnight. Only one colony grew which was screened using PCR with Accuprime *Pfx* polymerase from Invitrogen to ensure the vector had the ligated gene of interest and was not empty. A clear band at 1.3 kb indicated successful transformation. The cells were grown overnight in LB with kanamycin, centrifuged and plasmid purified using GeneJet miniprep from ThermoFisher. The samples were then sent to ACGT, Inc. for sequencing to confirm successful cloning.

P2.26

EXPRESSION AND PURIFICATION OF MSAB PROTEIN IN STAPHYLOCOCCUS AUREUS

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The *msaABCR* operon is a four-gene operon that governs biofilm development, controlled cell death, antibiotic resistance and persister cell formation. MsaB, the only protein produced, is a DNA-binding protein that directly regulates other genes based on nutrient availability. We have discovered that MsaB binds to the promoter of the capsule operon and protease genes, functioning as a transcriptional activator and repressor. Other studies showed MsaB is an RNA chaperone. In this study, we cloned the MsaB protein with 6X-his tag at the N-terminus or C-terminus in pCN51 vector. The MsaB expression construct was cloned in USA300 LAC *msaABCR* deletion mutant. We optimized the conditions for MsaB expression by testing a concentration gradient of CdCl2 inducer. The protein was purified using Ni-NTA column. SDS-PAGE checked for protein size and purity before confirmation using western blot with anti-his antibody. Electrophoretic mobility shift assay (EMSA) with biotin-labelled capsule operon promoter tested for comparative protein activity between the two constructs; the results showed greater activity for his-tag on the C-terminus, distinguishing greater stability for this construct. Our future aim is to use homogenous time-resolved fluorescence (HTRF) to determine the binding constant (Kd) of MsaB to the promoter regions of the *cap* operon and protease. We will measure the affinity of MsaB protein to their targets in the presence of GTP, ATP, AMP, Valine, Leucine, and Isoleucine. At the completion of these experiments, we expect to develop a model for the mechanism of regulation of *cap* and proteases by MsaB in response to nutrient availability.

P2.27

IDENTIFICATION OF CANDIDATE GENES INVOLVED IN ZEBRAFISH DORSOVENTRAL PATTERNING AND MORPHOGENESIS

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Early embryonic processes such as dorsoventral patterning, microtubule dynamics, and morphogenetic movements are essential for proper zebrafish development. Cathepsin B is a maternal factor that is important for dorsoventral patterning and morphogenesis. To identify molecular pathways used by Cathepsin B to regulate dorsoventral patterning and morphogenesis, proteonomic analysis was performed. The analysis revealed differential gene expression between wild type and Cathepsin B deficient zebrafish. Candidate genes were identified and classified according to their roles in dorsoventral patterning (Hdac3, PPP4C) and morphogenesis (GAPDH, Aldha2, PPP4C). Currently, antibodies for the candidate genes are being screened to identify ones that work in zebrafish. The project described was supported by an Institutional Development Award (IDeA) from the National Institute of General Medical

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P2.28

RAD51 MODULATION IN HUMAN METASTATIC LUNG CANCER CELLS

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Introduction. Lung cancer still remains the leading cause of cancer deaths in men and women. Although smoking is a high risk factor in developing lung cancer, lung cancer also develops in nonsmokers as well. RAD51 plays a key role in DNA repair. Increased DNA repair is often associated with chemoresistance. For this study, we used human metastatic lung cancer cell line H1299 to determine whether hop plant-based extract, xanthohumol modulates the expression of Rad51.

Methods and Materials. Human lung cancer cells, H1299, were obtained from the American Type Culture Collection (ATCC, Manassas, VA) and grown in Dulbeco's Modified Medium (DMEM, ATTC) supplemented with 10 % fetal bovine serum (FBS), and Streptomycin/Neomycin (10,000/100 units, ATCC) in an incubator at 37 ºC, 5% CO_2.RAD51 immunodetection was analyzed using immunofluorescence. Briefly, the cells were treated with xanthohumol 6.25, 12.5, or 25 µM for 24 h and RAD51 immunofluorescence was analyzed.

Results. Immunofluorescence analysis of RAD51 showed that xanthohumol at the tested concentrations of 6.25, 12.5, and 25 µM did not modulate RAD51 immunodetection. Whereas when the cells were treated with 25 µM of cisplatin, RAD51 immunodetection was increased compared to control samples. Conclusion. These results suggest that xanthohumol does not activate DNA repair via RAD51.

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P2.29

NEUROPROTECTIVE EFFECTS OF ESTRADIOL AND GENISTEIN IN ZEBRA FINCH CEREBELLUM

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Estradiol (E2) is neuroprotective, but it negatively influences reproduction in males and increases risk of stroke and some cancers. Synthesis of brain E2 from testosterone via neural aromatase avoids systemic E2 effects, and may be independently neuroprotective. Phytoestrogens might also provide neuroprotection without E2 risks. Thus, we tested whether the phytoestrogen, genistein, and E2 are similarly neuroprotective with and without aromatase inhibition and how treatments impact testicular regression. We used zebra finches as their brains are highly neuroplastic. Males were implanted subcutaneously with 6mg silastic "ropes" containing adhesive alone (Blank) or mixed with 1g genistein or 0.5g E2 followed by mechanical cerebellar lesions and intra-lesion injections of 1% Letrozole, an aromatase inhibitor (Genistein n=7, E2 n=7, Blank n=6) or Saline vehicle (Genistein n=4, E2 n=6, Blank n=7). If E2 and genistein reduce the post-lesion secondary wave of degeneration similarly, lesions will be largest in Blank and Letrozole groups and smallest in E2 and Genistein groups and have relatively low numbers of apoptotic and necrotic cells identified by Tunnel and Fluro-jade stains, respectively. Larger lesions in Letrozole vs. Saline groups, would suggest aromatase acts independently of E2 to afford neuroprotection. Measurements of lesions are incomplete. Reduced testes size and spermatogenesis is expected in E2 birds but not Genistein and Blank groups. Implant effectiveness will be confirmed by measuring E2 and genistein serum levels via HPLC. Results indicate that E2, but not genistein, reduces testis size confirming lack of reproductive harm by phytoestrogens.

P2.30

THE ROLE OF MATRIX METALLOPROTEINASES IN THE METABOLISM OF ATXN1 PROTEIN AGGREGATES

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Spinocerebellar Ataxia Type 1 (SCA1) is a fatal neurodegenerative disease caused by a mutation in the poly-glutamine stretch of the ATXN1 protein. ATXN1 proteins form nuclear inclusion bodies *in vivo* and *in vitro*. It is speculated that accumulation of the mutated ATXN1 causes a gain-of-function resulting in neuronal death in the cerebellum and brainstem of SCA1 patients. Matrix metalloproteinase (MMPs) are zinc-dependent endopeptidases that have gained popularity as possible therapeutic targets in neurodegenerative disease. Recent studies have shown that MMPs can degrade toxic poly-glutamine aggregates in Huntington's disease contributing to its' disease pathology. We hypothesize that MMPs will also degrade the toxic poly-glutamine aggregates in the SCA1 diseases. To test our hypothesis, we generated GFP-dMMP constructs and mCherry-ATXN1 constructs expressed in SHSH5Y neuroblastoma cell lines. This work is critical to supporting our long term goal, which is to test the efficiency of MMP inhibitors as SCA1 therapeutics using the drosophila SCA1 animal model.

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P2.31

THE EFFECTS OF PROBIOTIC, LACTOBACILLUS FERMENTUM, ON NEURONAL HEALTH

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Introduction: The C2BBe1 cell line is established for uptake studies across the human small intestine. C2BBe1 cells also regulate their own basal TNFalpha release, appropriate for signaling when the gut lumen is exposed to noxious agents, like bile salt (Brue et al, MSAS-2018). Herein, probiotic *Lactobacillus Fermentum* (*LF*) are shown to attenuate bile-induced TNFalpha release when added to C2BBe1 cells. Additional experiments show the transepithelial capacity of this probiotic to modify underlying enteric neurons.

Methods: Confluent polarized C2BBe1 cells on porous inserts, transplanted for one day above growing neurons from another human cell line (SH-SY5Y; neuroblastoma-derived), were treated apically with/without live *LF* (10^9 per 0.5 ml in apical compartment only). Repeated measures were obtained over two-plus hours (see below) followed by some wells receiving a micromolar dose of commercial TNFalpha, given only in the basal compartment, then continued monitoring for 45 hours. The repeated measures were TransEpithelial Electrical Resistance (TEER), and neurites number and length (staining and ImageJ).

Results: A significant gradual rise in TEER following *LF* addition (alone), plateaued by 45 hours. A gradual decrease in TEER after TNFalpha (alone), reached trough by 45 hours. No significant change in TEER when adding TNFalpha 2 hours post *LF*. There were also negative effects on the neurites due to both *LF* and TNFalpha (full analyses pending).

Conclusions: TNFalpha opens epithelial tight junctions shown by declining TEER. *LF* counteracts TNFalpha's drop in TEER but also damages neurites. There are implications for the role of probiotics in intestinal health (same meeting, Strickland et al, companion abstract).

Discussion: The current study will lead to a better understanding of pathways regulated by metabolic inhibitors in promoting chemoresponse in resistant OC cells that can be translated into meaningful clinical trials.

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. 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. By using a novel model system in which an active transposon can be silenced by a silencing trigger that is a source of small RNAs, we observed a switch of silencing mechanism from the de novo RNA directed DNA methylation (RdDM) in the germinating endosperm, to the post-translational inhibition in the embryo of maize. Here in this study, we analyzed high throughput sequencing data from RNA-Seq, small RNA-Seq and whole genome bisulfite sequencing experiments. We will present our preliminary data on the genome-wide change in DNA methylation, transcription and small RNA biosynthesis of transposons. We will also discuss the possible silencing pathways that was suggested by 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.

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P2.33

INVOLVEMENT OF RDRP IN AMPHIOXUS RNAI PATHWAY IS ASSOCIATED WITH MALE BIOLOGY

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RNA interference (RNAi) plays a key role in controlling gene expression as well as genome surveillance. Even though the protein, RNA-dependent RNA polymerases (RdRp) are known to contribute to RNAi in numerous clades, their role in the chordate phylum is yet to be determined. In this study, we seek to understand the role of RdRp in the RNAi pathway of *Branchiostoma floridae*, a modern survival of the basal chordate sub-phylum, Cephalochordata. Through bioinformatics analysis of small RNA sequencing datasets, we recovered a population of siRNAs believed to be associated with RdRp activity. Our analysis revealed that amphioxus RdRps show gender bias, contributing to RNAi in male species by generating long dsRNA dicer substrates possibly in a by-directional manner from certain mRNA transcripts. We uncovered three male specific siRNA producing loci generating siRNAs that appear to have their origins at regions producing male gamete associated genes. siRNAs produced at one of the observed locus appeared to target small ubiquitin modifier (SUMO) isopeptidase which is implicated in desumolyation of SUMO proteins. When these small RNA reads were traced to other locations in the genome, the testis-expressed transcription factor, Tbx1, often implicated in gonad differentiation was identified to be a target in the male species. With this evidences, we believe that it is highly likely that maintenance of gonad-associated genes by RdRp in this clade was the last role for the protein before it was lost, paving way for genome modifications that might have resulted in divergence of advanced chordate lineages.

P2.34

VERNONIA AMYGDALINA EXTRACTS INHIBIT CANCER CELL GROWTH BY DISRUPTING MICROTUBULE ASSEMBLY

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Vernonia amygdalina (VA) is one of the most medicinally used plants in the genus Vernonia. Previously we reported the *in-vitro* growth inhibitory and anti-proliferative activities of VA extracts on cancer cells. In this study, we examine whether VA inhibits cancer cell growth by disrupting microtubule organization. Using immunocytochemical analysis, 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 measured using Calcein Orange. Apoptosis was measured using Hoechst and Propidium Iodide. Our results indicate that organic and aqueous fractions abrogated the steady state-microtubule pattern into a disassembled form in DU-145. In MCF-7 cells, the fractions caused retraction, condensation and aggregation of tubulin protofilaments within the cytoplasm. Examination of cell structure and morphology revealed marked cell shrinkage, DNA and nuclear fragmentation, chromatin condensation, and formation of membrane blebs and apoptotic bodies. Fluorescence analysis indicated manifestation of condensed chromatin and nuclear fragmentation, confirming an apoptotic death, with greater quantities of apoptotic phenotypes observed in MCF-7 than in DU-145.Viability assay showed a dose-dependent reduction in viable cells, with petroleum ether and aqueous fractions exhibiting a higher reduction effect (IC_{50} 61.02 µg/mL; 65.82 µg/mL) than methanol fraction (IC_{50} 80.77 µg/mL) in MCF-7. In DU-145, methanol fraction exerted highest viability reduction (IC_{50} 44.21µg/mL) than aqueous (IC_{50} 131.7 µg/mL) and petroleum ether fractions (IC_{50} 130.5 µg/mL). Taken together, these observations demonstrate that VA contains active components capable of inhibiting growth of cancer cells, exerting their properties by disrupting microtubule organization, causing apoptotic death.

P2.35

QUINOLINE DERIVATIVES AS HIV-1 INTEGRASE MULTIMERIZATION INHIBITORS

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HIV-1 Integrase is a viral enzyme that is essential for the replication of HIV-1. Recent studies have highlighted the vulnerability of the virus to a new class of integrase inhibitors capable of disabling this viral enzyme by triggering its abnormal multimerization at several critical stages of the virus life cycle. In order to better understand the molecular and mechanistic mode of action of these compounds, we have synthetized a series of active quinoline derivatives to show how the 7th position aryl substitution on the scaffold has an overall enhancement on measured IC50s compared to the unsubstituted compound. This study will showcase our current methodology that combines medicinal chemistry, computational molecular modeling and *in vitro* testing using biochemical systems.

P2.36

KALE INHIBITS CELLULAR PATHWAYS CRITICAL TO THE GROWTH OF NEUROBLASTOMA CELLS

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Introduction: A long-term project in our laboratory focuses on kale juice as a potential anti-cancerous therapy in neuroblastoma (Yuhan Mao & Piletz, MSAS-2017). Alike kale, dandelion and lettuce have also been shown to have health benefits including, anti-inflammatory and anti-oxidative properties, and so the uniqueness of kale as anti-cancerous may be questioned.

Methods: The anti-cancerous properties of kale, dandelion, and lettuce juice were studied on a neuroblastoma cell line, SH-SY5Y. Two different doses (low and high) were applied after optical spectroscopic analysis provided knowledge of the juice's equivalent fluorescent emissions (lamda-excitation=334 nm/ abs=260 nm). Time dependent outputs included measures of cell growth, cell cycle, neurosphere formation, reactive oxygen species (ROS), lipid peroxidation, and stemness biomarkers (nestin and PHOX-2A).

Results: Kale inhibited growth of SH-SY5Y cells more efficiently compared to dandelion and lettuce. This corresponded with a unique cell cycle S-phase arrest by kale (+0.72-fold). Neurosphere formation (both number and size) was also reduced in kale treated cells. Kale treatment also increased reactive oxygen species (ROS) content and enhanced lipid peroxidation more than dandelion and lettuce. Immunoblot analysis of SH-SY5Ys following kale treatment revealed reduced expression of nestin and Phox2A more than dandelion and lettuce.

Discussion: These findings show that kale is more potent than dandelion or lettuce in the anti-cancerous effects on neuroblastoma cells by targeting various oncogenic pathways.

P2.37

KDM5B LEVELS DETERMINE THE SENSITIVITY TO PARP INHIBITOR IN PROSTATE CANCER CELLS

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Prostate cancer (PCa) is one of the most common cancers in males. Novel therapeutic drugs are being developed to target the specific pathways in PCa cells or their surrounding tumor microenvironments. Poly (adenosine diphosphate [ADP]–ribose) polymerase-1 (PARP-1) is a nuclear enzyme with key roles in transcription regulation and DNA repair. Lysine-specific demethylase 5B (KDM5B) is a histone demethylase that can silence transcription and plays a crucial role in cancer through epigenetic regulation. Previous studies have shown that KDM5B is upregulated across different cancers, including PCa, suggesting its role as a potent driver of oncogenesis. The overall objective of this study is to test the effect of the FDA-approved PARP inhibitor (PARPi), Olaparib, on the chemosensitivity of the androgen-sensitive (LNCaP) and castration-resistant cell lines (C4-2B and 22Rv1) when the KDM5B gene is deleted. Cell proliferation assay (Crystal violet staining) and Western blot analyses were performed. Cells were treated with Olaparib at 0.1μM, 1μM, and 5μM, respectively, in a dose-dependent manner for six days, while 0.1% DMSO was used as the vehicle control. Our results demonstrated that PCa cells with KDM5B-knockout (KO) are more vulnerable to PARP inhibition than the KDM5B intact control cells. In addition, we found that combined inhibition of KDM5B and PARP results in a significant reduction of cell proliferation of PCa cells, as compared to the single treatments. Our study on KDM5B and PARP inhibition in PCa provides valuable information on an integral step to other avenues of PCa control.

P2.38

THE HISTOPLASMA CAPSULATUM STRESS-RESPONSE PROTEIN HCDDR48 IS INVOLVED IN RESISTANCE TO THE ANTIFUNGAL DRUG AMPHOTERICIN B

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Histoplasma capsulatum (Hc) is a systemic, dimorphic, fungal pathogen. Hc grows as a multicellular mold at environmental temperatures (25˚C) whereas upon inhalation into a human or other mammalian host (37˚C), it transforms into a unicellular, pathogenic yeast. Our research is focused on characterizing the cellular stress response protein HcDDR48. Literature in *C. albican*s has shown that CaDDR48is required for optimal survival against the antifungal ketoconazole and amphotericin B. This study aimed to investigate if HcDDR48plays a role in antifungal drug resistance in Histoplasma as well. In a ddr48deletion mutant, we found decreased survival in a growth curve treated with 0.1μg/mL amphotericin B. Work is underway to construct an Hc strain that is over-expressing HcDDR48to determine if antifungal resistance increases in a HcDDR48-dependent manner.

P2.39

ACETAZOLAMIDE RESTORES BLOOD PRESSURE-LOWERING EFFECT OF TEMPOL IN FEMALE SPONTANEOUSLY HYPERTENSIVE RATS (SHR)

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Oxidative stress is thought to be one of the mechanisms responsible for control of blood pressure (BP). However, the role of oxidative stress in hypertension in females is controversial. Tempol (superoxide dismutase mimetic, antioxidant) fails to reduce BP in female SHR. In this study we tested the role of distal oxidative stress on BP regulation in females by using Acetazolamide (AZT), a carbonic anhydrase inhibitor that inhibits Na+ reabsorption in the proximal tubule thus increasing distal oxidative stress. Methods: Female SHR (9 months, n=13) were implanted with telemetry transmitters and allowed 2 weeks to recover. Results: Baseline mean arterial pressure (MAP)

was recorded for 3 days and then all rats were given AZT (100 mg/kg/day, sc) for 27 days. In addition to AZT, rats were given Tempol (30 mg/kg/d, n=7) or tap water (n=6) for 11 days. MAP decreased during the first 3 days of AZT compared to baseline (baseline: 146 ± 3; AZT: 135 ± 2 mm Hg, $p<0.05$). Tempol treatment further reduced MAP in female SHR (AZT alone: 139 ±2; AZT + Tempol: 132 ± 3), compared to no change in AZT alone group. Conclusion: Our data suggest that the blood pressure-lowering effect of Tempol in female SHR is dependent on renal sodium handling and distal oxidative stress. Studies were supported by NIH P01HL51971, R01HL135089, P20GM121334.

P2.40

EFFECTS OF PROBIOTIC, LACTOBACILLUS RHAMNOSUS, ON NEURONAL HEALTH

Kyndall Strickland, Kelly Brue, John Piletz

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Intestinal epithelial cells form a barrier through which selective signals pass from the lumen to neuronal afferents (predominantly cholinergic) up the Gut-Brain Axis. *In vivo* evidence also supports that ingestion of the probiotic, *Lactobacillus rhamnosus* (LR), diminishes human depression. A way to model this flow of information was presented at MSAS2018 (Brue et al, 2018) using 3-dimensional co-cultures of human epithelial cell line (C2BBe1) grown on porous inserts above human neuroblastoma cells whose primary phenotype is cholinergic neuronal (SH-SY5Y). Our hypothesis herein was that co-culturing with C2BBe1 epithelial inserts would, alone, promote more and longer SH-SY5Y neurites, and the addition of *LR* would promote even more neurites. Methods: SH-SY5Y cells were seeded at low density to elicit small colonies after 2-3 weeks wherein neurites could be stained and drawn to quantify. C2BBe1 cells were grown for 2 weeks on inserts to reach full confluence with tight junctions measured by Transepithelial Electrical Resistance (TEER). C2Bbe1 inserts were transplanted atop SH-SY5Y colonies and TEER and neurite-related properties measured. *LR* (active-growing; 109/0.5 ml) was added to the inserts and neurite-related properties and TEER assessed 24-48 hours later. Results: (1) No effect of transplantation alone on C2BBe1 TEER or SH-SY5Y neurites (post 24 hours). After *LR* for 24 hours, (2) TEER decreased by 12% ($p= 0.03$) with possible changes in SH-SY5Y neurites (sample analyses ongoing). Discussion: The findings reveal LR as relatively inert in terms of modifying epithelial or neuronal cell health which contrasts with another lactobacillus probiotic (same meeting, Najmi et al, companion abstract).

P2.41

NOVEL EDIBLE MEDICINAL PLANT INDUCING OXIDATIVE STRESS AND APOPTOSIS IN OVARIAN CANCER

Landrie Tchakoua[1,2], Dr. Clement Yedjou[1], Ariane T. Mbemi[1]

[1]Jackson State University, Clinton, MS, USA, [2]LSMAMP fellow

Cancer is a serious public health concern worldwide and United States (US) specifically Ovarian cancer is classified as the fifth most common forms of cancers and the first leading cause of death among all gynecological malignancies in women. The goal of the research was to determine the therapeutic mechanisms of leaf fraction extracts in the management of ovarian cancer. To achieve our goal, cell viability was determined by MTS assay using the spectrophometer. Cell morphology was evaluated by the brightfield and fluorescent microscope. Crude extract were fractionated using methanol and dichloromethane as solvent. Given different concentrations (ug/mL), different results were obtained. At 8ug/mL, cell viability was about 60 cells, at 16ug/mL, cancer cell viability decreased to 40, and at 32ug/mL, it reduced to 30. Our data indicated that herbal medicine inhibits the cell proliferation of the OVCAR-3 cells in dose-dependent fashion. With the flow cytometry assessment, we observed that herbal medicine induced cell cycle arrest and triggered apoptosis of OVCAR-3 cells. The result suggests that herbal medicine may be a good anti-cancer candidate for the treatment of ovarian cancer.

P2.42

METFORMIN TREATMENT DECREASES PARASITE BURDEN DURING LEISHMANIA INFECTION *IN VITRO*

Solangé Tchounwou

Cutaneous leishmaniasis (CL) is a tropical and subtropical disease caused by parasites of the *Leishmania genus*. Infection with Leishmania parasites causes skin lesions that persist over the years. Current treatments for CL cause harsh side effects and patients are often refractory to drug treatment, so new alternative treatment strategies are needed. As a result, the objective of this study is to identify new chemotherapy for the disease. Recent research has shown that metformin, a drug approved by the FDA to treat diabetes, is effective against infectious diseases. During infection, *Leishmania* parasites specifically, infect and reside inside macrophages. Therefore, an *in vitro* assay was established to examine the effects of metformin on parasite burdens in macrophages following *Leishmania* major infection. For this assay, bone marrow-derived macrophages from C57BL/6 mice were infected with metacyclic promastigote parasites for 24 or 72 hours. The parasites were genetically modified to express DsRed, a fluorescent protein that allows for the quantification of parasites. Macrophages were stained with DAPI, a fluorescent dye used to detect the nuclei. To examine the effect of metformin on infection, macrophages were infected with parasites and exposed to different concentrations of metformin (1, 2.5, and 5 mM). The results showed that the number of parasites per macrophage decreased in the presence of metformin. Given that metformin reduces parasite numbers in infected macrophages *in vitro*, these suggest that metformin may be a promising new treatment for CL.

P2.43

SCREENING OF CRISPR/CAS9 INDUCED MUTATIONS BY RESTRICTIONS FRAGMENT LENGTH POLYMORPHISM

Kordillia Thompson[1], Sweta Khanal[2], Alex Flynt[2]

[1]MS-INBRE and [2]The University of Southern Mississippi, Hattiesburg, MS, USA

MicroRNAs (miRNAs) are a group of small non-coding RNA molecules found in multicellular-organisms. miRNAs negatively regulate the production of a specific protein by pairing with and inhibiting translations in the RNA that will produce the proteins. This group is short because it is made up of 22 nucleotides. In this study, we want to investigate a particular miRNA called MiR-107 using a genome editing technology called CRISPR/CAS9 and the common fruit fly, *Drosophila melanogaster*. This type of technology is a precise and facile technology that researchers use to edit genomes by induction of double strand breaks in a targeted DNA sequence. We designed the gRNA sequence and the repair template that would generate two class of mutants. The first, with two SNPs within its seed sequence and the other with deleted seed sequence. We are using recombination immediate repairs to reconstruct the base pairs. Once the flies became adults, we crossed with a balancer stock. When the new embryos became older, we began a process called Restriction Fragment Length Polymorphism (RFLP). During this time of the project, we used Polymerase Chain Reaction (PCR) and digestion to

screen the flies to see if they have the desired mutation that we were seeking. Once we get the results, we will be able to determine that miR-1017 will expand the lifespan of the *Drosophila melanogaster* instead of reducing it.

P2.44

CONTRIBUTION OF EXOPOLYSACCHARIDE PATHWAYS TO THE BIOFILM FORMATION AND FITNESS OF PSEUDOMONAS SYNXANTHA 2-79 UNDER WATER STRESS

Kaelin Travis[1]

[1]MS INBRE and University of Southern Mississippi, Hattiesburg, MS, USA

Wheat grown in the low-precipitation areas of the Pacific Northwest supports large populations of phenazine-producing (Phz+) rhizobacteria. These beneficial microorganisms colonize plant roots and control *Rhizoctonia solani*, a ubiquitous soilborne fungal pathogen of cereal crops. Previous studies revealed that the abundance of Phz+ rhizobacteria is inversely related to irrigation, suggesting that these organisms are naturally adapted to arid soils. However, the molecular basis behind this phenomenon is currently unknown. In this project, we used *Pseudomonas synxantha* 2-79 as a model to study the contribution of capsular exopolysaccharides (EPS) to the fitness of Phz+ rhizobacteria under water stress. The annotation of 2-79 genome revealed the presence of pathways for the synthesis of three EPSs: alginate (*alg*), the aggregative polysaccharide Psl (*psl*), and a potentially novel exopolysaccharide (*eps*). We fused promoters of these pathways to gfp and demonstrated that *alg*, *psl*, and *eps* genes are induced under water-stressed conditions. We also tested isogenic mutants and demonstrated that although the EPSs minimally affect biofilm formation, they provide a crucial contribution to the ability of 2-79 to tolerate desiccation. Our findings will help to understand better how beneficial rhizobacteria maintain physiological activity and interact with their plant hosts under conditions of drought stress.

P2.45

GENERATION OF VAMP7 AND SYNTAXIN4 EXPRESSION PLASMIDS FOR MAST CELL DEGRANULATION

Nga Truong, Pratikshya Adhikari, Hao Xu

The University of Southern Mississippi, Hattiesburg, MS, USA

Mast cells contribute to innate and adaptive immunities, however they can also cause allergy and autoimmunity through the release of various mediators e.g. histamine, serotonin, TNF-α through a process known as degranulation. The mast cell plasma membrane fuses with granule membranes through interactions between SNARE (soluble NEM sensitive factor attachment protein receptors) proteins anchored on both membranes, forming a trans-SNARE complex. Studies have suggested a correlation between specific SNAREs and the release of specific mediators, however we are uncertain about the specificity of different SNAREs in different types of mediator release. To test our hypothesis that different SNAREs are involved in differential release of mediators, first the SNAREs (VAMP7 and Syntaxin 4) will be knocked out from Rat Basophilic Leukemia (RBL-2H3) cell lines using CRISPR technology. To rescue the knocked out cells and reintroduce the genes, we subcloned R-SNARE VAMP7 and Q-SNARE Syntaxin4(STX4) into two pLVX-IRES-BLAST Vectors (one with Green Fluorescent Protein(GFP) and one without GFP). The vectors were double digested with EcoR1-HF and BamH1-HF and extracted and purified from agarose gel. VAMP7 and Stx4 were PCR amplified using self-designed primers with incorporation of EcoR1 and BamH1 sites then double digested and then extracted and purified from the gel. The purified inserts and vector were ligated and then transformed into Novablue competent cells. The plasmid isolated from the transformed colonies was sequenced, confirming the correctly made constructs. This connection between certain mediators released through SNAREs will allow stabilizer drugs to target and suppress SNAREs that create harmful mediators.

P2.46

EXOSOME SIGNALING: COMPARISON OF EXOSOME ISOLATION METHODS AND POLARIZED STATUS OF EPITHELIAL CELLS

Alan Tu[1], Debarshi Roy[2], John Piletz[1]

[1]Mississippi College, Clinton, MS, USA and [2]Alcorn State University, Lorman, MS, USA

Most mammalian cells extrude exosomes (40-120 nm diameter), which encapsulate paracrine signals that sometimes - if hijacked – spread malignancies. In this report, we compare the exosomes from neuroblastoma SH-SY5Y and polarized colon cancer-derived C2BBe1 cells grown atop porous cell culture inserts, which allows for the comparison between apical and basal effluents. We describe a comparison of nanovesicles isolation methods from these cell lines. Methods: The cells were grown in special exosome free media. The apical, basal, and open (total) effluents of the 3D cell cultures were collected and exosomes isolated by either a multi-step ultracentrifugation method (UC) or a commercial Quick Prep kit (called "Q"). To distinguish from cellular debris and to compute the yield of exosomes, the biomarker, CD63, was measured by ELISA. CD63 ELISAs were performed after total protein measurements (BCA method) to calibrate each preparation (values = CD63-equivalence of 109 standard particles/mg protein). Results: The levels of exosomes were found to be comparable between the two cell lines. Both UC and Q methods had near identical yields for 3 samples (SH-SY5Y apical and open; C2BBe1 apical). However, the UC yields were on average 1.7x higher than Q for the remaining 3 samples (SH-SY5Y basal; C2BBe1 basal and open). Discussion: A previous study showed that purified exosomes from C2BBe1s, can - via modulated miRNA content - promote neurite outgrowth in SH-SY5Y cells (Sugihara 2019). Therefore, we are awaiting exosome miRNA sequencing data and planning exosomal treatment studies.

P2.47

TAT ACTIVATION PROMOTES RAGE-MEDIATED VENTRICULAR REMODELING AND DYSFUNCTION

Nason Wise, James A Stewart, Jr.

University of Mississippi School of Pharmacy, University, MS, USA

With the use of combined antiretroviral therapy (cART), the life expectancy of human immunodeficiency virus (HIV) patients has dramatically increased, and HIV infection has become a chronic disease with complications. Among the long-term HIV-related complications, cardiovascular disease is a leading cause of death in HIV patients. Of particular interest, the HIV Tat (trans-activator of transcription) protein, a small nuclear protein that serves to enhance the efficiency of viral transcription, has received recognition as a molecule of interest in HIV-related complications. The purpose of this study is to determine a role of Tat in signaling mechanisms demonstrated to promote cardiovascular disease, such as the RAGE signaling cascade. RAGE (receptor for advanced glycated endproducts) has been shown to promote oxidative stress, inflammation, and increase RAGE upregulation in response to increased cascade activation. We proposed Tat activation (Tat+/Doxycycline+) will increase RAGE signaling to cause changes in the heart. Using a Tat- transgenic mouse model, we observed a decrease in left ventricular (LV) wall thicknesses and percent ejection fraction (%EF) with echocardiography. Protein analysis revealed increased in RAGE and SOD-2 protein expression. Collectively,

these findings indicate Tat activation in the heart resulted in a shift towards a dilated LV, which may be caused by increased RAGE signaling. Future studies are necessary to determine if increased RAGE signaling promotes changes 1) inflammatory cytokines, 2) recruitment of inflammatory cells, such as mast cells, and 3) increased extracellular matrix remodeling of which promotes ventricular dysfunction.

P2.48

GARLIC PRESENTS A POSSIBILITY IN THE MANAGEMENT OF ACUTE PROMYELOCYTIC LEUKEMIA

Faren Renee White[1], Clement Yedjou[2]

[1]Tougaloo College, Tougaloo, MS, USA and [2]Jackson State University, Clinton, MS, USA

Garlic supplementation in diet has been shown to be beneficial to cancer patients. Recently, its pharmacological role in the prevention and treatment of cancer has received increasing attention. However, the mechanisms by which garlic extract induces cytotoxic effects in cancer cells remain largely unknown. The present study was designed to use HL-60 cells as a test model to determine whether garlic treatment induced toxicity to human leukemia cells is mediated through oxidative stress. Human leukemia (HL-60) cells were treated with different concentrations of garlic extract for 24 hr. Live and dead cells was determined by trypan blue exclusion test and microscopic imaging. The role of oxidative stress in garlic toxicity was assessed by lipid peroxidation, glutathione peroxidase (GPx) and catalase (Cat) assays, respectively. Oxidative stress biomarkers showed significant increase ($p < 0.05$) of malondialdehyde levels on one hand and gradual decrease of antioxidant enzyme activity (GPx & Cat) on the other hand with increasing garlic doses. Taken together, finding from the present study demonstrates that at therapeutic concentrations, garlic treatment induced cytotoxic effects through oxidative in HL-60 cells.

P2.49

IMPLICATING RIBONUCLEASES IN MAMALIAN TAILED MIRTRON BIOGENESIS

Farid Zia, Alex Flynt

The University of Southern Mississippi, Hattiesburg, MS, USA

Mirtrons are small RNAs which bypass Drosha cleavage and they are classified in three categories of 5' –tailed, 3' –tailed and conventional. Though many tailed mirtrons have been recognized in recent years, their biogenesis particularly removal of tail residues has 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 biogenesis of two tailed mirtrons miR-668 (mouse 3') and miR-5010 (human 5'). To achieve this, at first, we detected the expression of these two mirtrons in HEK cells. Next we performed structure and function tests using different constructs of the miR-668 and miR-5010. Through these minigenes we will be able to examine the basic processing of tails as well as the sequence requirements.

P2.50

ELUCIDATING THE REGULATORY ROLE OF *MSAABCR* IN STRESS RESPONSE IN *Staphylococcus aureus*

Shanti Pandey, Gyan S. Sahukhal and Mohamed O. Elasri

The University of Southern Mississippi, Hattiesburg, MS

Persister cells are a bacterial phenotypic variant that are extremely tolerant to antibiotics. By acquiring metabolic dormancy, persisters account for the paradox that antibiotic susceptible bacteria are major cause of treatment failures. Although, depletion of ATP has been associated as a general mechanism for persister formation in *S. aureus*, specific mechanisms have not been deciphered yet. Given all the stationary phase *S. aureus* cells behave as persister cells, deletion of *msaABCR* operon rendered stationary phase *S. aureus* cells defective in persisters against aminoglycosides stress. We found increased metabolic activity in *msaABCR* mutant generating higher ATP than wild-type strains. ATP synthesis occurs when glucose catabolism generates NADH which is oxidized by electron transport chain (ETC) followed by activation of F0-F1 ATP synthase. Our preliminary results also show higher NADH content in *msaABCR* mutant cells as compared to wild-type *S. aureus*. Therefore, we hypothesize *msaABCR* operon specifically regulates persister formation against aminoglycosides by repressing PMF generation. Apart from this specific mechanism, *msaABCR* also holds general mechanism of persister formation dependent on ATP production. Previous study shows *msaABCR* as an oxidative stress response regulator suggesting that it is required for *S. aureus* survival in the hosts. Furthermore, differential expression of immune invasion genes (*clfA, ebps, efb, fnbpA, hla)* in *msaABCR* mutant indicates that *msaABCR* also plays role in establishing infections. Further we plan to decipher the role of *msaABCR* in intracellular persistence. Understanding the regulatory mechanism of *msaABCR* in stress response will help minimize the treatment failures is staphylococcal infections.

P2.51

PYRUVATE INDUCES EXPRESSION OF *MSAABCR* OPERON TO REGULATE METABOLISM, VIRULENCE AND BIOFILM DEVELOPMENT IN *Staphylococcus aureus.*

Bibek G C, Gyan S. Sahukhal, and Mohamed O. Elasri

The University of Southern Mississippi, Hattiesburg, MS

Staphylococcus aureus is an important human pathogen equipped with virulence determinants that aid in the acquisition of nutrients and survival against host immune responses. Understanding intricate mechanisms by which staphylococci achieve metabolic adaptation and persistence provides useful information in finding novel targets for treatment options. Pyruvate is a critical metabolite that drives ATP production through central metabolism which is also shown as an important signal molecule that alter staphylococcal metabolic flux and virulence expression. Furthermore, pyruvate is thought to be the inducer molecule of *CidR* which induces *CidABC* expression during biofilm development. In this study, we showed that *msaABCR* represses expression of *CidR* and *cidABC* during overflow metabolism. Pyruvate is also shown to induce expression of *msaABCR* operon. However, molecular and physiological logic of *msaABCR* induction by pyruvate to regulate growth, biofilm development and virulence is still unknown. To test whether intracellular pyruvate affects *S. aureus msaABCR* mutant's physiology and virulence expression, we measured growth, acetate production and exoprotein profile of *msaABCR* and *msaABCR*/ proteases mutants in TSB supplemented with 1% pyruvate. Growth and acetate production of *msaABCR* and *msaABCR*/ proteases mutants increased significantly when grown in pyruvate supplemented TSB compared to wild type strain. Exoprotein profile showed differential expression of exoproteins by these strains in presence of pyruvate. These results suggest that *msaABCR* expression is induced by intracellular pyruvate to represses pyruvate catabolic pathways to promote biofilm development and exoprotein production. We seek to define molecular mechanism for *msaABCR* operon sensing intracellular pyruvate.

Friday, February 21, 2020

MORNING

Room D12

Oral Presentation Session IV

Moderators: Dr. James A. Stewart, Jr. and Rabina Kumpakha

8:15 WELCOME

O2.15

8:30 THE IMPACT OF DIABETIC CONDITIONS AND AGE/RAGE SIGNALING ON CARDIAC FIBROBLAST MIGRATION

Stephanie D. Burr[1], Mallory B. Harmon[2], James A. Stewart, Jr.[1]

[1]The University of Mississippi, University, MS, USA and [2]The University of Mississippi Medical Center, Jackson, MS, USA

Diabetic individuals have an increased risk for developing cardiovascular disease due to stiffening of the left ventricle, which is thought to occur, in part, by increased AGE/RAGE signaling inducing fibroblast differentiation. Advanced glycated end products (AGEs) accumulate within the body over time, and under hyperglycemic conditions, the formation and accumulation of AGEs is accelerated. AGEs exert their effect by binding to their receptor (RAGE) and can induce myofibroblast differentiation, leading to increased cell migration. Previous studies have focused on fibroblast migration during wound healing, in which diabetics have impaired fibroblast migration compared to healthy individuals. However, the impact of diabetic conditions as well as AGE/RAGE signaling has not been extensively studied in cardiac fibroblasts. 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. Cardiac fibroblasts were isolated from non-diabetic and diabetic mice with and without functional RAGE and used to perform a migration assay. Cardiac fibroblasts were plated on plastic, non-diabetic, or diabetic collagen, and when confluency was reached, a line of migration was generated by scratching the plate and followed by treatment with pharmacological agents that modify AGE/RAGE signaling. Diabetic fibroblasts displayed an increase in migration compared to non-diabetic fibroblasts whereas inhibiting the AGE/RAGE signaling pathway resulted in a significant increase in migration. The results indicate that the AGE/RAGE signaling cascade causes a decrease in cardiac fibroblast migration and altering the pathway will produce alterations in cardiac fibroblast migration.

O2.16

8:45 DOUBLE-STRANDED RNA ACTIVATED PROTEIN KINASE IS RESPONSIBLE FOR THE REDUCED CELL PROLIFERATION OF DICER DEFICIENT MOUSE EMBRYONIC STEM CELLS (Grad)

Chandan Gurung, Yan-Lin Guo

University of Southern Mississippi, Hattiesburg, MS, USA

Embryonic stem cells (ESCs) are highly proliferating pluripotent cells with potential as a cell source for cell therapy and regenerative medicine. Cell cycle time of ESCs is very short when compared to other somatic cells mainly due to inhibition of cell cycle inhibitors by ESC-specific microRNAs. As a result, knocking out a gene indispensable for the microRNA pathway called dicer (DKO) leads to a reduced proliferation rate in ESCs. However, mammalian dicer can also process endogenous RNA with double-stranded RNA (dsRNA) structures in addition to its canonical role in the microRNA biogenesis pathway. These dsRNA structures would otherwise bind to dsRNA binding receptors and intrinsically activate the interferon-based innate immune system. In ESCs, since the interferon system is underdeveloped, the physiological effect of these unprocessed dsRNA structures is still unknown. Here, we propose that these dsRNA structures activate dsRNA dependent protein kinase (PKR) and inhibit proliferation rate in DKO mouse ESCs. We found that PKR was activated even at basal levels in DKO mESCs. Inhibiting PKR activity by its inhibitor C-16 reduced cell number and increased proliferation rate in these cells. These results suggested that activated PKR is responsible for reduced proliferation in DKO mESCs. Similarly, the transcript level of B2 RNA, retrotransposons with dsRNA structures, increased by about 50% in DKO mESCs compared to WT mESCs. Our results highlight the non-canonical role of dicer in processing dsRNA structures to inhibit PKR activation and to maintain the normal cell cycle profile of ESCs.

O2.17

9:00 UNRAVELING THE INNATE IMMUNE RESPONSE IN *RICKETTSIA PARKERI* INFECTED *AMBLYOMMA MACULATUM* TICKS

Faizan Tahir

University of Southern Mississippi, Hattiesburg, MS, USA

Selenoproteins, incorporated from dietary selenium, plays an important role in immunity and inflammation responses due to its vital role in regulating reactive oxygen species and redox status in almost all tick tissues. Due to its importance, previous studies have been done to show that Selenophosphate synthetase 2 (SPS2), a homologue of Selenophosphate synthetase (SelD) identified in mammals, is essential for selenoprotein biosynthesis. In this study, we hypothesize that silencing of SPS2 will cause an increase in *Rickettsia parkeri* levels in infected *Amblyomma maculatum* ticks. To define the functional role of SPS2 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 SPS2. 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 play a role in the maintenance of tick pathobiome. In addition to SPS2, another gene that will be looked at is Relish, a homologue of nuclear factor-kappa B (NF-kB), in the immune deficiency signaling pathway, which regulates the expression of Microplusin, an antimicrobial peptide (AMP). Interplay between redox signaling of SPS2 and innate immunity pathways initiated by Relish will be discussed in the context of tick-pathogen interactions.

O2.18

9:15 ASSOCIATION OF DIFFERENT DCLK1 ISOFORMS WITH ONCOGENESIS AND CHEMORESISTANCE OF HUMAN COLORECTAL CANCER (Faculty)

Lianna Li

Biology Department, Tougaloo College, Tougaloo, MS, USA

Doublecortin-like kinase 1 (DCLK1) was identified as a putative stem cell marker along the human gastrointestinal tract. Over-expression of DCLK1 was observed in multiple human cancers, including the human colorectal cancer (CRC) and up-regulated expression of DCLK1 is correlated with poor prognosis of CRC. DCLK1 consists of five isoforms, and association of different isoforms with oncogenesis and chemoresistance of CRC is unclear. The current project aims to identify association of DCLK1 isoform 1 (DCLK1-L) and DCLK1 isoform 2 (DCLK1-S) with CRC tumorigenesis and their effect on the sensitivity of CRC cells to chemotherapeutic agents. In

order to achieve these goals, DCLK1-L and DCLK1-S stably expressed cell lines were established using HCT116 cells. Effects of DCLK1-L and DCLK1-S on the stemness of CRC cells were investigated via spheroid formation assay, migration and invasion assay, etc. RNA sequencing approach was applied to determine the transcriptome modifications of CRC calls by DCLK1-L and DCLK1-S with/without 5-Fu treatment, and Ingenuity pathway analysis was carried out to establish the molecular network of DCLK1. Our results indicated that DCLK1-L and DCLK1-S demonstrated different capability in affecting tumorigenesis of CRC cells. Several common canonical pathways were modified by both DCLK1 isoforms, and each of them modified several unique pathways as well. In conclusion, different DCLK1 isoforms may play different roles during oncogenesis and chemoresistance of CRC. Revealing the association of different isoforms of DCLK1 with human CRC will have a positive impact on providing more accurate therapeutic targets for CRC treatment.

O2.19

9:30 IDENTIFICATION OF GENE TARGETS OF MITOCHONDRIA-TO-NUCLEAR RETROGRADE SIGNALING IN *S. CEREVISIAE* (Faculty)

Donna M. Gordon[1], Ercan Seluçk Ünlü[2]

[1]Mississippi State University, Department of Biological Sciences, Mississippi State, MS, USA , [2]Bolu Abant İzzet Baysal University, Faculty of Arts and Science, Department of Chemistry, Bolu, Turkey

In *Saccharomyces cerevisiae*, cellular conditions that result in mitochondrial dysfunction triggers a cytosolic-to-nuclear signaling cascade known as 'retrograde signaling'. Central to this signaling pathway are three proteins: Rtg2p that functions as the cytosolic sensor of mitochondrial inefficiency, and Rtg1p-Rtg3p heterodimer that functions as a transcriptional regulator controlling R-box containing genes. The nuclear targets of this signaling pathway include genes that code for protein products that function to compensate for mitochondrial deficiencies. To date, only a few genes have been studied as retrograde targets including citrate synthase (*CIT2*), lactate dehydrogenase (*DLD3*), and pyruvate carboxylase (*PYC1*). In an attempt to identify the full complement of genes in the retrograde regulon, an RNA sequencing approach was taken to compare transcript level differences between wildtype and *rtg2* deletion strains. RNA sequencing data analysis identified 1,100 RNA transcripts that were upregulated at least 1.5-fold in an *RTG2* strain relative to *rtg2* strain, a list that included the three well characterized retrograde targets. Given that rtg2 cells have been shown to lose their mitochondrial genome, it is expected that a number of these differentially expressed target genes are secondary to the loss of retrograde signaling and likely reflect a response to a loss of respiratory competency. Further analysis will therefore include identifying target genes that have within their promoters an Rtg1p-Rtg3p binding site. Putative retrograde targets will then be confirmed by reporter-based growth assays followed by qPCR analysis. With the identification of additional retrograde signaling targets, a more complete picture of inter-organelle communication will be generated.

9:45 - 10:00 BREAK

10:00 Cellular, Molecular, Developmental Biology Division Awards

Oral Presentation Session V

Moderators: Drs. James A. Stewart, Jr. and Donna M. Gordon

O2.20

10:45 REGULATION OF EARLY ZEBRAFISH DEVELOPMENT BY CATHEPSIN B (Faculty)

Yvette Langdon[1], Mary Mullins[2]

[1]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. Proteomic analysis was performed to identify candidate genes/ pathways for the morphogenesis defects observed in mutant embryos. 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.

O2.21

11:00 DYNAMIC EPIGENETIC CONTROL OF TRANSPOSON SILENCING (Faculty)

Dafang Wang

Division of Math and Sciences, Delta State University, Cleveland, MS, USA

Transposable element (TE) activity results in genome instability in a wide variety of organisms, including humans. 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 the silencing of TEs in different tissues at different times in both plants and animals. By using a novel model system in which an active transposon can be silenced by a silencing trigger that is a source of small RNAs, we observed a switch of silencing mechanism from the de novo RNA directed DNA methylation (RdDM) in the germinating endosperm, to the post-translational inhibition in the embryo of maize. Here in this study, we analyzed high throughput sequencing data from RNA-Seq, small RNA-Seq, and whole-genome bisulfite sequencing experiments. We will present our preliminary data on the genome-wide change in DNA methylation, transcription and small RNA biosynthesis of transposons. We will also discuss the possible silencing pathways that were suggested by 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.

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.

O2.22

11:15 INHIBITION OF PFKFB3 INDUCES AUTOPHAGY AND CHEMOSENSITIVITY IN OVARIAN CANCER
(Faculty)

Debarshi Roy[1], Susmita Mondal[2], Viji Shridhar[3]

[1]Alcorn State University, Lorman, MS, USA; [2]Sammilani Mahavidyalaya, Kolkata, India, [3]Mayo Clinc, Rochester, MN

Introduction: PFKFB3, a critical enzyme in aerobic glycolysis has recently emerged as a contributing factor to the growth and survival of several solid tumors including lung, breast, and colon. PFK158, a novel glycolytic inhibitor targets the active form of PFKFB3, which is overexpressed in chemoresistant ovarian cancer (OV).

Method: Several isogenic sensitive and resistant OV cell lines were treated with PFK158 followed by measurement of cell viability, glucose uptake, ATP production, lactate release, lipid droplet biogenesis and autophagic flux. We have also tested if PFK158 synergized with carboplatin and paclitaxel treatment in chemoresistant cell lines. *In vivo* studies were conducted to test the anti-tumorigenic properties of single and combined treatment of PFK158 with carboplatin in mice model.

Results: We found elevated level of p-PFKFB3 (ser461) in isogenic chemoresistant OV cells (C13, HeyA8MDR) compared to its chemosensitive counterparts (OV2008, HeyA8). PFK158 treatment inhibited the active form of PFKFB3 along with a reduced cell growth, glucose uptake, ATP production, lactate release, lipid droplet (LD) biogenesis as well as induction of apoptosis and autophagy. Interestingly, we also found that PFK158 synergized with carboplatin and paclitaxel in the chemoresistant cells in an autophagic dependent manner. Combined treatment of PFK158 with carboplatin reduced tumor growth, ascites and LDs in a chemoresistant tumor model compared to untreated mice.

Discussion: The current study will lead to a better understanding of pathways regulated by metabolic inhibitors in promoting chemoresponse in resistant OC cells that can be translated into meaningful clinical trials.

Friday, February 21, 2020

AFTERNOON

12:00-1:00 Plenary Speaker

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

CHEMISTRY AND CHEMICAL ENGINEERING

Chair: Colleen Scott
Mississippi State University
Vice-Chair- M. Saiful Islam
Jackson State University
Vice-Chair: Yongfeng Zhao
Jackson State University

Thursday, February 20, 2020

MORNING

Room D6

8:50 Welcome

Session I: 9:00 AM – 10:20 AM (Chair: Byunggwon Jeon)

O3.01

9:00 DISCRIMINATION OF HALIDES WITH A DINUCLEAR COPPER(II) COMPLEX

Md Mhahabubur Rhaman, Md. Alamgir Hossain

Jackson State University, Jackson, MS

Anion recognition is an emerging area of research at the interface of chemistry and biology due to the key roles of anions in chemical, biological, and environmental processes. Complementary receptors could selectively recognize anions with different geometries, sizes, and charges through a variety of non-covalent interactions such as hydrogen bonding, electrostatic, and metal-ligand bonds. In this context, designed receptors functionalized with signaling components are of special interest since they can serve as rapid and cost-effective methods to identify certain guest species, displaying detectable spectroscopic or visible color changes. In our research, A rigid dinuclear copper(II) complex L based on furan spacers was synthesized and studied for its binding interactions with halides by colorimetric studies and UV-Vis titrations. Results from the titration studies demonstrate that L binds each of the halides in the order of fluoride > chloride > bromide > iodide, correlating directly with the charge density of the respective halide.

Acknowledgements: The project described was supported by the US Department of Defense (Grant Number W911NF-19-1-0006).

O3.02

9:15 A VERSATILE FE-TI OXIDE/BIOCHAR COMPOSITE ADSORBENT FOR CONTAMINANT REMOVAL FROM WATER

Shannon Warren, Amali Herath, Chanaka M. Navarathna, Todd Mlsna

Mississippi State University, Mississippi State, MS

Biochar is a porous charcoal that is rich in carbon made from waste biomass via pyrolysis. It can improve the water quality, adsorb and preserve nutrients in soil while increasing soil fertility. Also, it can generate composite adsorbents with small particle phases dispersed on larger carrier particles with improved sorption features. This work is the first report on Fe-Ti oxide/biochar (FTOBC) composite for the sorptive removal of contaminants from aqueous solutions. Nano Fe-Ti oxides were dispersed on a commercially available, cheap, high surface area Douglas fir biochar (S.A ~700 m^2/g) (BC) by a modified chemical co-precipitation method using $FeCl_3$ and $TiO(acac)_2$ salts followed by a base and high temperature treatment (~400 °C).

FTOBC consists of three phases; iron oxide, titanium oxide and BC that can adsorb a wide spectrum of contaminant classes including heavy metals, anions, oxy anions and organics. Preliminary sorption studies of Methylene blue (MB), Fluoride (F^-, chromate/dichromate (Cr^{6+}) and lead (Pb^{2+}) in simulated waters for both BC and FTOBC were performed. Adsorption was studied as a function of pH, equilibrium time and initial adsorbate concentration and temperature. Preliminary data suggest that FTOBC has a potential to simultaneously adsorb MB, F^-, Cr^{6+} and Pb^{2+}. BC, FTOBC and adsorbate-laden FTOBC was characterized by PZC, BET, SEM, TEM, EDS, XRD, TGA, DSC

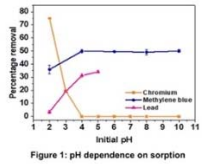


Figure 1: pH dependence on sorption

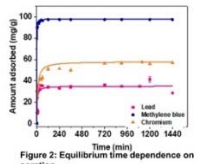


Figure 2: Equilibrium time dependence on sorption

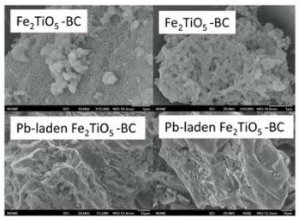
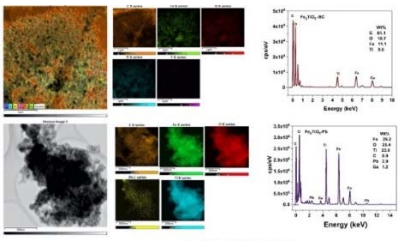


Figure 3: SEM characterization



O3.03

9:30 PATTERNING P3HT AGGREGATES ONTO PRE-PATTERNED ELECTRODES UNDER AN ELECTRIC FIELD

Nicholas Kreis, Song Guo, Trishal Zaveri, Kan Tang

University of Southern Mississippi, Hattiesburg, MS

In the past few decades conjugated polymers (CP's) have attracted attention in the semi-conducting for their unique anisotropic properties, flexibility, and cost, while remaining convenient to process. Although CP's are easy to process, there is still a need for developing novel methods that can achieve reproducible micron-size patterning. The capability to make reproducible micron-sized patterns remains necessary for moving device development from an academic research setting to an industrial scale. Many different patterning methods are known to be successful at attaining easily reproducible results, such as photolithography and E-beaming, but these methods rely on expensive instrumentation. The electrophoretic deposition of charged polymer aggregates offers a potential cost-effective alternative for traditional patterning techniques, while significantly reducing the amount of harmful byproducts. Preliminary results have shown that aggregated poly(3-hexylthiophene) (P3HT) can be selectively electrophoretic-deposited onto a pre-patterned ITO connected to a commercially available power supply. In this work we hope to develop a method for cleaner deposition, generate thin films from the selectively deposited polymer using solvent-vapor annealing or other annealing techniques, and deposit the polymer onto patterned-electrodes using an electric field rather than direct connection to a power supply.

O3.04

9:45 INVESTIGATING THE CYTOTOXICITY OF SILVER, COPPER, AND ZINC NANOPARTICLES ON PATHOGENIC AND NON-PATHOGENIC

Denise Yancey[1], Ifedayo Victor Ogungbe[1], Zikri Arslan[2]

[1]Jackson State University, Jackson, MS and [2] US Geological Survey, Denver, Colorado

Previous studies have shown the cytotoxic effect of silver nanoparticles (AgNPs), copper nanoparticles (CuNPs), and zinc nanoparticles (ZnNPs) against bacterial species. However, the impact of their cytotoxic effects is not fully understood. The objectives of this study are to determine cytotoxicity effects of AgNP, CuNPs, and ZnNPs at various concentrations, investigate the ion release of each NP, and investigate the effect of the NPs on glutathione (GSH) levels in *E. coli*. Freshly prepared AgNPs, CuNPs, and ZnNPs were suspended in DMSO and added to bacterial cultures that were incubated 2h. Growth inhibition was confirmed via the spread plate method. Exposed bacterial cultures were analyzed by ICP-MS to determine surface adsorption on and assimilation of NPs by bacteria. Free metal ion levels were measured from exposure medium to probe a mechanism of action caused by free metal ions and morphological changes to pathogenic (BAA 1161) and nonpathogenic *E.* coli (BAA 1431). GSH levels were used a gauge of redox state in the bacteria. The cytotoxicity results showed that Zn and ZnONPs were more effective against pathogenic and non-pathogenic *E. coli*, inhibiting over 90% bacterial growth at the lowest concentration of 1 ppm, while AgNPs achieved 50% inhibition at 1 ppm and CuNPs reached 50% inhibition at 5 ppm. An average of 40 ppb of ions for each NP was observed from medium analysis from each treatment group. Additional studies are in progress to better analyze the effects of NPs against *E. coli* species.

O3.05

10:00 ONE-STEP SYNTHESIS OF WATER-SOLUBLE ULTRASMALL IRON OXIDE NANOPARTICLES WITH NARROW SIZE DISTRIBUTION AND THEIR APPLICATION FOR T1-WEIGHTED MRI AND POTENTIAL DRUG DELIVERY

Pohlee Cheah

Jackson State University, Jackson, MS

Ultrasmall iron oxide nanoparticles (IONPs) have shown great potential in T_1-weighted magnetic resonance imaging (MRI). Monodisperse ultrasmall IONPs are conventionally synthesized by thermal decomposition procedure in organic solvent and required surface modification to make the IONPs water soluble for biomedical application. However, surface modification is proved to be sophisticated, time consuming and low efficient. In this work, one-step synthesis of size controllable, monodisperse and water-soluble IONPs was achieved by rapid hydrolysis with sodium hydroxide and reduction of iron (III) in diethylene glycol at high temperature. Size and dispersibility of IONPs can be controlled by adding different amount of sodium hydroxide. The higher the concentration of sodium hydroxide, the faster the rate of hydrolysis and the larger the size of nanoparticles. Poly(acrylic acid) (PAA) is used as the surface ligand to obtain nanoparticles with high water-solubility and enabling further functionalization. This nanoparticle has magnetite phase as evidence by X-ray diffraction analysis. Carboxylate group from the PAA can be seen in FTIR analysis. The colloidal stability of 3 nm core size nanoparticle is stable in various pH and salt solution for over

a month. The cytotoxicity test showed excellent biocompatibility and viability with HepG2 cells. The potential as a contrast agent for T_1-weighted positive contrast magnetic resonance imaging was also demonstrated with relative low $r_2/r_1 \approx 4$ (r_2= 12.89 $mM^{-1}s^{-1}$ and r_1= 3.22 $mM^{-1}s^{-1}$). Further functionalization of IONPs-PAA has successfully loaded with drugs. For example, metformin hydrochloride adsorbed on the IONPs via PAA surface ligand as shown by UV and FTIR analysis.

10:15 Break

Session II: 10:30 AM (Chair: Daijun Feng)

O3.06

10:30 CRYSTAL STRUCTURE, HYDROGEN BONDING AND HIRSHFELD SURFACE ANALYSIS OF 2,5-DIBUTYL-3,6-BIS((E)-2-(PYRIDIN-2-YL)VINYL)-2,5-DIHYDROPYRROLO[3,4-C]PYRROLE-1,4-DIONE

Daijun Feng

Mississippi State University, Mississippi State, MS

The crystal structure of the title compound 2,5-dibutyl-3,6-bis((E)-2-(pyridin-2-yl)vinyl)-2,5-dihydropyrrolo[3,4-c]pyrrole-1,4-dione (2-pyridyl-DVDPP) was fully investigated by single X-ray diffraction at low temperature (T = 100 K) using a monochromatized Copper X-ray radiation. It appears the molecule crystallizes in a centrosymmetric monoclinic unit cell space group P 2(1)/n with only the half of the molecule in the asymmetric unit. The whole molecule is generated by inversion symmetry. In the packing intermolecular and intramolecular hydrogen bonds can be observed. (Table 1). We can definite two intramolecular hydrogen bonds; the N atoms on the pyridine and the O atoms on the DPP moiety both form hydrogen bonds to the hydrogen atoms on the double bonds through a 5-membered and a 7-membered ring respectively. A double self-complementary intermolecular C-H….N bond between two pyridine rings on separate molecule can be observed as well. Contacts occur between the N2 atoms of the pyridine rings and the hydrogen atoms of the adjacent C7 carbon atoms on the neighboring molecule forming a 1-dimension infinite supramolecular chain. Interestingly, the lone pairs on the N2 atoms are shared by the intermolecular and intramolecular hydrogen bonds, which results in an unexpected torsional strain between the pyridine ring and –C-C double bond with a dihedral angle of 9.4°(torsion,C4C5-C6N2). Finally the crystal packing structure reveals features like: C-H…π stacking in herringbone pattern a distance of 3.7707 (12) Å.

O3.07

10:45 DISCRIMINATION OF LANDSCAPE, SEASONAL, AND ELEVATION EFFECTS ON ATMOSPHERIC MERCURY USING PASSIVE AIR SAMPLERS

Byunggwon Jeon, Byunggwon Jeon

The University of Mississippi, University, MS

Accurately measuring gaseous elemental mercury (GEM) concentrations in the atmosphere is important to understand its sources, cycling, distribution, and temporal trends. The MerPAS passive air sampler from Tekran Inc. captures GEM on sulfur-impregnated activated carbon after it passes through a Radeillo diffusive barrier. The atmospheric Hg in the samples was determined by the Direct Mercury Analyzer. In this study, we used the MerPAS to measure GEM concentration gradients at a mixed hardwood forest, wetland, pond, and a mowed (grass) field, all within proximity (<400 m) to each other. Vertical profiles (0.5, 3.0, 5.5 m) were assessed during summer and winter. The samplers captured between 0.90 to 2.2 ng over 2 weeks, well above the mean blank of 0.14 ng. We observed differences between landscapes, between elevation, and between seasons. Nearest to the surface, GEM concentrations were lowest in the wetland (both seasons), where there was dense vegetation, and highest in the mowed field (both seasons). GEM levels generally increased with elevation above the ground, except for the forest where the trend was slightly reversed. GEM concentrations were slightly higher in the winter than the summer at 5.5 m height where air masses were not retarded by vegetation. Overall, we conclude that the MerPAS is indeed capable of measuring GEM gradients between landscapes, elevations, and seasons, if given sufficient collection time, good analytical precision, and low blank levels.

O3.08

11:00 HIGH PHOTORESPONSIVITY OF FEW-LAYERED ZRS2 PHOTOTRANSISTORS VIA MULTITERMINAL MEASUREMENTS

[1]Frederick W Jackson, [1]Rukshan Tanthirige, [1]Jawnaye Nash, [1]Govinda Ghimire, [1]Paresh Ray, [2]Stephen A. McGill, [1]Nihar R. Pradhan

[1]Jackson State University, Jackson, MS, [2]Florida State University, Tallahassee, Florida

We report intrinsic photoconductivity studies on one of the least examined layered compounds, ZrS_2. ZrS_2 field-effect transistors were synthesized via chemical vapor transport method and photoconductivity measurements were performed using both two- and four-terminal configurations under the illumination of 532 nm laser light. We measured photocurrent as a function of the incident optical power at several source-drain (bias) voltages. We observe a significantly large photoconductivity when the transistors are measured in the four-terminal configuration than they are in the two-terminal configuration. For an incident optical power of 90 nW, the estimated photoresponsivity and the external quantum efficiency (*EQE*) for the two-terminal configuration are 0.5 A/W and 120%, respectively, under a bias voltage of 650 mV. Under the same conditions, the four-terminal measurements result a considerable rise in both the photoresponsivity and *EQE* to 6 A/W and 1400%, respectively. This significant improvement in photoresponsivity and *EQE* in the four-terminal configuration may have been influenced by the reduction of contact resistance at the metal-semiconductor interface, which greatly impacts the carrier mobility of low conducting materials. Hence, we conclude that photoconductivity measurements performed through the two-terminal configuration in previous studies on ZrS_2 have severely underestimated the true intrinsic properties of transition metal dichalcogenides and their remarkable potential in optoelectronics.

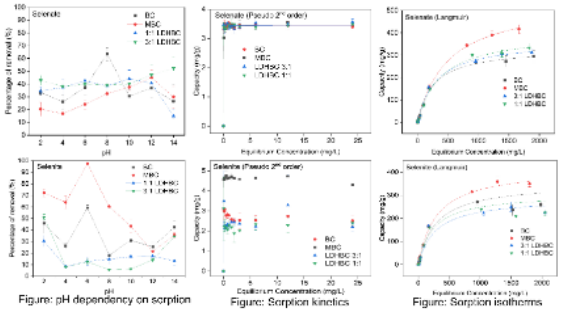


Figure: pH dependency on sorption Figure: Sorption kinetics Figure: Sorption isotherms

O3.09

11:15 9:15 USING PRELAB VIDEOS TO PREPARE STUDENTS FOR GENERAL CHEMISTRY LABORATORY SESSIONS

Joe Bentley

Delta State University, Cleveland, MS

Videos were created for the first semester of general chemistry lab and subsequently posted to YouTube. These videos show lab assistants performing the steps of the experiment for that lab session. Students are required to view the videos and take a quiz on them prior to coming to the prelab session. This presentation covers making of the videos and difficulties encountered in effective training of lab students through this method.

O3.10

11:30 UREA AND THIOUREA-BASED RECEPTORS FOR ANIONS

[1]Md. Alamgir Hossain, [1]Bobby Portis, [1]Corey R. Johnson, [2]Douglas R. Powell

[1]Jackson State University, Jackson, MS, [2]University of Oklahoma

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

O3.11

11:45 INVESTIGATION OF ACID CATALYZED PICTET-SPENGLER CYCLIZATION WITH SULFONAMIDES

Kaitlyn M. Birkhoff and Matthew G. Donahue

University of Southern Mississippi, Hattiesburg, MS

The piperidine scaffold is very prevalent in many FDA approved drugs, making it an important pharmacophore and essential in the field of drug discovery. Piperidines are the building blocks for over 70 different types of commercial drugs, such as Ritalin and Evista. By discovering new methods to access this scaffold, economic and chemical challenges such as high cost and diastereoselectivity can be eliminated. The overarching goal of this project is to develop a robust catalytic, asymmetric synthesis of piperidine rings from feedstock petrochemicals. In an initial study of the N-sulfonyl iminium ion Pictet-Spengler cyclization with *N*-para-toluenesulfonyl and *N*-tert-butanesulfonyl homoveratrylamine and 3-phenylpropanal, a screen of metal triflates was examined. The hypothesis is that transition metal triflates are sufficiently Lewis acidic to activate relatively inert sulfonamide nitrogen atoms to condense with the aldehyde to trigger the intramolecular cyclization forming piperidines. Initial results indicated that scandium (III), stannous (II) and copper (II) triflates gave the fastest conversion to the *N*-sulfonyl piperidine, while triflates such as lanthanum (III), sodium (I) and magnesium (II) gave little to no conversion under the allotted time. However, the triflates that proved successful with the N-para-toluenesulfonyl did not produce the same conversion when screened against the N-tert-butanesulfonyl. Based upon accepted knowledge of the mechanism we propose that the cyclization proceed through an *N*-sulfonyliminium ion intermediate. Future studies will focus on the use of chiral ligands to induce asymmetry. These experiments will examine enantioselectivity of the Pictet-Spengler cyclization in comparison to earlier results with analysis by chiral HPLC.

12:00 General Session

Thursday, February 20, 2020

AFTERNOON

Room D6

1:00 WORKSHOP

Industry Career Workshop

Chair, Dr. Collen Scott

1:45 Break

Session III: 2:00 PM (Chair: Nicholas Kreis)

O3.12

2:00 NOVEL HETEROCYCLES AS POTENTIAL ANTI-CYTOMEGALOVIRUS, ANTI-GBM, AND ANTI-CANCER AGENTS

[1]Prasanta Das, [2]Mohammad H. Hasan, [2]Dipanwita Mitra, [2]Sarah Boone, [2]Ratna Bollavarapu, [2]Ritesh Tandon, [2]Drazen Rauchey,

[1]Ashton T. Hamme II

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

Since heterocycles are prevalent core found in numerous synthetic drugs and natural products, significant efforts have been focused on finding novel therapeutic agents. In this context, isoxazole was found in numerous medicinal interests including anticancer, antimicrobial, anti-inflammatories, and analgesic; however, its spiro derivative has been less explored as a novel unit. Additionally, spirocycles were also found as important molecular scaffolds in many natural products, delivering the range of biological activities. Therefore, it is postulated that, spiro-isoxazoline framework could facilitates its multi-facet interaction through its 3D binding affinity, delivering a privileged class of scaffold. In this context of interest, we have been continuing our quest in developing novel spiro-isoxazoline core as a backbone for biomedical investigation and reported 4-bromo-spiro-ether and -lactone as potential targets for anti-cancer activity.

Herein, we are reporting design and synthesis of peroxo and fluoro derivative of spiroisoxazoline for biological intervention. The synthesis includes 1,3-dipolar cycloaddition followed by halo-cyclization. To our delight, the in vitro biological assay of spiroisoxazolines showed anticancer activity against MDA-MB-231 cell line, glioblastoma (GBM6) and antiviral activity against human cytomegalovirus HCMV. While further studies are necessitated to determine the mechanism of these compounds and what they are targeting to validate that the spiro-isoxazolaxolines have the potential to serve as anti-viral and anti-cancer agents.

O3.13

2:15 DONOR-ACCEPTOR-DONOR NIR II EMISSIVE RHODINDOLIZINE DYE SYNTHESIZED BY C-H BOND FUNCTIONALIZATION

Chathuranga Rathnamalala, Jacqueline N. Gayton, Austin L. Dorris, Shane A. Autry, William Meador, Nathan I. Hammer, Jared H. Delcamp, Colleen N. Scott

Mississippi State University, Mississippi State, MS

The development of NIR emission probes has been a major advancement to the field of biological imaging since their longer absorption and emission wavelengths allow for low background cellular autofluorescence and minimum cell damage. There are several examples of NIR I dyes derived from common fluorescent dye scaffolds such as cyanine derivatives, phthalocyanine derivativities, indolizine squaraine derivatives, BODIPHY analogs and xanthene derivatives. There are only a few NIR II fluorophores available such as nanoparticles and quantum dots which tend to be insoluble and slow to excrete from the body. The common dyes are synthesized by classical cross coupling reactions which produce toxic byproducts. In this research a NIR II emissive dye was synthesized by the C-H bond functionalization of 1-methyl-2-phenylindolizine with 3,6-dibromoxanthene. The rhodindolizine spirolactone product was nonfluorescent; however, upon opening of the lactone ring by the formation of the ethyl ester derivative, the fluorophore absorbs at 920 nm and emits at 1092 nm, which are both in the NIR II region. This fluorophore has a large stokes shift which is 172 nm, and this is the first xanthene-based fluorophore which emits in NIR II region. The water-soluble rhodindolizine and its ester derivative were synthesized for cell studies.

O3.14

2:30 HETEROCYCLE SYNTHESIS VIA ELECTROPHILE INITIATED CYCLIZATION OF CHIRAL, NON-RACEMIC HOMOALLYLIC AMINES

Gavin Rustin, Matthew Donahue

University of Southern Mississippi, Hattiesburg, MS

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 half-chair transition state setting the C4 stereogenic center. Guanidines and carbamates have been acylated to the homoallylic amines via carboxamidines and di-tert-butyloxy-carbonate, respectively, to introduce nitrogen or oxygen into the stereogenic C4 center. Upon a solvent screen, tetrahydrofuran worked best with succinimide and derivatives (saccharin and hydantoin), while dichloromethane works best with the molecular halogen electrophiles. Single crystal x-ray analysis of the structure of the carbamate compounds provide insight into the selectivity of the C4 stereocenter. Functionalization of the cyclized products for use in natural product synthesis is being investigated.

O3.15

2:45 NEW TOOLS FOR ENANTIOSELECTIVE C-H FUNCTIONALIZATION

Zhongyuan Li., Xin Cui,

Mississippi State University, Mississippi State, MS

Ruthenium(II)-catalyzed sp^2 C–H functionalization processes have been developed as new tools for the enantioselective functionalization of different sites of arenes and alkenes. The new systems open practical and step-economic pathways to enantiopure unsaturated compounds that have close relevance to bioactive molecule. Completion of the proposed research will lead to enantioselective access to several new types of value-added synthetic intermediates and bio- and drug-relevant molecules by modifying the inert sp^2 C–H bonds with atom- and step- economy.

Thursday, February 20, 2020

EVENING

3:30 Dodgen Lecture and Awards Ceremony (Ballroom)

General Poster Session

Immediately Following Dodgen Lecture

Divisional Posters

P3.01

SILVER COATED GRAPHENE OXIDE SUPPORTED POLYAMIDE PAPER FOR SERS DETECTION OF PRENATAL DISEASES IN WOMEN

Thomas J. Ondera, Kudakwashe P. Murinda

Alcorn State University, Lorman, MS

INTRODUCTION: Bacterial intra-amniotic infection (IAI) is the leading cause of perinatal and neonatal mortality worldwide, and the second leading cause of death in children under five years of age. To confirm the IAI condition, cultures of amniotic fluids remain the "gold standard". However, these are limited by the fact that it can take several days to obtain results. Early detection methods for prenatal diseases by finding biomarkers in amniotic fluids are much needed for point-of-care (POC) applications

METHODS: To overcome these challenges, we have developed a silver-coated graphene oxide (GO) supported polyamide paper (PA) for Surface-enhanced Raman Scattering (SERS) analysis of prenatal diseases in women. The plasmonic platform is made based on two stages: attachment of modified GO on a porous polyamide paper substrate (GO/PA) via the hydrothermal method, and the surfactant-free decoration of silver nanoparticles (AgNP) on the GO/PA platform through an optimized attachment technique for effective nanoparticle deposition.

RESULTS AND DISCUSSIONS: The SERS performance of the AgNP/GO/PA platform is evaluated with a trace amounts of a small Raman probe molecule and used to identify the types of diseases from amniotic fluids with impressive limit of detection and specificity.

CONCLUSION: The platform has the potential to be used for early detection of prenatal diseases and can be adapted for point-of-care applications.

P3.02

INVESTIGATION OF SINGLET OXYGEN FORMATION IN POLYCYCLIC AROMATIC HYDROCARBONS

Vennesa Valentine

Alcorn State University, Lorman, MS

Polycyclic aromatic hydrocarbons (PAH) are environmental pollutants that are directly emitted into the atmosphere by incomplete combustion of organic matter such as wood, oil and natural gas. PAHs have been widely examined because some have harmful effects on human health and the environment. The tissues of marine organisms can be damaged by the singlet oxygen ($^1O_2$) produced when UV radiation is absorbed by PAH molecules. The detection of singlet oxygen is difficult because of its short lifetime and low intensity, remote spectrum. Consequently, the colorimetric method proposed by Kraljic and El Mohsni was designed to measure the production of singlet oxygen in the visible range. In this method, the imidazole (Imd) functions as an acceptor, binding with the $^1O_2$ to form a trans-annular peroxide intermediate that bleaches the sensor p-nitrosodimethylaniline (RNO). The bleaching of the RNO is expected to be proportional to the $^1O_2$being produced by PAH

photosensitization. This study aims to investigate the tendency of singlet oxygen to bind some photosensitizers rather than the acceptor, undermining the assay performance.

P3.03

QUALITATIVE ANALYSIS OF TANNINS FROM THE BARK PINUS TAEDA, QUERCUS VIRGINIANA, CHAMAECYPARIS, CARYA ILLINOINENSIS, ACER NEGUNDO (BOX ELDER), QUERCUS PALUSTRIS (PIN OAK) AND POPULUS ALBA

Kudakwashe Murinda, Gwendolyn Boyd

Alcorn State University, Lorman, MS

Tannins are organic compounds that naturally occur in compounds that contain nitrogen free polyphenols that have high molecular weights. In this study the preliminary phytochemical screening, the separation and identification of compounds were present in crude extract of *Pinus taeda, Quercus virginiana, Carya illinoinensis, Acer negundo* (Box Elder), *Quercus palustris* (Pin Oak) and *Populus alba* by High Performance Liquid Chromatography and FTIR. FTIR of the crude extract has been studied. Qualitative analysis of the methanolic extract prepared from the bark revealed the presence of tannins. Tannins can be classified into hydrolysable, condensed and pseudo tannins. They can promote healing when they are applied to a wound or injury by forming a protective coating that prevents external irritation.

P3.04

EFFECT OF LAPATINIB IN EXPRESSION OF AnxA6 IN TNBC

Kalaedra Self

Alcorn State University, Lorman, MS

Triple Negative Breast Cancer (TNBC) is an aggressive form of breast cancer that lacks three major receptors that promote breast cancer growth- estrogen, progesterone, and HER2-but show a 50-70 percent increased expression of the Epidermal Growth Factor Receptor (EGFR). EGFR is a transmembrane protein tyrosine kinase that promotes cell proliferation and motility and treatment of cells with Lapatinib, a tyrosine kinase inhibitor, inhibits the activation of EGFR in TNBC cells. However, prolonged treatment with this drug is associated with upregulation of Annexin A6 (AnxA6) and the development of resistance. AnxA6 is secreted as a component of exosomes, and AnxA6 containing exosomes have been shown to promote pancreatic and breast cancer metastasis. Our hypothesis is that lapatinib induced increase in the expression of AnxA6 lead to increased AnxA6 in exosomes and that these exosomes may promote TNBC cell adhesion and motility. To test this hypothesis, four different TNBC cell lines (BT549, MDA231, HCC1806, MDA468) were treated with or without lapatinib for ten days then stimulated with EGF, while exosomes were isolated from the culture media.

P3.05

COMBINING PARP INHIBITOR OLAPARID AND HER2/EGFR INHIBITOR IN HER2 POSITIVE BREAST CANCER CELLS

Allison Norman

Alcorn State University, Lorman, MS

Approximately 25% to 30% of human metastatic breast cancers overexpress the human epidermal growth factor receptor 2 (HER2). However, most tumors ultimately develop therapeutic resistance to current HER2 targeted therapy, leading to disease progression. Neratinib (HKI-272), a tyrosine kinase inhibitor, is an irreversible inhibitor of HER1, HER2, and HER4, has been reported as highly active against HER-2 + human breast cancer cells. Olaparib, a poly(ADP-ribose) polymerase (PARP) inhibitor defects DNA repair, induce serious cytotoxicity in cancer cells. We hypothesize that the addition of Olaparib to Neratinib will increase cell death in HER2 overexpressed breast cancer cells. In this study, we performed cell proliferation assay to measure the cell growth with the combination treatment in selected HER positive breast cancer MDA-MB 361 cells. The results confirmed that combined PARP and HER2/EGFR inhibitors have a synergistic effect on decreasing cell growth. This can be an innovative treatment strategy to potentially improve outcomes in HER2+, especially in BRCA mutated patients.

P3.06

SYNTHESIS OF 3,6-SUBSITUTED KIKETOPHYRROLOPYRROLE (DPP) FOR OPTOELECTRONIC APPLICATIONS

Greg Cooper

Mississippi State University, Mississippi State, MS

N,N'-dialkyl diketopyrrolopyrrole (DPP) is one of the most commonly used moiety in organic electronic devices such as organic field effect transistors (OFETs) and organic photovoltaics (OPVs. Furthermore, DPP is utilized in organic light-emitting diodes (OLEDs) as well as fluorescent probes due to its distinguished fluorescent properties. The conventional synthesis of DPP can only give aromatic flanked DPP compounds; consequently, limiting molecular structure design in the real applications. Herein, a new and more efficient synthetic approach is presented, which uses readily available starting materials under mild reaction conditions. Moreover, this approach allows us to achieve a wide variety DPP compounds with varying substituents at 3 and 6-postions and those attached to the N atoms. Consequently, a molecular structure design by this approach extends beyond what can be obtained by the conventional synthesis leading to a broader application for DPP materials. We will report our results from the synthesis and the developments toward new optoelectronic materials.

P3.07

INHIBITION OF AMYLOID-β DIMER BINDING AFFINITY WITH MORIN DERIVATIVES: A MOLECULAR DYNAMICS AND TEMPERATURE-DEPENDENT STUDY

Steven Gwaltney, Romans Grant

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Amyloid-β peptides (Aβ) are protein deposits that can aggregate to form fibrils through the Amyloid Precursor Protein (APP) catabolic pathway. The proteolysis of APP resulting in 42 residues of Aβ42 is commonly associated with Alzheimer's disease (AD). Effective medicinal approaches are limited to the developmental stages of the disease which are usually assessed post mortem. Current studies on AD focus on the intra- and intermolecular mechanism of monomeric Aβ that binds to form fibrils. Molecular dynamics simulations of 100 ns were performed to study the dynamics of both the natural and modified Aβ42 at three different temperatures. Two Morin derivatives compounds were docked to the Aβ42 peptide to understand the inhibitory mechanism, binding modes, and binding affinity at three different temperatures. This study may help in the design of new drugs that will inhibit the aggregation of Aβ42 to serve as an effective treatment for Alzheimer's disease.

P3.08

EXAMINATION OF PHOSPHINE LIGANDS TO OPTIMIZE THE SUZUKI COUPLING REACTION USED TO PREPARE HIV-1 INTEGRASE INHIBITORS

Julie A. Pigza, Kaitlin A. McNeely, Krunal H. Patel, Jacques J. Kessl

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There are six potential drug targets in the HIV life cycle that can be targeted to inhibit HIV, a disease that more than 1.2 million people currently live with today. HIV-1 integrase is an enzyme responsible for inserting viral DNA into the host cells' DNA making the host cell a "HIV factory". The HIV virus has already gained resistance against two of the three FDA approved drugs that inhibit HIV integrase. These three FDA approved drugs target the active site of the enzyme; however, our goal is to develop and optimize a quinoline based inhibitor that targets the allosteric site of the enzyme. This collaborative drug discovery project explores substitution along different positions of a quinoline scaffold to probe for HIV integrase inhibition. Prior published studies have determined 2-methyl and 3-α-tertbutoxy-ester side chains must be conserved for maximum inhibition. We undertook and published a study of 4-position substitution, which probes a non-polar pocket within the enzyme. Currently, we are exploring substitution at the 7-position, which also interacts with amino acid side chains within the allosteric site. A Suzuki coupling reaction is used to install the substituent at the 7-position. This presentation will focus on an examination of different phosphine ligands that can be used to optimize the coupling reaction of substituted phenyl boronic acids onto the quinoline scaffold. Funding for portions of this project through the NSF CAREER grant (award #1848257, Dr. Pigza) and the NIH (award # R01-AI140985, Dr. Kessl) are gratefully acknowledged.

P3.09

CHIRAL ETHER SYNTHESIS VIA AN ORGANOCATALYZED REDUCTION OF ESTERS

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Organocatalysts are small organic molecules that can interact with a substrate via noncovalent interactions. These interactions serve to both orient a substrate within the catalytic pocket and activate it to attack. Chiral organocatalysts place the substrate in a chiral pocket, where each side of the substrate can be differentiated by an attacking nucleophile, leading to the formation of one enantiomer of a product. Forming only one enantiomer is essential, for example, in prescription drug development, since one enantiomer is usually favored in the body and the other can even have detrimental properties. Squaramide organocatalysts were utilized in this way beginning in 2008 and have shown the ability to catalyze a wide range of reactions. Our proposed work extends what is known to a new direction to form chiral ethers, compounds with desirable steric and electronic properties that have never been synthesized in this manner. Previously, our research group has shown that esters can be reduced to the trimethylsilyl (TMS)-protected acetal, which can further be reduced to an ether via an incipient oxonium ion. We propose chiral organocatalysts to introduce a nucleophile in an enantioselective fashion to the oxonium ion, which will generate enantiopure ethers. Enantioselectivities of the product ethers will be obtained via chiral HPLC. Our initial results of this research will be presented. The authors acknowledge the USM Drapeau Center for Undergraduate Research Eagle SPUR program (Davis) and the NSF CAREER award (#1848257, Dr. Pigza) for generous funding.

P3.10

A SENSOR ARRAY FOR THE DISCRIMINATION OF SEAWATER CONTAMINANTS USING CONJUGATED POLYMERS AND THE INNER FILTER EFFECT

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Natural and anthropogenic activities result in the production of polycyclic aromatic hydrocarbons (PAHs), persistent pollutants that negatively impact the environment and human health. Rapid and reliable methods for the detection and discrimination of these compounds remains a technological challenge owing to their relatively featureless properties, structural similarities, and existence as complex mixtures. Here, we demonstrate that the inner filter effect (IFE), in combination with conjugated polymer (CP) array-based sensing, offers a straightforward approach for the quantitative and qualitative profiling of PAHs. The sensor array was constructed from six fluorescent fluorene-based copolymers, which incorporate side chains with peripheral 2-phenylbenzimidazole substituents that provide spectral overlap with PAHs and give rise to a pronounced IFE. Subtle structural differences in copolymer structure result in distinct spectral signatures, which provide a unique "chemical fingerprint" for each PAH. The discriminatory power of the array was evaluated using linear discriminant analysis (LDA) and principal component analysis (PCA) in order to discriminate between 16 PAH compounds identified as priority pollutants by the US Environmental Protection Agency (EPA). This array is the first multivariate system reliant on the modulation of the spectral signatures of CPs through the IFE for the detection and discrimination of closely related polynuclear aromatic species.

P3.11

SCREENING OF TROPICAL PLANT-BASED NATURAL PRODUCTS LIBRARY AND SYNTHETIC BENZIMIDAZOLE LIBRARY FOR NEW ANTIBACTERIAL AGENTS

Destiny Taylor, Ifedayo Victor Ogungbe

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Infections caused by bacteria is a serious contributor to inpatient hospitalization and loss of productivity worldwide. Increasing development of resistance to most currently used antibiotics by pathogenic bacteria and the dearth of new and better antibiotics will lead to more hospitalization, loss of economic productivity and increased mortality due to untreatable bacterial infections. There is a need to find new antibiotics. The objective of this project is to find compounds that will inhibit the growth of Gram negative (*E. Coli)* and Gram positive (methicillin-resistant *Staphylococcus aureus*) as a first screen primary assay followed by screening the active sample on more pathogenic superbugs like *Pseudomonas aeruginosa*. One hundred extracts from a tropical plants fraction library and 23 benzimidazole-based compounds were screened for potential growth inhibition of *E. Coli* and MRSA. Three fractions showed significant inhibition of *E. Coli*(>50% at 5 µg/mL) and two benzimidazole-based compounds showed significant inhibition of MRSA (>60% at 5 µg/mL) compared with the other fractions/compounds. The minimum inhibitory concentration (MIC) of the benzimidazole compound is relatively high (about 50 µM) with the an EC_{50} of 12.5 µM. The active principles in the fractions is currently being investigated and compounds will be subjected to a SAR investigation.

P3.12

IRON-CARBON INTERACTIONS IN THE FISCHER-TROPSCH SYNTHESIS

Jaylan Billups

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Crude oil is a finite resource, so there is interest in finding other natural sources—such as coal, natural gas, and biomass—that can be

used to produce petroleum products, especially for high-performance applications. The Fischer-Tropsch synthesis (FTS) is a process that transforms CO/H_2 gas into short chain hydrocarbons that could potentially be used as fuels or chemical feedstocks. To date, this type of chemistry is known to occur on ruthenium, rhodium, cobalt and iron heterogeneous catalysts, of which iron is both the most robust and least expensive. The mechanism of this reaction is not well understood, and it suffers from poor selectivity and tunability. We plan to use small organometallic complexes that are able to chelate multiple iron atoms to probe the mechanism of the steps believed to be involved in the Fischer-Tropsch reaction. We have designed and synthesized several ligands capable of supporting clusters of two or three iron centers. Iron complexes are characterized by single-crystal diffractometry, NMR, EPR, and other standard techniques, and we will probe their reactivity with substrates and intermediates relevant to FTS. Experimental characterization is supplemented by electronic structure calculations. Studying these complexes will allow us to better understand the nature of the active species in FTS, and how the reactivity may be rationally tuned by altering the environment around the active metal atoms/clusters, leading to the development of improved homogeneous and heterogeneous catalysts.

P3.13

FTIR AND SEM CHARACTERIZATION OF CELLULOSE NANOFIBER AND ZEOLITE NANOCRYSTALS FOR THE REMOVAL OF ARSENIC (V) AND CHROMIUM(VI) FROM AQUEOUS SOLUTIONS

Terrance Burks, Jabari Thompson

Alcorn State University, Lorman, MS

The characterization of cellulose nanofiber and zeolite nanocrystals were studied in order to determine if the nanocomposite materials can be employed in the removal of As (V) and Cr (VI) from aquatic systems. Scanning electron microscope (SEM) micrographs showed that average diameter of cellulose nanofiber was and that of zeolite crystal (Si and Si/Al) was. FTIR was used to show the presence or absence of Cr (VI) and As (V) peaks as it pertains to each of the absorbents. A test of the weight of the adsorbents at a known concentration of As (V) and Cr (VI) was performed in batch mode. The preliminary results showed that the greatest absorption occurred at a weight of 10.3 g with a loading capacity of 0.0019 (mg Cr(VI) g^{-1}) and 0.0051 (mg (As(V) g^{-1}) for cellulose nanofiber. For the removal of As (V) and Cr (VI) using Si zeolite crystals the highest loading capacity occurred at a weight of 10.8 g of zeolite with q_e = 0.0023 (mg Cr(VI) g^{-1}) and 0.0055 (mg As(V) g^{-1}). The Al+Si zeolites showed similar results as the Si zeolites for a weight of 10.8 g and a q_e = 0.0018 (mg Cr(VI) g^{-1}) and 0.0052 (mg As(V) g^{-1}). The characterization and the initial adsorption data cellulose nanofibers and zeolites (Si and Si/Al) nanocrystals hold great potential for the removal of As (V) and Cr (VI) from aqueous systems.

P3.14

ELECTROPOLYMERIZATION OF ISOINDIGO BLOCK COPOLYMERS TO BE USED AS NIR-II THERANOSTIC AGENTS

Nicholas Sparks

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Conjugated polymers (CPs) that absorb and emit light in the near infrared-II (NIR-II) region (1000-1700 nm) are of particular interest in regard to their applicability as theranostic agents. Subsequent formation of conjugated polymeric nanoparticles (CPNs) enables their use as theranostic agents as the CPNs are able to retain the optical properties while being put into a controlled and applicable state that can then be used in a theranostic manner. Regarding the synthesis of the conjugated polymers, electropolymerization has inherent benefits over its chemical counterpart. The replacement of catalysts by simple electron oxidation and reduction processes is a push towards more green chemical techniques while still providing the desired products. Inclusion of a donor-acceptor (D-A) architecture allows for more tunability of the CPs optical properties, providing further extension into the NIR-II region. We have taken the electro-chemical approach for forming conjugated polymers using different monomeric units so that they can be used to form conjugated polymeric nanoparticles (CPNs) as NIR-II imaging agents. We electrochemically synthesize block copolymers consisting of functionalized isoindigo (Iso), terthiophene (T3), and thienothiadiazole (TTD). Analysis of the resulting polymers in both solution and solid state reveal unique electronic properties of the polymers, allowing for absorption and emission of NIR-II radiation. Formulations yield CPNs with sizes ranging from 126-278 nm via analysis by dynamic light scattering (DLS) and microscopy. The CPNs are then subjected to UV-vis and fluorescence studies to ensure that the desired electronic properties have been retained. Results indicate potential applications as efficient NIR-II imaging agents.

P3.15

URANIUM SPECIES IN HYPONICS SOLUTON AND UPTAKE INTO INDIAN MUSTARD UNDER DIFFERENT PH VALUES

Jing Nie

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Uranium is toxic to many plants, however Indian mustard has the ability to accumulate uranium, thus it is a promising model plant for uranium phytoremediation. Distribution and concentrations of U in different organs and tissues of Indian mustard as affected by different uranium species in solutions, were not reported. We grew Brassica Indian in pots and then transferred into hydroponics solutions with uranium under different pH values. Physiological and agronomy effects of uranium were observed and the plant mass and height were measured. Uranium concentration in different plant tissue were tested by ICPMS. Additionally, other metals were also analyzed. In addition to providing information of uranium uptake in Indian mustard, this study also sheds light on uranium influence on accumulation of other nutrition elements in plants.

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P3.16

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

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

Jackson State University, Jackson, MS

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 nanoplatform with high two-photon absorption, very strong two-photon luminescence, as well as two-photon stability in 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 O2 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 nanoplatform has the capability for bright two-photon bioimaging and two-photon photodynamic therapy for MRSA and carbapenem-resistant (CRE) Escherichia coli.

P3.17

TOWARDS DEVELOPING A GLOBAL POTENTIAL ENERGY SURFACE FOR ACETYLENE

Joe Bentley[1] and Joelle Dick[2]

[1]Delta State University, Cleveland, MS and [2]East Carolina University

Acetylene is a molecule that has vast research potential for quantum and theoretical chemists because of its rich vibrational structure and its ability to isomerize to vinylidene. Literature on the acetylene system has primarily been either experimental, theoretical or a combination of both. Within the scope of this research field, a limited number of projects with a predominant focus on developing a global potential energy surface for acetylene have been published. This project sought to address this gap by utilizing Gaussian16 software to create a potential energy surface for the configurational change of acetylene from a *cis*- form to a *trans*- form. The overarching goal of this research project was to create a global potential surface for the out-of-plane bending motion of acetylene by using Gaussian16 to solve the electronic Schrödinger equation, and then using Microsoft Excel to fit the points to a functional form. Gaussian's *ab initio* based electronic structure calculations were done using increasingly more accurate basis sets and these calculations were plotted to give potential energy curves for the out-of-plane motion of acetylene. These plots when fitted to mathematical functions yield a slice through the global potential surface for acetylene – known as a potential energy curve. Future applications of the data gathered are discussed in this paper.

P3.18

BIOINSPIRED MANGANESE CHELATION

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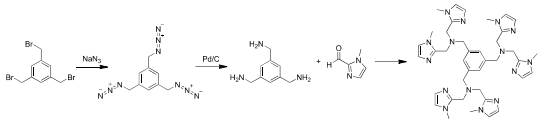
Immunity plays a role in all complex biological life forms. Pathogens survive off their host, using a variety of mechanisms to capture nutrients from the host, including transition metals, and inhibiting their ability to take up these nutrients is one mechanism the immune system uses as a defense. While the trafficking and sequestration of iron (Fe^{3+}) between hosts and pathogens has been extensively studied, several other transition metals seem to play important—but less well-understood—roles, including manganese (Mn^{2+}). In the human immune system, an enzyme called calprotectin strongly binds manganese, possibly in order to sequester it from the bacteria or pathogen, "starving" them of essential nutrients. In calprotectin, the binding site for manganese is a hexahistidine coordination site, which is unprecedented in the biological chemistry of manganese. Using this coordination site as a model, this work plans to synthesize a chelating structure with a similar polyimidazole-type site, and study its binding to manganese and other metals. This will provide insight into the thermodynamic and structural aspects of the unusual calprotectin binding site that favor strong manganese



[1]Jackson State University, [2]U.S. Army Research Laboratory, Adelphi, USA

Removal of heavy metals ions such as lead, silver, mercury, cadmium, thallium, and other from natural and industrial wastewater is tremendously important to the environmental health. Despite an intensive study, selective and highly efficient removal of metal ions from aqueous media is still challenging. Herein, we demonstrate a very fast, highly selective and efficient removal capacity of heavy metal ions of Ag^{+}, Pb^{2+}, and Hg^{2+} by a molecular polysulfide, $(NH_4)_2Mo_3S_{13}\cdot H_2O$. The rapid sorption of these heavy metal ions is governed by ion-exchange of NH_4^{+} by Ag^{+}, Pb^{2+}, and Hg^{2+}, however, the interactions of the disulfide groups to the Lewis acidic metal cations can enhance the sorption capacity. These cooperative efforts confer $(NH_4)_2Mo_3S_{13}\cdot H_2O$ to remove over 99.90% of Ag^{+}, Pb^{2+}, and Hg^{2+} of 10.0 ppm spiked solutions, which in-fact led the concentration well below the EPA limit for drinking water. The removals of Ag^{+}, Pb^{2+}, and Hg^{2+} are exceptionally rapid and reach >99.70% just within 5 minutes. Such higher removal capacity is essentially the means of the high affinity of the disulfide group of these metal cations beside the open its open framework molecular structure.The maximum sorption capacities for Ag^{+}, Pb^{2+}, and Hg^{2+} are 1390, 1410, and 1170 mg/g, respectively and the distribution coefficients(K_d) values for them reached $>10^5$ mL/g. These results place this material into the gallery of the top sorbents of heavy metals and thus could be a useful filter for the decontamination of Ag^{+}, Pb^{2+}, and Hg^{2+} pollutants.

P3.20

THE EFFECTIVENESS OF AN IRON-MODIFIED FLAX ON REMOVAL OF SELENIUM FROM CONTAMINATED SURFACE WATER

Hanrui Wang, Fuyu Guo, Li Bao, Qinku Zhang, Yajun Luan, Jing Nie, Chenglu Bi, Zhangyin Wang, Fengxiang Han

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With the development of industrialization, human activities, especially the mining and the smelting industry have become important sources of selenium pollution. Industrially produced selenate is discharged into surface water through wastewater as well as natural source Se was present in many geological locations. Both sources of Se caused selenium pollution of surface water to affect normal growth of aquatic animals and plants and human health and human health through food chains. The study mainly discusses a new material: flax fibers, modified with different iron materials to enhance

the adsorption capacity of selenate. We also investigated effects of other factors such as pH values of the selenium-containing sewage, the reaction time, and kinetics of adsorption processes. This study may expand the application of flax fibers as a green material in the field of pollution treatment of selenium contaminated surface water.

P3.21

EFFECTS OF FE (Ⅱ)/MN (Ⅱ) ON METASCHOEPITE TRANSFORMATION IN THE SOIL UNDER DIFFERENT WATER REGIMES

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Jackson State University, Jackson, MS

Metaschoepite is a primary product of depleted uranium munition corrosion at military test sites. In the present study, an incubation experiment was conducted to investigate the effects of Fe (Ⅱ)/Mn (Ⅱ)-sulfate on the behavior of metaschoepite, and the transformation of uranium (VI) in water dynamic soil systems (flooding and aerobic treatment). The soil pH and Eh were measured in situ at intervals of 0, 1, 3, 7, 14, 30, 60, and 90d. The changes of Fe/Mn/U solubility and U fractionation in soils were investigated at the time point of 0, 30, and 90d. In addition, the morphology of metaschoepite and the transformation of Fe/Mn/U were tracked by the XRD and XPS.

P3.22

SYNTHESIS OF POLYDOPAMINE DERIVED NANOPARTICLES FOR PH SENSITIVE MRI AND PHOTOTHERMAL THERAPY

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Stimuli-responsive multifunctional nanoparticles are of great interest, especially those combined with properties of photothermal effects and T1-weighted MRI. Recently, focus has shifted towards biocompatible melanin-like polydopamine nanoparticles which showed significant photothermal effect. After chelated with iron (III), polydopamine nanoparticles can be used for T1-weighted MRI as well. However, it is well known that MRI has relatively low sensitivity. High amount of contrast agents are needed to obtain satisfied results. To improve sensitivity, it is highly desired to develop nanoparticles capable of switching on MRI if they are triggered by a specific parameter, such as pH or reductive potential. In this study, we aim to synthesize pH-sensitive dopamine derived nanoparticle for use in MRI and photothermal therapy. The pH responsiveness magnetic nanoparticles “amino-Fe-PDANPs” were synthesized via a simple method based on coordination reactions among PDANPs, Fe3+, and 2-amino-N-[2-(diethulamino)ethyl]-3-(3,4-dihudroxyphenyl)propanamide (N-DOPA) at room temperature. PDANPs were synthesized via neutralization of dopamine hydrochloride with NaOH. The size control can be achieved by optimizing NaOH concentration. Transmission electron microscopy (TEM) imaging revealed that the PDANPs were spherical in shape, the size of the NPs was controlled at about 100 nm. The size about 100 nm of PDANPs showed excellent dispersion stability in water. The obtained amino-Fe-PDANPs will be further characterized for significant MRI signal enhancement by response to acidic microenviroment in tumor tissue. At the same time, the photothermal therapeutic effect will be studied. The integration of diagnosis and treatment will have great potential for clinical application.

P3.23

ION-EXCHANGEABLE K2SNMOS4 CHALCOGELS AS AN EFFICIENT AND EFFECTIVE ADSORBENT OF TOXIC HEAVY METAL CATIONS

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Chalcogels are porous materials that consist of interlocking aggregated nanoparticles extending in a 3D matrix of chalcogenides. This class of materials exhibit a wide range of applications in energy, heterogeneous catalysis, and environmental remediation. Heavy metals ions such as Hg^{2+}, Pb^{2+}, Cd^{2+}, Ag^{+}, Cu^{+}, and others are the most common contaminants of water that essentially cause serious harm to humans and other biological species. Consequently, water must be decontaminated. To address these issues, we have designed and developed ion-exchangeable K_2SnMoS_4 chalcogels. Its xerogels demonstrate highly efficient removal and selective binding of heavy metal ions of Cu^{+}, Ag^{+}, Cd^{2+}, Hg^{2+}, and Pb^{2+} from aqueous solutions. These experiments determined its superior kinetics ~90 % removal for Ag^{+}, Cd^{2+}, Hg^{2+}, Cu^{+} only in 15 minutes, while, ≥99% removal for Pb^{2+} Hg^{2+}, Cd^{2+}, Ag^{+}, and Cu^{+} in 6h. The selectivity order for the metal ions shown by K_2SnMoS_4 (KTMS) was Zn^{2+}< Co^{2+}, Ni^{2+}< Cd^{2+}< Pb^{2+}< Hg^{2+}< Cu^{+}< Ag^{+} obtained in an aqueous solution of 10 ppm for each cation. The xerogels of KTMS exhibits rapid and efficient ion-exchange behavior in a broad pH range 2 ~11. The superior sorption of metal cations results from the ion-exchange of K^{+} and the Lewis acid-base interactions of between surface polarizable polysulfide species of the chalcogels and the Lewis acidic soft heavy metals cations. Large sorption of cadmium, lead, mercury, copper, and silver qualify the xerogels of K_2SnMoS_4 as a top candidate for toxic heavy metal removal in acidic, basic and neutral media.

P3.24

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

Precious Cooper

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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, which requires an increasing need for an environmentally friendly way to remediate uranium polluted soil and water. Hydroxyapatite (HAP), a natural mineral, has a high affinity for uranium in groundwater removal. During the extraction/removal process groundwater also contains high carbonate concentrations that may affect uranium’s ability for 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 differing in chemical compositions. The ICP-MS results showed fast adsorption rate onto HAP. The results also showed that temperature had no effect on the adsorption of uranium onto HAP. However, higher pH values (9-11) and carbonate concentrations (100mM) decreased its adsorption. However, the results show that the HAP materials used are not ideal for U adsorption from groundwater due to its low adsorption concentrations and low binding affinity. Despite this carbonate still had a negative effect on its adsorption so further studies will be conducted to determine if humic acid can induce better adsorption of uranium onto HAP.

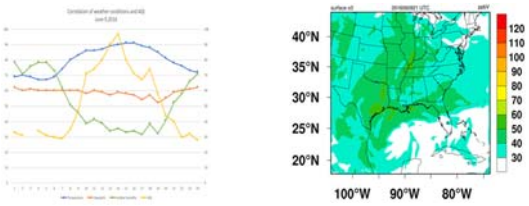
P3.25

THE INFLUENCE OF LOCAL METEOROLOGICAL CONDITIONS ON GROUND LEVEL OZONE CONCENTRATIONS

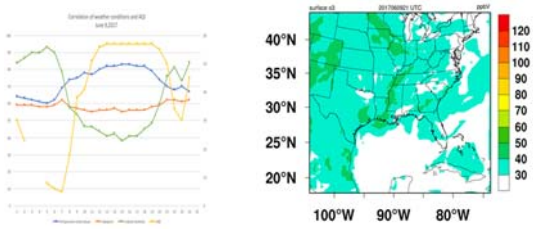
Brianna Ross

LSMAMP Bridge to Doctorate

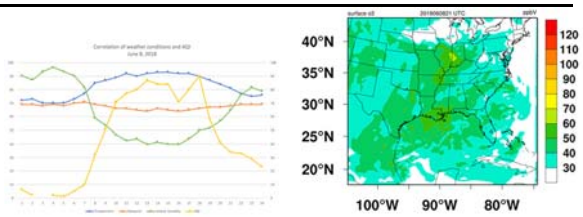
The influence of local meteorological conditions on ground level ozone concentrations is an area of increasing interest to those concerned about climate change and public health. High concentrations of ground level ozone can affect people with breathing difficulties such as asthma, emphysema, and bronchitis. The Mississippi Department of Environmental Quality (MDEQ) monitors pollutants and provides daily forecasts for particulate matter and ozone for DeSoto County, the Jackson Metropolitan area and the Mississippi Gulf Coast. Jackson, Mississippi is a mid-sized city located nearly 200 miles north of the Gulf of Mexico with very little industry. In 2015, United States Environmental Protection Agency (EPA) strengthened national ambient air quality standards (NAAQS) for ground-level ozone from 75 to 70 parts per billion (ppb). With the decreased standard, changes in population, land use and an increased number of commuters through the city, there is potential for Jackson to exceed the new standard. This study will look at the frequency of ozone action days in the Jackson, MS Metro area to determine if the National Weather Service Jackson Forecast office should partner with MSDEQ to issue air quality alerts for the Jackson metro area. Analyzing atmospheric conditions and MSDEQ ozone data, three case studies have been identified between June 2016 and June 2018 where conditions approached unhealthy levels. The analysis will show relationships between large scale atmospheric conditions, temperature, humidity and peaks in ground ozone. Air quality model simulations for these cases will be conducted to perform the study of model comparison.



Weather condition analysis and WOLF-Chem simulation for June 9, 2016



Weather condition and WOLF-Chem simulation for June 9, 2017



Weather condition and WOLF-Chem simulation for June 8, 2018

P3.26

SELECTIVE BINDING STUDIES OF A TRIPODAL TRIUREA-TRITHIUREA RECEPTOR

Bobby Portis

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Significant interests have recently been made on artificial receptors derived from urea and thiourea functional groups, with the goals of achieving selective recognition of anions of environmental and biological relevance. Because of their inherent properties of directional H-bonding interactions towards anions, such receptors could be used to bind anions under neutral conditions, mimicking the natural binding phenomenon occurred in biological systems. During this work, we have synthesized a new hexafunctional tripodal receptor connoting both urea and thiourea binding sites in a single molecule. As investigated by colorimetric, Uv-Vis, and NMR methods, this compound has been shown to interact halides and oxoanions, exhibiting excellent selectivity for fluoride and sulfate. This presentation will describe the synthesis of this new compound and its detailed binding results for environmentally important anions.

Acknowledgments: The project described was supported by US Department of Defense (W911NF-19-1-0006).

P3.27

MULTIFUNCTIONAL BIOCHAR FOR EFFICIENT CAPTURE, IDENTIFICATION, REMOVAL OF TOXIC METALS AND SUPERBUGS FROM WATER

Ye Gao

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According to the World Health Organization (WHO), more than two billion people in our world drink water contaminated in pathogens and heavy metals. The serious problem of unsafe water demands the development of an economically viable and environmentally friendly technology to create a sustainable future. This report describes the development of multifunctional materials by facile and cost-effective routes, which have the capability to solve challenges associated with unsafe drinking water. In this study, the water samples from the Mississippi River and the Mississippi Reservoir were contaminated with cobalt(II) and methicillin-resistant *Staphylococcus Aureus* (MRSA) superbugs. Targeted Multifunctional Fluorescent-Magnetic Biochar was synthesized by using EDC coupling of Biochar Carbon Dots (BCDs) and PEI-Magnetic Nanoparticles. BCDs that average 4 nm in size, with very bright photo-luminescence, were developed for the identification of pathogens and toxic metals in environmental water samples. Magnetic Nanoparticles were incorporated with BCDs to form Multifunctional Biochar, which allows pathogens and toxic metals to be completely removed from environmental water after separation by an external magnetic field. The photoluminescent BCDs were used for the detection of MRSA superbugs and cobalt(II) toxic metals, whereas Magnetic Nanoparticles were used to capture and separate

these toxins. This study demonstrates that Multifunctional Biochar can be used effectively for the selective capture and removal of cobalt(II) from environmental samples in the procedure of synthesis between Multifunctional Biochar and cobalt(II). Also, results demonstrate that Multifunctional Biochar can be used to remove 100 percent MRSA from environmental samples.

P3.28

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

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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.

P3.29

MECHANISM-BASED INHIBITORS OF VENEZUELAN EQUINE ENCEPHALITIS VIRUS

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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.

P3.30

INVESTIGATION OF NOVEL BENZIMIDAZOLE DERIVATIVES AS ANTITRYPANOSOMAL AGENTS

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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, and one of them have promising *in vivo* activity. Analogues of the most active compounds are being synthesized and evaluated against *T. brucei*, and the most selective compounds will be advanced to preclinical investigation.

P3.31

ENHANCED ELECTRON EXTRACTION BY DIP-COATING POST-TREATMENT OF TIO2 ELECTRON TRANSPORT LAYER FOR EFFICIENT PEROVSKITE SOLAR CELLS

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In this work, flower-shaped titanium dioxide (TiO_2) layers were obtained by the combination of chemical bath deposition (CBD) and dip-coating post-treatment methods, which were further used as electron transport layer (ETL) and scaffold for perovskite solar cells (PSCs). TiO_2 ETL was prepared by the combination of chemical bath deposition (CBD) and dip-coating post-treatment in 400 mM $TiCl_4$ DI-water solution, followed by low-temperature annealing at 200℃ for 30 min. Figure 1 (a, c) show surface SEM images of TiO_2 layer on FTO glass substrate formed by CBD method (CBD-TiO_2), there are compact TiO_2nanoparticles that less than 10 nm in size. In addition, the microstructure of rough FTO surface is also retained, indicating that TiO_2 nanoparticles adhere strongly and uniformly to FTO surface. More easy to transport eletrons. As shown in Figure 1 (b, d), our dip-coating post-treatment results in flower-shaped aggregates with diameters of 40~100 nm, and the rough FTO surface can be no longer observed.

P3.32

SYNTHETIC APPROACHES TO NEW POTENTIAL NON-TOXIC, SOLUTION-PROCESSABLE INORGANIC SOLAR CELL MATERIALS

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Global energy demands will continue to grow into the rest of this century and beyond and will become increasingly unsustainable unless a significant fraction of energy supply is derived from clean, renewable resources such as solar energy. The development of new materials for renewable energy production and storage is thus one of

the most significant and impactful challenges for materials chemistry in the 21st century. A class of materials known as lead halide perovskites ($CsPbX_3$) has recently been developed that shows considerable promise as an absorber material in inexpensive and efficient solar cells. However, issues with the poor stability and toxicity of the lead halide perovskites have so far prevented their widespread commercialization. Therefore, there is widespread interest in developing materials with similar structural and electronic properties, but with better long-term stability and using non-toxic, earth-abundant materials. We are using wet-chemical synthesis approaches to create colloidal nanomaterial inks of chalcogenide perovskites (e.g. $BaZrS_3$) and split-anion chalcogenide-halide perovskites based on non-toxic metals. We have demonstrated the use of ion exchange in nanomaterials as a synthetic route to access potential photovoltaic absorbers that cannot be produced through direct synthesis and have used this approach to introduce halide anions into chalcogenide semiconductor nanocrystals. The structural and optical properties of these materials are studied in order to evaluate their potential suitability for photovoltaic applications. Experimental results are supplemented with electron structure calculations. These results will help guide the development of new photovoltaic materials.

P3.33

ENVIRONMENTAL THRESHOLD OF PHOSPHORUS INFILTRATION IN RED SOIL UNDER DIFFERENT LAND USE PATTERNS

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The risk of soil phosphorus leaching increases in basin regions due to a large-scale use of phosphorus fertilizers driven by agricultural modernization. In this study, we conducted an earth pillar simulation test on the infiltration threshold of red soil, which covered the largest area of the Dianchi Lake Basin in China. Results showed that (1) the contents of the total available phosphorus in algae (NaOH-P) and dissolved labile phosphorus fractions ($CaCl_2$-P) in red soil were consistent with the content of available phosphorus (Olsen-P) under different use patterns manifested by greenhouse soil > open fields > grassland. Grassland had the highest phosphorus sorption index (PSI), followed by greenhouse soil and then by open fields. (2) The leachate under the same use pattern had the characteristics of TP>PP>TDP>DOP>MRP. The TP contents in the leachates of grassland, greenhouse soil, and open fields were 0.46, 0.61, and 0.49 mg/L, respectively. DOP, TDP, PP, and MRP had similar contents and their distributions in the three land types were consistent with that of TP. (3) Olsen-P had a significant correlation with TP, TDP, PP, and DOP in the leachates. Olsen-P of <40 mg/kg and PSI of >50 slightly influenced eutrophication of water body. Moreover, Olsen-P of >40 and <70.90 mg/kg and PSI of >40 had a minimal influence on the environment. Olsen-P of >70.90 mg/kg and PSI of <30 significantly influenced eutrophication in Dianchi Lake Basin. (4) When Olsen-P was >26.09 mg/kg, the TP content in the leachate increased sharply.

P3.34

SYNTHESIS OF NEW DIKETOPYRROLOPYRROLE SCAFFOLDS FOR THE FORMATION OF NOVEL DONOR-ACCEPTOR AND N-TYPE SEMICONDUCTORS BY C-H FUNCTIONALIZATION REACTIONS

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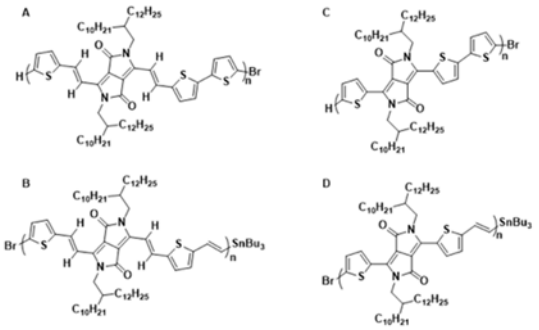
In recent years, conjugated polymers containing diketopyrrolopyrrole (DPP) units in the backbone have become attractive for application in solar cells and ambipolar field-effect transistors. The high charge mobility and self-organizing properties of these polymers make them perfect candidates for the organic electronic materials. Co-polymerization of DPP units with an electron-rich aromatic species such as thiophene will make it possible to tune the optical band gap of the polymer. In this study, four polymers (**A-D**) were synthesized and characterized for their structural, optoelectrical, and charge mobility properties. The presence and position of the alkenyl moiety will be studied to determine its effect on the optoelectronic properties of the DPP-thiophene alternating copolymer. Polymers **A** and **C** were synthesized by the direct arylation polymerization (DArP) reaction, while polymers **B** and **D** were synthesized via Stille cross-coupling polymerization. In this presentation, we will discuss the effect of the position of the alkenyl groups on the optoelectrical and charge mobility of the polymers, which were determined by UV/visible spectroscopy, cyclic voltammetry and charge mobility experiments. The structural morphology and the thermal properties of the polymers were characterized by Grazing Incidence X-ray Diffraction (GIXD), Atomic Force Microscopy (AFM), Differential scanning calorimetry (DSC) and thermal gravimetric analysis (TGA).



P3.35

AN ELEMENTAL STUDY OF REGIONAL VARIATION IN NONCOMMERCIAL JAMS AND JELLIES THROUGHOUT THE USA

Pamela Bellamy, Nina Baghai-Riding, Charles Smithhart

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The nutritional value of food is correlated with human health. Limiting elements in diets include calcium, magnesium, potassium, nitrogen, phosphorous, and more. Over the past three spring semesters (2017-2019), Dr. Baghai-Riding's Material and Method Class wanted to determine whether jams/jellies from different areas of the USA can be correlated to soil types in which they were grown. Nineteen noncommercial jams/jellies were acquired from 18 known areas. Samples included raspberry, peach, blueberry, grape, strawberry maple, blackberry, muscadine, sweet potato, elderberry, hot pepper, and tomato chutney. Each jam/jelly sample was cooked to remove water and volatiles and to consolidate chemical compounds. Cooked samples were then divided into crucibles and placed in a Muffle Furnace for 24 hours at 1,000 °C to generate an ash. Ash samples were analyzed with an energy dispersive x-ray unit associated with the JEOL scanning electron microscope to determine elemental composition. The Natural Resource Conservation Service soil website and geologic maps were used in establishing the local soil types associated with each sample. Overall, 22 elements were

noted. Many jams possessed unique properties. Nickel occurred in the Nampa, Idaho sample which may be from mineral tailings when this area was a gold mining town. Calcium was abundant in the elderberry sample from Lincoln County, Nevada and Brigham City, Utah which is probably due to limestone rich soils. The blackberry jam and sweet potato preserves from Mississippi yielded the most elements and are from floodplain deposits. Future classes will continue to expand this analysis to other regions.

P3.36

SYNTHESIS AND BINDING STUDIES OF ADAMANTYL-BASED DIPODAL UREAS FOR ANION BINDING

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The development of new chemical methods for anion detection is important due to the critical role of certain anionic species in the deadly pathways generated by chemical weapons of mass destruction. Recently, significant efforts have been made to use small molecules as chemical sensors to selective detection of anions. During this study, we have synthesized two adamantyl-based dipodal ureas from the reaction of 2-adamantylisocyanate with 2,2'-diamino-N-methyldiethylamine (**L1**) and 3,3'-diamino-N-methyldipropylamine (**L2**) in dichloromethane. The synthesized receptors have studied by proton-NMR titrations, demonstrating significant binding activity for fluoride and sulfate over other anions.

P3.37

PREPARATION OF MACROCYCLIC POLYPYRIDINYLARENES

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We report here the synthesis of a variety of macrocyclic polypyridinylethynylarenes from common intermediates. Highly conjugated molecules are attractive for use in the preparation of photoreactive materials such as electronic sensors or light harvesting materials. The synthesis of flat-highly conjugated organic structures is a primary focus of our group. Previous work in our group on the construction of flat two-dimensional architectures containing π-conjugation has shown that polyphenylethynylarenes are not as flat as desired. Hydrogen atoms in the ortho position of the phenyl rings is a problem. To alleviate steric interactions at this position, the phenyl groups have been replaced with 2-pyridinyl groups. The polypyridinylethynylarenes were synthesized in high yields through a series of Sonogashira coupling reactions using PdCl2(PPh3)2 as the catalyst. Cyclization was accomplished by reacting the primary amino groups with glyoxal under dilute conditions to give the diimine products. The conjugation of the mono-, di-, and tri-macrocyclic structures will be studied by UV-vis spectroscopy to determine if cyclization increases conjugation.

P3.38

METHOD DEVELOPMENT FOR ANALYSIS AND DETECTION OF FALSE POSITIVE RESULTS FOR METHYLXANTHINES AND ALKALOIDS IN ARCHAEOLOGICAL VESSELS

Timothy Ward, Ghaith Aleithawe, Jenna Mitchell, Anna Wilson, Josh Miller, Andrew Hollenshead, Jacob Niehaus, Rose Ward

Millsaps College, Jackson, MS

Samples were analyzed for biomarkers from two archaeological sites in this project. The first site included samples from melted adobe room-block complexes in the El Paso Phase Jornada Mogollon villages and Doña Ana phase pithouse villages. These villages are located in White Sands Missile Range and at White Sands National Monument in southern Tularosa Basin of south-central New Mexico. Additional samples analyzed from a recently identified Tusayan Polychrome (A.D. 1125–1290) jar that represents the only known Post-Chacoan cylindrical vessel from our second site in northern Black Mesa, Arizona. Biomarkers are compounds that can be used to determine the presence of specific drinks, food or other substances. These biomarkers, when combined with relevant anthropological data, can provide insight into the culture, social interactions, and religious practices of civilizations. The procedures to extract the samples included dremmeling and extracting the first and second layer. The samples were analyzed by liquid chromatography-mass spectrometry for known biomarkers for cacao, peyote cactus, jimson weed, and tobacco. Blanks were analyzed in between each sample to confirm there was no carry-over or contamination between samples. Several pottery samples analyzed contained biomarkers indicating the presence of cacao, peyote or other possible substances. In this presentation, we present a method to detect for potential false positives for biomarkers in archaeological artifacts.

P3.39

CHEMICAL BIOSIGNATURES IN THE MARTIAN SUBSURFACE

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Mars is one of the best candidates for detecting extraterrestrial life, past or present. While organic molecules have been detected on the Martian surface, signatures of past or present life cannot be confirmed. Due to the largely inhospitable surface environment of Mars, if biotic evidence does exist, it likely resides hidden in the subsurface. In order to effectively search for evidence of life on Mars, and accurately interpret data from exploration missions, we must understand the effects of subsurface conditions on the preservation of biosignatures. Ideal biosignatures are unambiguously of biological origin and can be preserved over multi-billion-year time periods. Here we present the results from Martian simulation experiments conducted at high pressures and temperatures on organic-rich analog material hosting a variety of potential biosignatures. Following the development of an efficient and sensitive extraction protocol, we performed bulk and trace analysis of selected diagnostic biomarkers and their degradation products by GC-MS.

P3.40

SYNTHESIS OF METAL-FREE PLASMONIC BORON PHOSPHIDE@CARBON NITRIDE WITH CORE-SHELL STRUCTURE AS PHOTOCATALYSTS FOR OVERALL WATER SPLITTING

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Enhancing the efficiency of semiconductor photocatalysts is of paramount importance for realizing more efficient conversion of solar energy in artificial photosynthesis.[1-2] In our work, a novel metal-free plasmonic composite photocatalyst consist of boron phosphide and carbon nitride was constructed by solid method. The broadened spectral response (from UV-vis to NIR) and finite element frequency-domain simulations suggest that it can significantly improve photocatalytic overall water splitting performance. We then further confirmed the surface plasmonic resonance effect stem from the boron vacancies, which may serve as a new design protocol for highly efficient photocatalysts.

P3.41

SPATIAL AND TEMPORAL TRENDS IN ATMOSPHERIC MERCURY ALONG THE GULF COAST DETERMINED USING PASSIVE AIR SAMPLERS

Byunggwon Jeon, James Cizdziel

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Mercury (Hg) is a persistent and toxic heavy metal that can concentrate on the aquatic food chain reaching levels that can harm both wildlife and humans. This is particular concerns on the Gulf Coast because residents there consume more seafood than other U.S. residents and because Gulf of Mexico (GoM) seafood tends to have higher levels of methyl-Hg compared to other coastlines. Mercury is dispersed through the atmosphere and is deposited into terrestrial and aquatic surfaces. Once deposited, inorganic Hg can be changed to methyl-Hg, a neurotoxin and accumulates in biological tissues. Accurately measuring total gaseous Hg concentrations in the atmosphere is important to understand Hg sources, cycling, and distribution. In this study, we deployed MerPas passive air samplers that use sulfur-impregnated activated carbon to capture Hg from the air along the northern GoM at six sites: Bay St. Louis, Gulfport, Gulf Coast Research Laboratory (GCRL) main campus, GCRL Cedar Point, Grand Bay National Wildlife Refuge (GB), and Dauphin Island. The captured Hg is determined by a direct Hg analyzer based on thermal decomposition atomic absorption spectrometry. This poster will present results for the summer and fall of 2019, as well as a comparison between active and passive sampling at GB. During the summer, atmospheric Hg concentrations (±1S.E.) averaged 1.17 ± 0.03 ng m^{-3}, with the highest concentration (1.26 ± 0.03 ng m^{-3}) at the GCRL main campus along the coastline and the lowest concentration (1.02 ± 0.03 ng m^{-3}) at GCRL Cedar Point within a coastal marsh.

P3.42

SEVERAL ORDERS-OF-MAGNITUDE ENHANCEMENT OF MULTIPHOTON ABSORPTION PROPERTY FOR CSPBX3 PEROVSKITE QUANTUM DOTS BY MANIPULATING HALIDE STOICHIOMETRY.

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All-inorganic CsPbBr3 perovskite colloidal quantum dots have recently emerged as promising material for a variety of optoelectronic applications, among others for multi-photon-pumped lasing.Two-photon absorption (2PA) and Three-photon absorption (3PA) processes feature many technological applications for fluorescence microscopy, photodynamic therapy, optical data storage, and so on. By simply changing the halide stoichiometry at the X site, *the* giant 2PA and 3PA properties for all-inorganic CsPbX3 (X =Cl, Br, I, and mixed Cl/Br and Br/I) Multiphoton absorption (PQDs) can be enhanced several orders of magnitude, respectively. Notably, reported data show that, with proper design of halide combination, PQDs can exhibit exceptionally high TPA properties whose 2PA and 3PA coefficients are about 2 orders of magnitude higher than semiconductor QDs and 5−7 orders of magnitude higher than common organic materials. Multiphoton absorption (MPA) cross sections can be tuned 2−3 orders of magnitude by band gap engineering in a predictable manner with increasing the electronegativity of the halides. Importantly, reported results provide a new strategy for manipulating MPA properties by halide composition varying which will be instrumental in the design of next-generation technological devices.

P3.43

A STRUCTURE - ACTIVITY STUDY ON THE BINDING OF MORIN AND FLAVONE PROTOTYPES WITH HUMAN SERUM ALBUMIN

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Plant flavonoids are ubiquitous in plants of higher genera and are widely studied for their high therapeutic potency and low systemic toxicity to treat a wide spectrum of diseases which include cancers, neurodegenerative disorders, and atherosclerosis. The present study is focused on a common flavonol morin (3, 5, 7, 2', 4'-OH flavone), which is widely present in citrus fruits. To date, there is not enough literature data on the behavior of morin in physiological environments. Hence, an exploratory study on morin has been performed in a protein microenvironment. Human serum albumin (HSA) is chosen as a model for macromolecule. HSA is the natural carrier of drugs/small molecules in a physiological system. Absorption, fluorescence, and circular dichroism (CD) spectroscopic measurements have been carried out at five different temperatures, 15, 20, 25, 30 and 37 °C to observe the influence of the structure of HSA on its binding with morin. Studies indicated morin binds in the hydrophobic cavity of HSA. Usually, flavonols with a 5-OH group show fluorescence emission only when they are bound with a rigid environment. Morin's emission is distinctive from the well-known flavonols fisetin (3, 7, 3', 4'-OH flavone), quercetin (3, 5, 7, 2', 4'-OH flavone) because the 2'-OH of morin makes an intramolecular H-bond with the -O- of chromone. Studies of morin with HSA at multiple temperatures indicated that the structure of the protein influences the thermodynamics of the binding process.

P3.44

ANODIC STRIPPING VOLTAMMETRY FOR DETERMINATION OF LEAD IN WATER

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Lead pollution is a global issue since lead mining and smelting, and battery manufacturing/disposal/recycling, are common in many countries. Poisoning typically results from ingestion of food or water contaminated with lead. Lead can be leached out into tap water from water pipes. The extraction, production, use, and disposal of lead and its products (such as lead-acid batteries) have caused significant contamination of the Earth's soils and waters. This research is to develop a sensitive electrochemical method for determine the lead in water based on the anodic stripping voltammetry (ASV). A graphene oxide modified carbon electrode was used as the working electrode. Lead is first preconcentrated on the electrode at -1.2V. The electrode is then subject to a square wave anodic stripping voltammetry. We have test different electrodes bare pyrolytic graphite (PG), PG modified with Hg-film or with graphene oxdie film. In all three experiments, the electrode was investigated by i-t Amperometry in a buffer solution of 0.1M HAc-NaAc pH 4.5. The electrochemical cell consists of a working electrode , a Pt wire counter electrode and Ag/AgCl (3M) reference electrode. We have found that during the experiments the lead(II) potential peaked at about -0.6 V to -0.7V at a current of $4x10^{-5}$ to $8x10^{-5}$ A. For a Hg-film electrode the peak current is at ~ -.05 V with a current of $7x10^{-5}$ to $15x10^{-5}$ A. Among the three tested electrode, graphene oxide modified graphite electrode shows the highest sensitivity which deserves further researches. This work is supported by LSMAMP program.

P3.45

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

Dean A. Damon, David H. Magers

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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 chloro and cyano derivatives of these aromatic heterocycles by homodesmotic reactions. In homodesmotic reactions the number and types of bonds and the bonding environment of each atom are conserved. The enthalpy of all of the reactants and products in each homodesmotic equation is computed using SCF theory, second-order perturbation theory, and density functional theory. The DFT functionals employed are Becke's three-parameter hybrid functional using the LYP correlation functional, the M06-2X high nonlocality hybrid functional from Thular and Zhao, and the ωB97XD functional from Head-Gordan and coworkers which includes empirical dispersion. The basis sets employed are Dunning and coworkers' correlation consistent basis sets, cc-pVDZ, cc-pVTZ, and cc-pVQZ. From the resulting enthalpy of reaction, the desired enthalpy of formation is determined by use of reference values for all other systems in the reaction, and the computation of atomization energies is avoided. We gratefully acknowledge support from the Mississippi College Catalysts, the alumni support group of the Department of Chemistry & Biochemistry.

P3.46

RELATIVE STABILITIES OF DERIVATIVES OF 9-METHYLANTHRACENE AND 9-METHYLENE-9,10-DIHYDROANTHRACENE AND DERIVATIVES OF 6-METHYLPENTACENE AND 6-METHYLENE-6,13-DIHYDROPENTACENE

Aaron W. Plunkett, David H. Magers

Mississippi College, Clinton, MS

In 1949, Clar and Wright reported that 6-methypentacene exists as 6-methylene-6,13-dihydropentacene at room temperature due to a [1,5]-sigmatropic hydrogen shift (Nature 1949, 163, 921). Thus, the aromaticity of the central ring and the planarity of the overall compound is destroyed by this shift. The same does not occur in anthracene. While the 9-methylene derivative of anthracene is a local minimum, the planar 9-methyl derivative is the more stable. In the current study we investigate if certain derivatives of these anthracene systems stabilize the methylene system relative to the methyl, and if certain derivatives of these pentacene systems stabilize the methyl derivative relative to the methylene. Specifically, nitro and trifluoromethyl derivatives of anthracene are considered, and amino and methoxy derivatives of pentacene are examined. Optimum equilibrium geometries, harmonic vibrational frequencies, and the corresponding zero-point vibrational energies are computed for each set of isomers using density functional theory. The DFT functionals employed are the M06-2X high nonlocality hybrid functional from Thular and Zhao and the ωB97XD functional from Head-Gordan and coworkers which includes empirical dispersion. The basis sets employed are Dunning and coworkers' correlation consistent basis sets cc-pVDZ and cc-pVTZ. We gratefully acknowledge support from the Mississippi College Catalysts, the alumni support group of the Department of Chemistry & Biochemistry.

P3.47

DO STABLE HYDROGEN BRIDGE BONDS FORM BETWEEN BORON AND SILICON?

Hannah M. Overstreet, David H. Magers

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Hydrogen bridge bonds (μ-hydrido bonds) are examples of 3-center, 2-electron bonding. Such bonds are known to form easily between boron atoms. Diborane, B_2H_6, is perhaps the prototypical example. While hydrogen bridge bonds are not as common between silicon atoms, the ground state of Si_2H_2 is the butterfly structure of C_{2V} symmetry with two hydrogen bridge bonds. In the current study, we investigate whether small molecules with one boron atom and one silicon atom might have stable configurations with hydrogen bridge bonds. Specifically, we investigate $BSiH_4$, $BSiH_5$, and $BSiH_6$ and compare isomers with bridge bonds to the more common classical structures. The geometries, corresponding electronic energies, and the corresponding harmonic vibrational frequencies for all systems are computed using SCF theory, second-order perturbation theory, and density functional theory. The DFT functionals employed are Becke's three-parameter hybrid functional using the LYP correlation functional, the M06-2X high nonlocality hybrid functional from Thular and Zhao, and the ωB97XD functional from Head-Gordan and coworkers which includes empirical dispersion. The basis sets employed are Dunning and coworkers' correlation consistent basis sets, cc-pVDZ, cc-pVTZ, and cc-pVQZ. We gratefully acknowledge support from the Mississippi College Catalysts, the alumni support group of the Department of Chemistry & Biochemistry.

P3.48

CONVENTIONAL STRAIN ENERGIES OF THIAZIRIDINE AND THE THIAZETIDINES

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The conventional strain energies for thiaziridine, 1,2-thiazetidine, and 1,3-thiazetidine are determined within the isodesmic, homodesmotic, and hyperhomodesmotic models to investigate the effect of third-row elements on the strain energies of three- and four-membered rings. Optimum equilibrium geometries, harmonic vibrational frequencies, and corresponding electronic energies are computed for all pertinent molecular systems using self-consistent field (SCF) theory, second-order perturbation theory (MP2), and density functional theory (DFT). The DFT functionals employed are Becke's three-parameter hybrid functional using the LYP correlation functional and the M06-2X high nonlocality hybrid functional from Thular and Zhao. The basis sets employed are Dunning and coworkers' correlation consistent basis sets: cc-pVDZ, cc-pVTZ, and cc-pVQZ. In addition, cc-pV(D+d)Z, cc-pV(T+d)Z, and cc-pV(Q+d)Z basis sets are also investigated to determine the effect of the extra d function for sulfur on the overall results. Results are compared to the conventional strain energies of small cyclic hydrocarbons and to other heterocyclic systems. We gratefully acknowledge support from the Mississippi College Catalysts, the alumni support group of the Department of Chemistry & Biochemistry.

P3.49

HOW CAN STERIC HINDRANCE BE ALLEVIATED IN THE FORMATION OF DENDRIMER PRECURSORS TO CONSERVE π-CONJUGATION?

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The Mississippi College Organic Research Group has an ongoing mission to design and prepare flat, two-dimensional dendrimers. In order for dendrimers to attain light-harvesting properties, conjugation of the π-bonding system must be conserved. It has been found that when twisting occurs about the single bonds of the dendrons, there is a decrease in energy transfer and therefore loss of conjugation and reduced light harvesting properties. In previous work, synthesized dendrimer precursors have shown this twisting, and therefore loss of π-conjugation, due to the hydrogens in the ortho positions of the phenyl rings. In the current project we investigate computationally if structures which incorporate diynes, as opposed to the ethynyl units previously used, will position the hydrogens far enough from one another that their steric interactions will be reduced and twisting of the structure will not occur and conjugation will be retained. Another goal of this research is to determine if twisting can be eradicated by changing the types of atoms and the length of the bridges that connect the phenyl rings. Nucleus-independent chemical shift calculations are also conducted to determine the aromaticity of the structures and prove whether conjugation is truly conserved. To investigate these questions, optimum structures are computed at the SCF and DFT levels of theory. The functionals employed are B3LYP, M06-2X, and ωB97XD. All calculations use correlation consistent basis sets. We gratefully acknowledge support from the Mississippi College Catalysts, the alumni support group of the Department of Chemistry & Biochemistry.

P3.50

AB INITIO ANALYSIS OF POLARIZABILITY IN MOLECULAR PIEZOELECTRIC RESPONSE FOR ORGANIC DIMER SYSTEMS

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In seeking to describe macroscale piezoelectric response, having a better understanding of piezoelectric response at the single-molecule level is a necessity. In the case of organic molecules, there are millions of possible candidates which possibly have the desired properties, revealed in the magnitude of the d_{33} coefficient. In seeking to extend research done by Arun Gagrai and co-workers which discovered a possible relationship between first-order polarizability of a molecule and its piezoelectric response (d_{33}), the current study seeks first to confirm this relationship with different levels of computational theory and to extend the previous work to application, where new molecules with even higher responses can be designed from principles discovered in the calculations. These results specifically take the calculations from previous results and model them in the Hartree Fock level of theory to see if the relationship is maintained, and then consider the extension of period 16 of the Periodic Chart to see if the relationship is maintained for heavier atoms, for which relativistic effects would need to be considered for in their computation, using tailored basis sets and effective core potentials. We gratefully acknowledge support from the Mississippi College Catalysts, the alumni support group of the Department of Chemistry & Biochemistry.

P3.51

EXPLORATION TO RED-SHIFTED AZOHETEREOARENES WITH "PHOTOSWITCHABILITY" BY LEWIS ACID COORDINATION TO AN ADVANTAGEOUS EXCITED "T-SHAPE" CONFORMATION

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Azoheteroarenes are an exciting class of molecular photoswitches with raved quantitative photoswitching and long excited half-lives. Red-shifting the maximum absorbance for azohetereoarenes into the coveted biomedical window (800-1000nm) is advantageous for creating novel materials for bioengineering and an interest for our lab in creating a library of azoheteroarenes with diverse absorbances for an application in tuning selectivity for C-H bond functionalization. Red-shifting absorbance yet retaining the ability to photoswitch is currently a non-trivial feat. Current strategies are troublesome for retaining both features. Key to our efforts is controlling coordination of Lewis acids to promote an exo-cyclic azo linkage that permits photoswitching and provides azo pi elongation for longer wavelength absorbance. This control is possible by key intramolecular distance and trajectory to the appropriate nitrogen of the azo bond available only from the the excited "T-shape" conformation of azoheteroarenes. This exclusively provides a subtle approach to solve needed selective coordination. Herein, we reveal data gained from computational and experimental pursuits.

P3.52

REMOTE ARENE C-H BOND FUNCTIONALIZATION VIA THE "T-SHAPE CONFORMER" OF AZOHETEROARENES

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Azoheteroarenes are growing class of important molecular photoswitches due to their near quantitative photoswitching and long excited half-lives made possible by their unique excited "T-shaped" conformer. We seek to exploit the "T-shape" conformer to aid in gaining vital intramolecular distance and trajectory to desired C-H bonds. The near orthogonal position of the heteroarene ring to a planar aryl base affords shorten distances between the two ends in the excited conformer. This is key for our efforts in remote C-H functionalization. We herein disclose computational data with a comparison to gained intramolecular distances from published templates for remote C-H functionalization and experimental work in remote C-H functionalization of aryl C-H bonds with azoheteroarenes. Our work culminates into the design of an "photoswitching auxiliary" for C-H functionalization that combines wavelength modulation for regioselective C-H functionalization.

P3.53

CONJUGATION TO ELPS: CHROMOPHORS FOR HYDRODYNAMIC PROPERTY DETERMINATION AND IMPROVED DRUG DELIVERY

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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.

The influence of the connective spacer and the chromophore is investigated in this study. For this, 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 National Institutes of Health under grant number P20GM103476.

P3.54

AN ASSESSMENT OF THE WATER QUALITY AT STEADFAST VILLAGE, STANN CREEK

DeArrius Rhymes

LSMAMP

Billy Barquedier Sub-Watershed is a sub-watershed located in the North Stann Creek Watershed in the Stann Creek District, "Belize". The Billy Barquedier National Park consist of six sites for water quality monitoring and provides potable water to Steadfast, Alta Vista and Valley Community. In Billy Barquedier National Park, there are four zones with six sites known as streams that vary in size and segue into one large river. Site 6 is the primary source of water for drinking, eating, and other recreational uses for the residents of the surrounding villages. The objectives of this study is to compare the quality of water via physical, chemical, and microbial parameters between Site 6 in BBNP, and the water provided to the residents of the upper and lower catchment sites in Steadfast Village, the primary recipient of Site 6. A total of seventeen water samples were collected for physical, chemical, and microbial analysis. The physical and chemical parameters were measured with a YSI DSS Multimeter and a HACH DR 900 Colorimeter. Moreover, microbial analysis was performed via a serial dilution technique and culturing to test for the presence of lactose fermenting and non-lactose fermenting bacteria on MacConkey Agar plates. Results indicated a general increase in concentration amongst lactose and non-lactose fermenting bacteria. Thus, a purification process should be mandated amongst all Steadfast Households for safe drinking consumption. Overall, understanding the general necessity for proper water management is important for appreciating the resource itself.

P3.55

MAKING RESONANCE TRANSPARENT: IMPLEMENTATION AND EVALUATION OF CHEMISTRY CARD GAMES TO TEACH RESONANCE

Theresa Gaines

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Organic chemistry is a notoriously difficult course with high attrition rates. To mitigate some of the trouble students have, chemistry card games have been used to help students learn and apply new content. Despite the prevalence of chemistry games in the classroom, the efficacy of chemistry games as learning tools are not well studied in the literature. With this dearth of game assessment, it is impossible to know if these games provide a meaningful experience. A play experience is described as meaningful when that experience has a quantifiable outcome—either a change in player's attitude towards the material or an acquisition of knowledge. The purpose of this pilot is to measure acquisition of knowledge and changes in student attitudes with respect to a new game focused on the concept of resonance. When it comes to drawing resonance structures, students struggle with mastering two main tasks: drawing appropriate curved arrows and drawing appropriate alternative Lewis structures. These tasks are the foundation for communicating electron delocalization (resonance) and are a vital problem solving tool in organic chemistry. In this work, a new resonance game designed to help students master these two tasks will be assessed. Acquisition of knowledge will be measured in second semester organic chemistry students through use of a pre-test and a post test. Semi-structured qualitative interviews will also be held to probe perceptions about the game, resonance and chemistry. These interviews will be used to create surveys that will be used in a later study.

P3.56

ABSORBANCE AND FLUORESCENCE MEASUREMENTS OF AMINO ACID INTERACTION WITH NOBLE METAL NANOPARTICLES USING VERNIER INSTRUMENTS

Sarah G Thompson, Tatyana McDonald, Samuel Dasary

Holmes Community College, Goodman, MS

Vernier probe ware technology offers an excellent platform to conduct undergraduate research projects in a community college setting. In this research project we have studied the spectroscopic properties of fluorescent amino acids and their interaction with noble metal nanoparticles by probing the fluorescence and absorbance spectroscopy using Vernier instrumentation. Further the amino acids are used as reducing/stabilizing agents to synthesize novel nanomaterial. Spectroscopic properties of the novel nanomaterial are tested using Vernier UV-Vis and fluorescence spectrophotometers. Preliminary results suggest that the synthesized material has a potential to serve as fluorescent sensor probes

P3.57

DOCKING STUDIES OF PYRIDINE-BASED HIV INTEGRASE INHIBITORS

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The Kessl lab at USM has developed an assay for the determination of the effectiveness of potential HIV integrase inhibitors. HIV integrase is an important enzyme in the life cycle of the AIDS virus, it incorporates the viral DNA into the host cell genome. HIV integrase, reverse transcriptase and protease are three prominent targets in HIV drug development as they are unique to the virus. In our lab, we use the pyridine core as a basis for the synthesis of HIV integrase inhibitors. To predict potential successful substituents on the pyridine we run docking studies with the protein. The literature-known compounds are correlating well with the calculations.

P3.58

RECOMBINANT EXPRESSION AND PURIFICATION OF CYSTEINE-RICH GRANULIN-7 FROM E.COLI

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Granulins (GRNs 1-7) are cysteine-rich, ~ 6 kDa repeat domains proteins that are generated by the cleavage of the precursor, progranulin (PGRN)(Fig 1A). These proteins possess multiple biological roles within normal physiology such as neurotrophic factors, immunomodulators, growth regulators etc. Pathologically, they have been implicated in neurodegenerative diseases such as Alzheimer disease (AD), frontotemporal dementia (FTD) and amyotrophic lateral sclerosis (ALS). Despite these links there is a dearth of information on the structure-function relation of the individuals GRNs. The goal of this study is to successfully standardize the recombinant expression and purification protocol for

one of the GRNs; GRN-7 within *E.coli* to allow a complete biophysical and biochemical characterization. In our lab, we have previously established a purification protocol for GRNs-3 and 5 based on immobilized metal-affinity chromatography. For GRN-7, however, we observed the presence of proteolytic cleavage products along with the purified protein. To overcome the issue of proteolytic digestion by endogenous proteases, we changed the expression system from Origami 2 to BL21 E. coli cells. The results of this project have been presented here and discussed.

P3.59

BIOAVAILABILITY OF DEPLETED URANIUM IN US ARMY SHOOTING RANGE

Markiesha James

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The area of environmental toxicology has grown over the years due to the increased use of Uranium in nuclear weapon testing. Uranium is a naturally occurring heavy metal that is easily oxidized and mobilized. The isotope of interest is 238U which has a common presence in both biotic and abiotic environments, with the influence of radioactive properties on the environment being of interest. Assessment of the inherent environmental risks associated with Depleted Uranium (DU), a major waste product of uranium used for nuclear warfare, are necessary. Analysis of DU is important because it is a vital part of determining how these sites will be cleaned up and is largely based on the available research and previously recorded data about bioavailability. The goal of this study is to determine Depleted Uranium uptake and bioaccumulation in soil and plants from various areas within a US Army testing site. Representative soil and plant samples were collected from Yuma, AZ, a US bomb testing site. Acid digestion and extraction via fractionation was performed on all representative soil samples to determine Depleted Uranium concentration. The study is ongoing. It has been hypothesized to be a direct correlation between Depleted Uranium concentration in the soil and plant samples. Through this study bioremediation methods will be further explored in hopes of improving soil quality, reducing toxicological harm.

P3.60

N-HETEROCYCLIC CARBENE (CCC-NHC) PINCER COMPLEXES IN OLEDS AND AS CATALYSTS

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Novel CCC-NHC backbones of symmetric ligand precursors have been synthesized and used to make metal pincer complexes. The symmetric ligand precursor was prepared by a copper coupling reaction between 1,3-dibromobenzene and imidazole. That product was alkylated with 1-chlorobutane, forming a dichloride disalt. Moreover, the dichloride salt was used to perform the metalation step using Zr(NMe2)4. The final Pt pincer complex was formed by transmetallation of the Zr complex using [PtCl2(COD)] with CCC-NHC as backbone. This CCC-NHC pincer complex has proven to be photolytically stable, withstands high temperature which makes it a great candidate to qualify in the usage in Organic Light Emitting Diodes (OLEDs). These CCC-NHC ligands when bound to other metals can be used as catalysts in the HaberBosch process to reduce energy consumption. Our research is focused on producing several ligands (1,3-bisimdazolyl benzene, 1,3-bistriazolyl benzene, 1,3,5-triimidazolyl benzene, 1,3,5-tris(triazole) benzene) with various alkylation reactions (including alkylation with butyl chloride, neohexyl iodide and decyl chloride) and different metals to see the effects by activating with UV light. Also, the backbone is being altered to extend the light emitting ability of the complexes.

P3.61

UNDERSTANDING HOW THE AUTOLYSIN LECTIN DOMAIN INTERACTS WITH FIBRINOGEN-COATED NANOPARTICLE SURFACES

Jilkiah Bryant

LSAMP-Image Program

Bacterial biofilm formation is a leading cause of illness in the United States. Biofilms can form on the surfaces of medical devices and orthopedic implants, creating a source of persistent and hard-to-treat infection. Lectin, a sub domain of staphylococcal Autolysin E (AtlE), has been implicated in the formation of these biofilms. Fibrinogen is a human protein that can coat the surface of medical devices and plays an important role in bacterial attachment during the early stages of biofilm formation. Therefore, understanding how lectin interacts with fibrinogen could be useful in treating and preventing biofilms. Gold nanoparticles (AuNPs) can be pre-coated with fibrinogen proteins, enabling the study of lectin binding in the solution phase. In this project, several different methods were used to investigate the lectin-fibrinogen interaction. These included monitoring the shift in the localized surface plasmon resonance absorbance (UV-Vis spectroscopy), examining the change in hydrodynamic radius (Dynamic Light Scattering), and visualizing the nanoparticle surfaces directly (Transmission Electron Microscopy. We found lectin properly folded and monolayer binding on a bare gold nanoparticle surface without cysteine residue and that monolayer binding of fibrinogen was not observed in this system. Overall, how lectin interacts with fibrinogen coated AuNP requires further experimentation to determine protein exchange and binding dynamics.

P3.62

PREPARATION AND CHARACTERIZATION OF A SILYBIN-LECITHIN PHYTOSOME

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Phytosomes are nanostructures generally composed of a bioactive component and a phospholipid. The bioactive component, which usually exhibits poor water solubility, is complexed with the phospholipid, which self-assembles into a spherical structure. Phytosomes differ from liposomes in that the bioactive component is distributed throughout the spherical shells, whereas liposomes have the uncomplexed bioactive component concentrated at the center of the sphere. Both phytosomes and liposomes have been reported to increase the bioavailability of herbal supplements such as curcumin and extracts of green tea and and milk thistle.

This work discusses the preparation of a phytosome from lecithin and silybin. Silybin is a poorly water-soluble bioactive component of milk thistle extract which is reported to have beneficial effects for the liver. Details of the preparation method and attempts to characterize the product by IR, NMR and SEM are discussed.

P3.63

HIGH BROADBAND PHOTOCONDUCTIVITY OF FEW-LAYER MOS2 FIELD-EFFECT TRANSISTORS

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Among the two dimensional transition metal dichalcogenides (TMDs), molybdenum disulfide (MoS2) structures is considered as an excellent candidates for their applications in optoelectronics and integrated circuits due to their bandgaps in the visible region, high electron mobility, high ON/OFF current ratio and strong light-mater interaction properties. In this study, we report high broadband photocurrent response (R) and external quantum efficiency (EQE) on few-layered MoS2 phototransistors using multi-terminal configurations. The photocurrent response was measured using white light as well as monochromatic light of wavelengths 350 nm – 900 nm from a home built monochromator. We measured the R = 182 A/W at 0.2 nW optical power illuminating with white light. The R value increases to 2400 A/W when measured using 4-terminal configuration. Using monochromatic light on the same device, the measured R and EQE becomes 1000 A//W and 105 % respectively at 400 nm measured in 2-terminal method. The R and EQE becomes 10,000 A/W and 106 % using 4-terminal configurations. The responsivity decreases from the UV region 400 nm to near IR at 900 nm. We will discuss the observed photoresponse in detail as a function of applied gate voltage, optical power and contact resistances

P3.64

INVESTIGATING THE FORMATION OF HYDROGEN BONDING IN GAMMA-AMINOBUTYRIC ACID

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Gamma-Aminobutyric Acid, commonly referred to as GABA, serves as an inhibitory neurotransmitter in the central nervous system. Produced from glutamic acid, GABA is responsible for sending chemical messages from the brain to the nervous system, which helps to reduce anxiety and depression, in addition to stimulating sleep. GABA utilizes hydrogen bonding, allowing it to bind to $GABA_A$ and $GABA_B$ receptors. Here, Raman Spectroscopy is used to analyze the hydrogen bond network created by GABA and water. The spectrum of solid GABA was compared to solution state spectra in order to analyze the effects of hydrogen bonding on the vibrational normal modes. Moreover, solutions of GABA and water were acidified to a pH of 6 using HCl and analyzed to probe any potential changes in hydrogen bonding that arise from changing the pH. Theoretical calculations were run with the B3LYP hybrid functional and the 6-311++g(2df,2pd) basis set on a single GABA molecule in isolation. Calculations were also run on GABA with the addition of up to three water molecules to investigate possible hydrogen bonding sites. Additionally, the relative energies of each system were compared to determine which configuration possessed the lowest energy. Simulated Raman Spectra was compared to the experimental Raman spectra to analyze GABA's hydrogen bonding capabilities. This represents ongoing research with more theoretical calculations currently being run on the same method and basis set as previous calculations.

P3.65

POLYMERIC FILMS FOR INTERVAL DRUG DELIVERY: IMPACT OF POLYMER CHEMISTRY ON DRUG RELEASE PROFILE

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Long-term controlled drug release is valuable when administering multiple medications. Due to the pulsatile dosing of pills and low bioavailability of most drugs administered orally, ideal kinetics are rarely achieved through this route. Multilayered biodegradable implants can help solve these issues. Implants are much more consistent in the slow, controlled release of a drug into the body when compared to oral administration. The current standard for biodegradable implants is a copolymer of cellulose phthalate acetate and Pluronics F-127, known as CAPP. CAPP is restricted by the ability to modulate the degradation, and consequently the drug release. Block copolymers are a material that could be ideal for use in long term drug delivery due to the ability to manipulate the rate of release by altering chemical factors like the monomeric ratios so as to not be restricted by mechanical factors like size. Poly(lactic-co-glycolic acid) (PLGA) and Polycaprolactone (PCL) are the polymers currently being used in this application, in conjunction with Pluronics F-127 to increase the solubility in water. Thus far, the films have been developed and release profiles have been determined for CAPP, however, films of PCL and PLGA have not yet been tested with time release studies. This new method of long-term drug release could have significant impact in the field of psychiatry. In many cases compliance is an issue with psychiatric medications, and many psychiatric medications require consistent dosing to be effective.

P3.66

GUIDED INQUIRY LABS AND RESEARCH EXPERIENCE FOR UNDERGRADUATES USING VERNIER PROBEWARE AND TECHNOLOGY

Samuel Dasary, Sarah G Thompson, Tatyana McDonald

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Undergraduate laboratory curriculum must include hands-on experience with modern instrumentation. This allows two-year college students to be competitive at the four-year college or universities. VERNIER probeware and technology provides an excellent platform for collection, analysis and interpretation of experimental data. Further, these instruments are easy to handle and are cost-effective. Equipping our chemistry labs with Vernier probeware and technology has not only helped in initiating guided inquiry based lab curriculum but also laid a good platform to promote undergraduate research that is crucial for their success in STEM careers.

Guided inquiry lab curriculum is developed to facilitate hands-on training to freshman chemistry students in measuring parameters like pH, melting point, temperature, pressure. For upper level chemistry students, a guided inquiry to understand Absorbance and Fluorescence spectroscopy of fluorescent amino acids like tryptophan, tyrosine and phenylalanine is implemented. This guided approach covers a comprehensive training on the following aspects a) introduction to spectroscopy, b) instrument operation and training, c) sample preparation and data acquisition, d) data graphing/analysis and e) writing a lab report.

Vernier instruments are also used to conduct undergraduate research projects. As a test-run we are training undergraduate chemistry and pre-med majors on small research project to synthesize metal nanoparticles with fluorescent amino acids as reducing/stabilizing agents. Spectroscopic properties are tested using Vernier UV-Vis and fluorescence spectrophotometers. Preliminary results suggest that the material can serve as promising fluorescent sensor probes.

P3.67

VITAMIN D MEDIATES POPULATION-SPECIFIC SKIN BARRIER CALIBRATION

Azia Gnahore

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Human populations around the world exhibit genetic variations in their genomes that enable them to adapt to their environment. The epidermis at the surface of the skin provides the essential barrier against the harsh environment and protects against infection and inflammation. The epidermal cell, or keratinocyte, comprises the epidermis and regenerates or differentiates as a result of proliferation and maturation. During differentiation, keratinocytes form a cornified envelope (CE) that surrounds the cell. The CE is formed by transglutaminase-mediated cross linking of proteins such as involucrin and loricrin. Involucrin (*IVL*)is the major crossed linked protein in the CE. The Genotype-Tissue Expression Project (GTEx) predicts that population-specific variants in the *IVL* promoter, intron, and upstream enhancer are associated with differential *IVL* expression. Only some of these (variants in the promoter and intron) showed population-specific expression in transfection experiments. I wanted to test the environmental variable of sun exposure, which we believe to be proxy for vitamin D exposure. I first optimized vitamin D dosages by visual cues of differentiation and induction of gene expression. I then tested the effect of vitamin D treatment in differentiated keratinocytes on reporter gene expression using population-specific enhancer variant alleles from European, East Asian, and African populations.

P3.68

ELECTROCHEMICAL PREPARATION OF FLUORESCENT GRAPHENE QUANTUM DOTS

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The versatility of graphene nanomaterials with their ability to interact with near-infrared light, biocompatibility, and affinity for absorbing show great promise for use of these nanomaterials in targeted drug delivery and theranostic applications. In this work, graphene oxide nanoparticles and quantum dots were prepared by electrochemical exfoliation of graphite rods using three sulfate-based electrolyte solutions: sodium sulfate, sulfuric acid, and potassium sulfate and 9-volt batteries. The nanomaterials were characterized using dynamic light scattering, transmission electron microscopy, and UV-visible, FT-infrared, Raman, and fluorescence spectroscopy.

P3.69

CHEMICAL DOPING OF P3HT NANOWIRE NETWORKS

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In this study, we report the optical, morphological, and electronic property changes when exposing poly(3-hexylthiophene) (P3HT) nanowire networks to 2,3,5,6-tetrafluoro-7,7,8,8-tetracyanoquinodimethane (F4TCNQ) dopant particles. These changes were primarily observed by UV-Vis, Atomic Force Microscopy (AFM), and Kelvin Probe Force Microscopy (KPFM). First, the nanowire networks were prepared by using a 60 µg/ml P3HT solution dissolved in a binary solvent (anisole:chloroform). These were then spin-coated onto various substrates and characterized. What was noticed was that when moderately doping the nanowire networks (250 µg/mL F4TCNQ), their morphological characteristics are conserved, but their charge potential difference (CPD) differ due to the charge transport with the dopant molecules. When using a higher dopant concentration (1 mg/mL), the AFM images show small "dot-like" features, indicating a strong presence of dopant molecules. Here, we report that by moderately doping P3HT nanowire networks, an increase in conductivity by 4 orders of magnitude is prevalent. This shows that a more crystalline nanowire network is needed to achieve better doping effects.

P3.70

SORPTIVE REMOVAL OF SELENATES AND SELENITES USING DOUGLAS FIR BIOCHAR/METAL OXIDE/HYDROXIDE NANOCOMPOSITES

Melanie McMillan

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Selenium is present in soil in both Selenite (SeO32-) and Selenate (SeO42-) forms. Selenium is an essential element for metabolism regulation in animals and counteracting environmental stresses in plants. High concentrations (> 2ppm) of these compounds in water results in toxicity, as they can alter protein structure and inhibit their function. Biochar allows an inexpensive and relatively simple avenue for water purification and soil remediation via adsorption. Four different biochars; Raw biochar (BC), magnetite modified biochar (MBC), 3:1 Fe:Mg LDH (FMBC3) and 1:1 Fe:Mg LDH (FMBC1) were assed for sorptive removal of both Selenite and Selenite. Each biochar was equilibrated with aqueous solutions of Selenite or Selenate (at different pH, equilibrium time and concentration) and Se contents after sorption were analyzed using ELAN DRC II ICP-MS. Adsorbents and Se-laden adsorbents were characterized using PZC, BET, SEM, TEM, EDS, XRD and XPS. Preliminary data suggest that all four adsorbents are potential candidates for Se reclamation from water. The complete understanding of the Se sorption Chemistry allows industrialization of this process to use in large scale water treatment. Se-laden biochars can also be used in soil amendment for Se deficient soils.

P3.71

INTRODUCING MUTATIONS IN THE GB3 PROTEIN TO UNDERSTAND GOLD NANOPARTICLE INTERACTIONS (Confused as they had both poster and oral)

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Alcorn State University, Lorman, MS, Mississippi State University, Starkville, MS

Understanding protein-gold nanoparticle (AuNP) interactions, especially understanding the binding competition among multiple proteins in the same solution--the significant challenge. These interactions are vital when designing functionalized AuNPs, where nanoparticles are used as biological sensors and drug delivery vectors. In these applications, proteins in the biological environment can compete with the AuNP surface, interfering with the nanoparticle's intended function. Various techniques have been employed to study this behavior, yet the biophysics of protein-surface binding remains insufficiently understood. We hypothesize that, using the right model system, it is possible to develop a predictive model for an amino acid's contribution to AuNP binding. Therefore, the introduction of point mutations is being explored through polymerase chain reaction (PCR) based site-directed mutagenesis in the third IgG binding domain of Streptococcal protein G (GB3). Previous studies have suggested that GB3 is appropriate for mutagenesis because changing a particular residue, K13, can dramatically alter AuNP binding. Primers were designed, and PCR was performed to vary the residue at position 13. Agarose gel analysis was used to confirm PCR product formation, and after transformation into *E. coli,* the DNA sequence was determined to ensure successful mutagenesis. Using this

approach, we have successfully developed a library of K13 GB3 variants, namely K13H, K13Q, and K13S. We have also optimized the primer sequence, and this sequence is being used to generate additional variants. Future work will study the binding of K13X relative to K13G on AuNPs, and this will reveal a numerical trend for each residue's intrinsic binding affinity

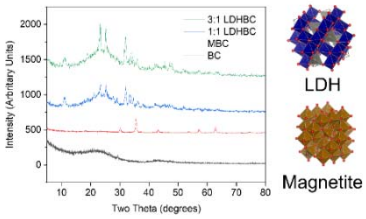


Figure: Powder XRD (PXRD) data

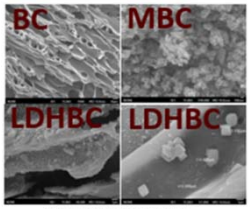


Figure: SEM micrographs

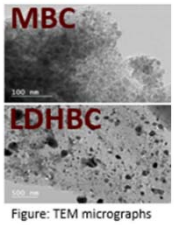


Figure: TEM micrographs

P3.72

ASYMMETRIC SYNTHESIS OF NITROGEN HETEROCYCLES BY ELECTROPHILIC CYCLIZATION REACTIONS

Sydney L. Boyd

University of Southern Mississippi, Hattiesburg. MS

Nitrogen containing heterocyclic compounds, which are bountiful in nature, are of great biochemical importance in the field of organic chemistry, particularly in pharmaceutical drug industry. Owing to this important socio-economic healthcare impact, the stereoselective synthesis of new heterocycles is vitally important. The purpose of this project is to synthesize heterocycles derived from acyclic homoallylic carbamates, thioureas and guanidines in order to difunctionalize the pendant alkene. Asymmetry is favorable in heterocyclic structures because enzymes are homochiral and single enantiomer prescription drugs are preferential. The thioureas used were synthesized in four chemical steps from commercially available benzaldehydes. The use of a stoichiometric chiral ammonia reagent (SCAR), namely the R-tert-butanesulfinamide or Ellman reagent, was utilized to create chiral imines. Indium mediated allylation of the imine afforded the homoallylic N-sulfinylamine in high yield and diastereoselectivity of greater than 20:1. Upon acid promoted deprotection of the N-sulfinyl group, the hydrochloride salts were isolated then further functionalized. For example, treatment with isothiocyanates such as phenyl isothiocyanate afforded the thiourea derivative. We hypothesized that the incipient C2 stereogenic carbon bearing the aromatic moiety would influence the nascent C4 stereocenter upon electrophile initiated cyclization. The cyclization process was initiated via halogenic electrophiles. All crude reaction mixtures were analyzed by carbon and proton nuclear magnetic resonance spectroscopy to determine diastereoselectivity. We rationalize the formation of C2-C4-trans stereochemistry based upon minimization of allylic strain in the reactive conformation of the six-membered chair like transition state. Overall, this method is useful for the creation of 1,3-aminoalcohols and 1,3-aminothiols.

P3.73

POLYANILINE MODIFIED BIOCHAR TO REMOVE NITRATE FROM AQUEOUS SYSTEMS

Claudia Reid

Mississippi State University, Mississippi State, MS

Helpful characteristics of biochar include the ability to increase soil fertility in dry environments and the ability to absorb and preserve nutrients in soil. Both aspects of use are available for low cost of production. The adoption of these uses of biochar have increased popularity of this product recently. Biochar has been proven to help improve the environment by decreasing the number of pollutants through its adsorptive properties. Douglas Fir biochar (DFBC) synthesized by fast pyrolysis method was modified with aniline to alter some of its properties. The modified biochar was then characterized by point of zero charge, BET surface area, thermogravimetric analysis and Scanning electron microscopy.

Nitrates can potentially have a negative effect on the environment when an excess amount is present. The significance of this experiment is to optimize the parameters for nitrate absorption by aniline modified biochar. The adsorption studies of nitrate were conducted using Liquid Chromatography with a UV detector at 210 nm for DFBC and PANI-BC. The kinetic studies were carried out at pH 6 with three different concentrations of nitrate. Batch sorption studies for nitrate were performed by varying the concentration of nitrate at three different temperatures ranging from 10- 45 ℃, and the data was fitted to different adsorption isotherm models for both types of biochar. PANI-BC exhibited a higher adsorption capacity for nitrate compared to the pristine DFBC.

Friday, February 21, 2020

MORNING

Room D6

8:50 Welcome

Session IV: 9:00 AM (Chair: Anna Maurer)

O3.6

9:00 INVESTIGATION OF ACID-CATALYZED N-SULFONYLIMINIUM ION CYCLIZATIONS

Dillon Cao, Matthew Donahue

University of Southern Mississippi, Hattiesburg, MS

Nitrogen heterocycles such as the six-membered piperidine are a major motif contributing to medicinal drugs. This research project has focused on two strategies to prepare multisubstituted piperidines using iminium ion triggered cyclization reactions. In the first vignette of this endeavor, vinylogous sulfonamides were employed as precursors to the desired N-sulfonyliminium ions. To that end, the action of ethyl propiolate upon N-tert-butanesulfonamides in the presence of inorganic bases such as cesium carbonate has been shown to produce both trans (major) and cis (minor) diastereomers when conducted in dicholoromethane. Other amine bases, such as DABCO or 4-methylmorpholine showed little to no conversion to the desired product. This is followed by an acid catalyzed aza-Prins cyclization during which an iminium ion is formed and initiates attack by the pendant unactivated alkene. This pathway differs in other cyclization pathways such as the more common Pictet-Spengler to access tetrahydroisoquinolines in that the Pictet-Spengler is limited to b-arylethylamines. In this second vignette, a series of homoveratrylamine sulfonamides was prepared by action with the requisite sulfonyl chlorides. The sulfonamides were then treated with

a series of aldehydes and metal triflates such as scandium in dichloromethane or acetonitrile to effect iminium ion formation followed by electrophilic aromatic substitution. Successful cyclization to a differentially substituted piperidines allows for the production of novel nitrogen heterocycle scaffolds from low-cost commercially available starting materials.

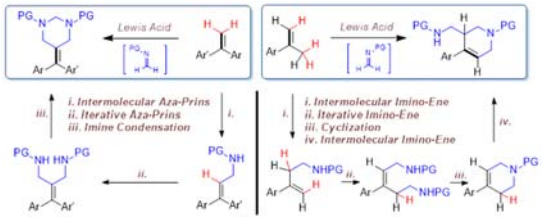
O3.17

9:15 FE(III)-CATALYZED AMIDOMETHYLATIVE TANDEM REACTIONS: SUBSTITUTION OF MULTIPLE C–H BONDS FOR BUILDING COMPLEXITY OF STYRENES

Xiaolin Qian

Mississippi State University, Mississippi State, MS

Catalytic amidomethylative tendam reaction has, for the first time, been proven to catalyze a wide range of alpha-phenyl styrenes and alpha-methyl styrenes with fomaldimine, affording amidomethyl-ative tendam derivatives. Using simple and environmentally benign catalyst $Fe(OTf)_3$, along with dito-sylaminal, this process disclosed a new catalytic intermolecular iterative aza-Prins reaction and inter-molecular iterative imino-ene reaction respectively as a key step. As a result, a general and practical synthesis of 4-methyl-N-((4-phenyl-1-tosyl-1,2,3,6-tetrahydropyridin-3-yl)-methyl) benzenesulfon-amide and 5-(diphenylmethylene)-1,3-ditosylhexahydropyrimidine derivatives from various of alpha-phenyl styrenes and alpha-methyl styrenes been established. Moreover, a gram-scale synthesis proved the economic viability of this method. Lastly, useful 1,3-diamine derivative and complex molecule 3,7-diazabicyclo[3.3.1]nonane were afforded just by one step from the amidomethylative tendam reaction products with mild to good yield.



O3.18

9:30 THE DEVELOPMENT OF A CHIRAL DERIVATIZING AGENT WITH A PENTAFLUOROPHENYL MOIETY

Emily B. Crull, Matthew G. Donahue

University of Southern Mississippi, Hattiesburg, MS

A pentafluorophenyl derived chiral derivatizing agent (CDA) that is chemoselective for amines bearing stereogenic carbons has been developed to differentiate between enantiomers through the formation of diastereomeric thioureas. Starting from commercially available pentafluorobenzaldehyde, the CDA was synthesized over four steps to give an enantiomerically pure benzylic isothiocyanate bearing an isopropyl reporter group. The perfluorinated benzene ring was chosen to eliminate ^1H NMR signals in the aromatic region from the CDA and to provide an electron-withdrawing environment to aid in the discrimination of enantiomers in ^1H and ^{19}F NMR. Unlike well-established CDAs such as Moser's ester, the signals that are being monitored shift shift in the CDA portion of the molecule and not the amine. Thus far, test substrates include both isomers of a-methylbenzylamine and both isomers of 3-aminopentanenitrile. 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 6 different levels of theory using Gaussian 09.

O3.19

9:45 SPECTROCOPY OF HETEROAROMATIC SALTS

[1]Wolfgang Kramer, [1]Courtney Mullins, [2]Ian Gould

[1]Millsaps College, Jackson, MS, [2]Arizona State University, Tempe, AZ

N-alkoxy substituted heteroaromatic compounds based on pyridine, quinoline, isoquinoline and phenanthridine allow the photochemical generation of transient species that can be used to damage biomolecules and induce controlled cell death. The transient species, heteroaromatic radical cations and a methoxy radical are produced with a quantum yield of about 0.55 as determined by trapping experiments. Laser flash photolysis was used to analyze the photophysical properties of the bifunctional compounds. Interestingly, the 1,8-naphthalimide radical cation was formed and confirmed.

The N-methoxy substituted heterocycles produce a radical cation and a methoxy radical, each of which can initiate DNA cleavage. By comparison with restriction endonuclease, cleaving assays indicates that both transient species might be involved in the cleaving process. DNA double strand cleavage is desired for efficient cleavage. The bifunctional compounds presented in this project have the ability to induce DNA damage by two different mechanisms, thus showing potential for double strand cleavage.

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

O3.20

10:00 A "PHOTOSWITCHING" AUXILARY FOR REMOTE ARENE C-H BOND FUNCTIONALIZATION

Stefan M Cooper, Jr.

Alcorn State University, Lorman, MS

Synthetic organic chemistry has substantial importance for many conveniences of contemporary living. Innovations are improving environmental sustainability in chemical work, aiding the creation of novel materials for technological advances, and giving newer synthetic methods for preparation of biological active molecules with improved or diminished side effects. Herein we disclose a contribution in arene C-H bond functionalization. C-H bond functionalization is a powerful technique that has afforded unrivaled opportunities for hydrocarbon manipulation. Our contribution lies with addressing C-H bond selectivity for functionalization. The near orthogonal positioned, "T-shape", excited conformer of azohetereoarenes has provided a strategy to functionalize remote C-H bonds by the shorten intramolecular distance garnered from the excited "T-Shaped" conformer. Additionally, azoheteroarene molecular photoswitches are tunable for excitation at different wavelengths and gives way to match activation of a C-H bond to a specific wavelength. This combination of unique conformation and wavelength modulation is exploited for an envisioned "photoswitching" auxiliary for C-H functionalization.

10:15 Break

Session V (Room D6 and Session VI (Room D7) Concurrent

Session V: 10:30 AM Room (Chair: Xiaolin Qian)

O3.21

10:30 SYNTHESIS OF PYRIDINE-BASED HIV INTEGRASE INHIBITORS

[1]Sharon Suffern, [2]Jacques Kessl, [2]Julie Pigza, [2]Matt Donahue, [1]Wolfgang Kramer

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

The Kessl lab at USM has developed an assay for the determination of the effectiveness of potential HIV integrase inhibitors. HIV integrase is an important enzyme in the life cycle of the AIDS virus, it incorporates the viral DNA into the host cell genome. HIV integrase, reverse transcriptase and protease are three prominent targets in HIV drug development as they are unique to the virus.

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

O3.22

10:45 INVESTIGATION OF PARINARI CURATELLIFOLIA, RAUWOLFIA VOMITORIA AND ALLIUM CEPA AS POTENTIAL SOURCE OF RHO-ASSOCIATED PROTEIN KINASE 2 INHIBITORS

Olamide Crown, Ifedayo Victor Ogungbe

Jackson State University, Jackson, MS

Rho-associated protein kinase (ROCK) is a serine-threonine kinase that is involved in regulating the shape and movement of cells. Rho-associated protein kinase 2 (ROCK 2) is one of the two isoforms of ROCK and previous studies have shown that ROCK 2 levels are upregulated in diseases such as cancer, cardiovascular disease, hypertension, and asthma. Efforts to discover and develop selective ROCK 2 inhibitors for clinical use has not been successful due to toxicity and non-specificity. The aim of this study is to investigate if constituents of *Parinari curatellifolia, Rauwolfia vomitoria and Allium cepa***,** plants used ethnomedicinally in the management of cardiovascular diseases, can inhibit ROCK 2. The plant materials were extracted with methanol and fractionated with *n*-hexane, dichloromethane, ethylacetate, acetone and methanol. Fractions from each plant were separated with preparative TLC, and the sub-fractions were screened at 10 µM against ROCK 2 along with known ROCK inhibitors (Y-27632 and KD025) using the ADP-GLO assay. Many of the fractions and sub-fractions showed significant inhibition (> 60%) of ROCK 2. Fractions that had ≥80% activity were selected for further purification and screening. The constituent(s) of the active sub-fractions will be isolated, purified and subjected to dereplication and structural elucidation.

O3.23

11:00 KINETIC ACTIVITY AND SELECTIVE POINT MUTATION OF AN ATP-DEPENDENT HEXOKINASE WITH BROAD SUBSTRATE SPECIFICITY FROM THE HYPERTHERMOPHILIC ARCHAEON SULFOLOBUS TOKODAII

Anna Maurer

Delta State University, Cleveland, MS

The novel ATP-dependent hexokinase (StHK) from the hyperthermophilic archaeon *Sulfolobus tokodaii* shows unique substrate promiscuity, being able to phosphorylate glucose, glucosamine, mannose and N-acetylglucosamine, all with rare efficiency and selectivity. Through protein point-mutation, we seek to determine if this broad substrate specificity can be further applied to disaccharides, beginning with determining the residues responsible for S. *tokodaii's* unique conformational flexibility and activity. Using genetic transformation into E.coli, and protein X-Ray crystallography, we distinguished the crystal structure of *S. tokodaii* in its wild-type and selectively mutated forms. Facilitating these point-mutations is computational analysis performed using SCHEMA recombination and RASPP software. The activity of mutated proteins with viable secondary and tertiary structures are compared using a coupled pyruvate kinase lactate dehydrogenase assay. Future work with this unique hexokinase could result in a new class of industrial promiscuous enzymes better suited to maintain their selectivity for a primary target while enhancing their activity with an additional substrate for multi-modal reactions.

O3.24

11:15 INVESTIGATING A POTENTIAL CHEMOTHERAPY- AND RADIATION- SENSITIZING MOLECULE

Bismark Amoh

Alcorn State University, Lorman, MS

Resistance of tumor cells to chemoradiation therapy is a major clinical problem confounding chemoradiation-based standard of care therapy in cancer. This problem is particularly notable in many solid tumor malignancies where cancer cells are only partially responsive to chemoradiation therapy. Failure of cancer cells to completely respond to chemoradiation therapy is the basis for increased resistance of solid tumor malignancies to overall anti-cancer treatment regimen. Currently, there are substantial number of cancer survivors who suffer from chemoradiation-induced tissue toxicities. Collectively, the resistance of many solid tumors to chemoradiation therapy has detrimental effects on posttreatment quality of life in patients across the field of oncology. Compound 281 is a novel small molecule with both anti-inflammatory and antibacterial activities. However, there is no data on direct antitumor or chemotherapy/radiation sensitizing effects of the compound. For my project, I used cancer cell colony formation (Clonogenic) assays to test the anticancer/chemosensitizing effect of the compound. In this *in vitro* assay, two different tumor cell lines, wildtype and chemoresistant, were plated in cell culture plates, treated with various combinations of chemotherapy and the compound for 24 hours. The cells were then incubated for two weeks at 37oC/5%CO2. Subsequently, the cells were stained with crystal violet and the number of colonies were counted for comparison between Compound 281 treated and control groups.

O3.25

11:30 COVALENT INHIBITORS OF RHODESAIN AS ANTITRYPANOSOMAL AGENTS

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

Jackson State University, Jackson, MS

Human African trypanosomiasis (HAT), caused by *Trypanosoma brucei*, a kinetoplastid protozoan parasite, endemic to sub-Saharan Africa (especially in central Africa) is serious life-threating disease. Current medicines for the disease are generally toxic, and in some

cases, difficult to administer and ineffective. In this work, a series of vinyl sulfone-based inhibitors of the major trypanosomal cathepsin L-like cysteine protease were investigated as potential growth inhibitors of *Trypanosoma brucei in vitro and in vivo* as well as candidates for preclinical investigations. We found that both tetrahydroquinoline- and quinoline-based vinyl sulfones have moderate but selective inhibitory activity on *T. brucei*, and the compounds displayed potent inhibition of rhodesain. The most potent compounds are metabolically stable and have high aqueous solubility. The compounds have the potential to become lead compounds for preclinical investigation against HAT.

Session VI: 10:30 AM Room D7 (Chair: Emily B. Crul)

O3.26

10:30 SYNTHESIS AND CHARACTERIZATION OF THERMALLY STABLE POLY(ESTER AMIDE)S FROM SUSTAINABLE FEEDSTOCK

Eric Munyaneza, Bruno Donnadieu, Colleen Scott

Mississippi State University, Mississippi State, MS

Lignin-derived precursors were used in the synthesis of bio-based high-performance polymers. The project consisted of synthesizing a series of poly(ester amide)s (PEAs) from lignin building blocks and natural amino acids. In particular, the amino acid moieties were incorporated into the PEAs' architecture to explore the effect of the side-chain size on the thermal properties and the crystallinity of resulting materials. The polymers, which were prepared by melt polycondensation, all possessed high thermal stability in nitrogen and air with the onsets of thermal degradation (T_d onset) exceeding 330 °C and glass transition temperatures (T_g) ranging from 136 °C – 238 °C. It is worthwhile noting that the T_g greatly depended on the size of the pendant R-group on the amino acids. Remarkably, this thermal stability was maintained even after subjecting the polymers to various pH media (pH 1, 4 and 8) for 1 week at 50 °C. Furthermore, WAXS experiments revealed semi-crystalline polymers with identical diffraction patterns and percent crystallinity ranging from 21% – 37%. Moreover, the meso polymer of DL-alanine was prepared and compared to the chiral version to assess the impact of chirality on the thermal properties. Interestingly, there was no significant difference in their thermal properties. However, there was a slight drop in the T_d onset and T_g of the DL-alanine-containing polymer relative to the L-alanine counterpart, signifying moderate thermal stability resulting from the chiral group. Overall, these characteristics make our bio-based PEAs potential candidates for further investigation as alternatives to petrochemical-derived thermoplastics for high-performance materials.

O3.27

10:45 CATIONIC, ANIONIC AND NEUTRAL FUNCTIONALIZED POLYAMIDOAMINE (PAMAM) - FATTY ACID AMPHIPHILIC JANUS DENDRIMERS FOR THERAPEUTIC APPLICATIONS

Mahesh Loku Yaddehige, Davita L. Watkins

University of Mississippi, University, MS

Amphiphilic Janus dendrimers have gained immense attention for their unique structure and properties relative to conventional symmetric polymeric systems. These dendrimers are capable of forming bioinspired nanoaggregates such as vesicles and micelles which can be highly beneficial in biomedical applications. By altering the properties of each dendritic block, these polymers can be modified for use as multifunctional delivery systems relevant for theranostics. Herein we report the synthesis and characterization of a library of self-assembling Janus dendrimers and their resulting nanostructure possessing NH_3^+, COO^-, and OH surfaces. Comprised of a polyamidoamine (PAMAM) dendron as the hydrophilic portion and fatty acid functionalized dendrons as the hydrophobic portion, structural modifications of the dendrimer terminus led to enhanced biocompatibility. Microscopy (TEM) and light scattering (DLS) analysis indicate the size (i.e., diameters) of spherical nanoparticles ranging from 40 to 100 nm with zeta-potential values ranging from -17.9 to +58.7 mV with respect to the terminal functional group. Further, these systems exhibited vesicle and micelle morphologies with critical aggregate concentrations (CAC) ranging from 2.81 to 15.81 mg/L. The results of this study provide strong evidence for the potential of these polymeric systems to be used as biocompatible carriers in nanomedicine.

O3.28

11:00 PAMAM DERIVATIVES FOR LOW-TOXICITY POLYMERIC BIOMATERIALS

Briana Simms

University of Mississippi, University MS

Advances in the structural design of polymeric materials has provided improved solubility, specificity, and sustainability of therapeutic agents as they are delivered to the body. Materials such as globular polymers, di- and tri- block copolymers, and network polymers have been used in drug delivery applications for many years. Polyamido amine (PAMAM) is a branched polymer that is often incorporated into the structure of these polymeric systems due to the many benefits of the dendritic structure such as well-defined molecular structure, high surface area to volume ratio, and encapsulating capabilities. However, due to the terminal amine functional groups on the periphery of PAMAM, *in vivo* there is a high cationic charge density that can ultimately lead to cellular membrane disruption and/or hemolysis. In this work, we explore several strategies to decrease/minimize the toxicity associated with PAMAM dendrimers. These PAMAM derivatives are then integrated into other polymeric structures to yield materials such as Janus-type linear dendritic block copolymers (LDBCs), amphiphilic star dendrimers, and hydrogels for applications in drug delivery. The structural modifications made to the PAMAM portion of these polymeric materials allows for the fine-tuning of the surface charge of the nanocarrier; ultimately decreasing the relative cytotoxicity. The materials synthesized with the PAMAM derivatives were characterized via spectroscopic techniques, microscopy, and light scattering techniques. The results of these studies will provide a general framework on how to fine-tune the surface charge of other biomaterials that utilize PAMAM dendrimers in their structural design.

O3.29

11:15 LIGNIN-BASED RANDOM COPOLYESTERS

Guery Saenz, Colleen Scott

Mississippi State University, Mississippi State, MS

Petrochemical-derived monomers are used to produce mostly commodity plastics. However, the unsustainability of petroleum resources, as well as the environmental pollution of plastics products have attracted strong interest not only academic, but also industry. Consequently, there is a strong interest to obtain these polymers from bio-based resources. For example, a variety of building precursors can be obtained from lignin, which is the second most abundant naturally occurring organic polymer. Utilizing these precursors, we synthesized various bio-based random copolyesters as alternative petroleum based thermoplastics. The starting materials for these polymers were lignin-derived monoaromatic compounds such as methyl vanillate, vanillic acid and methyl paraben; 1,4-butanodiol

and succinic acid. In general, the thermal properties of these copolyesters showed a broad glass transition temperatures (T_g) range between 20–110 °C, and the decomposition temperature (T_d) in the range of 300–450°C. Furthermore, these polymers were susceptible to degradation under acidic conditions, a property highly desired in degradable polymers. These promising copolymers are potential replacement for commodities plastics for applications in packaging, storage, and coating applications.

O3.30

11:30 NOVEL HETEROSTRUCTURE MATERIALS FOR COMBATING SUPERBUGS

Avijit Pramanik, Kaelin Gates, Ye Gao, Salma Begum, Shamily Patibandla, Dalephine Davis, Paresh Chandra Ray

Jackson State University, Jackson, MS

Development of a novel heterostructure materials has attracted substantial attention in clinical research due to its unprecedented electronic and optical properties, compared to the individual materials, for the advancement of next generation nanodevices. These promising new heterostructure materials also exhibit a high degree of anisotropy, chemical functionality, a unique hollow structure, high surface-to-volume ratios, strong adsorption ability, good biocompatibility, low toxicity, which allow for various biomedical applications including drug-delivery, bio separation, diagnosis and treatment of diseases.

According to the U.S. Centers for Disease Control and Prevention (CDC), more than two million Americans get an antibiotic-resistant infection and at least 23,000 people die. To overcome these issues, we have developed several novel heterostructure materials by combining graphene oxide with gold nanoparticles or MoS_2/ WS_2 based multimodal architectures for useful biomedical applications. In this study, we have used different types of antimicrobial peptides to enhance killing efficacy by preferential interactions with superbugs. A detailed mechanism, susceptibility tests, label-free detection, separation, and eradication of superbugs has been discussed.

O3.31

11:45 PHENOXAZINE POLYMERS FOR BIOSENSOR APPLICATIONS

Mohammed Noifa Almtiri

Mississippi State University, Mississippi State, MS

Phenoxazine is a conjugated fused heterocyclic compound commonly found in dyes, naturally-occurring antibiotics, and anti-cancer agents. It has excellent photophysical and electrochemical properties as well as high charge carrier mobilities, which make it an attractive material for solution processable thin-film transistors, and biosensor. This study aims to mimic the classically stable conducting polymer, polyaniline (PANI), which has been explored for a variety of sensing, optical and electrochemical applications due to its air stability and excellent optoelectrical properties. Unfortunately, PANI is not processable nor redox stable. Herein we discuss our efforts to develop a redox stable and processable polymer mimicking PANI. Our phenoxazine-based polymer was synthesized by 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 the polymer's optoelectrical properties and redox stability. The electrochemical measurement, such as cyclic voltammetry, shows high electrochemical stability and reversibility of emeraldine salt, which is the doped form of polyphenoxazine. Finally, we present the comparison of electrochemical properties and morphology of polyphenoxazine doped film using a variety of dopants such as polystyrene sulfonic acid (PSS), trifluoroacetic acid (TFA), and camphorsulfonic acid (CSA).

12:00 Business Meeting, Award Ceremony and Group Photos

Student awards are sponsored by: American Chemical Society, MS Chapter; Ergon Refining, Inc.; Department of Chemistry, Physics and Atmospheric Sciences, Jackson State University; and Department of Chemistry, Mississippi State University

ECOLOGY AND EVOLUTIONARY BIOLOGY

Chair: AHM Ali Reza

Delta State University

Vice-Chair: Nina Baghai Riding

Delta State University

Thursday, February 20, 2020

MORNING

Room D3

8:00 WELCOME

SYMPOSIA ON CONSERVATION THROUGH SCIENCE AND EDUCAITON

***Organizers*: Dr. AHM Ali Reza and Dr. Nina Baghai-Riding**

Delta State University

THE ROLE OF CONSERVATION PLANNING IN HABITAT AND SPECIES PROTECTION

Tom Mohrman, Director Director of the Mississippi Marine Program The Nature Conservancy (TNC)

INFORMAL SCIENCE EDUCATION AND GUIDED EDUCATIONAL TOURISM IN BANGLADESH'

***Joseph M. Lane**, Ph.D, Assistant Professor of Geography and Sustainable Development and Assistant Director of the Center for Interdisciplinary Geospatial Information Technologies at Delta State University*

8:45 Break

O4.01

9:00 EVALUATION OF SPATIAL PATTERNS AND TEMPORAL DYNAMICS OF MISSISSIPPI'S COASTAL WETLAND LAND USE/ LAND COVER USING REMOTE SENSING

Ranjani Kulawardhana

Jackson State University, Jackson, MS

Coastal wetland ecosystems serve many important ecosystem products and services. However, their spatial extents are decreasing worldwide at alarming rates and are attributed largely to LULC conversions resulting from natural and human-induced disturbances. Thus, quantitative assessments on the loss of wetland land extent and the evaluation of the causes of LULC change (LULCC) is of significant importance. Remote sensing data and techniques provide effective means for mapping and characterizing LULCC that are applicable even at larger spatial scales. This study was carried out to map and assess Mississippi's coastal wetland LULCCs using remote sensing. Specific objectives were to: 1) develop remote sensing-based LULC classification scheme applicable at local to regional scale for

monitoring and assessment of wetland LULC change; 2) evaluate the applicability of medium resolution remote sensing data (Landsat) to map and characterize wetland land use/ land cover (LULC); and 3) map and quantify wetland LULCC using multi-temporal RS data. This study focused on the coastal wetlands and adjacent landscapes of GB NERR of Mississippi, USA. LULC maps were derived using medium and very high-resolution RS data and were evaluated for their accuracies. Our findings indicate LULC mapping accuracies of medium resolution RS data as comparable to that of very high-resolution RS data and thus suggest RS based LULC classification using Landsat data as a promising approach for quantification of wetland LULC change.

O4.02

9:15 AVAILABILITY AND ASSESSMENT OF MICROPLASTIC INGESTION BY MARSH BIRDS IN MISSISSIPPI GULF COAST TIDAL MARSHES

Spencer L. Weitzel, Jared M. Feura, Mark S. Woodrey

Coastal Research and Extension Center, Mississippi State University, Biloxi, MS

Research on the fate and uptake of plastic pollutants in tidal marsh ecosystems is sparse. In an attempt to quantify microplastic prevalence in tidal marsh ecosystems along the coast of Mississippi, we sampled marsh sediments and resident tidal marsh bird stomach contents within three marsh complexes along the Mississippi Coast. To investigate the availability of microplastic pollutants in the marsh habitat, we collected marsh sediment samples at 12 sampling locations within the marsh complexes. To investigate possible microplastic ingestion by resident tidal marsh birds, we captured Clapper Rails (*Rallus crepitans*) and Seaside Sparrows (*Ammodramus maritimus*) near each sampling location and performed non-lethal stomach flushing to obtain a sample of their stomach contents. We used generalized linear models to assess differences in microplastic counts in sediment and bird stomach samples among species, marsh complex, the distance from the Gulf of Mexico, and combinations of these variables. We detected microplastics in 56% of marsh sediment samples, 66% of Clapper Rail, and 42% of Seaside Sparrow stomach samples. The dominant types of microplastics detected in sediment and bird samples were fibers. Model selection showed random and highly variable microplastic concentrations in the tidal marsh sediments within and between marsh complexes. The top models for microplastic counts in marsh bird stomach samples included species and the concentration of microplastics in the nearby sediments. This study provides the first evidence of microplastic ingestion by resident tidal marsh birds, and the first study of microplastic prevalence and distribution within tidal marshes along the Mississippi coast.

O4.03

9:30 MODELING CATFISH DISTRIBUTION WITHIN TWO RIVER DRAINAGES IN MISSISSIPPI

Yongqin Zhang and Chazz Coleman

Delta State University, Cleveland, MS

Species Distribution Models have become valuable tools in the world of conservation biology. Using species distribution modeling, researchers can examine the relationships between environmental variables and plant or animal occurrences. Properly built models can lead to range expansions, find areas important to a species survival, and suggest areas for reintroduction of extirpated species. A small species of catfish, the frecklebelly madtom, is located within two river drainages in MS. The Mississippi Department of Wildlife, Fisheries, and Parks is tasked with the protection of the frecklebelly madtom in order to keep its populations steady and prevent it from being extirpated from the state. We used geospatial datasets as input to a machine-learning model Maxent, which has demonstrated reliability in accurately predicting species presence, to simulate the spatial distribution of frecklebelly madtoms. Maxent models were run in order to determine areas with high probability of yielding frecklebelly madtoms. The model results are intended to inform researchers of potential sampling sites for locating and monitoring populations of the frecklebelly madtom.

O4.04

9:45 DIVERSITY AT HIGH-SPEED: REVEALING UNSEEN VARIATION IN AVIAN COURTSHIP DISPLAYS

[1]Lainy B. Day, [2]Willow R. Lindsay, [1]Alicia Hobbs, [1]Luat Nguyen, [3]W. Alice Boyle, [4]Lilian T. Manica

[1]Biology Department, University of Mississippi, Oxford, MS, USA, [2]Department of Biological and Environmental Sciences, Göteborg University, Göteborg, Sweden, Division of Biology, Kansas State University, Manhattan, KS, USA, and Behavioral Ecology and Ornithology Lab, Departamento de Zoologia, Universidade Federal do Paraná, Curitiba, PR, Brazil

Manakin males (Aves: Pipridae) perform physically elaborate courtship displays that vary in the number of display elements across species. Ethograms have given common labels to many display elements across species and it has been assumed that elements, like "butterfly flights" are performed in a similar manner. However, using high-speed videography (Phantom Camera Control Software, Wayne, New Jersey) and audio synchronization we have found distinct differences in the way movements are produced. For example, we found differences in posture and foot movements during "moon-walk" displays in two congeneric species. We believe these differences are related to the relationship between body weight and display perch resonant frequencies that require different kinematics to adjust for perch vibration. We are unaware of other studies showing that animal mass/substrate relationships alter courtship display kinematics. Additionally, we have discovered biomechanical commonalities among species that were previously undescribed in manakins. Several species appear to use their alula, the avian thumb homolog, to steer during particular display flights. The use of high-speed video has also revealed that species thought to have no aerial displays, are magicians of the air, performing acrobatics that no human can detect without playback at 1000 fps. Our results highlight a type of biodiversity we typically do not consider because we cannot see it and shows that uncovering this biodiversity enhances understudied areas of biomechanics and motor sequence evolution.

O4.05

10:00 MAMMALIAN SPECIES DIVERSITY AT THE CENTER FOR SCIENCE AND ENVIRONMENTAL EDUCATION CAMPUS IN MERIGOLD, MS

Michael Zarske, Eric Blackwell, AHM Ali Reza

Delta State University, Cleveland, MS

We conducted a survey to record the mammalian species diversity at the Center for Science and Environmental Education (CSEE) which is owned by Delta State University. The habitat of CSEE is mostly composed of small shrub habitat in the heart of Mississippi Delta about one-half mile south of Merigold, MS. CSEE facilities include six ponds, a greenhouse, and a office/lab building are located on a 10-acre parcel which is covered with grown up trees and shrub land. We used three motion activated Bushnell game cameras and placed them in CSEE campus covering the major habitat types. The sites were selected based on the merit of the area and the available habitat types: i) Site-1 over looked an edge transition between an open grass field and high herbaceous shrubs; ii) Site-2 looks over two ponds that are the only water source in the area; and iii) Site-3 is in the corridor through the herbaceous shrubs formed by an abandoned concrete slab. The project was initiated in early Spring of 2019 and data collection is still in progress. By October 31, a total of eight mammalian species were detected by the game cameras from CSEE. Our results show, Site-1 supports the highest number of mammalian species with a total of 8 species photographed: Coyote (*Canis latrans*), White-tailed Deer (*Odocoileus virginianus*), Bobcat (*Lynx rufus*), Raccon (*Procyon*

lotor), Opossum (*Didelphis virginiana*), Eastern Fox Squirrel (*Sciurus niger*), and Stripped Skunk (*Mephitis mephitis*). Site-2 recorded four mammalian speceis whereas Site-3 recorded only one species.

10:15 Break

O4.06

10:30 A STUDY ON THE AVIAN SPECIES DIVERSITY IN THREE DIFFERENT HABITAT TYPES IN MISSISSIPPI RIVER DELTA

Michael Zarske and AHM Ali Reza

Delta State University, Cleveland, MS

We examined the alpha, beta and gamma diversity of avian species in 3 different habitat types in the Mississippi delta. Three sites were selected, all in Boliver County in Mississippi and study was conducted as a part of BIO 459: Conservation Biology in Spring 2019. The selected sites were different from each other and had 3 different habitat types: a) Delta State University campus is a semi-urban habitat with plenty of trees and buildings; b) Bear Pen Park is a city park in Cleveland with numerous trees, pond, soccer field and walking trail; c) Dahomey National Wildlife Refuge is a bottomland hardwood forest located 10 miles west of Cleveland. We followed Whittaker's description of 3 terms for measuring biodiversity over spatial scales: alpha, beta, and gamma diversity. Alpha diversity refers to the diversity within an area and is usually expressed by the number of species in that ecosystem. If we examine the change in species diversity between these ecosystems, then we are measuring the beta diversity. Gamma diversity is a measure of the overall diversity for the different ecosystems within a region. Our results revealed that the Bear Pen Park had the highest alpha diversity at 9 species followed by Dahomey at 8, and DSU at 7 species. The beta diversity for Delta State vs Bear Pen is 8 species. The beta diversity for Bear Pen vs Dahomey is 9 species, and Dahomey vs Delta State is 9 species. The gamma diversity for all three study sites is 15 species.

O4.07

10:45 NO SEX DIFFERENCES IN SPATIAL MEMORY ABILITY OR RESPONSE TO AROMATASE INHIBITION AFTER CEREBELLAR LESION IN ZEBRA FINCHES

Chyna-Rae Dearman

University of Mississippi, Oxford, MS

Estradiol-17β (E2) is produced in the brain from testosterone by the enzyme, aromatase. E2 is a neuroprotective agent capable of reducing apoptosis, neuronal degeneration, and inflammation. After brain injury, aromatase mRNA is upregulated, suggesting a role for E2 in neural recovery. The zebra finch cerebellum is an excellent model for this process since it is plastic and steroidogenic. Previously, we found that lesioned zebra finches with inhibited aromatase were impaired on a spatial memory task. However, only male birds were tested. While E2 levels are similar between sexes, females produce more aromatase after injury than males. Therefore, we expected males to be more negatively affected by aromatase inhibition. In addition, sex differences in avian spatial memory remain unclear. Therefore, we lesioned the cerebellum of adult male and female zebra finches and evaluated their performance on a novel spatial memory task analogous to the Morris water maze. Birds received one of three treatments: sham lesion, lesion with vehicle, or lesion with aromatase inhibitor. We found no sex difference in response to aromatase inhibition following cerebellar lesions. Birds with lesions and aromatase inhibition performed significantly worse on the task than birds with sham lesions. There was no overall sex difference in spatial memory. These results suggest that females show greater amounts of aromatase upregulation as a compensation for lower testosterone. Future work will examine the effects of age on this neuroprotective process.

O4.08

11:00 THE IMPACT OF HABITAT FRAGMENTATION ON THE INFRA-COMMUNITIES OF Fundulus jenkinsi

McKenzi Turpin

University of Southern Mississippi, Hattiesburg, MS

Habitat fragmentation is the disruption of an organism's preferred habitat that causes a decline in population biodiversity and ecosystem decay. In particular, the Saltwater Topminnow, *Fundulus jenkinsi,* is an IUCN vulnerable species that has been relatively affected by habitat fragmentation. To better understand the impact of habitat fragmentation on biodiversity in coastal Mississippi, I examined the metazoan parasitic communities that use *F. jenkinsi* to determine if the parasite community varies in areas with low fragmentation to areas with high fragmentation. Parasites have different lifecycles that are either indirect, which require multiple hosts in its lifecycle, or direct that only require *F. jenkinsi* as its host. I hypothesized that areas experiencing greater habitat disruption will result in a less diverse parasite community. I will examine museum from different times and areas that have experienced different amounts of habitat fragmentation. Once the hosts' data is properly gathered, I will examine them for metazoan parasites that live in and on them. My preliminary examination of a congener of *F. jenkinsi,* the Gulf Killifish, *Fundulus grandis*, yielded five parasite taxa with indirect lifecycles and one taxa with a direct lifecycle. These data provided insight on the different parasite taxa that inhabit the same geographical location as *F. jenkinsi*. My study could play a role in providing a better understanding of how habitat fragmentation can influence the food-web dynamics of coastal marshes and provide direct insight for the conservation of *F. jenkinsi.*

O4.09

THE EFFICACY OF MARSH TERRACES FOR ENHANCING AND RESTORING GULF COASTAL WETLANDS

[1]Madelyn McFarland, [1]M. Armandei, [2]M. Brasher, [1]B. Davis, J. French, [1]A. Linhoss, R. Moorhead, [1]R. Morillo, [1]A. Skarke, [1]F. Vizcarra, [1]M. Woodrey

[1]Mississippi State University, Mississippi State, MS and [2]Ducks Unlimited

Marsh terracing is a restoration technique that uses in situ sediment to construct segmented ridges in open water areas of coastal wetlands. Marsh terraces are constructed primarily to: 1) reduce wave fetch and energy; 2) mitigate for marsh erosion; 3) promote growth of submerged aquatic vegetation; 4) create emergent marsh, and; 5) provide habitat for wildlife. Over 81 projects that have constructed >980 km linear feet of terrace in coastal Texas and Louisiana have occurred since 1990. Despite terraces being a potentially viable coastal restoration technique, long-term efficacy of terraces has not been studied. Our project is comprised of a multi-disciplinary team that is using modeling, and field and remote sensing techniques to study winds, waves, sediment transport, shoreline change, submerged aquatic vegetation, and avian species habitat use across multiple marsh terrace sites in coastal Louisiana. Preliminary results for these variables include: 1) for 20 terraces constructed between 2003-2017, 55% show more cumulative deposition than erosion, and terraces with adjacent channels, that may provide external sediment supply, show more deposition than do terraces within fully enclosed lakes; 2) cold front events generated most of the erosion events observed in marsh terrace sites; 3) terraced fields were used predominantly by non-focal species, and there was low use by focal species; 4) there was generally low use of both terraced and control (unterraced) sites by wintering waterfowl, although species abundances varied spatially and temporally. Our field and other monitoring efforts are ongoing and we will update these preliminary results.

11:30 Business Meeting

12:00 General Session

Thursday, February 20, 2020
AFTERNOON
Poster Area

DIVISIONAL POSTER SESSION
1:30-2:15
Posters will be judged in the division and will also be presented in the General Poster Session

Thursday, February 20, 2020
EVENING
3:30 Dodgen Lecture and Awards Ceremony
General Poster Session
Immediately Following Dodgen Lecture

P4.01

A CHANGING WORLD: POPULATION RESPONSES TO FALSE ENVIRONMENTAL SIGNALS

Jennifer Sublett

Mississippi State University, Mississippi State, MS

The use of environmental cues enable species to identify resources that will help (or hinder) their survival. It is an advantage for populations to distribute themselves according to resource quality. Our research examines the ways this behavior could fail to result in an ideal free distribution due to environmental change. If the signals given off by resources become misleading, how do populations react? We observed whether our experimental populations adapted to false environmental signaling or failed to maintain true fitness over generations. Using common fruit flies (*Drosophila melanogaster)* in a laboratory setting, we created model habitats to allow individual choice across gradients of perceived and actual resource quality. Actual quality of resources was represented via low and high proportions of sugar/carbohydrate/yeast in diets, while perceived quality was manipulated through the use of attractants and repellents. We collected data on the use of these 24 resource treatments over 8 generations of fruit flies, recording both the fecundity of fly larvae deposited on each resource and the behavior of the flies (using egg counts and image-analysis technology). This is a replication-extension experiment designed to clarify the results obtained from previous student Isabella Durham in her presentation "Adaptations to dishonest environmental signals: insights from an experimental microcosm". Our analysis will provide more insight into how the fitness of wild populations could react to a changing climate and world.

P4.02

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

Mason Nichols, Eric Blackwell, Nina Baghai Riding

Delta State University, Cleveland, MS

Vernal pools occur from December to early April at Dahomey National Wildlife Refuge (DNWR) in Bolivar County, Mississippi. These temporary wetlands occur on the bottomland, hardwood forest floor resulting from heavy winter rains. Most are less than an acre in size and are underlain by impervious clay. Vernal pools are important stopover sites for migrating birds as well as breeding habitats for macroinvertebrates and amphibian species. Over the past 13 years (2006-2019), during late February – late March, Dr. Baghai-Riding's Material and Methods of Environmental Science (BIO 415) class has conducted water quality tests on vernal pools at DNWR. Each year, five-to-six passive leaf trap samples, filled with leaf litter from deciduous trees that exist in the forested region, are placed in the deepest parts of vernal pools for three-to-four weeks. Time, date, geographic position, weather conditions, pool depth and pH, turbidity, iron, nitrate and phosphate values were recorded at each leaf trap location. Following collection of the traps, the number of aquatic invertebrates and species diversity are assessed. Although leaf litter provides an important source of energy to food webs, the number of different taxa recovered each year varied from 7-17 species and the quantity of organisms ranged from 54 – 207 individuals. Thirty-three species have been noted. Common taxa include Chironomidae, scuds, fingernail clams, and planorbid snails; less frequent taxa were water pennies, water bugs, hellgrammites, crawfish, and water beetles. The water quality fluctuated, having higher quality in wetter years than drier years.

P4.03

HONORING HENRY JUDSON JACOB, A FORMER DELTA STATE UNIVERSITY DEAN, FOR HIS CONTRIBUTIONS TO THE DELTA STATE UNIVERSITY HERBARIUM

Nina Bagahai-Riding and Emily Jones

Delta State University, Cleveland, MS

The Delta State University Herbarium (DSC), located on the campus of Delta State University (DSU), has been in existence since the 1930s. It contains approximately 17,000 species and serves as an educational resource for Biology and Environmental Science classes taught at DSU. Additionally, DSC is known for its abundance of species that are associated with the Mississippi Delta. Noteworthy plant taxonomists, who have contributed to this resource, include Harry Ahles, Delzie Damaree, Robert Stewart, John MacDonald, and Albert Radford. The DSC collection is unique in that it contains 1,300+ specimens collected by Dr. Henry Judson Jacob, a former Dean of Education at DSU, who enjoyed acquiring, pressing, and preserving plant specimens. Over a 28-year time, span (1946-1974), Dr. Jacob collected specimens from 29 counties within Mississippi and from various ecological habitats. He collected specimens associated with 137 different families; several families (Batidaceae, Najadaceae, Ruppiaceae, and Tofieldiaceae) only exist in the DSC collection because of his efforts. Numerous (500+) specimens that Dr. Jacob had acquired remained in the newspapers he used upon collecting for over 50 years. As a result, numerous specimens were unnoticed until Dr. Nina Baghai-Riding and some DSU students started to work on them. Countless laboratory hours have been dedicated to mounting them on herbarium paper, identifying them, and digitizing them into herbarium databases. According to Dr. Mac Alford, Professor of Botany, at the University of Southern Mississippi, some species that Dr. Jacob collected from the Mississippi Gulf Coast are rare or no longer exist in the area.

P4.04

SEASONAL CHANGE IN BODY MASS OF WEBSTER'S SALAMANDERS

Jackson Roberts, Debora Mann, Tom Mann

Millsaps College, Jackson, MS and Mississippi Museum of Natural Science, Jackson, MS

Webster's Salamander, *Plethodon websteri*, is a rare southeastern salamander species ranked as Imperiled in Mississippi. These salamanders are associated with rock outcrops, where they spend as much or more than half the year sheltered from heat and desiccation in crevices deep underground. Salamanders emerge from the rocks in the fall and forage for invertebrate prey on the forest floor when the soil is moist and cools to ~ 16ºC. The purpose of this study, still in

progress, is to quantify the difference in average mass of adults before and after their retreat underground. The average mass of males captured on drift fences as they migrated toward a rockoutcrop in Hinds County, Mississippi in March and April 2019 was 0.90g (n = 24, range 0.68 – 1.06); males captured upon emergence in October and November weighed an average of 0.60g (n = 10, range 0.45 – 0.82). Females captured during the same intervals weighed an average of 1.22g in spring (n = 18, range 0.68 – 1.63) and an average of 0.63g upon emergence in fall (n = 23, range 0.44 – 1.01). Females oviposit while underground, contributing to their loss of mass between spring and fall. These preliminary results suggest that adult Webster's Salamanders may lose a third or more of their body mass while underground. In a species already affected by habitat loss and degradation, a warming climate may contribute an additional stressor if it prolongs the time these salamanders must spend in underground refugia.

P4.05

NOVEL UNDERSTANDING OF AVIAN BIOMECHANICS AND SONATIONS USING HIGH-SPEED VIDEO OF THE WHITE-RUFFED MANAKIN (COROPIPO ALTERA ALTERA)

[1]Luke T. Nguyen, [2]W. Alice Boyle, [2]Natasha Bergevine, `Lainy B. Day

[1]University of Mississippi, Oxford, MS and [2]Kansas State University, Manhattan, KS

To attract females, male manakins perform noisy acrobatic courtship displays faster than human eyes can see. We used high-speed videography synced with field audio to characterize the display biomechanics in *Coropipo altera.* Males fly into the canopy, producing a thin whistle as they dive down. Approaching a display log, they perform a previously undescribed sequence accompanied by a loud "flap-chee-wah." Landing is followed by a "jump-about-face," a backwards aerial. We hypothesized that the "flap and chee" are mechanical sonations and the "wah" is a vocalization. We filmed from approximately 9am-4pm for 16 days over the breeding season. From 4 different display logs, we captured 94 displays of 5 males ($\bar{x}$=23.75); 30 with females present and 80 including the full "flap-chee-wah." We discovered that passage of air through separated wing primaries creates the "flap" at 9-14m above the log, higher than expected. The "chee" is produced at ~3m by aeroelastic flutter, as described in broadbills. Dramatic deceleration occurs via two J-banks and a parachute-like wing opening. The alulas, primordial thumbs, are used to steer as known for other birds, but previously undescribed in manakins. Despite deceleration, landings appear tremendously forceful. All flap-chee-wahs are highly stereotyped with each male having a preferred landing site on the log opposite observing females, which hop away from the "jump-about-face" unless copulating. The "wah" is vocal - produced during the "jump-about-face" when the beak is agap. We will complement these novel biomechanical discoveries with determination of the velocity and force of dive elements and landings.

P4.06

HUMAN IMPACT ON CANADA GOOSE (*Branta canadensis*) POPULATION AT BEAR PEN PARK IN CLEVELAND, MS

Anna Katherine Scott and AHM Ali Reza

Delta State University, Cleveland, MS

This study surveys the human impact on the Canada goose (*Branta canadensis*) population in the Bear Pen Park – a city park located in Cleveland, Mississippi. The study was conducted in the Spring of 2019 with the specific objective is to assess the interaction between the gaggle at Bear Pen Park and the visitors of the park. A pond is located at the center of Bear Pen Park and our study was mostly conducted around the pond. Other than a healthy Canada goose population (50-60 individuals), the pond is home for a population of Mallard duck (*Anas platyrhynchos*), both of which are mostly dependent on the provided food. Our study goal was to observe the waterfowl from a distance and quantify the interactions of the birds with the food providers. We also wanted to record the activity pattern of the goose. Our result revealed that the Canada goose are active throughout the days, and was not impacted by the variations in weather. We observed that the when food was offered by the park visitors, the Mallard ducks tend to respond first and circle around the food source. Once the food is provided, the Canada goose would take over the site and push away the Mallard ducks. We observed that in most cases the ducks and geese are over-fed by the park visitors, especially on the weekends. We also observed that most of the food was provided to the waterfowl are not healthy and potentially dangerous to the ducks and geese.

P4.07

COMPARATIVE STUDY ON POPULATION STATUS AND BEHAVIOR OF EASTERN FOX SQUIRREL (*Sciurus niger*) IN A SEMI-URBAN AND A FOREST HABITAT IN THE MISSISSIPPI DELTA

AHM Ali Reza and Josh Glover

Delta State University, Cleveland, MS

The Eastern Fox Squirrel (*Sciurus niger*) is one of the most common mammalian species encountered in urban, semi-urban, and forest habitats in the eastern United States. This study was conducted at two sites: Delta State University campus, a semi-urban habitat and Dahomey National Wildlife Refuge (NWR), a bottomland hardwood forest. The main objective of this study was to determine if squirrels living in a semi-urban environment are highly tolerant to humans when compared to their more isolated counterparts who lives in the forest. Our hypothesis was that the squirrels in the semi-urban environment would be less afraid of humans and therefore would be less likely to flee with nearby approaching human. We collected field data in the two sites in Boliver County, MS for 10 weeks in Fall 2018. Field data from each location was compared in order to determine whether the results would vary significantly. With regards to the squirrel activity in both locations, we found that the squirrels are more active on the ground, moving or actively looking for food. Foraging on the ground was the most common activity followed by in-canopy resting or vocalizing. Our results also suggest that squirrels on Delta State campus were much more accustomed to having people near them than the ones live in the forested habitat in Dahomey NWR. We were able to get twice as close to squirrels a Delta State, with an average of 13 feet before retreating, compared to 24 feet at Dahomey National Wildlife Refuge.

P4.08

USING WHITE-TAILED DEER AS A MODEL TO MONITOR SOCIAL NETWORK DYNAMICS IN URBAN AND RURAL POPULATIONS

Justin Hannah, Sylmia Shepard, Bryce Winn, Sharron Streeter, and Scoty Hearst

Tougaloo College, Tougaloo, MS

Urbanization is one of the strongest selective pressures that wildlife face today, leading animals to cope with new urbanized environments. The potential impacts of urbanization on animal social network stability remains poorly understood. We pair spatiotemporal mapping techniques with social behavioral analysis to determine how elements of the urban landscape influence the stability of animal social networks. We are using white-tailed deer as a model to assess how urbanization impacts animal social networking dynamics. White-tailed deer thrive in urban environments. Deer display social networking behaviors by forming social groups and by creating social media sites in their environment called scrapes. We hypothesize that the pressures from the urban landscape significantly influence social networks in urban white-tailed deer populations as compare to their rural counterparts. We are studying deer non-invasively using wildlife cameras paired with GIS mapping tools to better understand the influence of urban and rural landscapes on the stability of deer

social networks. We have focused on the forest around Tougaloo College campus as our urban study site. We use Bentonia, MS as our rural study site. In this study, we focused on white-tailed deer in urban and rural locations to determine how different environmental pressures influence the spatial patterns, social group dynamics, and social networking behaviors. Here, we display the preliminary results of our first study and propose some interesting questions warranting further research.

P4.09

AN ANATOMICAL SURVEY OF *Galium aparine* (Rubiaceae)

Pamela Bellamy, William Neal, Huntley Brewer, Abi Gibson, Tristan Moseley, Nina Baghai-Riding

Delta State University, Cleveland, MS

During the Spring 2019 semester, students enrolled in, BIO 410-Plant Anatomy at Delta State University elected to do semester group projects on various weeds that exist in the Mississippi Delta. Our group selected *Galium aparine* L. (cleavers), which is a naturalized weed that grows throughout the southeastern United States. Native to Europe, Asia, and North Africa, this species thrives in the Mississippi Delta throughout the early spring. It is most commonly found in post-burn regions, soil sites that are rich in nitrogen and phosphorous, and areas with improper and deprived drainage. *Galium aparine* has tiny, yellowish-green to white star-shaped flowers, winding stems, whorled leaves, abundant trichomes on its leaves and stems, and globular bur fruits. Internal anatomical sections of its roots, stems, leaves, and flowers were made using single-edged razor blades and then stained with methylene blue and neutral red dyes. Digital photographs were taken with an Olympus BX43F light microscope. Of special interest are paracytic stomata on the lower epidermis of leaves, glandular trichomes along the leaves and stems, and the abundance of enlarged cortical parenchyma cells in the root. When cutting transverse sections of the stem, the pith was soft and become separated and destroyed so making it difficult to study. Other notable morphological features include the intense red color of the roots and the dimerous flowers. Future work will compare the internal anatomy of other winter herbaceous weedy plants that exist in similar habitats throughout the Mississippi Delta; these studies may help in deducing ecological plant strategies.

P4.10

A MORPHOLOGICAL AND MOLECULAR STUDY OF *AMANITA* FROM THE GULF COAST OF THE UNITED STATES

Kiara Joiner

University of South Alabama, Mobile, AL

The genus *Amanit*a encompasses some of the most iconic mushrooms in the world due to an abundance of notably beautiful, as well as lethally toxic species. Amanitas are environmentally essential since approximately 95% of all plant species depend on them for nutrition via mycorrhizae. Research suggests there are as many as 1000 species of *Amanita* in the world. Despite this wide range of speciation, only around 100 species have been reported in Gulf Coast of the United States. This project aimed to identify and define *Amanita* species from Alabama and surrounding regions while attempting to establish relationships with other species in North America and the world.

This project utilized traditional methods of mushroom taxonomy including collection, description, imaging, and preservation of fresh specimens, followed by microscopy analysis, which focused on measurement of basidiospores. Additionally, tissues from specimens were used to extract and amplify DNA by PCR. The nuclear ribosomal Internal Transcribed Spacer (ITS) and the Large Subunit (LSU) regions were used to find matches of named sequences deposited in GenBank and a phylogenetic tree was generated. A list of suggested species names for specimens was compiled by using morphological keys and existing descriptions of basidiospores. This list includes: *A. rubescens*, *A. brunnescens*, and *A. arkansana.* Three species have been confirmed by spore measurements and positive DNA results from BLAST searches. Ultimately, this project classified and described species of *Amanita* that exist in the United States' Gulf Coast region to understand their relationship with other species throughout the world.

P4.11

THE LOSS OF EXPLORATORY ACTIVITY IN DROSOPHILA ECOLOGICAL SPECIALISTS

Darius Amos, Daniel Connolly, Royce Swayze, Prasiddhi Neupane, Achyuth Kalluchi, Gregg Roman

University of Mississippi, Oxford, MS

In new or changing environments many animals rely on behaviors collectively known as specific exploration to find new food, shelter or other resources. There are two fundamentally interesting and important components to specific exploration: 1) motivation to explore the new stimuli (neophilia), and 2) the goal-directed habituation of the novelty, in which the animal familiarizes itself with its environment. Different species have robust and consistent differences in neophilia. Previously, it has been shown that some ecological food specialists have reduced neophilic behavior compared to generalists, which may leave them more vulnerable to environmental change. The underlying causes of these differences in neophilic behaviors remain unknown, although there is clearly a genetic basis for differences in neophilia. It is the goal of our project to determine the genetic variants responsible for the loss of exploration during food specialization using *Drosophila* species. We have found that in *Drosophila*, the monophagous *Drosophila sechellia* lacks exploration of a novel arena, while the polyphagous sister species *Drosophila simulans* displays a high-level of exploratory activity. We will present our work characterizing the differences in exploration between these species. We will also present our progress in generating an interspecific recombinant inbred population, made with both *Drosophila sechellia* and *Drosophila simulans* parental lines, that we are using to determine the genetic architecture of exploration in these sister species.

P4.12

SEQUENCING AND ANNOTATION OF ENDANGERED SMALLTOOTH SAWFISH GENOME MAY REVEAL CONSERVATION STRATEGIES

Taiya Jarva and Nicole Phillips

University of Southern Mississippi, Hattiesburg, MS

The smalltooth sawfish, *Pristis pectinata*, once widely distributed in tropical and subtropical waters of the Atlantic Ocean, has seen severe population decline due to bycatch and habitat degradation. They are now listed as "Endangered" under the Endangered Species Act. A Smalltooth Sawfish Recovery team has developed a recovery program consisting of three primary strategies to rebuild populations and promote long-term viability of the sawfish: 1) minimize human interaction, 2) protect and restore smalltooth sawfish habitat, and 3) ensure population increases and re-expansion into their former range. To that end, the genome of the sawfish was sequenced from tissue samples of a female *P.pectinata* recovered by the Florida Fish and Wildlife Conservation Commission. A transcriptome that contains ~95% of expected homologous genes found across vertebrate genomes was constructed, and over 100,000 polymorphisms, from which ~300 high confident indels, were identified. These may be used in the future for finescale and rigorous population assessments of population structure. Also, 802 GPCR family genes were identified, which will allow identification of olfactory and electrosensing receptors in the sawfish.

Sequencing and annotation of the sawfish genome will obtain genetic markers useful in assessing population structure, implementing stock management techniques, understanding the mechanisms of parthenogenesis in the sawfish, assessing immune function (the major

histocompatibility complex), and identifying olfactory and electrosensory genes. These analyses will further assist in ensuring a healthy, viable population of smalltooth sawfish. Additionally, it will allow comparison of genes of interest between the sawfish and other closely related elasmobranch species.

P4.13

SEX DIFFERENCES IN ROLE OF ESTRADIOL IN RECOVERY OF FUNCTION AFTER CEREBELLAR DAMAGE

[1]Jervia Mia Powell, [2]LeMarcus Echoles, [3]Chyna-Rae Dearman, [2]Lainy B. Day

[1]Alcorn State University, Lorman, MS and [2]University of Mississippi, Oxford, MS

Estradiol is neuroprotective. In the brain, estradiol can be synthesized from testosterone via aromatase provisioning glia cells. Previously, we found that cerebellar lesions produced deficits in coordination and procedural learning in zebra finches, as they do in mammals. Further, we found that aromatase inhibition enhanced and estradiol reduced cerebellar induced deficits in spatial learning, but had no effect on coordination deficits. Given that zebra finch males upregulate aromatase more than males after cerebellar lesions and have more circulating estradiol, we predicted that males would recover better than males after cerebellar lesions. We lesioned the cerebellum of male and male zebra finches, with or without simultaneous injection of the aromatase inhibitor, letrozole. As found previously, only birds with cerebellar lesions and aromatase inhibition, not those injected with the saline vehicle, had impairments in our spatial task compared to sham lesioned birds. However, sexes performed similarly. These results support our hypothesis that aromatase improves spatial memory deficits after cerebellar lesions, and together with our prior work suggests this is due to estradiol synthesis. The lack of sex differences is quizical and could imply that local conversion of testosterone to estradiol is as important as circulating estradiol for neuroprotection and that the greater level of aromatase upregulation in males may be a compensation for their lower level of aromatizable substrate (testosterone). More work is needed to understand the roles of neurosteroidogenesis and brain steroid receptor regulation in neuroplasticity. Analysis of the motor task is still in progress.

P4.14

A PRELIMINARY PLANT ANATOMICAL STUDY OF *LAMIUM PURPUREUM* L. (LAMIACEAE).

Michael Zarske, Allison Hardin, Kaley Eldred, Madisyn Sheraka, Morgan Welch, Nina Baghai-Riding

Delta State University, Cleveland, MS

Students enrolled in the Spring 2019, BIO 410-Plant Anatomy course at Delta State University conducted semester group projects on various weeds that exist in the Mississippi Delta. One group selected *Lamium purpureum* L. (Lamiaceae), also known as purple deadnettle. This species is a common annual throughout the southeastern United States. Native to Europe and Asia, it thrives in the Mississippi Delta during the late winter to early spring. It occurs in cultivated fields, pastures, lawns and waste sites. *Lamium purpureum* is typically a low growing herb reaching 10 – 20 cm in height but it can sprawl on the ground. It possesses opposite leaves, a fibrous taproot, purple zygomorphic flowers, square stems, and fine trichomes on its leaves. Longitudinal and transverse anatomical sections were made using single-edged razor blades of roots and stems; these sections were then stained with methylene blue and neutral red dyes. Leaf paradermal sections of fresh leaves were analyzed. Additionally, leaf epidermal peels using clear nail polish were studied. Digital photographs were taken with an Olympus BX43F light microscope. Overall the epidermal, vascular and ground tissues exhibited characteristics that are like other mesophytic angiosperms. Of special interest are anisocytic stomata on the lower epidermis of leaves, numerous chloroplasts in the leaf mesophyll, and helical secondary wall thickening of xylem in stems. Root cross-sections exhibited the basic protostele vascular structure that is associated with most dicotyledonous angiosperms. Anatomical comparisons with other local species within the Lamiaceae, could help in determining evolutionary relationships.

P4.15

DUNG BEETLE EVALUATION ON THE CAMPUS OF THE UNIVERSITY OF BELIZE

Adrianna Chambers, Anajah Coleman, Tsige Gebresadek, Bria Goodson, Farae Jackson, Latha Thomas and Angela Verdell

Hinds Community College- Utica Campus, Utica, MS

Humans are destroying the habitats that plants, animals, and insects need to thrive and carry out biological processes. This human interaction also disturbs the biodiversity of these habitats. The patterns of insect behavior can be beneficial in studying the biodiversity of various habitats because they are a direct indicator when the habitat has been disturbed. When the area around them changes, they are forced to change as well. Scarabaeinae dung beetles have been utilized for the purpose of this study. Dung beetles are responsible for many tasks within their environment such as fertilizing the soil and promoting plant growth. On the 24th and 25th day of May 2019, Scarabaeinae were collected using baited pitfall traps and classified into their respective genus, sizes and guild. This collection occurred on the campus of the University of Belize. Open Habitat

(OPH) represented an exposed habitat with little to no shade from neighboring trees whereas the Scrub Forest (SF) served as a representation of a closed habitat that was overed by bushes, trees, and grasses. This study rendered 83 dung beetles which were classified into 16 species. The beetles were further classified by their size and functional guild which were rollers, tunnelers, and dwellers. Beetle species abundance did not vary between habitats but varied between bait types. There was no direct linkage between the magnitude of biodiversity in an open habitat versus a closed habitat. The removal of original forest habitat and prolonged anthropogenic disturbance in the region has resulted in the disappearance of forest specialist species and colonization of heliophiles and synanthropic species. It is necessary to conduct and document the biodiversity within this region continue to observe if species abundance will increase or decrease in the years to come.

Friday, February 21, 2020

AFTERNOON

The Field Trip

The field trip to the Sandhill Crane National Wildlife Refuge will involve a drive and walk through wet pine savannah, a mixed hardwood seepage area, and a tour of the refuge visitor center at the refuge headquarters.

- A sign up sheet to participate in the field trip will be provided on Thursday morning.
- We will have early lunch at the site. Please bring your own packet lunch with you. There is no restaurant or food place at the refuge.
- Free transportation will be provided by the organizers.
- We recommend all participants to have comfortable walking shoes and a bottle of drinking water**.**

GEOLOGY AND GEOGRAPHY

Chair: Jeremy Deans
University of Southern Mississippi
Vice-Chair: Paul Parrish
Mississippi Dept of Environmental Quality-Environmental Geology

Thursday, February 20, 2020
MORNING
Room D5

9:30 WELCOME

O5.01

9:40 SIMULATING DEFORMATION BEHAVIOR OF FRACTURED ROCK MASSES: A CASE STUDY

Tanner Avery

University of Mississippi, University, MS

Normal deformation modulus of rock masses (E_{rm}) is a critical design parameter for any permanent excavation and infrastructure project that requires limited or controlled deformations to ensure performance of permanent support systems and of foundations. Despite being a key parameter, the optimal methods for finding E_{rm} is still debated. These methods can be put into three categories: in-situ tests, empirical solutions, and numerical solutions. Current efforts to derive empirical predictions rely on rock mass classification schemes (RMCS) with the assumption that all RMCS are similarly effective at predicting $E_{rm.}$ Since different RMCS use different sets of variables this assumption does not likely hold true as a given rating or quality value can be representative of a wide range of rock mass conditions. This study is an attempt to explore the effectiveness of various classification systems and their constituting parameters.

For the purposes of this talk, we develop a numerical model using a finite element software to test the viability of different RMCS used in derivation of predictive formulas for $E_{rm.}$ We focus on recreating a real rock mass in Hardy, AR to test the accuracy of several empirical rock mass deformation modulus predictions in a real life setting.

O5.02

10:00 GEOMORPHIC CONTROL OF RECHARGE TO THE MISSISSIPPI RIVER VALLEY ALLUVIAL AQUIFER

Michael C. Gratzer, Andrew M. O'Reilly

University of Mississippi, University, MS

The Mississippi Alluvial Plain is a region of national economic importance for its agricultural industry, which thrives on the fertile soil, flat landscape, and highly productive alluvial aquifer created by the Mississippi River system as it has evolved since the Pleistocene. Groundwater withdrawals for irrigation and aquaculture have been lowering water levels in the Mississippi River Valley Alluvial Aquifer. To sustain this water resource, we must better understand how the aquifer is recharged. Documented zones of recharge to the aquifer include the Bluff Hills and streambeds of incised streams. Research recently completed indicates a third potential recharge zone: coarse-grained geomorphic features, including meander scrolls and natural levees, created by the Mississippi River and its tributaries. This study aims to characterize the hydrogeology of a meander scroll in northwestern Mississippi based on its formative processes: to understand how the deposition, weathering, and pedogenesis of these geomorphic features affect aquifer recharge. Methods to be applied include description of surface and subsurface lithology, measurement of physical and hydraulic properties of the soil and sediment, and subsequent modeling to determine how the unique depositional features of the meander scroll and its overlying soil influence the flow of water. A second phase of this study will evaluate the depositional factors controlling the contribution of aquifer recharge by the meander scroll. A third phase will examine how the evolutionary processes of the selected meander scroll relate to those of others and in turn how recharge might vary from one to another.

O5.03

10:20 GEOSPATIAL TECHNOLOGIES FOR MAPPING FLOOD INUNDATION

Jake Harvey, Yongqin Zhang

Delta State University, Cleveland, MS

Floods are a result of significant volumes of water usually from excessive rainfall or melting snow. The sudden influx of water fills rivers and streams to exceed their capacity levels and proceeds to lower lying ground. Proper distribution and quick response to a flood event is important for emergency staff and first responders. In this research, we use multiple spatial datasets and geospatial technologies to develop a flood inundation model for the Harpeth River in the City of Franklin, TN, where only historical flood data and maps are available for reference. We use geospatial data including Lidar, hydrology, flood events, and flood stages etc. to create inundation maps in ArcGIS Pro. A series of flood inundation maps is made available to identify what will be impacted, with the aim to provide flood information to the local government. An interactive dashboard is also developed for visualization and web sharing to the public. The mapping work provides accurate and individual flood stages of the river and its tributaries. Water impacted structures can be visually displayed and interactively inquired. This work would provide first responders with appropriate information to manage future floods effectively.

O5.04

10:40 TAPHONOMIC ANALYSIS OF A MOSASAUR SPECIMEN PROBING SIMILARITIES WITH MODERN WHALE-FALL ECOSYSTEMS

Joseph Moffitt, Renee Clary

Mississippi State University, Mississippi State, MS

Since the "bone wars" of the 1800's there has been little research into mosasaurs in Mississippi. This is in stark contrast to its neighboring states such as Alabama and Arkansas where some of the United States best *Mosasaurus, Clidastes, Platecarpus, Plioplatecarpus,* and *Tylosaurus* specimens have been recovered. The same chalk formations that yield these mosasuars in south central Alabama, the Selma Group, are also present in eastern Mississippi. These formations are all within driving distance of Mississippi State University's campus.

A recently recovered mosasaur skeleton (DSM 10176), of genus *Mosasaurus*, was recovered in excellent condition from the Prairie Bluff Chalk (Maastrichtian) in Oktibbeha County, MS. This current research focuses upon the taphonomic analysis of that specimen. Preserved trace fossils were examined and, where possible, identified, and analysis proceeded through comparative examination of published research specimens. Traces included grazing, boring in flipper bones and ribs, and scavenging marks on the scapula, ribs, and in flipper bones, as well as skeleton wide encrusting by bivalves. The

research probes for similarities between the traces on DSM 10716, and modern whale fall ecosystems as well as to published literature on fossilized ichthyosaurs.

O5.05

11:00 DIAGENETIC ALTERATION OF PLEISTOCENE AND HOLOCENE TUFAS, TURNER FALLS, MURRAY COUNTY, OKLAHOMA

Hashindra K. Herath, Brian F. Platt, Inoka H. Widanagamage,

University of Mississippi, University, MS

Tufa deposits form as a result of biological and physicochemical factors, typically at ambient temperatures due to loss of CO_2 from water supersaturated with $CaCO_3$. Turner Falls, along Honey Creek, in the Arbuckle Mountains of Oklahoma, is known for its Pleistocene and Holocene tufa deposits. Honey Creek is fed by the Arbuckle-Simpson aquifer, which is hosted by the carbonate-dominant Upper Cambrian through Middle Ordovician Timbered Hills, Arbuckle, and Simpson Groups. Both recent and Pleistocene tufa deposits were collected along Honey Creek and studied petrographically and geochemically. Pleistocene tufa provides evidence of diagenetic modifications, including secondary CO_3^{2-} mineral precipitation on grains, dissolution of crystals leaving voids, spar filling voids, micrite rims encrusting remnant outlines of primary grains, and replacements. Holocene tufa shows horizontal, thin laminations, formed possibly by alternating bio-mediated and inorganic micrite and spar, while old tufa lacks such prominent laminations, indicating that diagenesis may mask and alter primary biogenic fabrics. Variations in water levels and chemistry, possibly due to Pleistocene pluvial phases, paleoclimate changes, and biological activity, may have resulted in meteoric diagenesis of old tufa. A scanning electron microscope with energy dispersive X-ray spectroscopy will be used to map elemental distributions in tufa samples to identify the distribution of mineral phases during younger and older stages of diagenesis. It is expected that Pleistocene tufa has a different chemical composition and stable isotopic signature due to the conditions of formation and increased diagenetic alteration due to longer post-depositional exposure to the meteoric environment.

O5.06

11:20 REVISITING THE BLISS CREEK LINEAMENT, HINDS AND WARREN COUNTIES, MISSISSIPPI

Jack Duncan, Stan Galicki, James B. Harris

Millsaps College, Jackson, MS

The Bliss Creek Lineament was first identified by the US Army Corp of Engineers. A 1994 Mississippi Minerals Resource Institute Open File Report by Swann et al. used satellite imagery, stream alignment in the Bliss Creek and Clear Creek watersheds, as well as an anomalous straight stretch of the Big Black River to document the feature. Surface geology and a structure map constructed using well logs on top of the Glendon Limestone were also offered as supporting evidence. Recent investigations using reflection seismic and LiDAR data analysis were used in this study to document the interpreted Quaternary aged movement on a high angle fault extending between the Edwards and King piercement salt domes.

O5.07

LITHOLOGIC CHARACTERISTICS OF GRAVEL DEPOSITS IN HAMMETT GRAVEL MINE, MISSISSIPPI

Ana Leticia Batista, Ezat Heydari

Jackson State University, Jackson, MS

This undergraduate research project includes a study of lithologic characteristics of pebble to cobble size fragments in Hammett Gravel Mine in Holmes County, Mississippi. Here, the gravel layer is 10-15 m thick and weakly lithified. It is highly unsorted but consists of rounded fragments as large as 25 cm. The gravel layer is overlain with 3-5 m of loess deposit. Pebble to cobble size particles were collected from the gravel layer as well as from gravel piles in the mine.

Particles range in size from 2 cm to 25 cm and are white, beige, gray, red, and black in color. Regardless of their size, all samples are well rounded. However, they occur in different shapes. Their length to width ratio ranges from 1 to 20. Macroscopic and microscopic observations indicated that pebble to cobble size fragments consist primarily of chert, quartzite, silicified fossiliferous limestone, silicified ooid grain stone, and petrified wood. Fossiliferous silicified limestone fragments contain abundant brachiopod, coral, crinoids, and textures indicative of microbial construction. Observations indicate that limestones had experience extensive alteration prior to silicification. Surprisingly, unaltered carbonate fragments which are still composed of calcite or dolomite were not found at the Hammet Gravel Mine. They must have existed at the source area. Their absence indicates that they were either dissolved or pulverized during transport.

12:00 General Session

Thursday, February 20, 2020

AFTERNOON

Room D5

1:00 Divisional Keynote

QUANTIFYING COASTAL CHANGE BY USE OF REMOTE SENSING, GPS, AND GIS

Dr. Greg Carter, USM Professor of Geography

Low-elevation ecosystems along the Gulf of Mexico coast are vulnerable to an accelerating sea level rise, increasing coastal population, and severe storms. Research results from Mississippi coastal wetlands and barrier islands demonstrate how remote sensing, Global Positioning System (GPS), and Geographic Information Systems (GIS) science and technology enable quantitative measurements of key ecosystem variables in response to environmental change. These include surface elevation, land and water areal extent, erosion, and vegetation characteristics such as land coverage, ecological community type, and biodiversity.

O5.08

2:00 THE EVOLUTION OF CLARK LAKE, SHARKEY CO., MISSISSIPPI

Stan Galicki, Maria Bujenovic, Theresa Woehnker, Jeb Galtney, Trevor Galicki

Millsaps College, Jackson, MS

A 4,000-yr history at Clark Lake reveals natural variations in sediment geochemistry and nutrient levels and anthropogenic influence on 20th century sedimentation rates. Sediment texture and ridge and swale topography indicate that the channel system creating Clark Lake is now occupied by the Yazoo River. Within a 1650 yr interval between 1.24–0.60 m (2522–865 cal yr BP) total carbon percentages and the C/N ratio average 42% and 17, respectively. The base of the interval and onset of high organic activity in the lake coincides with the abandonment of the Yazoo Meander Belt. The top of the interval is marked by a drop in C/N ratio from 17 to 11 and a geochemical transition zone. No change in the rate of sediment

accumulation or clay mineralogy was observed above 0.60 m despite increased cumulative percentages of Al, Fe, K, Mg, Mn, Ca, and Na. The decrease in organic activity at 865 cal yr BP is attributed to unfavorable growth conditions related to the entrenchment of the Yazoo River and changes in the hydroperiod of the area. Significant shortening of the Yazoo River was completed in 1978. Completion of the Whittington Auxiliary Channel resulted in increased sedimentation at Clark Lake.

O5.09

2:20 TECTONIC SETTING OF THE M 3.7 JANUARY 8, 2019, HOLLANDALE (MISSISSIPPI) EARTHQUAKE

James B Harris

Millsaps College, Jackson, MS

The Saline River fault zone (SRFZ) in eastern Arkansas strikes 135◦ and has been interpreted as a Paleozoic-Mesozoic basement fault system reactivated in a strike-slip (left lateral) sense during the Quaternary. The M 3.7 January 8, 2019, Hollandale (Mississippi) earthquake is located along the southeastern projection of the SRFZ at a depth of 16.4 km, and the published moment tensor (USGS) shows a primarily left slip fault plane solution. Paleoseismic excavations across several surface faults in the SRFZ have documented Holocene deformation with a strong component of left lateral slip, and interpreted seismic reflection profiles show complex flower structures with both normal and reverse displacement in the near-surface, further supporting a strike-slip tectonic setting. Mapped liquefaction features in the area suggest strong shaking from potentially large paleoearthquakes far from the zone of current microseismicity centered near New Madrid, Missouri. Further understanding of the seismotectonics of the SRFZ, and other potentially active fault zones in the region, is critical for assessing seismic hazards in the lower Mississippi valley.

2:40 Divisional Student Awards

-awards provided by the Geological Society of Mississippi

Thursday, February 20, 2020

EVENING

3:30 Dodgen Lecture and Awards Ceremony

General Poster Session

Immediately Following Dodgen Lecture

P5.01

GYPSUM, PYRITE, AND IRON OXIDE IN ASSOCIATION WITH MICROBES AND ORGANIC MATTER IN THE PRAIRIE BLUFF AND RIPLEY FORMATIONS, OKTIBBEHA COUNTY, MISSISSIPPI

[1]Maurice Testa, [2]Claire E. Babineaux, [2]Robert D. Bise, [2]Susan Bridges, [2]Matthew Bychowski, [2]Laura Hollis, [2]Courtney Killian, [2]Brenda L. Kirkland, [2]Christina Meeks, [2]Bonnie Murray, [2]Ola Olsson, [2]Patrick Pierce, [2]Lyle Tavernier, [2]Michelle Wise-Bellard, [2]Jeremy Weremeichik

[1]University of Arkansas Fort Smith, Fort Smith, AR, [2]Mississippi State University, Mississippi State, MS,

Samples of the Cretaceous Prairie Bluff and Ripley formations (Selma Group) from two outcrops, in and near Starkville, Mississippi, were collected with the objective of determining if microbes played a role in formation of pyrite, gypsum, and iron oxide. Layers of gypsum crystals were observed growing *in situ* on the outcrop near the base of the Ripley Formation. In the Prairie Bluff Formation, gray to black nodules were composed of quartz and calcite and burrows were delineated by layers of iron oxide, gypsum, and pyrite. Samples were collected in the field and prepared for analysis in the XRD, as well as SEM, Confocal, and petrographic microscopes. In both the Prairie Bluff and Ripley formation samples, chains of bacilliform bacteria (<5 microns wide) were present. In the Ripley Formation samples, coccoid bacteria were also present. Samples from both localities contained fungal hyphae (> 10 microns wide) and filamentous bacteria. Organic matter was abundant in the form of fungal filaments, bacilliform microbes, and amorphous dehydrated biofilm. Thin sections and SEM photomicrographs of burrows reveal layers of iron oxide, gypsum, and calcite. Evidence of dissolution was abundant throughout all the samples. Dissolution seemed to be paired with abundant microbial material. Sulfur was present in the samples and sulfuric acid may have occurred as one phase of the chemical weathering process. The location of organic substances suggests that they played a role in dissolution, however, the results are inconclusive as to whether or not organic matter played a role in crystallization in these samples.

P5.02

INVESTIGATION OF MICROBES IN PYRITE CONCRETIONS IN THE DEMOPOLIS CHALK, OKTIBBEHA COUNTY, MISSISSIPPI

Jared S. Makamson, Bryan T. Beck, Larry B. Collins, Heather A. Fell, Alesha Jones, Brenda L. Kirkland, Michelle Lewis, Roger G. Sigler

Mississippi State University, Mississippi State, MS

Roadsides and embankments in the northeastern corner of Oktibbeha County are lined by outcrops of the Cretaceous Demopolis Chalk Formation that bear intriguing pyritic concretions. The objective of this study was to determine the role of organic matter in the origin of the pyrite concretions in the Demopolis Chalk by identifying types of microbes within the concretions. The hypothesis tested was that the pyrite concretions were biogenetic in origin. Samples were collected from two outcrops and analyzed in thin section, by X-ray diffraction, and with SEM imaging. Pyrite nodules were found within multiple carbonate layers at both collection sites and were distributed from a few cm to meters apart. The concretions ranged from spheres less than 1 cm in diameter to tubular shapes approximately 10 cm long. Most were 1-3 cm sub-spherical nodules. The concretions were covered by 2-5 mm sized bumps and were dark brown, purple, dark gray to almost brownish and have a distinctly high specific gravity. Stages of formation range from tiny framboids to heavily weathered relict nodules. SEM images of the center of the nodules revealed clusters and bands of crystals, bacilli-form bacteria, and ubiquitous organic debris, including dried biofilm. SEM images reveal that the chalk that hosts the concretions is rich in coccoliths and also contains fungal hyphae. X-ray diffraction analyses of metallic pyrite concretions exhibited the presence of pyrite and calcite at a 70:30 ratio. Based on the presence of fossils found within the concretions, pyrite formed *in situ* within the chalk.

Friday, February 21, 2020

MORNING

Room D5

8:20 Welcome/ Business Meeting

O5.10

8:40 ORIENTATION OF MAGMATIC FABRICS IN THE LOWER OCEANIC CRUST OF THE OMAN OPHIOLITE: OMAN DRILLING PROJECT HOLE GT1

Jeremy Deans, Justin Guillot

University of Southern Mississippi, Hattiesburg, MS

This study re-oriented core pieces back to the pre-drilled, geographic orientation to orient magmatic fabrics in the lower oceanic crust of the Oman ophiolite to better constrain the formation of the lower oceanic crust. The Oman ophiolite is the best exposed and most continuous oceanic crustal section in the world, making it ideal to study lower crustal formation and evolution. Magmatic fabrics may form due to flow in a magma body or from external strain fields during melt emplacement and therefore crustal formation. The Oman Drilling Project drilled two, 400 m deep holes in the foliated and layered gabbros, providing the first chance to study mm-scale changes. Two end member models of lower oceanic crust formation predict that magmatic fabrics should either form within smaller magma bodies or follow a predictable, crustal-scale pattern of steep to shallow dip and all dip the same direction. Preliminary data indicates that the dip of magmatic fabrics follows 50 to 100 m thick intervals of steepening than shallowing, in contrast to model predictions. Work will be completed to re-orient the magmatic fabrics by correlating core observations, not oriented, and borehole images, oriented. Once re-oriented, the dip direction of magmatic fabrics, in Hole GT1 within the layered gabbros, will place further constraints on lower crustal formation not provided by other methods.

O5.11

9:00 OUR STATE HAS A (GEOLOGICAL) HISTORY: LEVERAGING MISSISSIPPI'S GEOLOGY IN AN ONLINE HISTORICAL GEOLOGY COURSE

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

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

The NSF-funded Geo-SPARCC program develops online introductory geology courses for Mississippi's community college students. This collaborative effort between Mississippi State University's Department of Geosciences and Jones College develops online introductory geology courses and makes them available to all Mississippi community college students through the Mississippi Virtual Community College (MSVCC) consortium. These place-based physical and historical geology courses feature vignettes on Mississippi's geology and interviews with geoscientists, and they incorporate self-directed investigations and active-learning strategies. When designing content for the Earth History course, we found numerous fossils and outcrops within our state to readily support and document Mississippi's Mesozoic and Cenozoic geologic history, but content from the Precambrian and Paleozoic Era was more difficult to address. However, by finding creative solutions, we managed to "sit on the Proterozoic" at the Mississippi Museum of Natural Science, direct students to find Paleozoic fossils in gravel, and even search for "meteorite imposters" during a discussion of the formation of the solar system. As a result, Mississippi is featured in the content of all historical geology units. Students remarked that they were unaware that these geologic features and products existed in the state, or that the geologic history of our area extended back millions of years. Students also commented that these online course were (positively) different from any other online course they completed. We propose that Mississippi-based online geology courses fill the void of introductory geology courses that were previously missing at most of the community colleges in the state.

O5.12

9:20 GEOLOGIC AND GEOMORPHOLOGICAL REASSESSMENT AND THE IMPLICATIONS OF PALEOINDIAN AND TRANSITIONAL EARLY ARCHAIC OCCUPATION OF THE PORTER BAYOU MEANDER BELT IN THE MISSISSIPPI RIVER ALLUVIAL PLAIN OF NORTHWEST MISSISSIPPI

Anna Reginelli[1], James E. Starnes[2]

[1]Curator of L. B. Jones Collection Charitable Trust, housed at the Museum of the Mississippi Delta, [2]Mississippi Department of Environmental Quality, Mississippi Office of Geology, Jackson, MS

The back swamp created between the modern Mississippi River and abandoned Porter Bayou meander belts in northwest Mississippi forms the headwater basin for the Bogue Philia River. An intermittent anastomosing erosional system across a nearly level alluvial surface drains this back swamp and focuses headwaters of the Bogue Philia, a yazoo stream, along the base of a north-south trending erosional escarpment, starting along the western edge of the Porter Bayou levee system. The back swamp topography is composed of shallow anastomosing channels incised into thick floodplain clay deposits creating interfluve islands capped with a residuum of stoss, parabolic aggregated sands. This terrain was erroneously attributed to a larger braided stream system of a relic Pleistocene glacial valley train. Sand and gravel outwash deposits from glaciation exist within the greater alluvium but are buried well below the floodplain surface beneath the meander belt and back swamp deposits. Paleoindian component sites, as early as Clovis and Dalton through transitional Early Archaic, dot Porter Bayou's natural levee remnants, point bar ridges, and sandy splays perched along the escarpment overlooking the Bogue Philia basin. Detailed archaeological and geological field reconnaissance, coupled with enhanced geomorphological mapping utilizing bare-earth LIDAR has led to a necessary recharacterization. The cultural occupation of the ancient abandoned meander system (now occupied by Port Bayou) and the adjacent escarpment has important cultural resource and geological implications. Including new understandings of the earliest settlement patterns, mapping, and geologic history and evolution of the meander belts systems of the lower Mississippi River valley.

O5.13

9:40 EFFECT OF CO2 PRESSURE AND BRINE CONCENTRATION ON MINERAL CARBONATION USING LIBS

Herve Sanghapi

Alcorn State University, Lorman, MS

Mineral carbonation of CO2 in brine is a promising approach used in carbon capture sequestration (CCS) technology. In this study, we applied laser-induced breakdown spectroscopy on CaCl2 brine. The effect of CO2 pressure and initial brine concentration was investigated. Partial least squares regression was used to predict the concentration of Ca2+ cations after injection of CO2. Results show that CO2 pressure has little to no effect on Ca2+ in low concentration brine (50ppm); while in high concentration brine, the amount of Ca2+ cations drops by almost half with increasing CO2 pressure up to

5MPa after which it becomes almost constant. It was also observed that the limit of detection increases with CO2 pressure. The emission lines of calcium showed no self-absorption effect in high concentrations. The decrease of the concentration of Ca2+ in the initial CO2-saturated brine is the result of carbonation. With an estimated LOD of 8ppm, this study indicates that quantitative analysis of cations during carbonation under high pressure and high concentration is feasible with underwater LIBS and can help to monitor the variation of pH in order to accelerate carbonation rate.

O5.14

10:00 AN UPDATE ON THE STATUS OF GEOLOGIC MAPPING IN 2019 BY THE MISSISSIPPI GEOLOGICAL SURVEY

Jonathan R. Leard, James E. Starnes

Mississippi Department of Environmental Quality, Mississippi Office of Geology, Jackson, MS

On March 5, 1850, the Mississippi State Legislature approved an Act authorizing an Agricultural and Geological Survey for the State of Mississippi. Since that time, the survey has produced over 500 individual publications in the form of Maps, Open-File Reports, County Bulletins, etc. in efforts to better understand and document the Mississippi's complex coastal plain geology. The present-day State Survey is housed under the umbrella of the Mississippi Department of Environmental Quality as the Mississippi Office of Geology headquartered in the capital city of Jackson. In conjunction with state universities, the National Park Service, the United States Geological Survey, and the local efforts of citizens of Mississippi, the Mississippi Geological Survey's effort of deciphering the state's geology is in full swing. As of October 2019, seven 1:24000 Geological Quadrangles, one book (*Mississippi Environmental Geology*), four reports, and one pamphlet had been published by the Mississippi Office of Geology in 2019. The motivation of the State Survey's employees comes from a desire to garner and bring a deeper understanding of Mississippi's geology to the public and professionals working in the state and to inspire a younger generation of Mississippians to question what lies under their own feet.

O5.15

10:20 3D MAPPING OF MISSISSIPPI'S SHALLOW SUBSURFACE THROUGH GIS TOOLS

Andrew Newcomb

Mississippi Department of Environmental Quality, Jackson, MS

A portion of the Mississippi Office of Geology: Environmental Geology Division's FY19-FY20 mission is databasing depths of geologic formations and creating 3D models from the data. This geologic data was sourced from geologic bulletins, other geologic publications, the knowledge of the author, and other geologists. All depth measurements come from electronic geophysical logs found in the Mississippi Office of Geology Environmental Division's library. Triangulated irregular networks (TINs) and some interpolation surfaces were created from the accumulated data. The creation of these 3d models made the discovery of errors in the data easier and corrective measures were taken. Modeling the shallow subsurface of Mississippi's interior is a project that can be an integral base from which many future projects can evolve. This can include the mapping of aquifers, mineral resources, geologic hazards, and other pertinent geological and environmental issues. This is an ongoing project. Several upgrades are planned before the data becomes accessible to the public. Also, the geographic extent of the mapping will continue to expand to include more of Mississippi.

O5.16

10:40 CONSTRUCTION OF A DIGITAL VERTICAL PROFILE METHOD FROM AN X-Y TABLE IN ARCGIS

Jonathan R. Leard

Mississippi Department of Environmental Quality, Mississippi Office of Geology, Jackson, MS

Construction of a digital vertical elevation surface profile is an exercise relevant to the disciplines of geology, geography, geomorphology, archaeology, and engineering. Various methods have been developed among these disciplines to achieve a profile. All methods involve attributing points depicting an M or X value (for a distance along transect) and a Z value (for elevation). The more data points that are utilized, the more accurate the profile depiction. In most cases, the Z values are limited to topographical contours at some interval. This method, when applied to projects in Mississippi, typically leads to a limited depiction of the surface that can omit pertinent detail and easily be misinterpreted. This proposed new GIS method will use LiDAR data (currently available to the public) and 3D analyst tools in lieu of topographic contours for attributing Z values because the interpolation method utilizes as many as 20,000 individual elevation data points. However, any table of M and Z values can be created and converted into a vertical profile using this method. A Feature-Class should be created from this table using M values as the X value, and Z values as the Y value. This Feature-Class will plot points as specified, beginning at the origin. Any Points-to-Line tool can then be used to complete a profile.

O5.17

11:00 USING WEB-BASED GIS TO COMMUNICATE AND ENRICH RESEARCH

George Raber

The University of Southern Mississippi, Hattiesburg, MS

As part of a recent funded project with the Naval Research Lab (NRL), the University of Southern Mississippi (USM) has been able to purchase and setup a cluster of computer servers that we have used to create an online Enterprise "Web GIS (Geographic Information System)." This Web GIS portal enables the USM campus community to store, share analysis and visualize spatial data. We will present an introduction to using this tool as a means to collaborate and communicate research activity and results through presenting several case studies.

O5.18

11:20 CRETACEOUS (CAMPANIAN) BIVALVES OF MISSISSIPPI ILLUSTRATED

David T. Dockery III

Mississippi Department of Environmental Quality, Office of Geology, Jackson, MS

Norman F. Sohl listed 74 bivalve species, many unnamed, from the Late Cretaceous (Campanian) Coffee Sand of Mississippi in his 1964 publication Gastropods from the Coffee Sand (Upper Cretaceous) of Mississippi: U.S. Geological Survey Professional Paper 331-C, pages 352-353. In 1964, Sohl also published and illustrated the Late Cretaceous gastropod faunas of the Coon Creek and Owl Creek formations of Mississippi in USGS Professional Papers 331-A and 331B. The bivalves of the Owl Creek Formation in Missouri, with Mississippi specimens for comparison, were published by Lloyd William Stephenson in 1955 (U.S. Geological Survey Professional Paper 274-E). Few places in the world have Cretaceous molluscan faunas with the original unaltered shells preserved, which can rival those of Mississippi and Tennessee. An effort to photographically

illustrate the Bivalvia of the Coffee Sand in Mississippi is near completion; the labeled images will be available at the Mississippi Department of Environmental Quality, Office of Geology (state geological survey) website.

O5.19

11:40 LATE CRETACEOUS MAMMALS FROM TEXAS AND MISSISSIPPI: ON THE SHORES OF THE WESTERN INTERIOR SEAWAY

Alyson A Brink

University of Southern Mississippi, Hattiesburg, MS

Late Cretaceous mammals are well-known from Laurentia, but very few specimens are known from Appalachia. The Tombigbee Sand Member of the Eutaw Formation, deposited near the eastern shore of the Western Interior Seaway (WIS), has produced the only known Santonian-Campanian mammal teeth in the state of Mississippi. A single therian premolar was reported from a locality, Vinton Bluff, in Clay County in 1981. Vinton Bluff is now inaccessible due to collapse and vegetation overgrowth, but the matrix from that original work was curated in the Mississippi Museum of Natural Science. Three additional mammal teeth have been recovered from that matrix, although none have been published. Recently, another mammal tooth specimen from the Tombigbee Sand has been recovered from a second locality on Luxapalila Creek in Lowndes County. The Vinton Bluff matrix is currently being studied in the new micropaleontology lab at USM, although this project is in the early stages. Additional matrix collected from the Luxapalila locality is waiting to be processed, with a goal of finding more mammal teeth.

A very diverse assemblage of mammal teeth of similar age (Early Campanian) has been studied in the Big Bend Region of Texas: the western shore of the WIS. Additional Late Cretaceous mammal materials from Mississippi will not only expand our knowledge of mammals on Appalachia, but comparison to the mammal teeth from Texas may provide clues needed to help answer questions about mammalian speciation and diversity during the Late Cretaceous.

12:00 General Session

Friday, February 21, 2020

AFTERNOON

Room D5

O5.20

1:00 TAPHONOMIC AND PALEOECOLOGIC CONSIDERATIONS OF A PHENOMENAL ABUNDANCE OF TELEOSTEAN OTOLITHS IN THE GLENDON LIMESTONE (OLIGOCENE, RUPELIAN), BRANDON, MISSISSIPPI.

[1] Gary Stringer, [2]James E. Starnes, [2]Jonathan R. Leard , [3]Mark Puckett

[1]University of Louisiana at Monroe, Monroe, LA, [2]Mississippi Office of Geology, Jackson, MS, [3]The University of Southern Mississippi, Hattiesburg, MS

A new outcropping of the Glendon Limestone (Oligocene) in Brandon, Rankin County, Mississippi, revealed an unusual, approximately nine-cm, dark-colored, glauconitic, sandy, clayey shell-hash layer in one of the marls between the indurated limestone ledges. A small 1.17-kg bulk sample was collected and processed. Residue examination produced an astounding 811.1 otoliths/kg of bulk sample. This number of otoliths/kg is phenomenal compared to known concentrations. Subsequent sampling in the same layer was undertaken to ascertain if the otolith concentration was localized or present in other portions. Additional samples did not produce any results close to the original sample. The most abundant otolith concentrations in the subsequent eight samples were all less than 10% of the original sample. It appears that the remarkable otolith concentration was limited to the original sample and not present in other areas.

The otoliths indicated several points regarding the species diversity of the fishes. The number of species (richness) does not appear to be large, especially considering the quantity of otoliths, and the percentage of species (dominance) is distributed among congrids, ophidiids, codlets, and flatfishes. All otoliths represent marine fishes, and most are small juveniles. Ostracodes point to a normal, shallow-marine paleoenvironment and indicate that the assemblage was most likely in situ. There are no obvious paleoenvironmental factors that would account for the localized concentration. Since piscivorous predators (e.g., sharks, fish, toothed whales) and subsequent excretion are the primary method by which otoliths become part of the sediment, this process must be considered as a possible means.

O5.21

1:20 CHANGING CULTURAL LANDSCAPE AND NATURAL HAZARDS: PIERS AND WATERFRONT PROPERTY ON THE GULF COAST

Joby Bass

University of Southern Mississippi, Hattiesburg, MS

The cultural landscape or built environment is a tangible manifestation of values and intentions. Changes in the built environment can reflect larger changes in society, in technology, and in land use. A study of the coastal built environment of Hancock County, Mississippi using historical photographs and maps assesses changes that have taken place between 1857 and today. Changes in the presence and spatial distribution of piers and other built infrastructure near the shoreline show how humans have continued to interact with the coastline and how this interaction has changed. A decrease in infrastructure near the shoreline illustrates changing social adaptations to a storm-prone environment. This change also may be seen as reflective of larger changes in society and technology. While the role of policy and institutions play a role in this landscape change, what the coastal environment means to people may also be behind some of the observed changes.

O5.22

1:40 A SURPRISING CONVERGENCE OF PERCEPTION AND REALITY: GULF COAST RESIDENTS AND WATER QUALITY IN THE MISSISSIPPI SOUND

[1]David M. Cochran, Jr, [1]Christopher T. Hayes, [1]Hwanseok Choi, [1]Peter Papryzscki, [1]Joohee Lee, [1]Michelle Brazeal, [2]Tim Rehner

[1]University of Southern Mississippi, Hattiesburg, MS and [2]Ohio State University at Lima, Lima, OH

Risk perception is a dynamic area of hazards research within the social and environmental sciences. Much work focuses on rapid, catastrophic events, such as hurricanes or oil spills, but a considerable amount analyzes chronic conditions like air and water pollution. This study compares human perceptions of water quality in the Mississippi Sound to existing government data. It draws from reports by state and federal agencies and from the results of a 2018 survey conducted by an interdisciplinary research team at the University of Southern Mississippi. The survey, which focused on a sample of Mississippi households located on the Gulf of Mexico coast south of Interstate 10, included a series of questions that documented how respondents felt about the Mississippi Sound and how they saw its water quality and risks to public health. Results show that Mississippi residents

have a strong attachment to their coast, but they have a markedly negative view of the quality of its waters. Longitudinal data from state and federal agencies indicate their fears are valid. Mississippi recently ranked 28th out of the 30 coastal U.S. states with regard to bacterial water quality. How people perceive risk does not always correspond to the reality of risk. In this case, however, Gulf Coast residents are accurate in their perceptions of water quality in the Mississippi Sound. These results build upon our previous findings and highlight the intricate connections linking risk perception, experience, and resilience among residents of the Mississippi Gulf Coast.

O5.23

2:00 SOCIAL & ECONOMIC SURVIVAL NEAR TAAL VOLCANO NATURAL PARK PHILIPPINES

George William Moll

University of Mississippi Medical Center, Jackson, MS

Volcanoes contribute to global climate change. Volcano benefits over geologic time include: metallic minerals, geothermal energy, and fertile soil. I visited Philippines Jan-Feb 2019 and gathered socioeconomic data on Taal volcano, 2nd most active in Philippines. Methods: 2 day visit to Taal lake. Taal history obtained from on-line libraries. Population, agriculture and fishing statistics from Philippine Statistics Authority

Results: Taal volcano is in Batangas province. Since 1572, 33 Taal eruptions are documented with last 1977. Low magnitude 2 quakes continue almost weekly, but total Philippine and Batangas populations increased to last 2015 census 100,981,437 and 2,694,335, respectively. The 2 brangays (smallest local government units) including Taal Volcano Island populations are 1,005 and 1,327. Batangas 2012 Agriculture report indicates 67% farming. Batangas farmed area increased 137,846 hectares (H) in 1971 to 140,369 H in 1980. Permanent crops increased 31,409 H to 45,989 H, Meadows/ Pastures decreased 5,153 H to 2,862 H, Forests increased 2,647 H to 3,188 H. Aquaculture in Taal Lake (13% total Philippines lake area) increases 3-10% per year since 1997 and by 2017 contributes 40% to Philippine fish production.

Discussion: Taal volcano lies within seismically active Macolod Corridor across Luzon. Its violent eruptions 31 miles from Manila requires its close monitoring. Philippine Institute of Volcanology and Seismology (PHIVOLCS) classifies Taal Island a Permanent Danger Zone (PDZ) prohibiting permanent settlement. However, its fertile soil attracts farming and Taal Lake aquafarming. Level 2 alert was last issued 4/2011 but only 100 families evacuated while 7000 residents stayed.

O5.24

2:20 AQUIFER RECHARGE IN THE MISSISSIPPI DELTA BY AN OXBOW LAKE-WETLAND SYSTEM

[1]Andrew M. O'Reilly, [1]Michael C. Gratzer, [1]Gregg R. Davidson, [2]James R. Rigby

[1]University of Mississippi, University, MS, [2]USDA Agricultural Research Service

Intensive pumping for irrigation in the Delta region of Mississippi has caused long-term depletion of groundwater in the Mississippi River Valley Alluvial Aquifer (MRVAA). An immediate need exists for better understanding of the MRVAA water budget, including quantifying inflows and outflows, and development of management strategies to provide a sustainable supply of groundwater. The objectives of our study are to determine whether Sky Lake, an oxbow lake-wetland system in Humphreys County, Mississippi, is a significant source of recharge to the MRVAA and to identify the mechanisms by which recharge may occur. Potential sources of recharge in the study area are areal infiltration of precipitation, stream infiltration from the Yazoo River, and oxbow leakage from Sky Lake and surrounding wetlands. Our analysis indicates that Sky Lake provided significant recharge to the MRVAA over a two-year period. Recharge is indicated by a perennial groundwater ridge and temporary groundwater mounds lasting 1 to 6 months beneath the lake, increasing response times and decreasing magnitudes of groundwater-level changes with increasing distance from the oxbow, and higher correlation between groundwater level and lake stage than between either Yazoo River stage or rainfall intensity. Recharge is attributed to rising water levels spreading over point bar deposits and into surrounding forested wetlands where preferential flow pathways are likely to exist due to buried and decomposing tree remains. Retaining high water levels in oxbow lakes in the Delta during the fall and winter months could be a relatively low cost water-management practice for enhancing aquifer recharge.

O5.25

2:40 CONTROLS ON FLUID FLOW IN AN ACTIVE HYDROTHERMAL SYSTEM: BROTHERS VOLCANO, KERMADEC ARC, NEW ZEALAND

Jeremy Deans

University of Southern Mississippi, Hattiesburg, MS

This study used fracture and vein orientation and distribution, along with permeability of different volcanic rocks to constrain fluid pathways in an active hydrothermal, caldera-hosted system. Brothers volcano in the back-arc of the Kermadec Arc, north of New Zealand, is the location of the most active hydrothermal system of any volcano along the arc and hosts two distinct hydrothermal systems: magmatic volatile and seawater dominated. International Ocean Discovery Program Expedition 376 drilled five sites across Brothers volcano in part to constrain the hydrothermal pathways of seawater into and magmatic volatile out of the volcano in addition to fluid-rock interaction. This study focused on Hole 1530A, which was drilled into the caldera wall through active chimneys, well placed for investigating hydrothermal pathways. Fractures and veins are variably distributed with depth and dip throughout the hole with the most fractures and veins identified at ~60 mbsf and ~250 mbsf. These zones also had the largest range in dip, with other zones having dips of greater than 45. Both of the zones with a larger range in dip are hosted in volcaniclastic rocks, which are more permeable compared to intercalated lava flows. This suggests that zones of more brittle features, larger range in brittle feature dip, and hosted in volcaniclastic rocks will form preferential pathways. Lava flows will form fluid barriers, leading to more fluid-rock interaction. Fluid pathways in these systems are constrained by bulk flow and not large fault zones as suggested by some models.

O5.26

3:00 IMPACTS ON AWARENESS AND COLLECTIONS: MISSISSIPPI OFFICE OF GEOLOGY'S DIGITAL AND SOCIAL MEDIA OUTREACH

Paul C. Parrish and James E. Starnes

Mississippi Department. of Environmental Quality, Jackson, MS

The Mississippi Office of Geology staff has been actively involved in public outreach for decades. In the past three years, various staff members have begun to harness a more proactive digital outreach approach. The approach embraced by staff members mainly consists of improving communications with the public through MDEQ's new website and social media accounts. Staff members also communicate through their personal social media accounts. Firstly, one of the features that Office of Geology staff insisted upon at the launch of MDEQ's new webpage was the "Ask a Geologist" feature. This open

dialogue feature led to many public inquiries about geohazards, publication requests, groundwater availability, paleontological discoveries, archaeological discoveries, and meteorites. Secondly, staff members have begun to consistently utilize social media hashtags on both state and personal accounts to appeal to a more wide-spread audience in a shorter amount of time. The Mississippi Office of Geology has employed global hashtags such as *#fossilfriday* and *#microscopemonday* that have proven to be effective for increased interaction with the public both locally and worldwide.

These recent technological outreach approaches have resulted in several key discoveries made by the public and brought to the Office of Geology's attention. As a result of the proactive digital outreach approach by the Mississippi Office of Geology staff, these media forums have led to more widespread public awareness and engagement along with key additions to state collections and geological records.

HEALTH SCIENCES

Chair: Josie Bidwell
University of Mississippi Medical Center
Chair: Parminder Vig
University of Mississippi Medical Center
Vice-Chair: Barbara Wilson
University of Mississippi Medical Center
Vice-Chair: Ritesh Tandon
University of Mississippi Medical Center
Program Coordinator: Olga McDaniel
University of Mississippi Medical Center
Program Committee: Jana Bagwell
University of Mississippi Medical Center
Program Committee: George Moll
University of Mississippi Medical Center
Program Committee: Frank Spradley
University of Mississippi Medical Center
Program Committee: Vibha Vig
Sunshine Children's Clinic in Canton, MS

Thursday, February 20, 2020

MORNING

Room D11

8:40 Welcome D. Olga McDaniel

8:45 Announcement of the L.C. Dorsey Research Honor Society

Oral Presentation Session I:

Moderators: Drs. Josie Bidwell and George Moll

O6.01

9:00 MACHINE LEARNING BASED ON RADIOMICS FEATURES CAN DIFFERENTIATE RESIDUAL TUMOR FROM RADIATION CHANGES IN HEAD AND NECK CANCER PATIENTS TREATED WITH CHEMORADIOTHERAPY

Edward Florez, Toms V. Thomas, Seth T. Lirette, Ali Fatemi

University of Mississippi Medical Center, Jackson, MS

Purpose: To assess machine-learning models to differentiate residual disease from radiation changes using radiomics features extracted from surveillance CT and PET scans.

Methods: HIPPA-compliant, IRB-approved retrospective study of patients with head and neck squamous cell carcinoma (HNSCC) treated with definitive chemoradiotherapy (chemoRT) at UMMC was performed. Twenty-five patients reported having a residual disease on the first surveillance CT scan, two months after chemoRT. The information regarding further follow up imaging, salvage surgery with pathology, and long-term outcomes were collected. Gross tumor volumes (GTVs) were transferred from the treatment planning CT scan to MIM® software. Next, a radiation oncologist segmented the residual tumors using the 2-month follow-up CT scans and the 3-month follow-up PET/CT scans. Then, 250 CT radiomics features were extracted from each GTV through quantitative in-house MatLab® algorithms using different approaches. Finally, a neural network machine learning model was used to predict the response of the follow-up CT and PET/CT data.

Results: Each of the 250 radiomics features were used to construct the neural network models for predicting PET/CT findings and pathologic findings. Predicting positive pathologic findings from CT was not successful (AUC=0.52). Models predicting positive PET/CT findings from CT radiomics features and predicting positive pathologic findings from PET/CT radiomics features were modest in discriminative ability (AUC=0.70 and AUC=0.69, respectively).

Conclusion: A neural network model based on radiomics features of CT images was able to predict the residual tumor from radiation changes in a small group of HNSCC cancer patients treated with chemoRT.

O6.02

9:10 OKLA ACHUKMA PROJECT: PSYCHOSOCIAL CORRELATES OF HEALTHY BEHAVIORS FROM A MULTI-FACETED, CULTURALLY-ADAPTED COMMUNITY-BASED INTERVENTION TO ADDRESS OBESITY-RELATED HEALTH DISPARITIES IN SOUTHEASTERN AMERICAN INDIAN POPULATIONS

Tammy Greer

University of Southern Mississippi, Hattiesburg, MS

Southeastern Native Americans are disproportionately impacted by obesity and preventable chronic diseases that respond readily to diet and physical activity interventions. Participation rates are typically low in behavior modification programs that address diet and exercise for Natives so that rates of obesity and sequelae continue to be problematic. Psychosocial variables such as community or family support, self-efficacy, fatalism and, more generally, spirituality have all been identified as important determinants of health behavior change for Natives. There is a dearth of studies, however, that consider how these psychosocial factors impact participation/attendance in behavior management programs, eating and activity levels, and health outcomes. Preliminary survey (N=141) and focus group (N=10) results will be presented from this first in a series of studies aimed at addressing physical, mental, spiritual and social aspects of healthy living, along with built environments that facilitate healthy living. Correlations indicated that more advanced stages of change toward healthier eating and/or activity levels related to higher levels of social support, self-efficacy, healthy food

accessibility and ultimately, to self-reports of healthier eating (all r values between .20 and .31). Focus group participants mentioned fatalism with regard to getting diabetes, availability and expense of healthy foods and lack of motivation as barriers with living longer and without amputations as motivators to healthy living. Results from this study will be used to culturally tailor health interventions to leverage social support and address fatalistic attitudes and other risk factors related to preventable chronic diseases and, ultimately, reduce health disparities among Southeastern American Indians.

O6.03

9:20 TELENUTRITION CENTER: LESSONS LEARNED FROM PILOTING AN INTENSIVE BEHAVIOR THERAPY FOR OBESITY PROGRAM TARGETING AFRICAN AMERICANS IN MISSISSIPPI

[1]Jennifer L. Lemacks, [1]Jaqueline Reese-Smith, [1]Michael Madson, [1]Tammy Greer, [1]Sermin Aras, [1]LaShaundrea Bradford, [1]Michael Ramsey, [1]Daniel Credeur, [2]June Gipson

[1]University of Southern Mississippi, Hattiesburg, MS, [2]My Brother's Keeper, Inc.

INTRODUCTION. Due to unique cultural factors and limited resources, more guidance is needed to inform evidence-based weight management strategies in Mississippi. Particularly, the feasibility of existing models, such as the Center for Medicare and Medicaid Services Intensive Behavior Therapy (IBT) for Obesity, should be tested for effectiveness among underserved and minority populations. The Telenutrition Center implemented a pilot intervention to examine the feasibility of the IBT for obesity model among African Americans in South Mississippi. **METHODS.** Considering a goal to prevent disease and maximize weight loss versus quality of life benefits, the study targeted participants who were 25 to 50 years of age. To support the pilot phase, the Center conducted focus groups to inform intervention development as well as implemented a shortened intervention (4 months versus 12 months) to prepare for full-scale intervention implementation. The study aimed to enroll 15 participants to allow for a retention of 10 participants to complete pre and post data collection. **RESULTS.** Recruitment and study enrollment are ongoing and currently, 5 participants are active in the study. Focus group data revealed common themes regarding barriers/facilitators to diet/physical activity behaviors and participation in behavior change programs and role of culture in health. Other process outcomes included training lead interventionists, identifying implementation issues, and improving intervention fidelity. **CONCLUSION.** This study highlights lessons learned from testing an intervention in a hard to reach study population.

O6.04

9:30

OPIOID OVERDOSES AND RISK OF CARDIOVASCULAR DISEASES-CURRENT STATUS

Hafiz A. Ahmad, Oluwabunmi Ogungbe

Jackson State University, Jackson, MS

Introduction: Opioid overdoses and related high mortality has been a serious source of concerns for quite some time leading to high-profile litigation against pharmaceutical companies by several states. The issue is further complicated when linked with cardiovascular diseases (CVD), as 2150 and 115 adults, respectively die every day in the U.S. from CVD and opioid-related causes. Studies have found conflicting results on the relationship between opioid therapy and the development of CVD. Methodology: This study has explored the current status of opioid over doses and CVD using recent National Hospital Ambulatory Medical Care Survey (NAMCS) from 2014-2016. We have examined possible association between the use of prescription opioid medicines and CVD. Results: In 2015 NAMCS survey, the rate of CVD was higher among women [($p < 0.001$), 95% CI: 0.40–0.51]. Diabetes mellitus, hyperlipidemia, and hypertension were significant predictors of CVD [($p < 0.001$, 95% CI: 0.57–0.78); ($p < 0.001$, 95% CI: 0.34–0.44); ($p < 0.001$, 95% CI: 0.49–0.59)]. There was no significant association between prescription opioid medication use and coronary artery disease found in our study. Brief Discussion: Generally opioid users had higher rates of diabetes (29.2% vs 25.4%, p=0.017), obesity 112 (17.2% vs 14.4%, p=0.05), and tobacco use compared to non-opioid users, NAMCS, 2014-16. Results of this study has further highlighted the conflicting results in literature. Longer time frame with a geographical and ethnic focus may shed further insights on possible association between opioid and CVD risks and need to be examined.

O6.05

9:40 DENGUE DISEASE: SEARCH FOR VACCINE IMPACTING VACCINE HESITANCY

George William Moll

University of Mississippi Medical Center, Jackson, MS

CDC estimates global incidence 400 million Dengue infections, 500,000 dengue fever (DHF) and 20,000 childhood deaths. Considered tropical, dengue outbreaks have occurred in Texas, Hawaii and Florida. Dengvaxia received FDA 5/2019 approval limited to dengue seropositive 9-16 year-olds in high risk areas. Reasons for Dengvaxia limited approval, childhood deaths with vaccine hesitancy, and dengue disease prevention are of interest. Methods: 50-day visit to Philippines during which Philippine Health Department (PHD), Philippine Statistics Authority and web based data were explored for Dengue.

Results: Dengue is virus with 4 envelop (e-protein) genotypes mosquito vector transmitted human to human. The e-protein facilitates attachment and ssRNA passage into host cell. Dengue prevention focuses on reducing mosquito infectivity, vaccine activating host e-protein immunity and inhibitors of e-protein host cell attachment.

Dengvaxia clinical trials demonstrated 76% prevention in seropositive 9-16 year-olds. Philippine government initiated Dengvaxia immunization without seropositive testing in 800,000 children estimating 80% would be seropositive by 8 y/o. At least 103 immunized children died with DHF leading to Dengvaxia removal 12/2017. This removal was blamed for 2017 reduced 61.2% vaccination compliance and 2019 measles epidemic. Discussion: Dengue disease is now most common arboviral disease. With only symptomatic and early DHF recognition for dengue disease therapy, a vaccine is essential. Life-threatening DHF in seropositive individuals supports antibody-dependent disease enhancement hypothesis. Dengvaxia in seronegative individuals is similar to becoming seropositive after mild initial dengue disease raising life-threatening DHF risk "at next bite". Dengvaxia events should not cause vaccine hesitancy to accept established immunizations.

O6.06

9:50 MODULATION OF AQUAPORIN AND AQUAPORIN-1 BY XANTHOHUMOL IN LUNG CANCER CELLS

Maricicia Pacurari

Jackson State University, Jackson, MS

PURPOSE: Lung cancer still remain the second leading cause of death. The high NSCLC death is associated with advanced disease

stage at diagnosis and resistance to chemodrugs. The 5-year relative survival rate for regional and distant lung cancer is 32.2 and 4.7%. Aquaporins (AQPs) are important in lung physiology by facilitating fluid transport, airway humidification, pleural fluid absorption, and submucosal gland secretion. Studies suggest that AQPs may also play role in lung cancer biology and chemotherapy given their role in controlling cellular environment.

HYPOTHESIS: In the present study, we investigated whether xanthohumol, a prenylated flavonoid of hop plant modulates the expression of Aqp-1 and Aqp-5.

MATERIALS AND METHODS: H1299 cells were subcultured in growth media for 24 h, followed by treatment with XN (12.5 and 25 μM) for 24 h. Cell morphology, chromatin changes, and Aqp-1 and Aqp-5 were analyzed.

RESULTS: Xanthohumol induced a dose-dependent profound morphological changes including cell shrinkage and blebbing, and significantly increased the number of cells with condensed chromatin. Xanthohumol suppressed the expression of Aqp-1 and increased Aqp-5 mRNA.

CONCLUSION: The results of the present study indicate that xanthohumol leads to cell shrinkage and modulates both AQP-1 and AQP-5. Targeting AQPs in lung cancer may contribute to improve therapeutic outcome.

Acknowledgements: This research was supported by a grant from NIH (Grant No. G12MD007581) through the RCMI/CEH at Jackson State University.

O6.07

10:00 CANCER STEM CELL CHEMOTHERAPEUTICS ASSAY FOR TREATMENT OF RECURRENT GLIOBLASTOMA AND PROGRESSIVE ANAPLASTIC GLIOMA: A SINGLE INSTITUTION CASE SERIES

Candace M. Howard, Elliot Varney, Pier Paolo Claudio

University of Mississippi Medical Center, Jackson, MS

INTRODUCTION: To prospectively assess a cancer stem cell cytotoxicity assay and its ability to guide chemotherapy treatment in recurrent and progressive high-grade CNS gliomas.

METHODS: We prospectively used a Cancer Stem Cell Cytotoxicity Assay (ChemoID) to guide the chemotherapy treatments from a panel of FDA approved drugs or their combinations for 12 recurrent glioblastoma (GBM) patients and 2 progressive anaplastic gliomas, all eligible to receive a stereotactic biopsy. Patients were evaluated by MRI scans and response was assessed according to RANO criteria.

RESULTS: The median age of our patient cohort was 49 years (21-63), with 11 males and 3 femaleS. We observed 6 complete responses (43%), 6 partial responses (43%), and 2 progressive diseases (PD) 14%. Of note, the two PD were observed in patients not treated with assay recommended therapy due to their health status. Patients treated with ChemoID assay-directed therapy had a longer median overall survival (OS) of 13.3 months (5.4-NA) compared to the historical median OS of 9 months (8.0-10.8 mo) previously reported. Patients with recurrent GBM or progressive high-grade glioma treated with assay-guided therapy had a 57% probability to survive at 12 months, compared to the 27% historical probability of survival at 12 months observed in previous studies.

DISCUSSION: The data suggests that the ChemoID Cancer Stem Cell Cytotoxicity Assay has the potential to help guide individualized chemotherapy choices to improve recurrent and progressive high-grade glioma patient outcomes.

10:10 Break

10:15 Population Health Symposium I

"TRAUMA INJURY AND SPORTS MEDICINE"

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

Moderators: D. Olga McDaniel and Parminder Vig

Speakers:

10:30 Richard Summers, MD, UMMC, Jackson, MS

" TRAUMA RESEARCH IN SILICO"

11:00 Mary Townsley, PhD. USA, Mobile, AL

" UNDERSTANDING ACUTE LUNG INJURY: IT TAKES A VILLAGE"

11:30 Raj K. Prabhu, PhD.MSU, Mississippi State, MS

" MINDING THE BRAIN: A MULTISCALE MODELING APPROACH FOR STUDYING BRAIN INJURIES"

12:00-12:15 Symposium Discussion

Thursday, February 20, 2020

AFTERNOON

Room D11

1:30-3:00 Health Sciences Division Workshop

Live Culinary Medicine

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

Moderators*:* Drs. Vibha Vig and Barbara Wilson

Speakers: Josie Bidwell, DNP, RN. & Elena Dent, RDN.

"Dietary Strategies for Reducing Inflammation in Chronic Disease

3:00 – 3:15pm HSD Business Meeting

Thursday, February 20, 2020

EVENING

3:30 Dodgen Lecture and Awards Ceremony

General Poster Session

Immediately Following Dodgen Lecture

Divisional Posters
Coordinators for Health Science Posters:
Drs. Olga McDaniel and Michelle Tucci

POSTER PRESENTATIONS:

Investigator

P6.01

SODIUM BICARBONATE REMEDIATION OF ANTHROPOGENIC CONTAMINATION OF WATER AT THE GBNERR IN MISSISSIPPI

Ibrahim O. Farah

Jackson State University, Jackson, MS

The objective of this study was to evaluate the interaction of physicochemical and microbiological water quality parameters at the GBNERR, determine quantitative levels and establish the potential for remediation of post-contamination of water and seafood by human fecal pollution from anthropogenic sources at the reserve. Water samples were collected aseptically from Bayous Heron, Cumbest, Point Aux Chenes Bay and Bangs Lake (Pine-O-Pine). Physicochemical parameters were determined using standard protocols. Eight bacteria/parasitic species including Cryptosporidium 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. Data from this study indicates significant variability ($p < 0.0001$) in mean bacteria concentrations between sites. The data also indicates significant impact of Sodium bicarbonate treatment in the remediation of post contamination and survival of pathogens from the GBNERR 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 Sodium bicarbonate 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 suggest public health concerns for oyster and shellfish consumers as well as other water contact activities. Hence, control strategies should be developed and implemented to prevent or remediate any future contamination of the GBNERR waters citing the economic impact of such contamination on shellfish fishing activities on the reserve.

P6.02

THE GENETICS ENGAGEMENT IN PUBLIC EDUCATION AND POPULATION HEALTH

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Background: The studies of science education and population health will increasingly be empowered by testing measurement requirements, which are developed on a state-by-state education basis. There has been little support at the state level for common national standards. Considering the importance of standards in teaching and learning curricula the American Society of Human Genetics (ASHG) investigated the quality of the study curricula for biological sciences and technology in K-12 education with respect to genetics for all 50 states and the District of Colombia, using core concepts developed by the ASHG. The goal was to capture a moderate number of concepts that are reasonably essential for genetic knowledge within the scope of biological sciences. **Methods:** Five major conceptual areas of genetics including: nature of the genetics-material**,** transmission genetics, patterns of inheritance, gene expression and regulation, genetic variation and evolution were addressed. Evaluation was conducted by ASHG's Genetics Outreach Network, who had expertise with K-12 or greater curricula and pedagogy and those who helped grade "DNA Day Essays. **Results:** The states with high overall averages appeared to have maximum number of concepts adequately addressed. The lowest-scoring concepts were associated with complex traits, polygenic inheritance, and multifactorial causations. The states genetics standards were poor and greater than 85% of the states received scores below fair. The standards in every state were lacking an updated version of genetic concepts. **Conclusion**: More comprehensive genetics standards are needed to help prepare future genetics researchers to strengthen the foundation of genome studies in population health and therapeutics.

P6.03

MINOCYCLINE REDUCES BRAIN INJURY AND IMPROVES SENSORIMOTOR BEHAVIORAL PERFORMANCE IN NEONATAL RATS FOLLOWING SYSTEMIC LIPOPOLYSACCHARIDE EXPOSURE

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Inflammation plays an important role in brain injury in neonatal human and animal models. Our previous studies have shown that systemic administration of endotoxin lipopolysaccharide (LPS) induces brain injury and behavioral deficits in the neonatal rats, which is associated with activation of microglia. The objective of the current study was to determine whether minocycline, a putative suppressor of microglial activation, ameliorates LPS-induced brain inflammation, brain damage, and neurological dysfunction. Intraperitoneal (i.p.) injection of LPS (2 mg/kg) was performed in P5 rat pups and minocycline (45 mg/kg) or vehicle was administered (i.p.) 5 min after LPS injection. The control rats were injected (i.p.) with sterile saline. Neurobehavioral tests were performed and brain injury was examined on P6. Our results showed that minocycline protected against LPS-induced neurobehavioral impairments, including reduction of mean latency times in wire hanging maneuver and hind-limb suspension tests. Minocycline treatment also provided protection against LPS-induced brain damage, including loss of oligodendrocytes as well as reduction of white matter size. Minocycline significantly attenuated LPS-induced increases in the number of activated microglia and concentration of interleukin-1β in the neonatal rat brain and serum. These results suggest that minocycline may provide protection against systemic LPS exposure-induced brain injury and neurobehavioral disturbances, and that the protective effects are associated with its ability to attenuate LPS-induced microglial activation.

(Supported by NIH grant NIH/NINDS R01NS080844, and Newborn Medicine Funds from the Department of Pediatrics, University of Mississippi Medical Center)

Graduate Students

P6.04

DEVELOPMENT OF CIPROFLOXACIN LOADED NANOSTRUCTURED LIPID CARRIER FORMULATIONS FOR OCULAR ADMINISTRATION: PART I. EVALUATION OF FORMULATION VARIABLES

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The aim of this study was to develop nanostructured lipid carriers (NLCs) for intraocular delivery of ciprofloxacin and to investigate the influence of various excipient variables on the physico-chemical properties and stability of the formulations. A structured and organized six factors, two levels design-of-experiment approach was utilized to determine the main factor(s) or the interaction among factors that play an important role in the formulation characteristics. Six different formulation variables (the type and concentration of solid lipids, liquid lipids, and surfactants) were investigated

simultaneously within 14 runs of experiments by using the JMP software. The results showed that the solid lipid and surfactant concentrations determine the particle size. Nanoparticle aggregation can be prevented by selecting the appropriate type and concentration of lipids and surfactants. In addition, all formulations containing the liquid lipid castor oil demonstrated a significantly higher encapsulation efficiency.

Lastly, none of the factors showed any significant influence on the zeta potential, particle size distribution or assay of the formulations. It conclusion, experimental design in the early preformulation development of ciprofloxacin loaded NLCs provided a detailed understanding of the formulation variables that are critical to achieving the targeted final products.

P6.05

ANTIHYPERTENSIVE EFFECTS FROM IMMUNOSUPPRESSANT TREATMENTS OF SYSTEMIC LUPUS ERYTHEMATOSUS

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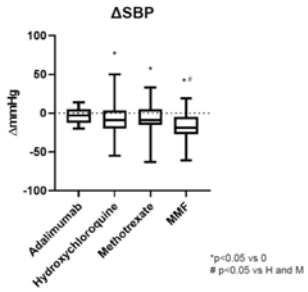
Systemic lupus erythematosus (SLE) is an autoimmune disease that primarily affects women and is characterized by lymphocyte hyperreactivity that damages the kidneys, skin, joints, and central nervous system. There is frequent hypertension in SLE which significantly increases the morbidity and mortality in these patients. One commonly prescribed immunosuppressant therapy, mycophenolate mofetil (MMF), depletes proliferating lymphocytes and ameliorates hypertension in an experimental rodent model of SLE, the NZBWF1 mouse. However, the antihypertensive benefits of MMF in human SLE are unclear. We hypothesized that SLE patients taking MMF would have significant improvements in blood pressure (BP) due to its impact on immune function. We retrospectively analyzed the Research Data Warehouse containing de-identified patient data (>800,000 individuals) from the University of Mississippi Medical Center for all patients with a clinical diagnosis of SLE and hypertension (SBP≥130 mmHg). Hypertensive SLE patients prescribed MMF (n=27) had significantly lower systolic BP (-19±20 mmHg) which was a greater BP lowering effects as compared to hydroxychloroquine (-9±17 mmHg, n=195) and methotrexate (-7±18 mmHg, n=33), two other commonly prescribed SLE drugs. There were no significant differences found among groups in neutrophils, white blood cell counts, or renal function (plasma creatinine levels) before or after immunosuppressant therapy. These data indicate that MMF provides greater attenuation of hypertension in SLE as compared to other common drug treatments without altering renal function and while preserving desired immunological factors such as neutrophils. This study supports the concept that the immune system plays a role in the development of hypertension in autoimmunity.

Table 1. Baseline blood pressure and characteristics of hypertensive Lupus patients having either hydroxychloroquine, methotrexate, or mycophenolate mofetil in drug regimen

Variable	HC (n=195)	Methotrexate (n=33)	MMF (n=27)
Age (yr)	45 ± 15	48 ± 13	40 ± 14
SBP (mmHg)	147 ± 16	145 ± 14	148 ± 15
HR (bpm)	85 ± 16	89 ± 15	92 ± 14
BMI (kg/m^2)	32 ± 9	32 ± 8	30 ± 9
HTN medications	0.2 ± 0.6	0	0.4 ± 0.5
Follow up (days)	101 ± 37	111 ± 40	80 ± 57*
Female (%)	92	90	89
Black (%)	80	76	89

SBP indicates systolic blood pressure; HR, heart rate; BMI, body mass index; HTN, hypertension; HC, hydroxychloroquine; MMF, mycophenolate mofetil.
*p < 0.05 vs. HC



P6.06

EFFECTS OF IGF2BP1 INHIBITION ON THE SENSITIVITY OF HCT116 CELLS TO IRINOTECAN

Tsige Gebretsadek

Jackson State University, Jackson, MS

IGF2BP1 (Insulin growth factor 2 mRNA binding protein 1) also known as IMP1, ZBP1, CRDBP, IMP-1, or CRD-BP isan RNA-binding protein whose overexpression has been reported in various types of human cancers including, colon, breast, liver, skin, ovary, and lung cancers. Induction of IGF2BP1 has been shown to be responsible for a variety of pleiotropic effects of Wnt/β-catenin signaling pathway in human colorectal cancer cells. Some of its identified mechanisms of action are: 1) inhibition of apoptosis and 2) induction of active drug efflux from cells through elevated expression of MDR-1. These mechanisms are believed to be responsible for the resistance of colorectal cancer cells to chemotherapeutics. We therefore hypothesized that inhibition of IGF2BP1 would sensitize colorectal cancer cells to drugs. To test our hypothesis, we used the colorectal cancer cell line HCT116 and the FDA-approved drug for the treatment of colorectal cancer irinotecan. Using the MTT assay, we observed that inhibition of IGF2BP1 in HCT116 cells significantly reduced their ability to proliferate when treated with low doses of Irinotecan (1.0 μM) for 72 hours. This reduction of proliferation was associated with a significant increase in apoptosis in the same cells as assessed by the caspase assay (P<0.005). This shows that HCT116 cells depleted of IGF2BP1 respond better to treatment than control cells. Inhibition of IGF2BP1 might represent a novel target in colorectal cancer treatment.

P6.07

THE ROLE OF LIPID ABNORMALITIES IN PREDICTING CVD IN PARTICIPANTS WITH CHRONIC DISEASE: FINDINGS FROM THE JACKSON HEART STUDY

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Jackson Heart Study, Jackson, MS

Introduction: The prevalence of CKD is paramount. CKD affects almost 1 in 7 adults in the United States and is associated with increased rates of CVD. Cardiovascular complications are a

prevailing cause of morbidity and mortality in individuals with CKD. CVD and CKD are significantly interrelated, as both are inflammatory states and inflammation adversely affects lipid balance.

Methods: Epidemiological study design, meta-analysis was used to systematically assess the results of previous research to derive conclusions about CVD and CKD.

Brief Discussion: Lipid abnormalities increases CVD risk in individuals with CKD. There are significant associations between CKD, increased lipid levels in the blood and CVD risk in individuals with CKD. Reduced kidney function is associated with accelerated atherosclerosis, along with disruptions in the morphology and metabolism of lipids.

Results: Individuals with CKD should be viewed among the highest-risk groups for cardiovascular events and disease. CVD is more frequent and severe in people with CKD, compared to general population. People at every stage of CKD are at increased risk of CVD. The level of oxidized LDL cholesterol increases and HDL cholesterol dysfunction occurs as kidney function declines and inflammation becomes more pronounced. Literature distinguishes an association between abnormal levels of lipids such as triglycerides and cholesterol, particularly HDL-C and LDL-C increase CVD risk. A higher triglyceride to HDL cholesterol ratio has also associated with a greater decline in eGFR in observational studies.

Conclusion: Several epidemiological studies have found significant associations between CKD, increased lipid levels in the blood and CVD risk in individuals with CKD.

P6.08

POTENTIAL RISK OF ALCOHOL CONSUMPTION ON ALZHEIMER'S DISEASE

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Jackson State University, Jackson, MS

Introduction: Alzheimer's disease has affected an estimated 5.7 million Americans in 2018 nearly every minute someone develops this irreversible form of dementia that degenerate the brains cognitive functions. Currently ranked as the sixth leading cause of death, it is estimated soon to be third following heart disease and cancer, particularly among the elderly spectrum. Potential contributing factors to this disease remains to be determined definitively. Methodology: This research examined using CDC and other data to determine if alcohol consumption increased the chances of individuals acquiring Alzheimer's disease. Data was arranged under five US regions: Midwest, Northeast, Southeast, Southwest and West from 2014 until 2018. Results: Southwest of the US had highest mortality rate, while Northeast had lowest, 34.90 vs. 22.67, respectively. Regions and time were significantly different ($P<0.05$) and there was no interaction found between the two. Regression model using Alzheimer's mortality as a dependent variable with various drinking consumptions and age groups as independent variables were significant ($P<0.05$) with a combined R-square value of 0.17. Chronic drinking contributed the most with significantly highest slope value. Brief Discussion: Our results indicated the effects of various alcohol consumptions levels and different age groups on Alzheimer's mortality. Although other contributing factors such as education, income, etc. remained to be explored and included to develop a comprehensive model. Time had a linear positive increase on Alzheimer's mortality from 2014 to 2018. Geographical regions of the country showed significantly different mortality rate with Northeast being the lowest.

P6.09

THE RELATIONSHIP BETWEEN BUILT ENVIRONMENT INFRASTRUCTURE AND PHYSICAL ACTIVITY LEVELS OF AFRICAN AMERICAN ADULTS IN MISSISSIPPI

Austin Barnett, Craig Hughes

According to the Mississippi Department of Health, 45.2% of African American adults in Mississippi are classified as obese and, relatedly, 61.1% do not meet physical activity (PA) recommendations. Access to and condition of built environment infrastructure (BEI), such as parks and sidewalks, can potentially increase PA levels and lower rates of obesity in health disparate groups, especially those with lower income. The purpose of this study was to determine the relationship between BEI and PA levels in African Americans in Mississippi and whether that relationship is moderated by income. Data collected from paper and pencil surveys and electronic surveys were analyzed using SPSS 20. Eligible participants included 108 African American adults (27 male and 81 female) who were recruited from outreach events conducted at a university and in Mississippi minority communities. The dependent variable in this study was PA and the independent variables were income and BEI computed as the mean of three variables (sidewalk condition, park proximity, and park condition). A simple correlation and moderated multiple regression were used to determine the relationship between these variables. Multiple regression showed BEI and income were not significant predictors of PA levels. However, the simple correlations provide some evidence of PA levels being related to BEI, with condition of sidewalks ($r=.250$, $p=.05$) being associated with PA levels. Further research is needed to elaborate on how BEI can increase PA and whether income influences this relationship.

P6.10

ENVIRONMENTAL HEALTH SERVICES INTERN EXPERIENCE AT ANCHORAGE, AK

Marquiza Bernard

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This abstract discusses the internship experience at the Municipality of Anchorage Department of Health and Human Services in Anchorage, Alaska. This project covers the five topic areas that include the mission and services of Anchorage DHHS, the intern experience within the various departments that include Food Sanitation, Air Quality, Epidemiology, Reproductive Health, and Policy & Planning. The third topic explains how this task contributed to my development as a graduate student and environmental health professional, fourth is an appendix detailing my weekly duties in each department and the final topic area discusses the importance of food safety and sanitation and ways to prevent foodborne illnesses. In conclusion, there are many reasons to consider interning at the Department of Health and Human Services in Anchorage, Alaska. Some of the reasons include, learning about the air quality system used in Anchorage, inspecting different facilities, following inspection procedures and filing reports, learning to write grants, reviewing applications for building permits, and learning about routines and patient check up procedures in reproductive health clinics. However, none are more worthwhile than being a part of something bigger than yourself. The important work done here—helping provide access to a safer and cleaner environment, and thus, improving the community—changes lives. It has certainly changed mine. It has helped me to realize how important earning my degree in Environmental Health is and how much it can help me improve the health and wellness of my community and the people in it.

P6.11

INTRANASAL INSULIN REDUCES BRAIN INJURY AND SENSORIMOTOR BEHAVIORAL DISTURBANCES IN NEONATAL RAT FOLLOWING HYPOXIC-ISCHEMIC INSULT

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Neonatal hypoxic-ischemic encephalopathy has been shown to cause permanent brain injury, as well as motor and cognitive disability. Intranasal insulin has shown neuroprotective effects against neurodegeneration in recent animal and clinical studies. The current study sought to determine whether intranasal insulin also provides neuroprotection against hypoxia-ischemia (HI)-induced brain injury and neurobehavioral dysfunction in postnatal day 10 (P10) rats, which corresponds to mature human infants. At P10, the rat pups were randomly divided into four groups: Sham+Vehicle (Veh); Sham+Insulin; HI+Veh; HI+Insulin. Pups were subjected to right common carotid artery ligation followed by an exposure to hypoxia (8% O2) for 90 minutes or sham surgery. Recombinant human insulin (25 µg) or vehicle (0.1% BSA saline) was administered immediately intranasally in each nare after HI or sham. Sensorimotor neurobehavioral tests were performed on P11, followed by brain tissue collection and examination. Intranasal insulin attenuated HI-induced sensorimotor behavioral disturbances including righting reflex, negative geotaxis, wire hanging maneuver, and hind limb suspension test in the P11 rats. Intranasal insulin treatment also reduced HI-induced ipsilateral brain damage volume and degenerated neuron numbers (Fluoro-Jade C+ cells) in the neonatal brain. These results indicate that insulin provides protection against neonatal HI exposure-induced brain neuronal injury and sensorimotor behavioral disturbances, and that the protective effects are associated with the reduction of neuronal death. These neuroprotective effects of insulin in the neonatal rat HI model suggest that exertion of neurotrophic effects in the brain might be an effective approach for therapeutic treatment of neonatal brain injury induced by hypoxia-ischemia.

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Undergraduate Students

Basic Science

P6.12

AN INVESTIGATION OF THE EFFECT OF THE EXTRACTS FROM Bidens pilosa ON THE GROWTH OF Escherichia coli

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Escherichia coli is a Gram-negative bacterium. It is found in the human. The study was based on the understanding of the effect of the extracts from *Bidens pilosa*. The hypothesis of the study was that the extracts from *B. pilosa* would inhibit the growth of the *E. coli*. The seeds of *B. pilosa* were purchased from the seed company. The seeds were dried, ground and shaken in acetone, ethanol, methanol, and water for 72 hours. Solvents were evaporated and the crude extracts were screened for antibacterial activities using a modified Kirby-Bauer disk method. The results revealed that the growth of *E. coli* was inhibited by the extracts using ethanol. The zones of inhibition were 19 mm. The extracts using acetone was not effective in inhibiting the growth of *E. coli*. *B. pilosa* that is extracted using ethanol can inhibit the growth of *E. coli*.

P6.13

PROGESTERONE INDUCED BLOCKING FACTOR ATTENUATES HYPERTENSION AND PLACETAL MITOCHONDRIAL DYSFUNCTION AND REACTIVE OXYGEN SPECIES IN RESPONSE TO S-FLT-1 DURING PREGNANCY

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Introduction. Preeclampsia (PE) is characterized by new onset hypertension in association with placental ischemia, reduced fetal weight, elevated soluble fms-like tyrosine kinase-1 (sFlt-1) and placental mitochondrial (mt) dysfunction and oxidative stress (ROS). Infusion of sFlt-1 causes hypertension and other characteristics of PE in pregnant rodents.

Hypertension. This study was designed not only examine the role of mt mediated ROS in sFlt-1 induced hypertension during pregnancy but to also examine the effect of PIBF to improve mt function and hypertension in response to sFlt-1 during pregnancy.

Methods. sFlt-1 was infused into normal pregnant (NP) Sprague-Dawley rats (3.7 µg·kg−1·day−1 for 6 days, gestation days 13-19) in the presence or absence of PIBF (2.0 µg/mL) administered intraperitoneal on gestation day 15 to normal pregnant (NP) rats.

Results. Infusion of sFlt-1 into NP rats increased MAP 112 +2 (n=11) compared with control NP rats 98+2 mmHg (n=15, $p<0.05$). Administration of PIBF reduced MAP to 100+1 mmHg in the presence of sFlt-1(n=5, $p<0.05$). Mt ROS in placenta was 108+6 in NP (n=4), 429+32 in NP+ sFlt-1(n=3) and reduced to 234+15 in NP+ sFlt-1+ PIBF (n=3). State 3 respiration, was reduced in placentas of sFlt-1 infused rats versus NP, but was improved with PIBF.

Conclusion. Overall, our study indicates a role of sFlt-1 induced hypertension during pregnancy to reduce placental mt function. Importantly, supplementation of PIBF improved placental mt function which was associated with improved blood pressures during pregnancy, indicating the efficacy of improved progesterone signaling as potential therapeutics for PE.

P6.14

INFLAMMATION DURING PREGNANCY INCREASES REDUCED UTERINE PERFUSION PRESSURE-INDUCED HYPERALGESIA AND SPINAL CORD INFLAMMATION IN RAT DAMS

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Emerging epidemiological and experimental studies suggest that systemic inflammation induced by preeclampsia during pregnancy may affect CNS functions including pain signal processing. Our

previous studies in rats with reduced uterine perfusion pressure (RUPP) demonstrated that systemic inflammation during pregnancy induced CNS inflammation of rat dams, which has shown to increase pain sensitivity in other pathological conditions. This study was designed to further examine whether maternal inflammation via lipopolysaccharide (LPS) exposure enhances pain sensitivity associated with RUPP in dams. LPS (100 µg/kg) was administered intraperitoneally into pregnant rats on day 13 of gestation (G13) and RUPP surgery was performed on G14. The dams were subjected to tail flick testing via thermal stimuli and von Frey filament testing via mechanical stimuli. Spinal inflammation and unmyelinated c-fiber projections were examined on day 21 after delivery. All induced inflammation groups (Saline+RUPP, LPS+Sham, and LPS+RUPP) showed significant increases in thermal sensitivity across postnatal days but only the LPS+RUPP group showed significantly increased sensitivity to mechanical stimuli across postnatal days. Additional LPS exposure enhanced the RUPP-induced microglia and astrocyte activation as well as unmyelinated c-fiber projections in the lumbar spinal cords of dams on day 21 after delivery. Collectively, LPS-induced systemic inflammation during pregnancy exacerbates RUPP-induced nociceptive afferent plasticity which alters spinal pain signal processing contributing to the development of nociceptive hypersensitivity in rat dams.

P6.15

ANGIOTENSIN II TYPE 1 RECEPTOR AUTOANTIBODY INHIBITION IMPROVES BLOOD PRESSURE, CEREBRAL EDEMA AND BLOOD-BRAIN BARRIER PERMEABILITY IN BRAINS OF PLACENTAL ISCHEMIC RATS DURING PREGNANCY

[1]Daniel Azubuike, [2]Mark Cunningham, [2]George Booz, [3]Brandon Fisher, [2]Taprieka Robinson, [2]Daniel Kennedy, [2]Brett Bowling, [2]Karen Brooks,

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Preeclampsia,which is hypertension caused by placenta ischemia, is a pregnancy disorder occurring in the third trimester. It is characterized by an increase in blood pressure, oxidative stress, angiotensin II type 1 receptor autoantibodies (AT1-AA), and neurological complications arising from blood brain barrier dysfunction. The RUPP (reduced uterine perfusion pressure) model, which mimics preeclampsia in rats, shows an increase in blood pressure, AT1-AA , brain swelling etc. **HYPOTHESIS:** Due to the increase in AT1-AA in RUPP rats, we hypothesized that AT1-AA plays a crucial role in the cerebral pathology of preeclampsia, and specific inhibition of AT1-AA using 7 amino acid peptide sequence (7AA) would improve blood pressure, oxidative stress, markers of neurological damage and blood brain barrier (BBB) integrity. **METHODS:** Using Sprague Dawley rats, we created 3 groups: normal pregnant, RUPP, and RUPP+7AA-treated. RUPP surgery was conducted on gestational day 14 and 7AA was administered at a concentration of (2ug/ul) via mini-osmotic pumps. On gestational day 19, mean arterial pressure was determined and BBB permeability was assessed using the IVIS procedure and Evans Blue test using harvested brains. **RESULTS:** Mean arterial pressure (MAP) was decreased in RUPP + 7AA vs RUPP (100 ± 1 vs 122 ± 2 mmHg). Brain weight/body weight ratio, which is indicative of edema, was decreased in RUPP + 7AA vs RUPP (5.8+1 VS 6.0+0.5 G/1000Gbw). Texas Red/FITC Green were smaller in RUPP + 7AA vs RUPP (0.2+0.001 vs 0.6+0.001), indicating less BBB leakage. **Conclusion:** AT1-AA inhibition decreased blood pressure, improved BBB permeability, decreased brain weight.

P6.16

INTERROGATING THE ANGIOTENSIN PEPTIDOME IN RODENT MODELS

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Angiotensin II (Ang II) is a regulatory peptide hormone that is essential in regulating high blood pressure and fluid balance. Ang II binds to and activates the AT1 receptor through a signal transduction pathway resulting in vasoconstriction, trophic and fibrotic effects, sodium reabsorption, and inflammation. Human diseases such as hypertension, diabetes, and chronic kidney disease can be caused or exacerbated by excessive levels of Ang II. Contrarily, other Angiotensin I-derived peptides serve other functions. Ang 1-7 causes vasodilation; is anti-inflammatory, and has several other beneficial effects. The levels of Ang II, Ang 1-7 and other Angiotensin-derived peptides are difficult to measure in plasma for a number of reasons including low abundance, contaminating peptides/proteins, and instability. This makes the Angiotensin Peptidome very difficult to quantify. We used LC/MS to characterize the Angiotensin Peptidome in plasma samples from an acute kidney injury rodent model. Our results suggest that even though levels of the Ang I-derived peptides are low, LC/MS provides the sensitivity to quantify the Angiotensin Peptidome. Preliminary results indicated that acute kidney injury results in elevated levels of Ang II while levels of Ang 1-7 are not significantly different in the injury state. Based on this assay and utilizing plasma samples from rodent models of illness and disease, we propose that quantifying differences in the Angiotensin Peptidome will suggest pathways to target in order to predict outcomes and evaluate the success of different drug treatment therapies.

P6.17

MULTIPARAMETRIC MRI BRAIN CANCER IMAGING AS A METRIC FOR THE GUIDED RADIATION TREATMENT PLANNING USING RADIOMIC FEATURES

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Purpose: 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 eight 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. 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, the 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 show 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 post-contrast 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.

P6.18

ASSOCIATION OF ABDOMINAL FAT DENSITY WITH SIMPLE ANTHROPOMETRIC MEASURES AND ITS CORRELATION WITH CARDIOVASCULAR DISEASE RISK FACTORS AMONG AFRICAN AMERICANS

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Purpose: To assess the relationship of fat density and anthropometric measures, and its correlation with Cardiovascular Disease (CVD) risk factors among African Americans (AAs).

Methods: Non-enhanced abdominal CTs from AAs were gathered (N=2873). Attenuation measurements of psoas/paraspina l/abdominal wall skeletal muscle and abdominal fat depots such as visceral adipose tissue (VAT) and subcutaneous adipose tissue (SAT) were measured using a multi-layer segmentation software (Tomovision, Slice-o-Matic, v5.0). In addition, anthropometric measures of waist circumference (WC) and sagittal abdominal diameter (SAD) were measured using a DICOM viewer software (OsiriX MD, v10.0). 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).

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.

P6.19

GARLIC POWER SHOWS PROMISE FOR THE TREATMENT OF ACUTE PROMYELOCYTIC LEUKEMIA

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Background: Garlic supplementation in diet has been shown to be beneficial to cancer patients. Recently, its pharmacological role in the prevention and treatment of cancer has received increasing attention. However, the mechanisms by which garlic induces cytotoxicity, oxidative stress, and apoptosis in cancer cells remain largely unknown. The present study was designed to use HL-60 cells as a test model to evaluate whether or not garlic powder-induced cytotoxicity and apoptosis in human leukemia (HL-60) cells.

Methods: Human leukemia (HL-60) cells were treated with different concentrations of garlic powder for 24 hours. Cell survival was determined by MTT assay, and trypan blue exclusion test. Cell apoptosis was measured by flow cytometry assessment.

Results: Data obtained from the MTT assay indicated that garlic powder significantly ($p < 0.05$) reduced the viability of HL-60 cells in a concentration-dependent manner. Flow cytometry data showed a strong concentration-response relationship between garlic powder exposure and Annexin-V positive cells. Together, our findings indicated that garlic powder inhibited the proliferation of human leukemia (HL-60) cells and induced of apoptosis.

Conclusion: Our study that garlic power used every day in our kitchen may be valuable medicine for both the prevention and treatment of acute promyelocytic leukemia.

P6.20

VERNONIA AMYGDALINA SHOWS ANTICANCER ACTIVITY AGAINST ACUTE PROMYELOCYTIC LEUKEMIA

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Background: The treatment of Acute Promyelocytic Leukemia (APL) has been founded on the organization of all-trans retinoic acid (ATRA) in addition to chemotherapy, which is exceptionally successful as a first line treatment; conversely, 25% to 30% of patients will regress, with their illness getting to be recalcitrant to ordinary treatment. Hence, the goal of this research was to determine the therapeutic mechanisms by which *Vernonia Amygdalina* (VA) induces cytotoxic and apoptotic effects of HL-60 cells.

Methods: To accomplish this goal, HL-60 cells were treated with various doses of VA for 24 hours. Cell viability was examined by the MTS assay; oxidative stress was estimated by lipid peroxidation assay, and cell apoptosis was analyzed by the flow cytometry.

Results: The MTS assay indicated that VA significantly reduced the viability of HL-60 cells in dose-dependent manner. Data obtained from the lipid peroxidation assay demonstrated a significant ($p < 0.05$) reduction in the malondialdehyde level in treated HL-60 cells compared to the control cells. The results showed that VA acts as antioxidant by decreasing the production of MDA levels in treated HL-60 cells. The flow cytometry assessment showed an increased in the number of apoptotic cells in treated HL-60 cells compared to the control group.

Conclusion: Taking together, our results suggest that VA can act as a complement to the current treatment for APL patients.

P6.21

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-alpha (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 ± 1%) versus lean rats (2 ± 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 ± 1,922 vs. Sham: 55 ± 25 IU/mL) compared to lean rats (I/R: 1,185 ±

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 ± 14% in lean and 47 ± 26 in obese rats (P<0.05). In conclusion, these data implicate increased inflammatory responses in mediating the exaggerated liver IRI in obese female rats

P6.22

INVASION OF HUMAN MIDDLE EAR EPITHELIAL CELLS BY NONENCAPSULATED STREPTOCOCCUS PNEUMONIAE EXPRESSING GREEN FLUORESCENT PROTEIN

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Streptococcus pneumoniae (pneumococcus) colonizes the human nasopharynx and causes human infections including pneumonia, conjunctivitis, and otitis media (OM). Currently licensed pneumococcal vaccines have reduced the incidence of invasive pneumococcal disease but have not effectively reduced mucosal infections such as OM. Nonecapsulated Streptococcus pneumoniae (NESp) have been isolated from up to 8% of OM cases, and the incidence of NESp-associated OM has increased over the past decade. In a chinchilla model of OM, we have shown that NESp MNZ41 causes high bacterial burden resulting in invasive disease. However, the mechanism by which MNZ41 is able to invade middle ear epithelial cells (MEECs) to cause invasive disease is unknown. To determine the host-pathogen interactions between MNZ41 and MEECs, we aimed to isolate human MEECs containing intracellular bacteria. We hypothesized NESp expression of green fluorescent protein (GFP) will allow detection of hMEEC containing intracellular NESp. To test this hypothesis, we transformed MNZ41 into GFP-expressing bacterium and verified the presence of the gfp cassette using PCR. Expression of GFP in MNZ41 was confirmed by fluorescent microscopy and flow cytometry. Then GFP-expressing MNZ41 cells were allowed for adhesion and invasion to hMEEC before removing extracellular bacteria. We were able to detect hMEEC containing intracellular GFP-expressing MNZ41. These cells were collected for downstream dual-RNA sequencing of both hMEEC and intracellular MNZ41 to reveal interactions between NESp and the host. Overall, this study will allow for a better understanding of NESp virulence mechanisms during OM.

P6.23

MICROWAVE-ASSISTED ALKYLATION OF DISUBSTITUTED ANILINES: ALKYLATION OF 2,4-DIMETHYLANILINE WITH VINYLARENES AND MTT ASSAY TEST OF THESE DRUGS ON PROSTATE CANCER CELLS

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Ortho-alkylation 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-butoxysytrene were used as alkylating agents with triflic acid (CF3SO3H) as the catalyst. Products were easily recovered in good yields and characterized using proton NMR. The purity of the product was determined with 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. Selected drugs were tested for their cytotoxicity on prostate cancer cells. We hypothesized that these compounds would be effective in killing prostate cancer cells, a first step in developing a prostate cancer drug. The objective of this research was to determine the effect of these drugs on prostate cancer cells using the 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. While the development of the concentrations was difficult for the MTT test, initial results are encouraging.

P6.24

THE RELATIONSHIP BETWEEN MOBILE HEALTH APPLICATION USE AND PERCEIVED HEALTH IMPROVEMENT OF MISSISSIPPI ADULTS

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There are currently over 259,000 mobile health applications (apps) available to consumers. Many of these apps are designed to make health information more accessible and to promote positive health outcomes, such as an increase in regular physical activity to create a greater sense of well-being. However, more research is necessary to verify if these apps improve user physical health perception. Application usage can affect its perceived helpfulness, thus altering the perception of health benefits experienced by the user. Thus, the purpose of this research was to determine if the use of mobile health apps improve the physical health of adult app users in Mississippi and whether they perceived health improvements. Of the 14 reasons for the use of health apps, there were five specific purposes ("Help me with what I eat/improve what I eat," p= 0.003; "Show/teach me exercises," p=0.010; "Track how much I sleep," p=0.004; "Access health information on symptoms, treatments, diagnoses, etc.," p=0.025; and "I want to kill time when bored," p=0.048) that were significantly and positively associated with perceived overall health improvement; nine showed no relationship. Thus, there seems to be some evidence to suggest that a relationship may exist between the purpose of health app use and perceived improvement in overall health. Future research is needed to determine the influence of health app use on health behaviors and outcomes. Health app usage may facilitate motivation and support for health improvement.

Population, Translational and Community Health

P6.25

FACTORS THAT INFLUENCE INTEREST IN NUTRITION COUNSELING IN A SAMPLE OF MISSISSIPPI ADULTS

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Introduction: Obesity and related chronic diseases are prevalent health concerns in Mississippi; for example, Mississippi has both the second highest adult obesity and diabetes rate in the nation. Past research suggests that nutrition counseling can prevent and treat various chronic diseases. Yet, few Mississippians (only 13%) have actually attended nutrition counseling. Previous research has shown that both socioeconomic status (SES) and self-efficacy for diet are positively related to dietary quality and that disease diagnosis may motivate participation in behavior management programs. While SES, self-efficacy for diet, and chronic disease status may promote healthy behavior, these variables' influence on interest in nutrition counseling has not been explored.

Methods: Therefore, the purpose of this study is to determine the impact of yearly income, chronic disease status, and self-efficacy for diet on interest in nutrition counseling in a sample of Mississippi White, Black, and Native American adults (n = 357). Participants were recruited from university outreach events and community settings. Linear regressions were computed using SPSS 20.0 with interest in nutrition counseling regressed onto yearly income, chronic disease status, and self-efficacy for diet.

Results: Chronic disease status predicted interest in nutrition counseling for White individuals while self-efficacy for diet predicted interest in nutrition counseling for Black individuals. No significant predictors were found for interest in nutrition counseling in American Indians.

Discussion: These results highlight the importance of race in the discussion of nutrition and healthcare services in Mississippi. Examining gender and further racial differences (e.g. Latino, Asian) for interest in nutrition counseling is an important future direction.

P6.26

HOW PERCEIVED SOCIAL AND EMOTIONAL SUPPORT IMPACTS HEALTHY DIETARY BEHAVIORS AMONG ADULTS IN MISSISSIPPI

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Mississippi has one of the largest obesity rates in the United States at 37.3%. This research focused on the relationship between Mississippi adult's general social support, support for diet, and their dietary behaviors. Data was collected from Mississippi residents, 18 years or older, using paper and pencil surveys. The variables studied included dietary behavior measured by fruit and vegetable intake, general perceived social support, and social support for diet. Variables were measured using survey response data. Correlations were run to examine the relationship between general social support and fruit and vegetable intake, in addition to social support for diet and fruit and vegetable intake. Results indicated there was no significant correlation for general social support and fruit and vegetable intake. However, there was a significant correlation for dietary social support and fruit and vegetable intake. There were significant differences in fruit and vegetable intake for demographic variables such as race, gender, and marital status. Social support for diet was significantly correlated with greater fruit and vegetable intake for both African Americans and American Indians but not Caucasians. A z prime test indicated correlations were significantly different (z=1.776, p=0.038) between Caucasians (n=105, r=0.183) versus African Americans (n=108, r=0.407) but not between Caucasians and American Indians (z=-1.004, p=0.158). Significant correlations between dietary social support and fruit and vegetable intake were noted despite marital status (married, divorced, separated, or single groups). Results can be used to promote strategies for healthier eating that consider the role of social support, especially among Mississippi's minority populations.

P6.27

STUDENT WELLNESS RESEARCH

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According the United States Department of Agriculture, the Healthy Hunger Free Kids Act of 2010 was issued to respond to the nation's obesity rate, promotion of healthy eating, and to contribute to students' overall wellness. However, despite of the law and requirements, meeting the needs of children is challenging for leaders in some communities. The purpose of this research is to determine what barriers that impacts the faculty, staff, and administration's ability to meet nutrition and physical. Using the Social Ecological Theory and Organizational Readiness Theory, this study interviewed professionals that contribute to student wellness of a rural middle school in Mississippi. In appreciation of each participant's time, a $ 20 gift card was distributed, and all responses in the questionnaire was analyzed and coded using a qualitative data analysis software called NVivo.

P6.28

THE DAILY BREAD: EXAMINING THE RELATIONSHIP BETWEEN CHURCH ATTENDANCE AND DIETARY BEHAVIORS IN MISSISSIPPI ADULTS

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Mississippi is in the center of the 'Bible Belt' and notorious for unhealthy lifestyles. Many of the chronic diseases that plague Mississippi adults are linked to obesity and prevented by healthy dietary behaviors. Previous global studies have shown that religious teachings, for example viewing the human body as a sacred temple, have positively impacted health behaviors that have the potential to influence obesity rates and result in reduced chronic diseases. The purpose of this study is to examine the relation between church attendance, level of religiosity and dietary behaviors such as fruit and vegetable intake in Mississippi adults. The results showed a relationship between church attendance and religiosity with fruit intake. Church attendance also showed to have a positive correlation with average fruit and vegetable intake. Religiosity showed a significant relationship with average fruit and vegetable intake. For the multiple regression while none of the unique predictors were significant, together they are able to significantly explain 7.4% of the variance between fruit and vegetable intake ($R2$=.074 $F(2,88)$=3.494, p=.04). This indicates that people who tend to be more religious also tend to eat more fruits and vegetables.

P6.29

CARDIOVASCULAR DISEASES' RISKS IN AFRICAN AMERICAN COMMUNITIES

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Introduction: Cardiovascular diseases (CVD) are the leading cause of death in America according to the CDC, accounting for every 1 out of 4 deaths, costing $200 billion dollars a year. At the center of the issue is the African American community who are at a greater risk of CVD than their Caucasian American counterparts, 44% vs 37%, respectively. The issue's origin is difficult to locate, however one could point out the lifestyle differences, among many others as the leading source of this disparity. For example, African Americans are more likely to consume fast food than Caucasian Americans (42.40% vs 37.60%) -- via CDC. The present study will determine recent trends in CVD among African Americans and their associated risk factors, particularly the Southern US. Methods: Secondary data including CDC and related health departments will be explored for various risk factors for CVD in African Americans, particularly in the Southeastern US. Data will be organized in a master spreadsheet file for subsequent analysis using various strategies and statistical methodologies to assess the risk and health disparities of CVD in African Americans. Results: Once the data are analyzed, results will be compiled for publications in various scientific forums. Discussion: Based upon our data analysis, factors leading to a higher rate of CVD among African Americans will be explored to understand the

causality of this issue and for subsequent research methodology to understand the problem from various dimensions.

P6.30

TRENDS IN MAJOR RISK FACTORS FOR CARDIOVASCULAR DISEASE AMONG ADULTS AGE 55+ IN THE MISSISSIPPI DELTA REGION

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The Mississippi Delta region covers about 11,000 square miles of the northwest part of the state, between the Mississippi and Yazoo rivers. The population is 554,754, with 49.7% of residents being black and 46.9% being white. The Mississippi Delta has been recognized for its recurrent poor health outcomes and has some of the most profound disparities in cardiovascular health in the state and the nation. The primary researchers from this project used the Behavioral Risk Factor Surveillance System (BRFSS). Using the BRFSS, primary researchers conducted a Longitudinal study design from 2001 to 2010 on 11,978 participants in the Mississippi Delta. They investigated using self-reported data in prevalence of high blood pressure, high cholesterol, diabetes, obesity, physical inactivity and current smoking. For our study, as secondary researchers, we focused on The Transtheoretical Model, also integrating a nonexperimental evaluation design with logistic regression analysis. This was used to test for change over time in the prevalence of high blood pressure, high cholesterol, diabetes, obesity, physical inactivity and current smoking. Overall, the researchers were able to conclude that from the years 2001 to 2010, there was a significant increase in the prevalence of high cholesterol, diabetes, and obesity in the Mississippi Delta, which includes the Yazoo County with significant risk factors for cardiovascular disease.

P6.31

SOCIOECONOMIC IMPACT ON GARDASIL RATES IN THE SOUTH

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In the southern region of the United States there is a lower rate of individuals receiving the Gardasil vaccine. Gardasil is a vaccine approved in 2006 by the Food and Drug Administration (FDA) used for the prevention of certain strains the human papillomavirus (HPV), more specifically HPV types 6, 11, 16, and 18. HPV types 16 and 18 cause an estimated 70% of cervical cancers and are responsible for most HPV-associated vaginal, anal, penile, and vulvar related cancer cases. Typically, the vaccine is administered to children, male and female, ages 11-12 but may be given as early as age 9. According to a study done by the Henry J Kaiser Family Foundation, the HPV vaccination rate is the lowest in Mississippi at 29% compared to the highest in D.C. at 78%. Approximately 12,000 cases of cervical cancer occur annually in the United States and majority occur in southern states. Utilizing secondary data, southern states also have the lowest overall HPV vaccination rate due to lack of information, concerns related to sexual activity, religious beliefs, and lack of health insurance. Data from the 2015 Prevent Cancer Foundation survey indicated 92% of respondents believed that there is a need for more information regarding the dangers of HPV. It was concluded that barriers to get the Gardasil vaccine consist of perceptions, fear of side effects, its relatively new, fear patient is too young, lack of time, cost, acceptability, and discomfort discussing sex with young patients.

P6.32

THE INTENT TO SEEK MENTAL HEALTH SERVICES AMONG BMSM IN JACKSON, MS

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A reported 44 million, 18%, of American adults have a mental health condition. However, no demographic is more affected by mental health than black men who have sex with men (BMSM). It is hypothesized that when educational conversations about mental health issues and services are initiated, there can be an increase in intent to seek mental health services among BMSM in Jackson, MS. Data was obtained using reports from baseline, pre, and post intervention surveys in 8 sessions of year three, quarter three of the Connect with Us - ManDate program in Jackson, MS. There was a total of 67 participants identifying as BMSM ranging from 18-58 years of age. The Baseline survey measured ways to understand the current state of mental health, and mental health seeking behaviors. In the Pre and Post-Intervention surveys, the intent to seek mental health services every 3 months was reported by participants and measured. The Pre-Intervention survey ascertained initial intent and the Post-Intervention survey evaluated intent after the ManDate sessions. In the Baseline survey, 60.7% of participants reported having not considered speaking with a mental health professional. The Pre and Post-Intervention surveys revealed 27% (pre) and 37.3% (post) reported the intent to seek mental health services every 3 months. Participants' intent to seek mental health services every 3 months increased by 10.3%. Therefore, these findings show an increase in the intent of BMSM seeking mental health services due to educational conversations on mental health through the ManDate Intervention program.

P6.33

IF THEY BUILD IT, THEY WILL COME": ASSOCIATIONS BETWEEN INFRASTRUCTURE & PHYSICAL ACTIVITY

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Obesity rates in America have steadily remained around 39.8 percent, or roughly 93.3 million people. Comparatively the rates are similar in the Mississippi where 35.5% of adults and 15.4% of adolescents are dealing with obesity. Physical activity is important for obesity prevention because it can burn and/or help maintain body fat. However, for many residents of Mississippi, access remains an impediment in achieving physical activity for obesity prevention. The purpose of the research is to examine the access to spaces for physical activity across the state of Mississippi. Data was extracted from Project Change 3.0 which aim to investigate food and physical activity access among residence in Mississippi. Five cities were chosen based on their population size in Mississippi. Questions selected link the role that physical activity has with obesity prevention. Statistical analysis included descriptive statistics and completed in SPSS. Data shows that counties with greater access to physical activity infrastructure also had a greater percentage of residents engaging in physically active lifestyles. One limitation is that the survey does not provide respondents' definition of "active"; therefore, the data could be skew regarding participants' perception of "active lifestyle". These results were enhanced by secondary data which showed that counties with greater access had better county health rankings. Overall, the research found that access to physical

infrastructure does increase the likelihood of residents engaging in physical activity. Future recommendations are to work with counties that lack these spaces in effort to create them and promote a healthier lifestyle for its residents.

P6.34

ANALYZING HIGHER PREVALENCE OF DEPRESSION IN ASSOCIATION WITH OBESITY AND HEALTH OUTCOMES: THE MS DELTA

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Studies have shown that poor success with weight loss can be predicted by higher depression rates whereas successful weight loss is associated with a reduction in depression. While obesity and depression often coexist, the relationship between these conditions is ineffectively seen, particularly among African Americans in the South, who obesity rates are the highest in the country. MBK's Project CHANGE 3.0 hopes to improves the quality of life and the stability of food among residents across the state of Mississippi. Qualitative surveys were distributed through various cities and county events within the Mississippi Delta. Questions consisted of demographic as well as food access and mental health. Responses were analyzed using SPSS to determine descriptive statistics, crosstabs, and frequencies. Research shows that financial hardships are not limited to mental and emotional problems. In addition, 77.6% families who eat at fast food restaurants are satisfied with their life. However, it can be argued that these individuals may eat fast food as a coping mechanism because they are not being properly diagnosed by a health professional with having a depressive disorder. In addition, the data also showed that most children who are being bullied have an unhealthy diet (60.8%). Studies show that obesity and mental illness, such as depression, regularly coincide especially among African Americans in the South.

P6.35

A COMPARATIVE ANALYSIS OF SEXUAL REPRODUCTIVE EDUCATION RETENTION AMONG AFRICAN AMERICAN TEENS AGED 13-18 AND THEIR CAREGIVERS IN THE JACKSON MSA

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The My Brother's Keeper, Inc. ICAN Project engages teens aged 13-18 and their respective caregivers in a multi-modal, interactive sexual and reproductive health intervention. In Mississippi, social and clinical trends associated with sexual and reproductive health practices are alarming. For instance, Mississippi ranks 3rd in teen pregnancy rates, 3rd in chlamydia rates, 1st in the US in HIV-related deaths, 6th in new HIV diagnoses per 100,000 people (CDC, 2009), while the capitol, Jackson, MS, has the 4th highest rate of HIV in the US among metropolitan cities. MBK's ICAN Project aims to decrease these disparities by increasing evidence-based knowledge about sexual/reproductive health among teens and their caregivers in Mississippi. The training requires teens/caregivers participate separately, yet simultaneously, in a 4-hour educational session that includes pre/post-tests. The data analyzed for the purpose of this study was collected between 2016-2018 to evaluate the varied increases in knowledge between the two ICAN training groups: teens/caregivers. Secondary quantitative data analysis method was exercised for the study by comparing means between the pre- and post-test. The results show that teens retained more information than their caregivers in the 4-hour time frame. Thus, the study hypothesis was confirmed. Because the range in knowledge gain between the two groups was not substantial, training modifications to increase knowledge retention for one group is not recommended. However, it has been suggested, for future research purposes, that the pre- and post-tests include demographic indicators to allow researchers to gauge specific gains within subgroups based on gender, age, zip code, etc.

P6.36

RISKY EARLY LIFE ENVIRONMENT AND INCREASED VULNERABILITY TO HIV/AIDS AMONG BLACK MSM

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Adverse childhood experiences are traumatic events that can result in the form of physical, emotional, or sexual violence that can increase health risks for HIV and STD transmission. African American Men who have Sex with Men (MSM) are disproportionately affected by HIV in Mississippi, where there has been a 38% rise in newly diagnosed HIV infections among this demographic. Therefore, the purpose of this research is to understand the factors that put African American MSM at an increased risk for acquiring HIV. An analysis of the Minority HIV/AIDS Research Initiative (MARI) was conducted in SPSS to understand the underlying factors that can contribute to an increased vulnerability to HIV. Questions analyzed the characteristics of home life, specifically regarding the presence of sexual abuse, and then cross tabulated with current HIV status to indicate whether environment was a contributor to an increase in vulnerability. Results show that MSM who were HIV positive experienced lesser forms of sexual abuse than those who were negative. The study reveals that most of the participants were hesitant to report these incidents with 59.2 percent not reporting the incident, 36.7 being HIV positive. The study and results reveal that sexual abuse was heavily prevalent in their homes. The study done on "Risky Early Life Environment" highlighted the underlying issue of all HIV positive participants- sexual abuse was heavily present in the home. Future research should focus on public health professionals developing more services for those affected by sexual abuse, specifically treating trauma from the environmental exposure.

P6.37

DISCRIMINATION OF BLACK MSM AND ITS EFFECTS ON COMMUNITY STIGMA

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Currently, there are around 1.1 million people living with HIV (PLWH) in the United States, with black southern men who have sex with men (MSM) disproportionately affected by the epidemic. Stigma serves as a serious psychosocial factor that can affect PLWH, in healthcare, social, professional, and other settings. The purpose of this research was to examine the effect of stigma on rates of HIV infection in order to determine whether discrimination leads to a greater impact on Black MSM living with HIV. The Minority HIV/AIDS Research Initiative (MARI) is a survey-based study given to African-American MSM which features a variety of questions geared toward understanding psychosocial factors including stigma (discrimination) pertaining to race and sexual orientation. Certain questions pertaining to discrimination were selected for analysis, which includes descriptive statistics and correlation analysis in SPSS. Descriptive analysis of the data showed that 25% of participants reported being avoided because of their sexuality. Significant results from correlation analysis include a particularly strong positive correlation between discrimination at work due to either sexuality

and/or perceived HIV status. Similar correlations were found in settings outside of the work environment. There was also a strong negative correlation between participant's perceived sexuality and the amount of respect one received from others. From the results, it can be concluded that sexuality-based discrimination can lead to assumptions about HIV status, which can then lead to major life influences, such as losing a job. Future research should focus on community perceptions regarding sexual orientation and perceived HIV transmission.

P6.38

COMMUNITY CONNECTEDNESS & ITS ASSOCIATION WITH OVERALL HEALTH AMONG BLACK MSM

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The LGBT population has experienced stigma within the healthcare field which has formed a vicious cycle that turns them away, particularly black gay men. Studies show that two common themes affirm patients' distrust: 1) provider bias and 2) provider discomfort with this population. However, it has been shown that the efforts of social networking among black MSM's can ensure better health outcomes. We extracted data from the My Brother's Keeper's *Connect With Us*program, who's goal was to improve sexual health outcomes and social networks for black gay men. Preliminary data analysis included frequency and crosstab analysis, which was followed by correlation analysis. Using our preliminary data from the Post-Intervention surveys, which was collected from 391 participants, two key themes emerged: (1) Healthcare providers are not asking the proper questions in relation to the health status of Black MSM, and (2) Black MSM like and believe that creating a social network is important and helps curate better health outcomes. These two common themes help to affirm the need for proper training on aiding MSM for healthcare providers. Findings from the studies indicate a relationship between Black MSM sexual health behaviors and highlights the importance of developing a social network to address health concerns holistically for Black MSM. Future research should continue to focus on the relationship between Black MSM and healthcare providers and how social networks help to provide better health outcomes to Black MSM.

P6.39

WHAT YOU SEE IS WHAT YOU GET, RIGHT?

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Thousands of youth in the US use alcohol, tobacco, and other drugs (ATOD) before the legal age of consumption, and it continues to be a major health problem from pre-adolescence through young adulthood because of ATOD being advertised on television, radio, and social media. The purpose of our research was to determine if TV, radio, and social media advertisements influence the usage of ATOD among youth ages 11-18. Using the Youth Message Development (YMD) intervention, we evaluated 322 youth to determine if what's advertised on television, radio, and social media influences ATOD use. The goal of the YMD intervention is to prevent adolescent substance use by increasing youth's knowledge of advertising techniques used to sell ATOD products; developing their counter-arguing and critical-thinking skills in response to ATOD messages; and helping them actively apply these skills and techniques to create youth-driven, anti-substance use messages. During YMD sessions, participants received pre- and post-test assessments to determine increase in knowledge, as well as a satisfaction survey to assess media literacy/skepticism, media identification, self-efficacy to counter-argue, and ATOD use intention. The data collected showed 238 participants (85%) increased their knowledge; 158 participants (49%) increased critical thinking and counter-argument skills; and 267 participants (83%) increased their self-efficacy to create ATOD messages. Using the YMD intervention, we proved that advertisement through television, radio, and social media does influence the usage of ATOD among youth ages 11-18. However, prevention and education programs, such as YMD, are proven to prevent ATOD use and abuse among youth.

P6.40

EXAMINING UNSATISFACTORY STI TESTING AND ITS EFFECTS ON CLINIC SPENDING

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The United States has an increasing five-year trend in sexually transmitted infection (STI) case openings. To better handle these cases and to reach a cure, intensive research is required. A hindrance for reaching a cure is the unsatisfactory STI vitals sent by clinics. The unsatisfactory vitals also place an additional financial burden on the clinics. With more patients coming, it is not viable to increase the unsatisfactory reports. This research project looks at the causes of the unsatisfactory reports within one Jackson, MS clinic and provides solutions. Primary data was extracted from Open Arms Healthcare Center Clinic. Data consisted of de-identified STI results from 2018 until now. All data was recorded in an excel spreadsheet and transmitted to SPSS for statistical analysis. Analysis consisted of descriptive and financial statistics. Results showed a 58% decrease from 2018 in the number of unsatisfactory results. Primary reasons for unsatisfactory results include: 1) specimens over hemolyzed, 2) specimen remaining in clinic too long, and 3) specimens not identified or labeled properly. Overall over the year, OAHCC managed to decrease the number of repeat tests which in turn increase OAHCC revenue by 78.14%. Research identified the primary factors for unsatisfactory results and insight into human error within the clinical laboratory. Recommendations include, increased staff training on laboratory procedures and policies as well as processes for transporting laboratory specimens.

P6.41

RACIAL DIFFERENCES ASSOCIATED WITH RISK FACTORS AND PREVALENCE OF HYPERTENSION AT OAHCC

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The prevalence and consequences of hypertension remain high in the African American population, particularly in Mississippi, with over 700,000 cases and thousands more at risk. This study investigated hypertension patients at Open Arms Healthcare Center (OAHCC) by analyzing commonly prescribed medications, demographics, and correlation of patient's body mass index (BMI) using an electronic health record review (EHR) between January 1, 2016 to December 31, 2018. Descriptive analysis established the hypertensive population at OAHCC using age, gender, race/ethnicity, and BMI and were compared using SPSS. EHR data revealed 5% the 2,237 patients receiving BHU (Becoming a Healthier U) services were hypertensive. Of these 112 patients ages 18-64 identified with hypertension, 76 patients were prescribed a single hypertension medication, and 30.3% were prescribed multiple hypertensive medications. The most common individually prescribed medications were Hydrochlorothiazide (22.4%), Lisinopril (17.1%), and Amlodipine (17.1%); whereas Amlodipine was most prescribed to females and

Hydrochlorothiazide was most prescribed to males. BMI analysis revealed 28% of patients were overweight, 41.3% were obese, and 17.3% were extremely obese. This research enhances awareness of hypertension, commonly prescribed medications, and its correlation with obesity in OAHCC patients. The BHU program provides sexual health screening (STIs) with wellness testing (blood pressure, blood glucose, etc) with a primary goal to link individuals to necessary support services. With only 5% of patients receiving BHU services having a hypertension diagnosis, it may be likely that many patients are unaware that they may have hypertension. This study begins to address the prevalence of chronic disease at OAHCC.

P6.42

THE IMPACT OF UNTREATED TRAUMATIC BRAIN INJURIES IN ELDERLY ADULTS OVER THE AGE OF 65 OVER A THREE-MONTH PERIOD OF TIME

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[1]Jackson State University, Jackson, MS, [2]Tougaloo College, Tougaloo, MS, [3]My Brother's Keeper, Inc.

Bharat R. Narapareddy, MD from Modern Medicine Network reports that elderly adults may not know they are living with a Traumatic Brain Injury (TBI). Approximately 5 million Americans are coping with a TBI. According to the Psychiatric Times, the elderly, presuming adults 75 years and older, have experienced some of the highest numbers of injuries that surpass the numbers of infants. 350,000 military veterans were evaluated and correspondingly their mild TBI nearly doubled their risk of dementia diagnosis. The aim of this study is to determine the effects untreated Traumatic Brain Injuries in the elderly. We will determine whether traumatic brain injuries have a detrimental irreversible effect on the body when left undiagnosed over a three-month period. This study will interpret data collected from the at the time of recognition of traumatic brain injuries in elderly ages 65 and older. A recent meta-analysis suggests a correlation between TBI and Parkinson disease. There is still little evidence that traumatic brain injuries are sustained over a period of time longer than five months. Patrick Cambell's study (2019) speculates that 25% of concussions correlate to visual dysfunction. When the elderly were diagnosed with visual dysfunction due to a concussion related injury, recovery time caused more issues when day to day tasks were performed. When visual dysfunctions occur, recovery time increased an additional two months compared to elderly adults that had not suffered visual imparities. Women were also found to have a higher positive VOMS compared to men (42% compared to approximately 23%).

P6.43

COPING AND RESILIENCE: ASSOCIATION BETWEEN POSITIVE ASPECTS OF CAREGIVING AND HEALTH OF PARENT CAREGIVERS

Cendonia Thomas

Tougaloo College, Tougaloo, MS

The purpose of this study was to evaluate associations between Positive Aspects of Caregiving (PAC), health and the resilience of parent caregivers across two different caregiving contexts. Data from the Inherited Disease, Caregiving, and Social Networks Study was used and was subset to only include parents of children, under the age of 18, with Inborn Errors of Metabolism (IEM) or typically developing children (TD). General Estimating Equations were used to carry out linear regression. We found that PAC was positively associated with mental health, but not significantly associated with physical health of Parent-Caregivers. However, resilience was positively associated with both physical and mental health. After accounting for perceived stress, the association between PAC and physical and mental health was no longer significant, although resilience was still positively associated with physical and mental health. Also, perceived stress was negatively associated with physical and mental health. Lastly, we found that the association between PAC, resilience, and caregiver health was not moderated by caregiver context. Considering that resilience had direct, independent associations with both physical and mental health among all parent caregivers it may act as a potential buffer against the negative impacts of stress. Furthermore, PAC's association with mental health demonstrates positive psychological impacts of caregiving on the overall health of parent-caregivers. Overall, PAC may still play a vital role in the overall health of parent caregivers, potentially through perceived stress.

P6.44

SOCIAL SUPPORT AND THE EFFECT IT HAS ON HIV POSITIVE PATIENTS AT OAHCC

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[1]University of Mississippi, University, MS, [2]Open Arms Healthcare Center, [3]My Brother's Keeper, Inc.

Social support, as well as social services, both are imperative to the well-being of HIV-positive individuals and is also impacted by the individual's demographics. The purpose of this research is to analyze the relationship of social support with self-management and quality of life among people living with HIV; examining those who have fallen out of care versus those who have remained in care. This research examined nine case studies that covered the impact and importance of social support along with how demographics affect people diagnosed with HIV. We also pulled data from the Careware system from January 2017 to December 2018, containing overall demographic information of HIV-positive patients in care at Open Arms Health Care Center. Preliminary findings suggest that social support is positively correlated with a better quality of life among people living with HIV. They also show that there is no correlation between social support and people who have better self-management and viral load suppression versus those who do not. Further research should compare patients with a lower viral load in comparison to those who do not to determine if the results are in fact valid. There should also be more programs implemented to further support those people living with HIV.

P6.45

THE IMPACT OF SELF-EFFICACY FOR DIET ON FRUITS AND VEGETABLES INTAKE AMONG YOUNG ADULTS IN MISSISSIPPI

[1]Precious Patrick Edet, [2]Xavier Sam, [1]Jennifer L. Lemacks, [1]Tammy Greer, [1]Sermin Aras

[1]University of Southern Mississippi, Hattiesburg, MS, [2]East Central Community College, Decatur, MS

According to the Center for Disease Control and Prevention, Mississippi adults consume among the lowest daily recommended amounts of fruits (8.7%) and vegetables (6.2%) compared to the national averages of 12.2% and 9.3%, respectively. Fruit and vegetable consumption is beneficial to health as it reduces the risks of obesity, diabetes, and other preventable health conditions. Self-efficacy for diet, including fruit and vegetable intake, has been shown to serve as a motivational factor in the consumption of fruits and vegetables among adolescents. However, the relationship between self-efficacy for diet and fruit and vegetable intake and its link to dietary behaviors, has not been well researched in general populations, especially those with higher incidences of preventable

chronic diseases. The specific objective of this research was to determine the impact of self-efficacy for diet on fruit and vegetable intake in a sample of young adult residents of Mississippi. Participants were 18-30 years old and recruited from university and community outreach events. Data were collected from eligible participants by using paper and electronic surveys. Correlation between self-efficacy and fruit and vegetable intake were computed. There was a significant, positive correlation between self-efficacy for diet and fruit ($r = 0.428$, $p = 0.01$, $N = 80$) and vegetable ($r = 0.275$, $p = 0.01$, $N = 81$) intake. Knowledge obtained from this research will be highly beneficial in improving dietary choices among young Mississippi adults, alongside it being vital to disease prevention and dietary programs.

P6.46

HEALTHY FOOD PURCHASE COMPARISON BETWEEN WELFARE PARTICIPANTS AND NON-WELFARE PARTICIPANTS

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Food security *can* be defined as a measure of the availability of food, affordability and accessibility. Approximately 20% of the population has been defined as being food insecure. Out of Mississippi's 82 counties, 34 have a food insecurity rate higher than 22%. Within this state's capitol, 61,000 residents lack access to fresh, affordable foods. While Supplemental Nutrition Assistance Program can provide some help to individuals, many believe the aid is minimal. The purpose of this research is to examine the differences in food spending among individuals who are on government assistance. Using data from MBK's Jump Start Jackson program, individuals were surveyed to determine the places they shop and their food choices. Data was extracted and entered into SPSS for analysis. Statistical analysis consisted of descriptive statistics, including frequencies and crosstabs analysis to compare those who are enrolled in government assistance programs to those who are not by examining the variety of foods they selected as common purchases in their homes. Using the snowball sample technique, it was determined, that of the 138 surveys completed for analysis, only 14%of the participants surveyed were enrolled in SNAP or WIC. However, participants enrolled in SNAP/WIC demonstrated healthier food choices than those who were not enrolled in the programs. Results concluded the government assisted participants in Jackson, MS were more likely to select healthier foods option compared to other participants. Future research should continue to examine the relationship between food access and healthy food knowledge among those on government assistance.

P6.47

EXAMINING THE RELATIONSHIPS BETWEEN WHERE MISSISSIPPIAN MINORITIES PREFER TO RECEIVE THEIR HEALTH, NUTRITION, AND PHYSICAL ACTIVITY INFORMATION AND THEIR STAGE OF CHANGE FOR DIET AND PHYSICAL ACTIVITY

Kaliq Sims, Timmothy Benton

University of Southern Mississippi, Hattiesburg, MS

Health knowledge is crucial for prevention and intervention regarding preventable chronic diseases such as diabetes, hypertension and obesity. Medical professionals are common sources of health information. Many people, however, receive information from sources outside of health clinics. In Mississippi, 50% of 82 counties have 10 or fewer primary care providers making health care information from alternative sources even more likely. Easy access to healthcare information is crucial for people who are ready to improve their health. Minorities, particularly African Americans and Native Americans, suffer disproportionately from preventable chronic diseases, have barriers to health-care access, score lower on health care knowledge and are more likely to live in places with limited health care access. We examined where Mississippi minorities prefer to receive health information, not including health clinics, and whether their preferences relate to stage of change for diet and physical activity and to disease status. Participants were recruited in Mississippi minority communities. Findings indicated that alternative site preferences for health-related information were not related to stage of change or disease status. African Americans and Native Americans prefer the grocery/retail store and worksite as alternative sites to receive health care information. Future research should examine population differences in relation to alternative site preferences to further identify implications for health outreach.

P6.48

AN EXPLORATION OF PERCEIVED OPIOID MISUSE IN COMMUNITIES: ASSOCIATION WITH DEMOGRAPHIC CHARACTERISTICS

[1]Kailey Clinton, [1]Mary Nelson Robertson, [1]Laura H. Downey, [1]Alisha M. Hardman, [1]Holli H. Seitz, [1]Je'Kylynn S. Steen, [1]Amanda Stone,

[2]Daniel C. Williams, [1]David R. Buys

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

Introduction: Prescription opioid misuse directly affects many Mississippians and the communities they live in. In 2017, an average of over 500,000 opioid dosage units were dispensed every day throughout the state of Mississippi. This research determined if there is an association between opioid misuse as a perceived community problem and demographic characteristics such as race, sex, employment status, and rurality.

Methods: 335 Mississippians, ages 30-59, participated in a 164-item online survey administered by Qualtrics that measured participants' perceptions of opioid misuse in their community and demographic characteristics.

Results: Survey findings indicate there is an association between rurality and opioid misuse perceived as a community problem (community problem) ($\chi^2(1)=5.82$, $p=0.02$), employment status and community problem ($\chi^2(1)=4.13$, $p=0.04$), and race and community problem ($\chi^2(2)=6.43$, $p=0.04$). Results demonstrate that a higher percentage of those who identified as rural, Black or African American, or unemployed view opioid misuse as not a problem in their community. No significant associations were found between other demographic characteristics and community problem.

Discussion: The findings of this survey support previous literature findings which suggest there is an association between rurality, race, employment status, and opioid misuse perceived as a community problem. These findings are important for health care providers in Mississippi to know in order to provide adequate care to people who live in areas that are perceived to have a higher prevalence of opioid misuse. Health care providers can raise awareness through having discussions with their patients about opioids and alternative pain management methods to help prevent opioid misuse among Mississippians.

P6.49

FROM THE MIRROR TO THE MIND: ARE RACE AND GENDER MODERATORS OF THE RELATIONSHIP BETWEEN MENTAL HEALTH AND BODY IMAGE DISPARITY?

Sara Crosby and Dylan Kittrell

University of Southern Mississippi, Hattiesburg, MS

Along with the second highest adult obesity prevalence, Mississippi ranks as the fifth highest state in the nation reporting frequent mental distress. Even though research suggests being overweight negatively impacts mental health, body perception seems to be an important mediator of the relationship between obesity and depression. Additionally, the difference between current and ideal body image, body image disparity (BID), appears to be variable among men and women as well as between different races. Thus, it seems warranted to explore the association between BID and mental health among Mississippians, a population with largest proportion of African-Americans compared to the nation. This research explores the association between different racial populations (African-American and Caucasian) and gender in Mississippi adults. Data was collected via outreach events and surveys where participants (incentivized with a chance to win $50 gift cards) rated their overall mental health and BID. Out of 405 participants, 73.6% were female, 25.9% were white, and 26.7% were black. Two two-way ANOVAS were computed with self-rated mental health as the dependent variable and BID and gender as independent variables for one analysis, and BID and race as independent variables for the other. We hypothesized that BID would predict low mental health for all populations, but that there would be differences between gender and race. While BID was found to predict low mental health for all populations, no significant differences were found between gender/race. For future studies, there is room to explore different moderating factors between BID and mental health.

Friday, February 21, 2020

MORNING

Room D11

7:30 Student Evaluation &Award Preparation (Chairs Only)

Oral Presentation Session II A

Moderators: Drs. George Moll and Frank Spradley

O6.08

8:40 INTRANASAL INSULIN REDUCES HYPOXIA-ISCHEMIA-INDUCED NEURON APOPTOSIS, BRAIN DAMAGE AND SENSORIMOTOR BEHAVIORAL DEFICITS IN NEONATAL RATS

Sandifer SP, Talati CP, Lee JW, Ojeda NB, Lu S, Prakash V, Dankhara N, Nielson TC, Winborne LE, Bidwell GL, Pang Y, Bhatt AJ, Fan LW

University of Mississippi Medical Center

Perinatal hypoxic-ischemia (HI) brain injury occurs in approximately 1 to 3 out of every 1,000 births, with 15-20% dying in the postnatal period. The present study is to investigate whether intranasal insulin attenuates hypoxia-ischemia-induced neuron apoptosis and brain damage in neonatal rats. P10 rat pups either had the HI exposure by ligation of the right carotid artery followed by 90 min of hypoxia (8% O2) or sham surgery. Immediately after HI or Sham, pups were given florescence-tagged insulin (Alex-546-Insulin)/Vehicle, human insulin (25 µg), or vehicle or in each nare under anesthesia. Sensorimotor behavioral tests were carried out 24 hours after HI exposure and brain tissues were collected to conduct neuronal damage studies on P11. Widespread Alex-546-Insulin-binding cells were detected in the brain and double-immunostaining showed that Alex546-Insulin-bindings were primarily co-localized with neuronal nuclei-positive neurons. In the hippocampus, phospho-Akt was found to be activated in a subset of Alex546-Insulin double-labeled cells, suggesting activation of the Akt/PI3K pathway in these neurons. Intranasal insulin treatment also reduced HI-induced sensorimotor behavioral disturbances and ipsilateral brain damage, as indicated by Fluoro-Jade C+ degenerated neurons and caspase 3+ neurons in the P11 brain. These results suggest that insulin may provide protection against neonatal HI brain neuronal injury and sensorimotor behavioral disturbances, and that protective effects are associated with the reduction of neuronal death by activation of intracellular cell survival signaling. If further pre-clinical research shows long-term benefits, intranasal Insulin has the potential to be a promising non-invasive therapy to improve outcomes of newborns with hypoxic-ischemic encephalopathy.

O6.09

8:50 ASSOCIATION OF ABDOMINAL FAT DENSITY WITH SIMPLE ANTHROPOMETRIC MEASURES AND ITS CORRELATION WITH CARDIOVASCULAR DISEASE RISK FACTORS AMONG AFRICAN AMERICANS

Jeremiah J. Reese, Sarah Miller, Charlene Claudio, Juliana Sitta, Seth T. Lirette, Edward Florez, Candace M. Howard

University of Mississippi Medical Center, Jackson, MS

Purpose: To assess the relationship of fat density and anthropometric measures, and its correlation with Cardiovascular Disease (CVD) risk factors among African Americans (AAs).

Methods: Non-enhanced abdominal CTs from AAs were gathered (N=2873). Attenuation measurements of psoas/paraspinal/ abdominal wall skeletal muscle and abdominal fat depots such as visceral adipose tissue (VAT) and subcutaneous adipose tissue (SAT) were measured using a multi-layer segmentation software (Tomovision, Slice-o-Matic, v5.0). In addition, anthropometric measures of waist circumference (WC) and sagittal abdominal diameter (SAD) were measured using a DICOM viewer software (OsiriX MD, v10.0). 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).

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.

O6.10

9:00 LIVER ISCHEMIA/REPERFUSION INJURY AND INFLAMMATORY RESPONSES IN OBESE FEMALE RATS

Hezekiah Williams

University of Mississippi Medical Center, Jackson, MS

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-alpha (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 ± 1%) versus lean rats (2 ± 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 ± 1,922 vs. Sham: 55 ± 25 IU/mL) compared to lean rats (I/R: 1,185 ± 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 ± 14% in lean and 47 ± 26 in obese rats ($P<0.05$). In conclusion, these data implicate increased inflammatory responses in mediating the exaggerated liver IRI in obese female rats

O6.11

9:10 EVALUATING THE PREVALENCE OF ALCOHOL CONSUMPTION AND DISORDERED ALCOHOL USE AMONG FEMALE COLLEGE STUDENTS AT MISSISSIPPI STATE UNIVERSITY

Grace Adegoye, Nicole Reeder, Manal Sunbul, Ning Tanapee, Madison Irby, Anna Persel, Terezie Tolar-Peterson

Mississippi State University, Mississippi State, MS

Background: Alcohol consumption is one of the top leading risk factors of increased mortality globally, associated with cancers, infectious diseases, liver and pancreatic disease, and alcohol-related injury. This study aimed to investigate the prevalence of alcohol usage and problematic behaviors related to alcohol use disorder among female college students.

Material and methods: In this ongoing cross-sectional study, 573 female college students between the ages of 18 and 24 years filled out a self-administered Alcohol Use Disorder Identification Test (AUDIT) survey, which was developed and validated by the WHO to assess alcohol usage, and alcohol-related problems in individuals.

Results: The majority, (81.8%) of female students reported ever consuming alcohol, among which 67 (11.8%) consume five or more per drinking occasion, and 4% of students reported binge drinking every week. 40 students (7%) reported that they have experienced an occasion where they couldn't stop drinking once they started. Also, 102 (18%) reported failure to do what was normally expected of them due to their drinking within the past year. Other problematic alcohols related behaviors reported were: needed a first drink in the morning to get going after a heavy drinking session (2.1%), feeling guilty after drinking (29%), and "blacking out" or inability to remember what happened the night before due to drinking reported by 169 (29.7%) students, and 4.5% reported injury to themselves or others.

Conclusion: Alcohol-related problems among college students can include increased risk of contracting STIs from unsafe sex, misconduct, injury, and poor concentration or memory.

9:20 Break

O6.12

9:25 INVASION OF HUMAN EPITHELIAL CELLS BY NONENCAPSULATED STREPTOCOCCUS PNEUMONIAE

Courtney Thompson, Jay Nguyen, Cecile Snell, Jessica Bradshaw, Larry S. McDaniel

University of Mississippi Medical Center, Jackson, MS

Streptococcus pneumoniae (pneumococcus) colonizes the human nasopharynx and causes infections such as pneumonia, conjunctivitis, and otitis media (OM). Currently licensed pneumococcal vaccines have reduced the incidence of invasive pneumococcal disease but have not effectively reduced mucosal infections such as OM. Nonencapsulated *S. pneumoniae* (NESp) have been isolated from up to 8% of OM cases. In prior experiments, a chinchilla model of OM showed that NESp MNZ41 produces a high bacterial burden and results in invasive disease. However, the mechanism by which MNZ41 invades middle ear epithelial cells (MEECs) and causes invasive disease is unknown. To determine the host-pathogen interactions between MNZ41 and MEECs, we aimed to isolate human MEECs (hMEECs) containing intracellular bacteria. We hypothesized that NESp expressing green fluorescent protein (GFP) would allow detection of hMEECs containing intracellular NESp. Thus, we transformed MNZ41 and validated the presence of the *gfp* cassette using PCR. Furthermore, GFP expression was confirmed by fluorescent microscopy and flow cytometry. The GFP-expressing MNZ41 cells were used in an adhesion and invasion assay to determine if they adhere to and invade hMEECs. Using a multiplicity of infection (MOI) of 1000, we were able to detect intracellular MNZ41 in hMEECs. Future studies will involve isolation of hMEECs with intracellular MNZ41 by cell sorting. The sorted cells will be used in dual-RNA sequencing of hMEECs and intracellular MNZ41 to reveal interactions between NESp and the host. Overall, this study will allow for a better understanding of NESp virulence mechanisms during OM.

O6.13

9:35 SALT-FREE FRACTIONATION OF COMPLEX ISOMERIC MIXTURES OF GLYCOSAMINOGLYCAN OLIGOSACCHARIDES COMPATIBLE WITH ESI-MS AND MICROARRAY ANALYSIS

[1]Hao Liu, [2]Apoorva Joshi, [2]Pradeep Chopra, [2]Lin Liu, [2]Geert-Jan Boons, [1]Joshua S. Sharp

[1]University of Mississippi, University, MS | [2]University of Georgia, Athens, Georgia

Heparin and heparan sulfate (Hp/HS) are linear complex glycosaminoglycans which are involved in diverse biological processes. The structural complexity brings difficulties in separation, making the study of structure-function relationships challenging. Here we present a multi-dimensional separation method for Hp/HS oligosaccharide fractionation with cross-compatible solvent and conditions, combining size exclusion chromatography (SEC), ion-pair reversed phase chromatography (IPRP), and hydrophilic interaction chromatography (HILIC) as three orthogonal separation methods that do not require desalting or extensive sample handling. With this method, the final eluent is suitable for structure-function relationship studies, including tandem mass spectrometry and microarray printing. Our data indicate that high resolution is achieved on both IPRP and HILIC for Hp/HS isomers. In addition, the fractions co-eluted in IPRP could be further separated by HILIC, with both separation dimensions capable of resolving some isomeric oligosaccharides. We demonstrate this method using both unpurified reaction products from isomeric synthetic hexasaccharides and an octasaccharide fraction from enoxaparin, identifying isomers resolved by this multi-dimensional separation method. We demonstrate both structural analysis by MS, as well as functional analysis by microarray printing and screening using a prototypical Hp/HS binding protein: basic-fibroblast growth factor (FGF2). Collectively, this method provides a strategy for efficient Hp/HS structure-function characterization.

O6.14

9:45 HEAD-TO-HEAD COMPARISONS OF NONINVASIVE TESTS FOR STAGING HEPATIC FIBROSIS

Elliot Varney, Blake Becker, Kevin Zand, David Gordy, Judd Storrs, Akash patel, Manahor Roda, Candace M. Howard

University of Mississippi Medical Center, Jackson, MS

INTRODUCTION: Liver biopsy is the current standard for

diagnosing liver fibrosis; however, it is invasive and has many potential complications. Although many validated non-invasive tests exist, there has never been a comparative analysis to assess accuracy amongst them. We propose a prospective pilot study comparing common and emerging non-invasive tests.

METHODS: Adults with liver disease presenting for liver biopsy were recruited. Ultrasound shear-wave elastography (USE) and MR elastography (MRE) were performed to measure liver stiffness. CT images from liver biopsy image protocols were used to measure liver surface nodularity (LSN) using a previously validated software. Serum labs were used to calculate FIB-4 score, a serum biomarker of fibrosis. Concordance of FIB-4 score, LSN score, USE, and MRE with histologic staging of hepatic fibrosis were assessed using Harrell's C-statistics, and accuracy with the use of area under the receiver operating characteristic curve was assessed. Inter-observer agreement for LSN scores was assessed using linear regression models.

RESULTS: Range of hepatic fibrosis included no fibrosis (F0):7, mild-moderate (F1-2):3, and advanced (F3-4):5. Accuracy was highest for LSN scores and MRE when compared to that of USE (AUC:0.79) and FIB-4 (AUC:0.82) with an AUC=0.94 and 0.86, respectively. The C-stat concordance for FIB-4, LSN, USE, and MRE were 0.84,0.87,0.77, and 0.85 respectively. Inter-observer agreement between the two readers for LSN score was excellent with a **ρ**-value of 0.92,$p<0.001$.

BRIEF DISCUSSION: Our preliminary data indicates that LSN score and MRE are the superior non-invasive diagnostic tests when compared to FIB-4 score and USE in staging hepatic fibrosis.

O6.15

9:55 A RETROSPECTIVE STUDY OF 4 FACTOR PROTHROMBIN COMPLEX CONCENTRATE USE IN THE PREHOSPITAL SETTING

Hannah Cockrell, Kristen Carter, Damon A Darsey, Stephanie Tesseneer, Kelsey Dearman, Stacey Ferguson, Christal S King, Christopher Pearson, Robert O'Brien, Matthew Kutcher

University of Mississippi Medical Center, Jackson, MS

Several studies suggest a benefit to prothrombin complex concentrate (PCC) in conjunction with early balanced transfusion in the treatment of hemorrhagic shock. Few studies have evaluated prehospital administration of PCC for hemorrhagic shock outside of the context of vitamin K antagonist reversal. The objective of this study is to compare transfused patients who received prehospital PCC to patients who did not receive prehospital PCC.

We retrospectively reviewed adult (age>16) patients arriving to a single Level 1 trauma center by aeromedical transport who received prehospital blood products from 7/1/14-3/31/19. Outcomes included mortality and transfusion requirements.

Of 77 included patients receiving prehospital transfusion, 30 received prehospital PCC and 47 blood products only. Indications for prehospital PCC included trauma (10), gastrointestinal bleeding (10), vaginal bleeding (5), intracranial bleeding (2), postoperative bleeding (1), ruptured visceral aneurysm (1), and epistaxis (1). Of PCC patients, 19 were known to be on anticoagulants and 11 received PCC empirically for hemorrhagic shock. Patients who received prehospital PCC were older (mean 52.8 vs. 62.8y, p=0.013) but there were no differences in gender or trauma (p>0.23). PCC patients had a trend towards lower 24h plasma transfusion (p=0.06) and received less cryoprecipitate (p=0.03) but had similar 24h crystalloid, red blood cell, and platelet requirements (p>0.37).

Existing studies suggest efficacy of PCC for anticoagulant reversal in acute bleeding. This study suggests that these findings likely generalize to the prehospital setting and provides early evidence that empiric PCC use in hemorrhagic shock outside of known anticoagulant reversal deserves further study in the prehospital arena.

Friday, February 21, 2020

MORNING

Room D9

Oral Presentation Session II B

Moderators: Drs. Barbara Wilson and Candace M. Howard

O6.16

8:40 PROGNOSTIC SIGNIFICANCE OF A CANCER STEM CELL CHEMOTHERAPEUTIC CYTOTOXICITY ASSAY FOR RECURRENT OVARIAN CANCER

Elliot Varney, Pier Paolo Claudio, Candace M. Howard

University of Mississippi Medical Center, Jackson, MS

INTRODUCTION: Disease recurrence of ovarian cancer is common with development of platinum-resistant or refractory disease partially to the presence of chemo-resistant cancer stem cells (CSCs) that contribute to tumor propagation, maintenance, and treatment resistance. Our study assesses the ability of a chemotherapeutic drug cytotoxicity assay (ChemoID) to identify the most effective chemotherapy treatment against CSCs and bulk of tumor cells as compared to historical data.

METHODS: Fresh tissue samples were collected from 45 patients affected by (3^{rd}- 5^{th} relapse) recurrent ovarian cancer. Test results from the ChemoID assay were used to guide treatments of patients taking into consideration their health status and using dose reductions, as needed. CT and PET scans were used to monitor patients for tumor response, time to recurrence, progression-free survival (PFS), and overall survival (OS).

RESULTS: We found that recurrent ovarian cancer patients (3^{rd}- 5^{th} relapse) prospectively treated with ChemoID-guided, high cell kill chemotherapy had an improvement in the median PFS corresponding to 5.4 months (3^{rd} relapse), 3.6 months (4^{th} relapse), and 3.9 months (5^{th} relapse), respectively when compared against historical data. Additionally, we observed that ovarian cancer patients identified as non-responders by ChemoID had 30 times the hazard of death compared to those women that were identified as responders ($p<0.001$) with respective median survivals of 6 vs. 13 months ($p<0.001$).

DSICUSSION: The data suggest that the ChemoID drug response assay has the potential to help guide individualized chemotherapy choices to improve ovarian cancer patient outcomes.

O6.17

8:50 3D-SPHEROID CELL CULTURE SYSTEM PROVIDES A SENSIBLE IN-VITRO MODEL FOR HCMV INFECTION

Dipanwita Mitra, Ritesh Tandon, Amol V. Janorkar

University of Mississippi Medical Center, Jackson, MS

Human cytomegalovirus (HCMV) has traditionally been studied in the laboratory in a monolayer of fibroblast cell culture. It is unlikely that these two-dimensional (2D) cell cultures represent a true *in-vivo* environment. To understand the host-pathogen interaction of HCMV in a more natural cell culture setting, we are utilizing an established 3D-spheroid cell culture system that is likely to provide a sensible *in-vitro* model. Tissue culture polystyrene plates/surfaces coated with ELP (elastin-like polypeptide) - PEI (polyethyleneimine) conjugate was used to induce 3D spheroid organization of human foreskin derived primary fibroblast cells (HFF). 3D HFFs were successfully infected with HCMV as indicated by the expression of late viral

protein, pp150 (GFP tagged). The late viral protein expression and localization suggests that HCMV replication progresses to a late stage in 3D cells. Also, cytoplasmic viral assembly compartment (vAC), where final steps in virus maturation occur, has been studied only in monolayer cells, whereas its functionality is determined by its interaction with cellular organelles in a 3D space. Therefore, we intend to explore how vAC functions in 3D cells. Also, whole transcriptome comparisons of 3D vs. 2D adipocytes (generated using the ELP-PEI system) show significant differences in the expression levels of several established HCMV receptors. Therefore, our goal in this project is to explore the differences in HCMV tropism for 2D and 3D cells, and understand how HCMV replication kinetics/levels in 3D cells measure up to 2D cells in order to establish 3D-spheroid cell culture system as a working model for HCMV infection.

O6.18

9:00 INTERACTIONS BETWEEN LIVER SURFACE NODULARITY, SARCOPENIA AND VISCERAL OBESITY IN AN AT RISK AFRICAN AMERICANS POPULATION

Juliana Sitta, Elliot Varney, Sarah Miller, Charlene Claudio, Caroline Doherty, Niki Patel, Amy Krecker, Gerri Wilson, Khalid Manzoul, Rana Gordji, A.S. Shalaby, Stella Powell, Seth Lirette, Edward Florez, Candace M. Howard

University of Mississippi Medical Center, Jackson, MS

INTRODUCTION: This retrospective observational study was designed to assess the association between Liver Surface Nodularity, muscle mass and visceral fat depots in a high-risk population of African Americans (AAs).

METHODS: Non-enhanced abdominal CT images from AAs were analyzed (N=2847). 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=0.19, p<0.001), SAD (R^2=0.21, p<0.001), and all fat compartments. For SAD ≥25cm, each 1cm increase in SAD was associated with a 0.08 unit increase in LSN score (ß=0.08, p<0.001). WC ≥100cm also correlated with an increase in LSN (ß=0.02, p<0.001). When adjusted for total muscle volume (TMV), the LSN-WC/SAD correlation actually showed a proportional increase as TMV increased (WC≥100cm: TMV=800, ß=0.02; TMV=450, ß=0.01, p<0.001 and SAD≥25cm: TMV=800, ß=0.07; TMV=450, ß=0.06, p=0.004). Finally, inter-observer agreement was excellent (ICC>0.92, N=300).

DISCUSSION: Anthropomorphic measurements above a certain cut-off point (SAD ≥25cm; WC ≥100cm), were linked to increased LSN scores.

O6.19

9:10

EMPIRIC PREHOSPITAL TRANEXAMIC ACID USE IN PEDIATRIC TRAUMA: A SINGLE INSTITUTION CASE SERIES

Taylor Shaw, Kristen Carter, Hannah Cockrell, Stephanie Tesseneer, Kelsey Dearman, Stacey Ferguson, Christopher Pearson, Christal S King, Michael Morris, Damon Darsey, Matthew Kutcher

University of Mississippi Medical Center, Jackson, MS

Tranexamic acid (TXA), an antifibrinolytic agent, has been shown to reduce blood loss in elective pediatric surgery and to potentially increase survival in adult trauma. However, the empiric use of TXA in the prehospital environment has not been evaluated in pediatric trauma.

All pediatric (age < 18) injured patients arriving to a single trauma center from 7/1/14-3/31/19 who received TXA during transport were retrospectively reviewed. The primary outcome was mortality; secondary outcomes include transfusions, and bleeding and thrombotic events.

Twelve patients received at least 1g of TXA during transport; three received an additional 1g at definitive care. Mean age was 14.3±2.3y (range: 11-17y), and mean injury severity score was 23.8 ± 7.3. Fifty-eight percent were male; 67% had blunt trauma; and 33% had a traumatic cardiac arrest. Patients received a median of 4.6 units (interquartile range (IQR): 1.8-6.2) of packed red cells and 3.5 units (IQR: 0-2.0) of plasma during the first 24 hours; 67% required operative intervention. Five patients had hemorrhagic shock (defined as base deficit ≤ -6). There were three mortalities, all of which were traumatic arrests related to non-survivable head injury. Only one superficial venous thrombotic event (cephalic vein clot) and one bleeding complication requiring intervention (epistaxis) occurred.

Mirroring studies of TXA in the adult population, there is equipoise for the empiric use of TXA in pediatric trauma patients with hemorrhage. As TXA has logistical advantages compared to blood products in the prehospital environment, further prospective study of TXA in the pediatric prehospital arena is needed

9:20 Break

O6.20

9:25 SIMPLE ANTHROPOMETRIC MEASURES AND THEIR CORRELATION WITH BODY COMPOSITION IN AFRICAN AMERICANS

Sarah Miller, Juliana Sitta, Elliot Varney, Amir Khadavi, Amy Krecker, Benjamin Rushing, Niki Patel, Khalid Manzoul, Rana Gordji, Candise Johnson, Charlene Claudio, A.S. Shalaby, Caroline Doherty, Stella Powell, Seth Lirette, Edward Florez, Candace M. Howard

University of Mississippi Medical Center, Jackson, MS

INTRODUCTION: In order to assess the relationship of fat density and anthropometric measures, and its correlation with CVD risk factors in African Americans (AAs) non-enhanced abdominal CTs from AAs were gathered (N=2847).

METHODS: Using a multi-layer segmentation software, regional fat volumes and abdominal skeletal muscle including psoas, paraspinal and abdominal wall were measured. Visceral adipose tissue (VAT) and subcutaneous adipose tissue (SAT) were separated in abdominal adiposity. 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=0.37, p<0.001) and showed good correlation with SAT volumes (R^2=0.70, p<0.001). SAD most notably represented VAT volume (R^2=0.55, 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: VAT and SAT have shown potential as critical

biomarkers of obesity-related CVD; however, calculation takes >35 min/subject on cross-sectional images. SAD and WC showed strong associations with VAT and SAT, respectively. This data supports anthropometric biomarkers use in stratifying cardiometabolic risk in AAs.

O6.21

9:35 THE ROLE OF NLRP3 INFLAMMASOME IN SEPSIS-INDUCED MULTI-ORGAN INJURY

Robert Tramel, Marivee Borges-Rodriguez, Olivia Travis, Cedar Baik, Ann Bullen, Chelsea Giachelli, Jan M. Williams, Denise C. Cornelius

University of Mississippi Medical Center, Jackson, MS

Sepsis is characterized by organ dysfunction due to a dysregulated immune response to infection. Currently, no effective treatment for sepsis exists. Platelets are recognized as mediators of the immune response a potential therapeutic target for the treatment of sepsis. We previously demonstrated that NLRP3 inflammasome activation in sepsis-induced activated platelets was associated with multi-organ injury in the cecal-ligation puncture (CLP) rat model of sepsis. In this experiment, we tested the hypothesis that inhibition of NLRP3 would inhibit platelet activation and attenuate multi-organ injury in the CLP rat. CLP (n=10) or Sham (n=10) surgery were performed in male and female Sprague-Dawley rats. A subset of CLP rats were treated with MCC950 (20mg/kg/d), a specific NLRP3 inhibitor (CLP+M, n=10). At 72h post-CLP, blood and organs were harvested for analysis of platelet activation, NLRP3 activation, inflammation and end organ damage. Platelet activation increased from 7.6±2.9% in Sham to 15.9±4.4% inCLP, and was reduced to 8.9±4.1 in CLP+M rats ($p<0.05$). NLRP3 activation was also increased in platelets, kidney, and lung of CLP vs Sham rats. MCC950 treatment attenuated NLRP3 activation. Plasma, kidney, and lung levels of NLRP3 inflammasome associated cytokines, IL-1ß and IL-18, were significantly increased in CLP compared to Sham rats. Inhibition of NLRP3 normalized cytokine levels.Glomerular injury, pulmonary edema, and endothelial dysfunction markers were increased in CLP rats vs Sham. MCC950 treatment significantly decreased renal and pulmonary injury and endothelial dysfunction in CLP+M.Our results demonstrate a role for NLRP3 in contributing to platelet activation and multi-organ injury in sepsis.

O6.22

9:45 TEG-BASED EVALUATION OF GENDER-ASSOCIATED HYPERCOAGULABILITY

Kristen Carter, Skylar Rodgers, Deepti Patki, Robert O'Brien, Matthew Kutcher

University of Mississippi Medical Center, Jackson, MS

Age, race, and gender differences in coagulation status of healthy volunteers have been previously reported; however, rigorous multivariate analysis adjusting for these factors is lacking. We aimed to investigate the effects of age, race, and gender on baseline coagulation status in healthy volunteers.

Thirty healthy volunteers with no history of bleeding/thrombotic events and no previous anticoagulant/antiplatelet use were recruited. Blood samples were drawn and thromboelastography (TEG) performed.

Thirty participants had a mean age of 36.8 ± 11.1y, mean BMI of 29.0 ± 5.7kg/m^2, and were 47% African-American and 70% female. Women were significantly older than men (40.0 ± 10.9y vs. 28.2 ± 6.7y, p=0.002); there were no significant differences in demographics by race. Multivariate analysis of variance for the effect of age, race, and gender across TEG parameters yielded evidence for gender differences in hypercoagulability (Pillai's trace p=0.02), which appear to be driven by differences in K-time, alpha angle (a), maximal amplitude (MA), and G parameter. Specifically, K-time was 1.60 (95% confidence interval 1.50-1.72) in females vs 2.39s (1.99-3.23) in men; a was 67.0 (65.4-68.2) vs 59.2° (52.2-62.7), MA was 68.2 (67.0-69.5) vs 60.7mm (56.7-63.5), and G was 10,848 (10,281-11,672) vs 7,922 (6,833-8,911). Thus, women were relatively hypercoagulable compared to men.

Women at baseline have relatively hypercoagulable fibrin deposition kinetics, platelet contributions to clot formation, and overall clot strength compared to men, even when adjusted for age and race. Additional research is needed to detail the key patient-level factors related to gender-associated hypercoagulability.

10:30 Population Health Symposium II

"MEDICINE, IMMUNITY AND INFECTION"

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

Moderators: Drs. Vibha Vig and Ritesh Tandon

Speakers:

10:35 Nita Maihle, PhD, UMMC, Jackson, MS

"PERCISION MEDICINE, WOMEN'S HEALTH, AND THE UMMC CANCER CENTER"

11:05 Fengwei Bai, PhD, USM, Hattiesburg, MS

"HOST IMMUNITY TO VIRAL INFECTIONS: WHAT IS IL-17?"

12:00 – 1:00 Poster Session II (High School)

Poster Coordinators: Drs. Olga McDaniel and Barbara Wilson

P6.50

EFFECTS OF A LIPID LOWERING DRUG ON THE PROGRESSION OF PROTEINURIA IN OBESE DAHL SALT-SENSITIVE RATS

LaMari Sutton, Corbin A. Shields, Evan Browning, Bibek Poudel, and Jan Williams

Prepubertal obesity (PPO) is becoming a worldwide epidemic. Recent studies suggest that PPO is associated with increased risk of renal injury in children. Recently, we reported that obese SS^{LepR}mutant rats exhibit dyslipidemia and renal injury independent of hyperglycemia and elevations in arterial pressure prior to puberty. Moreover, the SS^{LepR}mutant strain displayed significant glomerular injury along with the presence of lipid droplets in the glomeuli. Lipid-lowering drugs such as fibrates have proven to be renoprotective in various models of kidney disease. Therefore, in the current study we tested the effects of gemfibrozil (200 mg/kg/day, orally) on the progression of renal injury in SS^{LepR}mutant rats. We observed greater than a 10-fold increase in plasma triglyceride levels in the SS^{LepR}mutant strain versus the values measured in SS$_{WT}$rats. Gemfibrozil treatment significantly reduced plasma triglycerides by 64% in SS$_{WT}$rats and 57% in the SS^{LepR}mutant strain. During the course of the study, proteinuria rose from 89±26 and 416±11 mg/day to 181±46 and 675±47 mg/day in SS and SS^{LepR}mutant rats, respectively. Chronic treatment with gemfibrozil markedly decreased the progression of proteinuria by 52% in SS$_{WT}$rats and 43% in the SS^{LepR}mutant strain. The kidneys from vehicle-treated SS^{LepR}mutant rats displayed significant glomerular injury with mesangial expansion and increased interstitial fibrosis and tubular protein casts compared to SS$_{WT}$rats. Gemfibrozil treatment markedly decreased these renal abnormalities in both strains. These data indicate that reducing plasma lipid levels with gemfibrozil prevents the progression of proteinuria in both lean SS$_{WT}$ and obese

SS^{LepR}mutant rats. This study was supported by GM104357 and DK109133.

P6.51

PROGRESSIVE CHANGES IN MICROGLIAL MORPHOLOGY IN SCA1 AND CALBINDIN-SCA1 DOUBLE MUTANT MICE

Asiah Clay, Madison Elise Land, Maripar E. Lopez, Parminder J. S. Vig

University of Mississippi Medical Center, Jackson, MS

Spinocerebellar ataxia type 1 (SCA1) is a dominantly inherited neurological disorder caused by the expansion of a polyglutamine tract in the mutant protein ataxin-1. Progressive ataxia in SCA1 disease results in the loss of Purkinje cells in the cerebellum. The mechanism of PC death in SCA1 is not known; however, previous work indicates that targeted deprivation of PC specific calcium binding protein calbindin-D28k (CaB) exacerbates ataxin-1 mediated toxicity in SCA1 transgenic (Tg) mice. The objective of this study was to determine if the cerebellar microglia in SCA1 are early indictors of neuronal stress and exhibit altered morphology. Further, to understand if these morphologic alterations are more pronounced in SCA1 Tg double mutants than SCA1 mice. Paraffin embedded mouse cerebellar tissue from wild type (WT), SCA1, and CaB: SCA1 double mutant (DM) mice at postnatal week 2 and 4 were cut into 6 um sections. Sections were de-paraffinized, rehydrated and processed for immunohistochemistry using a microglial marker IBA1 antibody. The immunostained sections were observed by Olympus Epi-fluorescence microscope and photographed by a high resolution digital camera. Changes in morphology were measured by Image J software and subjected to statistical analysis. Results showed that DM mice had markedly larger microglial cell sizes than SCA1 and WT at both ages. SCA1 and DM mice do not show behavior or immunohistochemical abnormalities at 2 wks of age; however, microglia showed early signs of activation in SCA1, which increased with age. These data indicate that microglia could be used as markers in chronic neurodegenerative diseases.

P6.52

FORMAULATIONS OF DRUG DELIVERY HYDROGELS

Jessie James III[1], Jared S. Cobb[2], Pallabi Pal[2], Ratna Bollavarapu[2], and Amol Janorkar[2]

[1]Murrah High School Base Pair Program, Jackson, MS; [2]Biomedical Materials Science, University of Mississippi Medical Center, Jackson, MS

Hydrogels have existed for more than half of a century, providing one of the earliest records of cross linked hydroxyethyl methacrylate. Today, hydrogels make a great impact on the scientific community by providing a biocompatible platform that can be easily tuned by controlling the formulation components. Hydrogels have been used for wound healing, cell therapeutics, and sustained release of drugs. The objective of our research is to use elastin-like polypeptides (ELP) and collagen to provide an extracellular matrix to deliver oxalic acid, doxycycline, and bone morphogenetic protein 2 (BMP-2) in a controlled manner. We will make these hydrogels by using the method of composite formation through gelation. We will measure the release of oxalic acid, doxycycline, and BMP-2. We will develop an assay using a microwave reaction to measure the release of oxalic acid. We will use ultraviolet (UV) absorption to measure the doxycycline release and an ELISA method to measure the BMP-2 release. These studies will help determine the optimum hydrogel properties that will be beneficial for tissue engineering and drug delivery applications.

P6.53

ANGIOTENSIN II TYPE I RECEPTOR AGONISTIC AUTOANTIBODY BLOCKADE IMPROVES HYPERTENSION AND IMMUNE ACTIVATION IN POSTPARTUM RATS WITH THE PRECLINICAL MODEL OF PREECLAMPSIA

Brandon Fisher, Pooja Chinthakuntla, Karen Vincen, Tarek Ibrahim, Lorena Amaral, George Booz, Babbette LaMarca, Mark W Cunningham, Jr.

University of Mississippi Medical Center, Jackson, MS

Preeclampsia (PE), hypertension during pregnancy, is a disease that affects ~ 5-8 of births in the USA and is the leading cause for preterm birth, morbidity, and mortality for both the mother and the fetus. Several studies have shown that women with PE have an increased risk of developing renal disease, cerebral disease, and cardiovascular diseases (CVD) later in life. Angiotensin II, type I receptor agonistic autoantibodies (AT1-AAs) are elevated in women with PE, the preclinical rat model of PE, and women postpartum (up to 2 years after pregnancy). The exact role AT1-AAs after pregnancy is unknown.Thus, studies performed by Cunningham, (2018). Hypertension, showed that blockade of the AT1-AA by using seven amino acid sequences (7AA) improved the blood pressure, natural killer cell activation, and the pathology of PE in the pre-clinical rat model of PE. The long-term effects of the AT1-AA inhibition on blood pressure, natural killer cell activation, and CVD physiology on the pre-clinical rat's model of PE postpartum has not been studied, and is the purpose of this study. Thus we hypothesize that rats postpartum of PE will have elevated blood pressure and NK cell activation; while PE rats administered AT1-AA inhibition during pregnancy will be protected from these changes postpartum.

P6.54

ESTABLISHING A THREE DIMENSION TISSUE CULTURE MODEL FOR HUMAN CYTOMEGALOVIRUS (HCMV) INFECTION

Jeffery Caliedo[1] and Ritesh Tandon[2]

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

Human cytomegalovirus (HCMV) is a herpesvirus that causes congenital abnormalities. HCMV can also cause severe infection in immunocompromised individuals leading to life-threatening complications. HCMV has traditionally been studied in the laboratory in human foreskin fibroblasts cell cultures, which grow into 2D monolayers. It is unlikely that these 2D cells represent true *in vivo* environment. To understand HCMV replication in a more natural setting, we are trying to establish a 3D spheroid cell culture system. Our current efforts are aimed towards comparing infection rates, virus yields as well as expression level and localization of viral proteins in 3D spheroid cells compared to 2D cells. For our preliminary experiments, we grew HCMV in 2D and 3D adipocyte cells and harvested the virus at different time points (0, 3, 5, 7 days post-infection). We then infected confluent monolayers of human foreskin fibroblast cells with harvested virus and measured virus growth at 9-10 days post-infection. We expect that the 3D HCMV infected model will have similar titers compared to the 2D HCMV infected model. Currently, it is clear that the 3D adipocytes being tested are effective, and proteins localized as expected. However, challenges arise when attempting to produce better virus titers than the standard fibroblast cell. Ultimately, we expect to establish a new three-dimensional tissue culture model for HCMV infection.

P6.55

ASSESSING INFLUENZA VIRUSES FOR ANTI-CANCER ACTIVITY

Evan Morrisey[1], Stephen Stray[2], Pier Paolo Claudio[2]

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

Glioblastoma (GB) is the most common malignant primary tumor of the adult brain. Despite recent advances, GB remains difficult to treat, usually involving an aggressive combination of surgery, radio-, and chemotherapy. This set of treatments typically has a poor long-term survival rate. A recent breakthrough has been the development of two oncolytic (cancer-killing) virus therapies for GB, based on Herpes and Adenoviruses. We investigated the possibility of using influenza viruses as therapeutics to increase the arsenal available to patients and physicians. We have tested a panel of influenza A, B, and C viruses for their ability to inhibit the growth of GB cell lines. Several influenza viruses demonstrate the ability to reduce the growth of some, but not all, GB cell lines tested. Ongoing studies will determine whether the growth inhibition observed is due to cell killing, and whether the viruses are effective in cells resistant to temozolomide (TMZ/Temodar), the "standard of care" drug, to which patients frequently develop resistance.

HSD program sponsored by: Sunshine Children's Clinic in Canton, MS and the Sigma Si of UMMC

HISTORY AND PHILOSOPHY OF SCIENCE

Co-Chair: Gregory Johnson
Mississippi State University
Co-Chair: Robert Waltzer
Belhaven University
Vice-Chair: Paula Smithka
University of Southern Mississippi

Thursday, February 20, 2020
MORNING
Room D10

8:50 WELCOME

O7.01

9:00 LOCKWOOD'S BIOLOGICAL SPECIES AS HOMEOSTATIC PROCESS CLUSTERS AND WHY BIOLOGICAL SPECIES AS HOMEOSTATIC PROPERTY CLUSTERS IS STILL THE BEST EXPLANATION

Paula Smithka

University of Southern Mississippi, Hattiesburg, MS

Various solutions to the "species problem" have been offered concerning the nature of biological species. Jeffrey Lockwood (2012) has offered a novel solution. He argues that species are processes. Relying on process philosophy, which contends that dynamic change or processes (i.e. 'becoming') is the fundamental nature of reality (against more traditional 'substance-based' metaphysics approaches, i.e. 'being') and Robert Ulanowicz's (1997, 2001, 2005, 2009) work in the metaphysics of process ecology, Lockwood contends that species, like ecological systems, are emergent, autocatalytic systems with "propensities for centripetality and mutuality" balancing persistence and change. Instead of accepting "*species-as-processes*" to be *the* solution to the species problem, he advocates a "pluralistrealist" approach, claiming compatibility with various "solutions." But Richard Boyd's (1999) position that species are homeostatic *property* cluster kinds (HPCKs) is particularly fruitful for reframing: as "homeostatic *process* clusters." I argue that this position does not offer a better solution to the species problem than does the HPCK approach. Lockwood accepts that processes are more fundamental than entities; however, processes are relational, and relations require *relata*, so one can question whether this view is more advantageous than more traditional accounts. More crucially, Lockwood's degree of understanding of homeostasis is unclear. He discusses positive feedback in a system but not negative feedback. Negative feedback is the way homeostasis is maintained in a system. Furthermore, the examples Lockwood gives as homeostatic properties are, rather, perturbations to a homeostatic system. Thus, HPCKs are still the best explanation for biological species.

O7.02

9:30 THE FANTASIES OF TIME

Jim Shelton

University of Central Arkansas, Conway, AR

I define three referents of the word 'time' (daily time, yearly time and timing time) that are used in physics and cosmology. However a very common usage in many scientists' speculations about "time" is intended to denote a universal physical reality "out there" in space. This time, often thought to be the time in "space-time" and which existed prior to the solar system, I call "cosmic time." I argue that this supposed cosmic time is a fantasy. There is no possible confirmation of its existence since it is never scientifically defined. This idea of time is mainly supported by the false claim that clocks measure time. I show that clocks are not measuring instruments in the required sense of 'measure.' The rejection of cosmic time has some important suggestions for cosmological speculation, including the concept of "space-time" when posited as reality. Nothing I say is intended to deny any established theory or finding of physical science

10:00 Break

O7.03

10:15 PRESERVING MARS TODAY USING BASELINE ECOLOGIES

Daniel Capper

University of Southern Mississippi, Hattiesburg, MS

Current calls to protect the Martian environment with "Planetary Parks" maintain environmental merit. However, they lack a sufficiently urgent time frame for initiating protection as well as a robust scientific method for the establishment of noteworthy Martian natural landmarks as natural reserves. In response, if we return to the seminal environmental preservation teachings of Aldo Leopold and John Muir, we encounter the importance of grounding Martian preservation efforts on the fundamental environmental science method of a base-datum of normality, or baseline ecology. This method establishes natural reserves that feature both minimal human interference as well as known origination dates, thereby providing longitudinal environmental control samples for scientific use. Applied before humans appear on Mars, preserved baseline ecologies thereby aid our scientific understanding of human environmental impacts, both now and well into the future, while they enhance a variety of other outcomes in terms of Martian protection. However, the baseline ecology method requires that, through international agreements, we establish these reserves as quickly as possible and certainly before humans arrive on the planet.

O7.04

10:45 A UNIVERSAL EPISTEMOLOGY: THE EPISTEMIC VIRTUES OF ONTIC STRUCTURAL REALISM FOR DIFFERENT PERCEPTUAL FRAMEWORKS

Daniel Stearman

University of Southern Mississippi, Hattiesburg, MS

There is an epistemological and metaphysical divide in the philosophy of science between scientific realism and anti-realism. Scientific realism is "a positive epistemic attitude toward the content of our best theories and models, recommending belief in both observable and unobservable aspects of the world described by the sciences" (Chakravartty, 2017). Anti- realism is the position that theories are "merely empirically adequate" (Park, 2018) and do not adopt a positive epistemic attitude toward unobservables. I contend that the realist position is the better epistemological position because realism more adequately accounts for the success of scientific theories that do not rely so heavily on direct empirical evidence of the observer. Specifically, I defend ontic structural realism because it allows for continuity of scientific knowledge through theory change and because it is concerned with relations between observable and unobservable objects in the world, rather than their properties. Ontic structural realism is distinct from the standard realist position because that perspective is concerned with theoretical reference. Ontic structural realism accounts for the epistemological concerns raised by Ladyman (2009) about theoretical reference. I further argue that it is the best epistemological position to take into account the different perceptual frameworks of various biological species and their epistemic access to the world.

11:15 Break

O7.05

11:30 HACKING, MICROSCOPES, AND CALCIUM IMAGING

Gregory Johnson

Mississippi State University, Mississippi State, MS

Hacking's analysis of light microscopy provides a "modest" argument for scientific realism. We are, he contends, "convinced about the structures that we see" through a microscope for the following reasons. (1) We are aware of possible aberrations in the image; (2) we can intervene on the structures that we observe with the microscope; (3) we can observe the same specimen with microscopes that rely on different optical principles; (4) we understand the scientific principles on which these microscopes operate; and (5) we understand the biology and biochemistry that intersects with what we are learning about the specimen (1983: 186-209).

Separate from Hacking's worries about realism and anti-realism is a question about the verification of proposed explanations for cognitive processes. Typically, investigations in cognitive psychology are indirect: by observing behavior, we make an inference about internal components and activities. Investigating the relevant neurobiology, on the other hand, provides a more direct method of investigation, although obviously, such investigations do not let us see the activity of neurons in the same way that we can see an appropriately sized object in front of us. Nonetheless, Hacking's criteria are satisfied by a technique such as calcium imaging—a type of microscopy used to detect individual action potentials. Hence, by Hacking's standards, calcium imaging lets us "see" neurobiological processes. Since observing a process is clearly superior to an indirect method of detecting it, we should prefer neurobiological investigations over the indirect methods that are typically used in cognitive psychology.

12:00 General Session

Thursday, February 20, 2020

AFTERNOON

Room D10

O7.06

1:30 1952 AND ALL THAT: WHAT HODGKIN AND HUXLEY REALLY ACCOMPLISHED

John Bickle

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

The popular lament that "we know so little about how the brain works" is manifestly false. At the level of basic neurobiology our knowledge is now vast, and down to the level of molecular mechanisms. And all of this knowledge in neurobiology traces back directly to the work of Alan Hodgkin and Andrew Huxley mid-20th century. But while Hodgkin and Huxley's contributions to neuroscience are widely acknowledged, a mythology has arisen among computationalists that occludes their real contributions to neurobiology. Here I debunk that myth by documenting the details of their 1952 series of publications. Not surprisingly, to those who follow mainstream neurobiology, their actual accomplishments depend upon ingenious and detailed experimental use of a then-new research tool.

O7.07

2:00 MEMORY TRANSFER: THE RISE, FALL, AND REVIVAL OF A TARGET OF NEUROSCIENCE RESEARCH?

David Colaço

Mississippi State University, Mississippi State, MS

Memory transfer is perhaps the most notorious phenomenon to have been alleged in the history of neuroscience. This phenomenon was characterized as the transfer of associations from one organism to another via the transfer of tissue. It received a great deal of attention, due to its implications and to researchers' use of sensational experiments involving cannibalism. This led to a cottage industry about its significance and its underlying mechanism. However, this target was abandoned in the 1970s, allegedly because of the undercutting of evidence that was initially put forward in the phenomenon's favor (Colaço 2018).

If memory transfer was abandoned in the 70s, how do we explain its apparent revival in the past decade? In this talk, I analyze the historical and contemporary research on memory transfer and what this case tells us about the characterization and the conceptualization of targets of scientific research. I argue that contemporary research fails to fall victim to the issues with its historical counterpart due to (1) a change in the experiments used to evince it, as well as (2) a change in researchers' views on what counts as a memory and, by implication, the transfer of memory. These changes, I argue, do not make the contemporary research without issue, but they fundamentally change the nature of the target that memory transfer researchers' investigate.

Colaço, D. (2018). Rip it up and start again: The rejection of a characterization of a phenomenon. *Studies in History and Philosophy of Science Part A*, *72*, 32-40.

2:30 Break

O7.08

2:45 SCIENTIFIC CARICATURES AND THE NATURE OF SCIENCE

Renee M. Clary

Mississippi State University, Mississippi State, MS

During the emerging professionalization of geology in the mid-1800s, scientific caricatures served as unique visualization tools in the Golden Age of Geology (1788-1840). Scientific caricatures could be humorous commentaries or thinly veiled criticisms to proposed theories. These unique graphics illuminate the early modern science, complete with the disagreements and arguments among the gentlemen geologists as the science progressed. Therefore, scientific caricatures encapsulate the social, cultural, and political context in which the theories emerged and effectively demonstrate the nature of science. Several geologists actively constructed these unusual graphics, including William Coneybeare (1787-1857), Thomas Sopwith (1803-1879), and Henry James (1803-1877). One of the most prolific producers of scientific caricatures was Henry De la Beche (1796-1855), the first director of what would become the British Geological Survey. De la Beche used his exceptional artistic skills to construct scientific caricatures that comically commented on his colleagues' research or sharply challenged their theoretical interpretations. Although constructed in the 1800s, these graphics continue to have relevance in modern geology classrooms by counteracting final form science and illustrating the practice of science that is not always apparent to students. Additionally, scientific caricatures increase the depth and breadth of student understanding and effectively expand the variety of methods for probing comprehension and learning. When offered scientific caricatures as an assessment option, some college students opt to construct them in lieu of traditional exam items. Students reported that scientific caricature construction requires deeper integration and understanding of the content, and helps them to retain the science they learn.

Thursday, February 20, 2020

EVENING

3:30 Dodgen Lecture and Awards Ceremony (Ballroom)

General Poster Session

Immediately Following Dodgen Lecture

Friday, February 21, 2020

MORNING

Room D10

8:50 Welcome

THEME: HISTORY AND PHILOSOPHY OF MEDICINE

TITLE: "DETERMINING DISEASES:

CONCEPTUAL AND POLITICAL PROBLEMS IN DEFINING AND RESPONDING TO DISEASES "

O7.09

9:00 CASE OF MURDER AND MEDICAL INSANITY IN NINETEENTH- CENTURY MISSISSIPPI

Amy W. Forbes

Center for Bioethics and Medical Humanities

University of Mississippi Medical Center, Jackson, MS

This presentation examines how medical insanity was being translated into legal context in nineteenth-century Mississippi through the murder trial of Edward Yerger, newspaper editor and member of one of Mississippi's most prominent families. In 1869, Yerger murdered Col. Joseph Crane, mayor of Jackson, in a duel gone wrong. Yerger's defense team, led by his uncle, Judge William Yerger, did not contest the facts of the case. Instead, they used the testimony of Yerger's friends, relatives, and ex-slaves to attempt to establish his moral insanity. The insanity defense was new, first used successfully in New York in 1859. Just ten years later, the Yerger case helped define how the plea would be used in Mississippi. Prosecution and defense disagreed about whether Yerger met the criteria for insanity. The prosecution argued that Yerger may have been partially deranged, but still knew the relations of things and persons and right and wrong and was therefore responsible for the homicide. The defense argued that the fact that he apparently retained reason did not mean he was sane—that he suffered from "moral insanity", a brain disease in which insane impulses influenced thought and behavior only selectively. Both sides quoted experts extensively. At this time of transition, the Yerger case shows medico-legal professionals grappling with how to use the concept of moral insanity, attempting to determine how exactly questions about a healthy or unhealthy mind fit into questions of culpability, with implications for establishing both psychiatry as a specialization and thesuccessful insanity defense.

O7.10

9:30 NON-DISEASE DISEASES

Patrick D. Hopkins

Center for Bioethics and Medical Humanities

University of Mississippi Medical Center, Jackson, MS

This presentation examines a phenomenon in which conditions are given disease status (and official disease codes for insurance purposes) but which are at the same time explicitly or near-explicitly described as normal or non-pathological. There are three ways this currently occurs. First, a condition is classified as a disease but is explicitly described as a normal, endogenous pattern of human activity that is simply at odds with what the individual desires or needs for their occupation. The example is shift-work sleep disorder. Second, a condition is classified as a disorder but is explicitly characterized as the distress associated with that condition, not the condition itself, though access to medications and surgeries to "treat" the condition itself rather than the distress is then secured by the disease classification. The example is gender dysphoria. Third, a condition is classified as a disorder because it interferes with functioning, but instead of being stigmatized, becomes a highly desirable diagnosis due to social advantages and rewards, motivating individuals to mimic symptoms. In all these cases, a combination of politics, values, financial incentives, and attempts to work around medical gatekeeping reveals a serious conflict in the practice and purpose of disease classification—people want to use medicines without having to be sick.

10:00 Break

O7.11

10:15 PROTEINS WITH BUILT-IN TIMERS: A RESULT OF FINE-TUNING AND DESIGN OR UNGUIDED PROCESSES?

Robert Waltzer

Belhaven University, Jackson, MS

Engineers construct components of a machine within the constraints of known principles of physics and engineering. If biological systems are reverse engineered, principles can be derived that account for their functions (Principles of Neural Design: Sterling and Laughlin, 2015). For instance, signaling pathways that begin with G-protein coupled receptors (GPCRs) have a component, the alpha-subunit of a trimeric G-protein, which does two actions. When active and associated with GTP, it attaches to an effector molecule triggering a reaction. It also initiates its own deactivation by catalysis of the GTP associated with it. Many enzymes carry out catalytic reactions rapidly. However, the alpha-subunit has a more prolonged attachment to its substrate, GTP, before it carries out hydrolysis. This is functionally relevant in that the longer it stays active, the stronger the signal generated through its attachment to its effector. It seems that there are limited answers to how accidental, unguided processes would produce a protein that has unique binding properties. Moreover, building that protein so that it stays active sufficiently long to provide the needed functional signals presents an even greater challenge. A design-perspective will be considered in relation to this problem. Presumably a designer would begin with what he/she wants to build, would then look at the available materials and consider how they could be arranged to accomplish that task, and then would consider the assembly instructions. Thinking like a designer may give insights into potential experiments on such proteins as well as challenge our current understanding of origins

O7.12

10:45 CRESCENTS IN THE BLOOD: IMAGES OF MALARIA PARASITES – 1897 to 2020

Ralph Didlake, Dax Busway, Ariel Childs, and Susan Clark

University of Mississippi Medical Center, Jackson, MS

Malaria has been a significant human disease burden from antiquity to the present day. Direct visualization of *Plasmodium* species parasites, the causative agents of clinical malaria, in blood smears has been central to the delineation of the organism's lifecycle and to understanding the pathophysiology of clinical infection in man. Direct visualization has also remained the gold standard for diagnosis of the disease for well over a century. This fact has made the availability of high-quality images of infected human red blood cells essential for the training of microbiologists, parasitologists, physicians, and laboratory technologists who study and treat this infection. This paper traces how illustration techniques of infected malaria blood smears have evolved from the initial hand drawings of Charles Laveran in 1880 to the current production of digital images via cell phone microscopy. Over the course of the twentieth century, this evolution maps not only to medicine's understanding of malaria as a disease but also parallels the development of medical illustration as a discipline, microscopy as a diagnostic technique, and photography as a teaching and research tool. This presentation will also examine selected illustrations of malaria parasites for their individual aesthetic value.

11:15 Break

O7.13

11:30 THE CUTTING EDGE: SURGICAL PROCEDURES AT THE MISSISSIPPI STATE ASYLUM, 1910 to 1935

Ralph Didlake and Lida Gibson

University of Mississippi Medical Center, Jackson, MS

The Mississippi State Lunatic Asylum was founded in 1855 to house and treat Mississippians with mental illness, but by 1910 a new hospital building was built that included a surgical suite. By that time the name had also been changed to the Mississippi State Insane Hospital. While surgical procedures were not always documented in superintendents' biennial reports, the records that do exist provide insight into an evolving understanding of how physical conditions affected a patient's mental health. The 25-year period between 1910 and 1935 also saw the development of the "mental hygiene" movement on a state, national, and even international level. This movement strongly encouraged the sterilization of the "feeble-minded" and those with "mental defects." An analysis of the documented surgical procedures performed at the MSA sheds light on the extent to which this recommendation was embraced at this particular institution.

O7.14

12:00 FARM TO TABLE: THE CHALLENGE OF NUTRITIONAL SELF-SUFFICIENCY IN THE MISSISSIPPI STATE ASYLUM, 1855 to 1935

Sara Gleason, Caroline Compretta, Lida Gibson, and Reid Black

University of Mississippi Medical Center, Jackson, MS

When the Mississippi State Lunatic Asylum opened in 1855, its grounds consisted of 140 acres located two and a half miles north of the rapidly growing capital city of Jackson. By the time it closed in 1935, the Insane Hospital (as it was then known) included 1320 acres with almost 700 acres under cultivation. Approximately 30,000 patients admitted over the 80-year period were fed with vegetables, grain, poultry, beef, pork, and eggs produced on site. Despite the bountiful yearly harvests, well-documented in the biennial superintendent's reports submitted to the legislature, some patients still suffered and even died as a result of diseases connected to diet and nutrition. This analysis of farm production records compared with patient population growth and diagnoses will inform the understanding of the nutritional resources and how they might have been distributed among a diverse patient population during the institution's history.

12:30 Student Awards

12:45 Business Meeting

MARINE AND ATMOSPHERIC SCIENCES

Chair: Nicole Phillips

University of Southern Mississippi

Vice-Chair: Francis Tuluri

Jackson State University

Vice-Chair: Remata Reddy

Jackson State University

Thursday, February 20, 2020

AFTERNOON

Room D3

12:50 WELCOME

O8.01

1:00 TOTAL ORGANIC ANALYSIS AND CATCH PER UNIT EFFORT OF BLUE CRAB, *CALLINECTES SAPIDUS* IN THE MISSISSIPPI SOUND

Tasheena Powers

University of Southern Mississippi Department of Marine Science, Long Beach, MS

Blue crabs (Callinectes sapidus) are an important staple culturally, ecologically, and economically, for many people in the southern United States. These crabs are heavily harvested in the Gulf of Mexico (GoM) throughout the late spring and fall months, when they are abundant and presumably have higher organic content within their body mass. In a preliminary effort to conduct a catch per unit effort (CPUE) study of blue crab body mass parameters, two geographically distinct environments were selected in Mississippi waters: one coastal location landward of Deer Island and one bayou location within Biloxi Bay. Sampling was conducted in the winter months from March through the end of April 2016. Environmental parameters such as light flux, salinity, and temperature were measured in order to discern environmental conditions at selected locations. Individual blue crabs were measured, and analyzed for location/habitat, sex, live weight, wet claw weight, dry claw weight, and ash-free dry claw weight. Results from this study show that the majority of the crabs were caught in the bayou, suggesting that environmental conditions were somewhat predictive of CPUE, as well as the total organic content of captured blue crabs. The majority of crabs caught were male, suggesting that male crabs prefer the lower salinities of the bayous; whereas in the literature females are shown to venture to higher salinity environments during colder seasons. A more extensive sampling effort throughout the year might allow researchers to better distinguish blue crab movements and population health along the Mississippi sound, barrier islands, and bayous.

O8.02

1:20 SEAGRASS DISTRIBUTION AND CONDITION AT CAT ISLAND, MISSISSIPPI

Kelly Darnell.

University of Southern Mississippi Gulf Coast Research Laboratory, Ocean Spring, MS

Seagrasses growing along Mississippi's barrier islands provide a range of ecosystem services and functions to coastal communities and to commercially and recreationally fished species in the State's nearshore waters. Understanding the distribution and condition of these seagrasses in the context of the surrounding environment is necessary for understanding their role in the system and for predicting response to future changes. We used a tiered monitoring approach to determine seagrass distribution and condition across Cat Island, Mississippi, and related this information to historic data collected at or near our 30 stations and nine transects. Results from our first year of annual monitoring indicate that both shoal grass (Halodule wrightii) and widgeon grass (Ruppia maritima) grow in the shallow waters around Cat Island in a mosaic of monospecific patches and mixed assemblages. Seagrass bed structure is patchy, with patch size and location varying over annual timescales, suggesting that the surrounding environment is a main driver of seagrass distribution and condition. Results from the first year of sampling will also provide a baseline for annual monitoring over subsequent years.

O8.03

1:40 QUARTERLY SEASONAL TRENDS OF OZONE AND ITS EFFECTS ON ASTHMA IN EASTERN PART OF TEXAS, USA

Francis Tuluri[1], Amit K. Gorai[2], Erin Wickerham[3], Tiffany Thomas[1]

[1]*Jackson State University, Jackson, MS,USA,* [2]*National Institute of Technology, Rourkela, India,* [3]*Texas Department of State Health Services, Austin, TX, USA*

Association between air pollutants and asthma prevalence is complex and is being investigated to predict measures to be taken for control and mitigation. Ozone air pollutant data and asthma in Eastern Texas, USA is collected from the secondary sources for the period 2009 to 2011 to see the effects of quarterly seasonal trends using Geographical Information System (GIS) statistical analytics. From the various county data, monthly averages are used for determination of quarterly average calculation. Descriptive statistics of the data are estimated for each of the counties in the study region. For spatial mapping, inverse distance weighted (IDW) method of ArcGIS software is used in each of the cases. The Pearson the correlation coefficients between asthma discharge rate (ADR) and ozone concentration are -0.034, -0.066, -0.007 and -0.020 respectively in four quarters of 2011. By comparing the regional data year wise, the computed results show that ozone is negatively correlated with ADR in every quarters of 2009 and 2011. By and large, the association of short-term exposure of air pollution and asthma discharge rate was not statistically significant in the study area. A negative correlation coefficient was observed between the quarterly mean concentrations of ozone with the quarterly asthma discharge rate**.**

O8.04

2:00 VARIABILITY OF ALL INDIA SUMMER MONSOON RAINFALL: LARGE-SCALE QBO, ENSO, AND CLIMATE CHANGE IMPACTS AND PROCESSES

Remata S. Reddy, Francis Tuluri, Mehri Fadavi, Wilbur Walters

Jackson State University, Jackson, MS

India much depends on monsoon rainfall for agricultural planning, industry, human and other life. A good monsoon resulting in improved agricultural yields, which brings down prices of essential food commodities and reduces their imports overall reducing the food and inflation. Further improved rains result in increased hydroelectric production. All these factors initiate positive ripple effects throughout the economy of India. Studies have reported about the Indian summer monsoon onset and rainfall variability. Recent studies have reported that the variability of monsoon rainfall during the northern summer is well associated with the great deserts, equatorial lower stratospheric

winds (QBO) and 11-year solar cycle (2). In the present study, we further examine the seasonal, inter-annual and long-term variability of monsoon rainfall using all India rainfall data during June-September, for the period 1881-2010. We looked the impacts and processes including large-scale events such as QBO, ENSO and Climate Change including SST's over the Arabian Sea, on monsoon variability. The study has pointed out that the cooling SST's effect the monsoon onset and seasonal rainfall. The large-scale floods/droughts were associated with the westerly/easterly phases of the QBO. The large-scale droughts were associated with the ENSO and easterly phase of the QBO. Decade analysis revealed a long-term variability (~ 50 year) in all India rainfall. We will discuss some of the processes associated with the monsoon variability.

2:30 Business Meeting

Thursday, February 20, 2020

EVENING

3:30 Dodgen Lecture and Awards Ceremony

General Poster Session

Immediately Following Dodgen Lecture

POSTER SESSION

P8.01

INFERRING OCEAN VELOCITY FROM SEQUENCES OF OCEAN IMAGES

Courage Klutse[1], Dmitri Nechaev[1], Ngodock Hans[2]

[1]University of Southern Mississippi Department of Marine Science, Stennis, MS, [2]Naval Research Laboratory, Stennis, MS

Assimilation of observed ocean velocity information have been shown to have significant impacts on the quality of forecasts for ocean surface circulation. Additionally, previous studies have suggested that ocean velocity information can be estimated from sequences of images containing geophysical features. This work examines a unique opportunity of hypothetically estimating reliable ocean velocity information for regions where ocean images are available. The assimilation of the image sequences, using a four-dimensional variational data assimilation (4DVAR) analysis system is tested in a controlled environment. Synthetic images of the surface trace concentration are obtained from the solution of the advection-diffusion equation with prescribed velocity field. The velocity field is then reconstructed from synthetic images. The ability to invert images of the passive tracer concentration into surface velocity by assimilating tracer concentrations is a validation for the approach in these initial experiments. Other experiments focused on assessing the differences between the extracted velocities and independent velocity observations and assessing the impact of assimilated reconstructed velocities on model forecast.

P8.02

EVALUATION OF URBAN HEAT ISLAND EFFECT USING REMOTELY SENSED LAND SURFACE TEMPERATURE AND LAND USE LAND COVER DATA PRODUCTS

Kennedy Jones, Ranjani Kulawardhana

Jackson State University, Jackson, MS

Urban Heat Island (UHI) effect is known as the heat accumulation in urban areas due to influence of anthropogenic activities and growth of urbanization. Quantification of the differences in land surface temperatures (LSTs) over different land covers can help understanding differences in energy and heat accumulations over various surface areas and can be used to evaluate how urban landscapes contribute to UHI effect. In this study we used MODIS (Moderate Resolution Imaging Spectroradiometer) LST and NCLD (National Land Cover Database) land use/ land cover (LULC) data to quantify LST differences between natural and urban LULCs during most recent years (i.e. from 2000 to 2018). Specific objectives of this study were to: 1) evaluate Urban Heat Island (UHI) effect using LST and LULC data over conterminous United States and 2) understand potential linkages between urban growth and UHI effect. Our results indicate significant differences in LSTs between urban and natural LULCs. Further these differences were significantly variable during different times of the day (i.e. day & night) and during different seasons (i.e. summer & winter). However, further analyses are necessary for better understanding of potential linkages between urban growth and LST.

P8.03

TECHNOLOGY APPLICATIONS IN EMERGENCY MANAGEMENT

HuiRu Shih, Mia A. Griffin, Kionna J. Taylor

Jackson State University, Jackson, MS

With new technology comes a variety of applications that can have tremendous benefits to our society and the way we handle emergency management. Technology should give us a way to improve emergency prevention, response, and recovery operations.

Drones can provide an aerial vantage point that helps cover large amounts of ground. Therefore, drone can play an invaluable role in supporting disaster response and recovery. Large-scale disasters often disrupt the critical infrastructure of a region. The post-disaster survey using drones can provide first responders with the information they need to locate and reach survivors, see the extent of the damage, and assess any existing danger.

360-degree video, also known as immersive video, allows the viewer to look in all directions. 360-degree videos are most impressive when viewed with virtual reality headset. 360-degree video, which feels real, can be used for training in emergency preparedness and response.

360-Degree Videos can be created with 360-degree cameras. A 360-degree camera is a camera with the ability to capture a 360-degree field of view. Such cameras are needed when large visual field coverage is desired. As augmented and virtual reality (AR/VR) is rising in prevalence, 360-degree cameras have been used more widely recently.

Technology has proven to be effective for all phases of emergency management. The available technologies are constantly evolving. From drones to virtual reality, technology presents the opportunity to transform disaster relief efforts and help communities to develop resilience for when the next disaster strikes.

P8.04

CHEMICAL COMPOSITION ACROSS PM2.5 FILTERS: POTENTIAL IMPACTS FOR PM2.5 TOXICOLOGY RESEARCH

Allie Sidwell, Oscar Black, Courtney Roper

University of Mississippi, Oxford, MS

Toxicology research into the impacts of exposure to air pollution often requires the extraction of fine particulate matter ($PM_{2.5}$) from filters. In order to generate relevant toxicity data, there is an interest in validating that laboratory procedures create samples truly representative of samples collected from the environment. The ability

to run multiple analyses on the same filter sample is beneficial to provide a robust characterization of $PM_{2.5}$, both from a compositional and toxicological viewpoint. Some methods of analysis destroy the sample like inductively coupled plasma mass spectrometry (ICP-MS). The goal of our study is to identify if portions of the same filter have similar elemental concentrations and thus provide information on if splitting a single filter for chemical analysis and toxicology testing provides data that can be used for associations between the two data sets. We will cut $PM_{2.5}$ collected filters (n=15) into quadrants and analyze each portion for elements (n ~ 25) via ICP-MS. We anticipate that there will be no significant difference in elemental concentrations between quadrants from the sample filter. Our preliminary data from testing two sample filters split into quadrants for elements (n=14) mainly supports this. However, we observed significant differences between arsenic concentrations on different quadrants of the same filter. We are in the process of continuing to investigate these findings and the possible implications for toxicology testing. Our study will demonstrate the feasibility of allocation of the different portions of a $PM_{2.5}$ filter for multiple analyses and the potential impacts on $PM_{2.5}$ toxicity findings.

P8.05

AIR-SEA INTERACTIONS AND PRECIPITATION VARIABILITY ASSOCIATED WITH LAND FALLING HURRICANES IDA AND NATE OVER THE GULF OF MEXICO USING RADAR AND SATELLITE DATA

Avaionia Smith, Remata S. Reddy

Jackson State University, Jackson, MS

This research focuses air-sea interactions, high winds and precipitation variability of 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 Atlantic hurricane season. On November 8-11, 2009 Ida strengthen 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 in widespread destruction and casualties in Central America and was also the costliest natural disaster in Costa Rican history. Nate strengthens 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 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.

P8.06

TRANSFORMATION OF THE NWS: THE INFLUENCE OF IMPACT-BASED DECISION SUPPORT SERVICES (IDSS)

Ja'Nia Dunbar[1] and Mike Bettwy[2]

[1]Jackson State University, Jackson, MS, [2]National Weather Service, NOAA

The purpose of this research is to examine the demanding need for the National Weather Service (NWS) and its core partners to have better preparation and immediate response to drastic weather events for the communities of America to help save lives and property by the use of episodic and recurring actions. Since the exemplification of the Weather Research and Forecasting Innovation Act of 2017, the National Weather Service and the communities of its four core partners: Emergency Management, Water Resources Management, Government Partners, and Electronic Media have worked together like never before by creating Impact Based Decision Support Services (IDSS) in a major effort to enhance communication and messaging for the public to foster action and behavior that minimizes adverse impact caused by severe weather. In this study, similar severe weather events prior to IDSS and after implementation will be compared to analyze the effectiveness that the policy has had on the readiness of the NWS and the preparation of at risk communities in the United States.

P8.07

AN INVESTIGATION OF OCEAN-ATMOSPHERIC INTERACTIONS, HIGH WINDS, AND PRECIPITATION VARIABILITY ASSOCIATED WITH HURRICANE HARVEY USING RADAR AND NASA/NOAA SATELLITE DATA

Geetika Polepalli[1], Prasanna Guduru[2], Aditya Remata[3], Remata S. Reddy[4]

[1]Northwest Rankin High School, Brandon, MS, [2]Summer Hill Junior High School, Clinton, MS, [3]Clinton High School, Clinton, MS, and [4]Jackson State University, Jackson, MS

The study investigates ocean-atmospheric interactions, high winds and precipitation variability associated with Hurricane Harvey using RADAR and satellite data. Hurricane Harvey was a category 4 storm that made landfall in Texas near the Gulf of Mexico on August 25, 2017. It created 180 billion dollars worth of property damage and caused a total of 82 fatalities. We developed an empirical model to calculate the large-scale heat fluxes and air-sea interface associated with Hurricane Harvey. We developed the model by differentiating the ideal gas law and by using the large-scale heat fluxes and bulk model equations. Heat fluxes are the measurement of energy flow per unit of area per unit of time. We used RADAR and satellite data in order to collect wind speed, air pressure, air temperature, ocean temperature and precipitation. We collected data from RADAR, NOAA, NDBC, and NASA. Hurricane Harvey was at its strongest point on 26 August 2017 with the low pressure, 938 mb. There is an inverse relationship between pressure and large-heat fluxes, so when pressure is low, the large-scale heat fluxes must be high. The difference between and air and sea temperature was highest at 4.9 degrees Celsius, and wind speed was highest at 58.1 m/s with larger precipitation variability. The results show that Harvey's maximum large-scale heat fluxes were 4600 j/s/m^2. In the future, we could use satellite data and our empirical model to determine the severity and track of land falling Atlantic hurricanes.

MATHEMATICS, COMPUTER SCIENCES AND STATISTICS

Chair: Jamil Ibrahim
University of Mississippi Medical Center
Co-Chair- Ping Zhang
Alcorn State University
Vice-Chair: Yuanyuan Duan
University of Mississippi Medical Center
Vice-Chair: Reena Patel
US Army Corp of Engineers

Thursday, February 20, 2020

MORNING

Room D8

8:15 WELCOME

O9.01

8:30 DEMYSTIFYING MACHINE LEARNING

Indu Shukla, Haley R. Dozier, Brandon Hanson, William G. Bond

US Army Corps of Engineers

Machine learning (ML) uses sophisticated algorithms to "learn" from massive volumes of Big Data which powers many of today's most innovative technology. It is used in so many industries of applications such as healthcare, retail, publishing, financial sector and social media. In retail ML algorithms help generate shopping recommendations by discovering browsing behaviors and purchase histories. It is used in cybersecurity to better analyze threats and respond to attacks. In financial sector ML is crucial for effective detection and prevention of fraud involving credit cards. Social media uses ML to provide users with personalized contents like relatable stories, targeted videos, and advertisements.

ML not only identifies trends and patterns to solve the problems, it also has ability to improve over the time as ML algorithms experience keep improving in accuracy and efficiency. While Machine Learning can be incredibly powerful, it is not entirely perfect. We need to identify our goals and datasets to train our algorithms otherwise it is unable to deliver an accurate forecast.

O9.02

8:50: TEACHING PERFORMANCE ANALYSIS ON ONLINE AND TRADITIONAL FACE-TO-FACE CLASSES

Ping Zhang, Elizabeth Udemgba, Kevin Robinson

Alcorn State University, Lorman, MS

In this research, we conducted research on the comparison of teaching performances between online class and traditional class-sitting class and how the different ways of course delivery will affect students' active learning. The pro and cons of the two ways of teaching are analyzed. It shows that traditional class lecture has more students focus and more interactive between lecturer and students. Whereas online class has remote (distance) learning advantages. The student's performances of College Algebra and fundamental Math and Computer Science courses are conducted and analyzed and some results are obtained.

O9.03

9:10 DEVELOPING A NEW COURSE USING OPEN EDUCATIONAL RESOURCES

Ping Zhang and Jarvis D. Morrow

Alcorn State University, Lorman, MS

In this project, we propose a new course development project using open educational resources. A new undergraduate course: Data Mining and Machine Learning is proposed and developed. In this project, teaching materials from MIT Open Courseware are adopted. The concepts of Data Mining and Machine Learning are introduced beginning with topics, such as boosting, support vector machines, hidden Markov models, and Bayesian networks. The course will give the student the basic ideas and intuition behind modern machine learning methods as well as a bit more formal understanding of how, why, and when they work. For Data Mining, a number of successful applications have been included in the course, such as credit rating, fraud detection, database marketing, customer relationship management and stock market investments. This course will examine methods that have emerged from both fields and proven to be of value in recognizing patterns and making predictions from an applications perspective. We will survey applications and provide an opportunity for hands-on experimentation with algorithms for data mining using easy-to- use software and cases.

O9.04

9:30 QUANTITATIVE AND QUALITATIVE ANALYSIS OF THE MOBILE DEVICE USAGE PATTERNS IN STUDENTS' PARTICIPATION IN LEARNING ACTIVITIES

Jamil Ibrahim

University of Mississippi Medical Center, Jackson, MS

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 fall of 2018-2019 academic year, a survey was administered online to students from an Academic Health Sciences Center (AHS) 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. Of a total of 1185 responses, 924 (79%) students said they used mobile devices to access course content and other learning activities. 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.

9:50 break

O9.05

10:10 ANIMATION OF THE TANGENT LINE OF A CURVE

Mubarak Ibrahim and X. Wu

Mississippi Valley State University, Itta Bena, MS

In mathematics, a tangent line is a line which locally touches a curve at one point only. There are a lot of applications. For example, a tangent line can be used in measuring the changing rate and the geometry of the curve locally. The animation of the tangent line of a curve displays how a tangent line can be visualized moving along a curve. However, the implementation is a big issue since the coding is not obvious. In this project, we use Python to implement the moving

tangent line with a fixed length. We are utilizing python because of its widespread use in computational/scientific research and its invaluable Graphical User Interface (GUI) tools. Python offers more resources when expanding and applying this research into other domains.

O9.06

10:30 FUNCTIONAL TESTING FOR DETECTING PRECISION ERRORS OF 1D, 2D, AND 3D INTEGRALS

Barbara Pilate

US Army Corps of Engineers

Binary representation of floating-point numbers may lead to loss of numerical precision and errors in mathematical calculations. Routines with such calculations could run without any error; however, their results are inaccurate. These errors are difficult to find because the loss of precision with certain mathematical operations is usually gradual and cumulative. One way to test the results is to use symbolic math software to implement the equations, and then implement functional tests to analyze precision errors with the results from the symbolic math software. This presentation discusses (1) the 1D, 2D, and 3D integrals used in the Adaptive Hydraulics (AdH) model, and (2) how to check for precision errors using functional tests.

O9.07

10:50 A PRELIMINARY STUDY ON AUTOMATED CITATION ANALYSIS

Antonio Austin, Bhargav Manoharan, Ayush Baral, Milan Ghimire, Lixin Yu

Alcorn State University, Lorman, MS

A research paper usually cites many academic reference sources. Some cited references are highly related to the research of the paper. Readrs are interested in reading these sources since these papers may lead them to similar researches. In contrast, some references are cited only for the source of some concepts. These cited references may actually have little to do with the research in the citing paper. Readers will have to pick the useful source from a large list of references. Dr. Ben-Ami Lipetz, an established researcher in information science, addressed this issue in his 1965 paper and proposed a solution to identify the relationship between the citing and cited paper. Fifty year later, researchers are still studying this issue and proposing new solutions, but no commercial searching tool has addressed this issue yet. This study compares, categorizes, and evaluates the previous research in this subject, such as the methods of using location of the citations in the paper, frequency of the citations, length of the citation, natural language processing, and other methodology. The focus of this study is to explore the approach to use a computer algorithm to analyze the relationship between the citing paper and the cited papers.

O9.08

11:10 VIRTUAL REALITY APPLICATIONS AND ADVANCEMENTS

Tony, T. Lewis. Miles Dedeaux, Ganesh Sharma, David M. Brantley Jr.and Partha Sengupta

University of Southern Mississippi, Hattiesburg, MS

Virtual Reality (VR) being a product of mere science fiction has now become reality to the world. The focus of this paper is to process and inform about VR. We discuss the origins of VR and some of the earliest examples of it, as well as, how VR technology has advanced and sharpened since its origins. VR has become much more useful to multiple fields of study and work than its previous singular role for entertainment purposes. Thanks to VR and its array of different uses and applications such fields related to education and science have changed significantly for the better. In education systems, VR allows the students to feel much more immersed in the lesson which may prove to boost their attentiveness and ability to retain the information since there are those who learn best through hands-on experience. Virtual reality's science applications have also allowed scientists and doctors alike to experiment without invading the human body. Giving neuroscientists the capability of studying an individual's brain activity while they are immersed in a VR world that may replicate real world scenarios. Doctors may now use VR to experiment and prepare surgeries on the human body to explore the "what ifs" while also removing the potential for human error. Though it now has more purposes that just entertainment, it now allows the user to be much more involved in the games they play and feel the action first hand. VR is progressing and improving different areas in our society.

O9.09

11:30 VIRTUAL REALITY AND ITS APPLICATIONS

Nyharika Rai, Ryan P. Cavett, Brycie L. Wiseman, Brandon A Shoemake, Colby J. Dorsey, and Partha Sengupta

University of Southern Mississippi, Hattiesburg, MS

In this paper, we have carried out extensive research on the prospective applications of Virtual Reality (VR) and some ethical concerns that rise along with it. A brief explanation of the mechanism behind VR is provided to show how VR works physically. With the technological advancement seen in the last decade, uses of VR can be seen in areas such as but not limited to, education, medicine (surgery, therapy), business, etc. There are many different topics that dwell both on the fear of being in a virtual environment as well as the excitement of being so immersed in a situation. Although not all situations for VR are based on recreation, there is much to be considered in other fields of practice. While not all VR applications deal in make-believe situations, it is highly regarded as a recreational device. However, in this paper we have researched prospects of VR other than that of entertainment/ recreation.

As it is with every phenomenon, there are pros and cons to using VR. We have focused more on the social and ethical concerns regarding VR and its applications. These concerns are not only limited to the physical world but also the online world, for example bullying other people in a virtual world, is it a punishable crime or not? Hence, in this paper, we discuss the possible rules and regulations that might be implemented concerning VR.

12:00 General Session

Thursday, February 20, 2020

AFTERNOON

Room D8

1:00-2:30 WORKSHOP

ILLUSTRATING SPECIFIC STATISTICAL TOOLS REQUIRED FOR DESIGNING RESEARCH STUDIES Workshop/Symposium

Jamil Ibrahim

University of Mississippi Medical Center, Jackson, MS

Statistics is useful in almost all fields especially in research studies. Statisticians should be involved from the beginning of these studies. In research practice, the most common requests to statisticians from investigators are sample size calculations or sample size justifications. The techniques of statistical power, sample size estimations and confidence intervals are the most important aspects

of a research study. 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.

2:40 **Divisional Business Meeting**

Thursday, February 20, 2020

EVENING

3:30 Dodgen Lecture and Awards Ceremony

General Poster Session

Immediately Following Dodgen Lecture

Divisional Posters

P9.01

FINITE ELEMENT ANALYSIS OF PTERYGOID IMPLANT-SUPPORTED MAXILLARY PROSTHESES

[1]Rimsha Bhatta, [2]Ravi Chandran, [2]Yuanyuan Duan

[1]University of Southern MS, Hattiesburg, MS and [2]University of Mississippi Medical Center, Jackson, MS

Introduction: The aim of this study is to create 3D composite models of pterygoid implant-supported maxillary prostheses based on CT data, and to investigate the stress distribution of pterygoid implants with different implant inclinations using Finite Element Analysis (FEA). **Methods:** A high-resolution micro-CT scanner (Skyscan1172) was used to scan dental implants (NobelBiocare). A standard saw-bone human skull model was scanned using a cone-beam CT scanner (iCAT). CT images were exported to an interactive medical image processing software (Simpleware) and converted into 3D models. Two clinical scenarios were created to investigate the influence of implant inclination angles (45 degrees and 70 degrees) on the stress distribution of pterygoid implants. Volume meshes were then created and exported into a commercial FEA software (ABAQUS) for stress analysis. Convergence test was performed to determine the optimal mesh density. **Results:** FEA models of pterygoid implant-supported maxillary prostheses were successfully created with a good structural similarity with the physical specimens. It was found that the model with a lower angle of inclination (45 degrees) has the higher von Mises stress value than the model with higher angle of inclination (70 degrees). **Conclusion:** Accurate three-dimensional FEA models of pterygoid implant-supported maxillary prostheses can be generated by combining CT scanning and Simpleware software. With the limitations of this study, it has been found that increasing angle of inclination of pterygoid implants reduced the stress level in the implants. **Acknowledgement:** This work was supported by AAID Foundation Research Grant.

P9.02

ALGEBRAIC TECHNIQUES APPLIED IN LATTICE-BASED CRYPTOGRAPHY

Arnel I Smith

Jackson State Univeristy, Jackson MS LSMAMP Fellow

This project investigates the mathematical methods used in lattice cryptography. The objective was to increase the dimension of a specific vector space to n and incorporate Linear Algebra techniques to understand the LLL algorithm and the RSA cryptosystem. Additionally, we used Abstract Algebra concepts to characterize elements that belong to the lattice and explored the properties of lattices. In hindsight, with the use of finite-dimensional vector spaces and the quotient field, we were able to prove that the cryptosystem behaves like a simple vector space and a myriad of theorems are able to be proved such as the Cauchy-Schwartz Inequality and Triangle inequality.

P9.03

DEVELOPMENT OF LEARNING APPLICATIONS FOR COMPUTER SCIENCE EDUCATION

La'Andrea Gates, and Kyanie Waters

Mississippi Valley State University, Itta Bena, MS

According to the Higher Education Statistics Agency (HESA), current figures show that 9.8% of computer science undergraduates dropped out before even completing their degree [1]. HESA also states that computer science has the highest dropout rate. Learning applications have been created in many branches of knowledge, even though the effectiveness of the applications are not clear from a quantitative point of view. The hypothesis of this research is as stated: "Discipline explicit learning applications can improve undergraduate students' grades and performance on class assessments." This research is a longitudinal study that has two versions of the learning applications, a web-based application, and a mobile application. Our preliminary research has shown promising results based on the use of the application. The students' grades on the material covered increased dramatically after using a web-based version of the application.

[1] K. Flinders and K. Flinders, "Computer science undergraduates most likely to drop out," ComputerWeekly.com. [Online]. Available:https://www.computerweekly.com/news/252467745/Computer-science-undergraduates-most-likely-to-drop-out.

P9.04

MATCHING SHOEPRINTS OF A SUSPECT WITH SHOEPRINTS OBTAINED FROM A CRIME SCENE VIA IMAGE REGISTRATION

Taylor Collins

Jackson State University, Jackson, MS

INTRODUCTION: Approximately 20,000 innocent people are currently in the United States prison system. One in four inmates who have been exonerated since 1989 were initially convicted with false or misleading forensic evidence. In this project, our objective is to accurately match shoeprint images collected from a crime scene to that of the corresponding suspect. In current investigative settings, shoeprints are matched manually by forensic experts or by computer-aided landmark registration. Moreover, there is no objective similarity measure for the subsequent matching. Our goal is to formulate a similarity measure based on the computational rigid registration of the shoeprint impressions.

METHODS: Rescaling the images, cleaning up the data. Registering the images. Performing transformation parameter investigation .Formulating similarity measure. Configuring multi scale approach.

DISCUSSION: Unreliable and unsound forensic evidence accompanied by unsupported expert testimonies leads to wrongful convictions. Such misleading evidence comprises of mistakes made by practitioners and, occasionally, misconduct by forensic analysts. In certain cases, previously accepted scientific testimony

are challenged by new scientific advancements in disciplines including image processing. The function that we aim to minimize is D[f, T(u)] , the L^2 difference between f and T(u).

RESULTS/CONCLUSIONS: By rescaling the images and extracting all miscellaneous information, the method to achieve the rigid registration of the shoe print images proved to be effective as our obtained accurate similarity measures for the registered images. Although the shoe print image database consisted of matching pairs of shoe impressions, the research results demonstrate the effectiveness of the experimental design and also encourages the use of computational rigid registration for improved forensic analytical experimentation.

P9.05

APPLICATIONS OF MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE TECHNIQUES IN CLASSIFYING CHRONIC KIDNEY DISEASE (CKD)

Anirudh Reddy Cingireddy, Robin Ghosh, MD Mohiuddin Hasan, Venkata Kiran Melapu

Jackson State University, Jackson, MS

Introduction: Chronic kidney disease (CKD) is an irreversible process. It may occur at any age. In the initial stages usually, there will be no early symptoms shown but unfortunately, the patient will end up with dialysis at the last stage. There are several risk factors that can affect the kidneys. The kidney function is measured with Glomerular Filtration Rate (GFR). Mississippi ranks 1st in the nation along in the occurrence of kidney sickness. In African Americans, kidney disease will develop four times faster than white Americans. The capital city of Mississippi, Jackson has a 26% higher occurrence of kidney failure than the national average.

Methods: In this research, we used CKD data from UCI Machine learning. UCI machine learning is an open-source data repository for machine learning users, researchers, and data scientists. we applied several two-class Machine learning algorithms such as Two-Class Averaged Perceptron, Two-Class Bayes Point Machine, Two-Class Boosted Decision Tree, Two-Class Decision Forest, Two-Class locally deep Support Vector Machine, Two-Class Logistic Regression, Two-Class Neural Network, Two-Class Support Vector Machine.

Results: Two-Class Boosted Decision Tree, Two-Class locally deep Support Vector Machine got 100% accuracy.

Discussion: We performed various machine learning techniques on CKD to identify whether the patient is having CKD or not CKD.

Conclusion: After applying the all the algorithms it has been seen that the Boosted Decision Tree and the Locally Deep Support Vector Machine got better accuracy on this dataset among other algorithms which can be used in future works on other problems.

P9.06

NUMERICAL SOLUTION OF BOUNDARY VALUE PROBLEMS

Cherica Scott and Caixia Chen

Tougaloo College, Tougaloo, MS

This study focus on the numerical method- shooting method used on solving nonlinear ordary equation with boundary value conditions (boundary value problems). A practical boundary value problem will be studied numerically. The numerical solutions will be analyzed and discussed. Several different numerical methods used to solve initial value problems (such as Euler's Method and Runge-Kutta Method) will first be introduced. The shooting method for solving linear boundary value problems will then be explained in detail. Finally, the numerical approach to solve nonlinear boundary value problems will be discussed and the corresponding computer programs will also be developed.

P9.07

CODIMENSION-2 BIFURCATIONS OF THE DISCRETE KALDOR MODEL OF BUSINESS CYCLE

Danielle Dotson, LaQuandria Murry, Tycravious Davis

Mississippi Valley State University, Itta Bena, MS

In 1940, Kaldor [1] model proposed the following system, which describe the growth rates of gross product and capital stock of a business cycle.

$$dY/dt=\alpha[I(Y,K)-S(Y,K)]], dY/dt=I(Y,K)-qK,) \quad (1)$$

Here Y is gross product, K capital stock, $\alpha > 0$ the adjustment coefficient in the goods market, $q\in[0,1]$ the depreciation rate of capital stock, and $I(Y,K)$ and $S(Y, K)$ investment and saving functions, respectively. The first equation of (1) describes the dynamics of gross product and the second one the dynamics of capital stock. Here I(Y,K)=I(Y)-βK, S(Y,K)=γY. Since then, (1) has been studied by many researchers, see Chang and Smyth [2] and Wu [4]. After discretiing with step size $\delta > 0$, (1) becomes

$$Y_(n+1)=Y_n+\delta\alpha[I(Y_n)-\beta K_n-\gamma Y_n], K_(n+1)=K_n+\delta[I(Y_n)-(\beta+q) K_n]$$

or

$$(Y,K)\rightarrow(Y+\delta\alpha[I(Y)-\beta K-\gamma Y]),(K+\delta[I(Y)-(\beta+q)K]) \quad (2)$$

It is well-known that discretized models exhibit more complicated dynamical behaviors that the corresponding continuous models. (2) has not been studied in the literature. In this project, we study the codimension-2 bifurcations by using (k,γ) as parameters. Conditions are given for the model to demonstrate 1:2, 1:3, and 1:4 strong resonance bifurcations. By calculating their corresponding normal forms and unraveling bifurcations parameters, bifurcation diagrams such as Hopf, homoclinic and double limit cycle bifurcations are presented. Some examples are provided.

P9.08

SIMPLIFYING HPC SIMULATION INPUT GENERATION USING PORTABLE, USER-FRIENDLY INTERFACES BUILT WITH JUPYTER, DOCKER, AND SINGULARITY

Brandon Randle

US Army Engineer Research & Development Center

High Performance Computing offers great capabilities to solve problems that can not be resolved through physical testing, whether on account of cost or simple physical impossibility. However, the use of HPC to perform simulations to solve these problems is a complicated process that usually requires expert involvement in the entire process. These simulations have a high barrier to entry to prepare and run as complex, time-consuming inputs are often required. Moreover, depending on the simulation inputs required, user workstations for preparing inputs may require significant resources to perform the operations necessary. By combining Jupyter notebooks with container technologies such as Docker and Singularity, the process of preparing inputs for simulations can be

significantly simplified and automated. The barrier to entry for a user is lowered as their workstation requirements simply become installing a web browser and Docker software. Jupyter Notebooks can be designed with clean, intuitive widgets that make input generation significantly easier for users. Docker containers make the environment for using these notebooks extremely portable and consistent among users. Through the use of Singularity containers, tedious, time-consuming, and resource-heavy tasks can be offloaded to an HPC where automated scripts will perform the pre-processing tasks. The purpose of this presentation is to illustrate a case where Jupyter, Docker, and Singularity are being used to simplify and automate the pre-processing steps for input generation for a simulation that operates on modeled scenes.

Friday, February 21, 2020

MORNING

Room D8

8:20 Welcome

O9.10

8:30 STUDY ON THE FORMATION AND EVOLUTION OF ASYMMETRICAL VORTEX STRUCTURES IN THE LATE TRANSITIONAL BOUNDARY LAYER

[1]Caixia Chen, [2]Yong Yang, [3]Yonghua Yan, and [1]Tashana Irving

[1]Tougaloo College, Tougaloo MS, [2]West Texas A&M University, Canyon, TX, and [3]Jackson State University, MS

The objective of this research is to study the evolution of coherent structures in the late transitional boundary layer. A DNS (direct numerical simulation) of compressive fluid flow at Mach 0.5 on a flat plate, with only TS waves as input in the inlet (without additional asymmetric perturbations such as suction and blowing at wall boundary) is conducted to investigate nonlinear growth of the large vortex structures in the late transitional boundary. The mechanisms of the development of asymmetric coherent structures in the boundary layer are studied in detail. The evolution of the asymmetrical vortex structures and their role on the further randomization of the boundary layer are also investigated. It is found that the growth of streamwise asymmetric perturbations in the boundary layer influences the formation and development on the asymmetrical vortex structures and the boundary layer loses its symmetrical distribution in spanwise direction immediately after the asymmetric vortex structures is formed in the flow.

O9.11

8:50 NUMERICAL STUDY ON THE RING-LIKE VORTEX STRUCTURE GENERATED BY MVG IN HIGH-SPEED FLOWS WITH DIFFERENT MACH NUMBERS

[1]Yonghua Yan, [2]Yong Yang, [3]Caixia Chen, [1]Herious A Cotton

Jackson State University, Jackson, MS, [2]West Texas A&M University, Canyon, TX, and [3]Tougaloo College, Tougaloo MS

The objective of this research is to study the Mach effect on the generation of ring-like vortex structure in the downstream of MVG (Micro Vortex generator) which is a kind of low-profile passive control device used to control the boundary layer flow. In the supersonic ramp flows, the ring-like vortex structure was found to play a very important role on the reduction of separation zone induced by the ramp shock wave. A clear understanding of the mechanisms of ring-like vortices helps to further understand SWBLI (shock wave boundary layer interaction) and control of the flow separation. MVG controlled supersonic turbulent flows at five different Mach numbers, from 1.5 to 4.0 are investigated in this study. Same turbulent inflow condition with same boundary layer thickness and turbulent intensities is generated in front of the MVG. It can be found clearly that with higher Ma number, the vortex structures generated by MVG are intensified. These vortex structures also interact with the lower boundary layer in the downstream of the MVG more intensively. The morphology of ring-like vortices, vorticity origins, momentum deficit zones, streamwise velocity profiles in the downstream of MVG are also studied in detail.

O9.12

9:10 MULTI-OBJECTIVE OPTIMIZATION USING GREEDY ALGORITHM FOR NODE PLACEMENT PROBLEM IN WIRELESS SENSOR NETWORK

Tanzia Rouf Tuie, and Sardar Anisul Haque

Alcorn State University, Lorman, MS

Efficient deployment of Wireless Sensor Networks (WSNs) is challenging unless careful planning of the different network resources are considered. One of the key of WSN planning principles is sensor node placement which can be formulated as a multi-objective optimization problem with the consideration of different optimization criteria in our objective functions. These will include improving network coverage and performance, maintaining energy efficiency, and reducing financial cost. The exact solution to this problem has exponential complexity. We propose the development of a greedy algorithm with linear time complexity considering the search space size. This is going to be then used to experiment our developed solution in different complex WSN situations and understand its efficiency and applicability.

O9.13

9:30 IMPLEMENTATION OF CONDENSATION METHOD FOR COMPUTING DETERMINANT OF SPARSE MATRIX

Sardar Anisul Haque

Alcorn State University, lorman, MS

In this work, we will do a computational study on the condensation method for calculating determinants for large sparse matrices.. Computing determinant is considered as an important routine in numerical algebra. Determinants can be applied in a variety of situations, such as solving a system of linear equations with Cramer's Rule, determining invertibility, finding eigenvalues of a matrix, determining the energy levels of molecules using Molecular Orbital Theory, and so forth. Various techniques are available to compute determinant in the literature of numerical algebra, (for example, determinants by cofactor expansion, by row reduction etc.). These are all well-known methods in numerical algebra. The computational complexity of condensation method based determinant computation and its variants are higher than that of any popular methods. That is why, determinant computation by condensation is not so popular among mathematician. But one important characteristic of condensation method attracts scientific community is that the main operations in this method are independent and can be done in parallel. In this study we are interested to investigate the condensation method and its variant for computing the determinant of some structured and sparse matrices. In this context, this is a new technique to compute determinant for those special matrices. We are mainly interested to devise the computational complexity.

O9.14

9:50 THERMAL IMAGING SENSOR ARCHITECTURE FOR MASSIVELY PARALLEL SIMULATIONS

Aaron Valoroso

US Army Corps of Engineers Engineering Research and Development Center

Artificial intelligence and machine learning algorithms for radiative environments require large scale high-resolution environmental models and realistic sensor emulation. Many current synthetic thermal image tools cannot efficiently generate and tag the large quantity of images needed for training these algorithms. In response, the Virtual Environment for Sensor Performance Assessment (VESPA) project has developed the Thermal Imaging Sensor Engine. The Thermal Imaging Sensor Engine architecture supports the use of both plugins and message passing interface (MPI) to rapidly generate images and support customizable sensor configurations. This application is capable of generating multiple images concurrently on varying computing resources due to a parallel queuing system designed to manage the resources for all incoming jobs. Both Linux High-performance computing (HPC) and desktop resources are supported. The combination of the VEPSA pre-process workflow for generating blackbody data and the Thermal Imaging Sensor Engine application enables any user to rapidly create synthetic images for any infrared sensors configured by the Thermal Imaging Sensor Engine plugin API. This presentation will walk you through the VEPSA pre-process workflow, the running of the Thermal Imaging Sensor Engine, the generated output, and the benchmarks for the application.

O9.15

10:10 USING MODERN PORTFOLIO THEORY TO ANALYZE VIRGIL'S AENEID

David E. Patterson

University of Southern Mississippi, Hattiesburg, MS

Few pieces of literature have had such an important role in Western culture as the *Aeneid*. Yet, the Roman poet Virgil died before completing his epic. This paper seeks to quantitatively determine the relative completeness of the books of the *Aeneid* by applying Modern Portfolio Theory (MPT). The epic is composed of twelve books, each with a sequence of *n* sections with their own number of lines. Substituting line number for an individual price, everyone of the books can be viewed as an individual asset with an expected return and standard deviation. Markowitz's MPT optimizes the weights of the assets in a portfolio to maximize the expected return and minimize standard deviation in financial models. Altering the definition of optimization allows MPT to be used for data sets that are slightly different from financial markets. The literary tradition around the *Aeneid* indicates that Virgil sought to minimize return and variance. Minimizing both the expected return and standard deviation of the twelve books with MPT produces a vector of weights. Lower weights correspond to less complete books. This paper reviews the mathematics behind MPT and also examines the strange history of mathematical analysis of the *Aeneid* from the mystical *sortes Vergilianae* to Duckworth's exploration of the Golden Ratio.

O9.16

10:30 PARTITIONING TERABYTE-SCALE FACETED GEOMETRY MODELS FOR EFFICIENT PARALLEL RAY TRACING USING OUT-OF-CORE MEMORY

Robert H. Hunter

US Army Corps of Engineers Engineering Research and Development Center

Simulating radiative energy sensor performance is a memory-intensive task that is challenging or even impossible to conduct using the current DoD software architectures. An architecture developed under the Virtual Environment for Sensor Performance Assessment (VESPA) project seeks to address this scalability problem with High Performance Computing (HPC). The VESPA project generates realistic, virtual images using ray tracing methods on sensor data and synthetic geometry for forested landscapes, i.e. large, complex environments. This research presents a parallel architecture for distributing geometry and the creation of structures to support efficient ray tracing on these large-scale models. The proposed architecture uses an out-of-core memory framework to facilitate efficient handling of models larger than a single processing element's available RAM without having to employ constant disk I/O. To fit the geometry data to this architecture, the geometry model must be partitioned into spatial chunks, requiring spatial sorting methods, collective communication, and parallel I/O. Once the mesh is distributed, bounding volume hierarchies (BVHs) are constructed on the geometry for more efficient ray intersection methods. The approach used for spatial sorting and BVH generation will be discussed; then, the ray query architecture and its use in the VESPA project will be described. Applying this distributed methodology to build a ray tracing engine on a high performance computer resulted in an architecture that is able to efficiently trace rays into faceted, geometry data over a terabyte in size.

O9.17

10:50 POLYNOMIAL PARTICULAR SOLUTIONS FOR FINDING CRITICAL DOMAINS FOR QUENCHING PROBLEMS

Thir Dangal

Alcorn State University, Lorman, MS

In this work, the method of particular solutions (MPS) using polynomial particular solutions has been used for solving nonlinear Poisson-type problems defined on different geometries. The MPS is also applied to compute the sizes of critical domains of different shapes for a quenching problem and compared with the sizes of critical domains obtained from some other numerical methods. Numerical examples are presented to show the efficiency and accuracy of the method.

O9.18

11:10 SPYSOFT: A PARENTAL CONTROL AND EMPLOYEE MONITORING SOFTWARE SUITE USING SPYWARE

Worlanyo Adom and Ping Zhang

Alcorn State University, Lorman, MS

Spyware has fast become a hotbed of controversy, yet there are times when spyware can be a useful tool. For instance, solution providers and system administrators have found that the ability to re-create a user's session can prove vital when it comes to troubleshooting and forensic investigation.

That process is accomplished by using a key-logging and screen-capture utilities, which is essentially the basis for what has become a spyware. There are 3 main areas which makes Spyware a legal and acceptable tool and these are parental stewardship, informed consent and computer ownership.

A proposed software called SpySoft uses the basic and extended features of a spyware for parental control and employee monitoring. SpySoft is designed as software to monitor activities of children or employees. It can be configured to be invisible to the computer user in order to avoid detection thus aiding in forensic examination.

SpySoft PC Monitoring and Surveillance Suite is equipped with a hardy set of surveillance features. It logs keystrokes, captures screenshots, tracks windows and applications opened, clipboard

activity, captures voice conversations and tracks all documents opened by users.

O9.19

11:30 GEOGRAPHIC INFORMATION SYSTEM: A STUDY OF ANTHROPOGENIC ACTIVITIES AND THEIR IMPACT ON THE MOUNT PLEASANT CREEK

Deunta Collins

Jackson State University, Jackson, MS

Watersheds are natural, viable sources of water that are utilized by many inhabitants living in close proximity; in many cases, watersheds are first and primary source of water for many. These watersheds can vary in size and ecological biodiversity, providing homes for many aquatic species. The Mount Pleasant Creek is one of the largest watersheds in Belize, and communities such as the Maya Mopan and the San Martin communities rely on this water for sustenance if potable water is not available. As populations increased in the surrounding areas, the residents imposed anthropogenic effects to the creek. Most notably, one of the effects is the destruction of the surrounding Riparian forests, which is dense vegetation that helps the creek to stay clean and vibrant. As a result, the water of the creek has dramatically decreased in hygiene, harboring bacteria that may be dangerous for human consumption. The objective of this study is to create a map to show the sites of the creek that residents used for washing, recreational activities, etc. The creek was surveyed using GPS software and descriptions to determine the purposes of the many sites that had visible human impact. After the GPS data retrieval, ArcGIS was used to create a virtual story map as the creek progressed from the University of Belize to Maya Mopan. In total, there were 41 sites. Most of these sites were used by residents to wash their clothes, with dump sites being close in number. In addition, surveys were conducted with the general populace to gauge the public perception and the frequency of usage of the Mount Pleasant Creek. Most of residents in both communities that were interviewed agreed that the creek's water is contaminated and is unsafe, so much so that many of them do not visit the creek at all. As the economic climate changed to more affluent residents, those residents with potable water steered away from the creek, for hygiene purposes.

PHYSICS AND ENGINEERING

Chair: Shanti Bhushan

Mississippi State University

Co-Chair- Likun Zhang

University of Mississippi

Co-Chair: Parthapratim Biswas

University of Southern Mississippi

Co-Chair: Jason Griggs

University of Mississippi Medical Center

Thursday, February 20, 2020

MORNING

Room D7

8:15 Welcome

8:30 – 10:20 AM Session I

Moderator: Dr. S. Bhushan

8:30 DIVISIONAL KEYNOTE

TAKING THE DEPARTMENT OF ENGINEERING TECHNOLOGY TO THE NEXT LEVEL

Sabrina Phillips

Dept. of Engineering Technology, Mississippi Valley State University

O10.01

9:00 FACE DETECTION AND FACE RECOGNITION USING COMPUTER VISION AND PYTHON

Ramakalavathi Marapareddy, Chaitanya Kumar Maddala

University of Southern Mississippi, Hattiesburg, MS

Face detection is a computer vision technology that helps to locate/visualize human faces in images in real time. This technique is a specific use case of object detection technology that deals with detecting instances of semantic objects of a certain class (such as humans, buildings or cars) in digital images and videos. Face detection has gained a lot of importance especially in fields like photography, security, and marketing. This project is about using real time raw unprocessed images for detecting and recognizing the faces with labels. Using the pytorch, computer vision (cv2), logistic regression modelling and optimization algorithm. Using a deep neural networks to train the model and to optimize the loss and improve the accuracy is the main objective of modeling technique. Usage of generalized modeling technique is preferred as the time for training the model can be reduced drastically. Major steps involved are: 1. Pre-processing the raw input images (train or test sets). 2. Building the model. 3. Test the model of custom input.

O10.02

9:20 OPTIMIZATION RESEARCH ON MVG POSITION IN SWBLI CONTROL

[1]Yonghua Yan, [1]Herious A Cotton, [2]Yong Yang, Caixia [3]Chen, [3]Alitzel Serrano

[1]Jackson State University, Jackson, MS, [2]West Texas A&M University, Canyon, Texas, [3]Tougaloo College, Tougaloo, MS

A high-resolution LES (large eddy simulation) is used to study the SWBLI (shock wave boundary layer interaction) in MVG (Micro

Vortex generator) controlled supersonic turbulent flows. MVG is a kind of low-profile passive control device, which has practical value in engineering, used to control the boundary layer flow. The objective of this research is to study the influence of different streamwise positions of MVG on the SWBLI in the supersonic ramp flow. Supersonic ramp flows with four different streamwise locations of MVG in the domain, from 10h (height of the MVG) to 18h to the ramp corner, are investigated in this study. Same turbulent inflow condition with same boundary layer thickness and turbulent intensities is generated in front of the MVG. It can be found clearly that with longer distance to the ramp corner, the vortex structures generated by MVG experienced a greater degree of deformation and have more involvement in the interaction with the lower boundary layer vortex structures. The interaction between the upper boundary layer vortex structures generated by MVG and the ramp shock wave at the ramp corner is also investigated. The flow separation zones from different cases are measured. Based on the numerical results, the optimized streamwise position of MVG to the ramp corner is determined.

O10.03

9:40 NUMERICAL SIMULATION FOR A TWO-PHASE CONDENSING OR EVAPORATING EJECTOR FLOW

Nagadarshan Rao Bhounsly Janardhan Rao, Mohammed Elmellouki, Shanti Bhushan

Mississippi State University, Mississippi State, MS

Nuclear reactors use water for cooling, wherein high pressure steam generated at the end of cooling loop is injected into the cold fluid through an ejector (or orifice) to drive the cold fluid. This involves complex mass-momentum-thermal flow physics including two-phase flows, condensation and evaporation, turbulence and heat transfer. This research focuses on assessment of two-phase and turbulence models for the prediction of two phase condensing or evaporating turbulent mixture flows, including the investigation of the effect of buoyant flow conditions. To achieve the objective, numerical simulations are performed to study fluid or thermal mixing of in-compressible steam jet into a cooling tank using Ansys 7.0. For the prediction of two-phase flow, predictive capability of mixture model, wherein the fluid fractions are tracked using a volume fraction, and interface tracking model, where the two-phase interface is tracked explicitly using either volume of fluid (VoF) approach, are assessed. Simulations are performed using laminar, low-fidelity (URANS) and high-fidelity detached eddy simulation, to evaluate the effect of turbulence of fluid mixing and heat transfer. The models are then used to perform a parametric study to understand the effect of ejector steam pressure on the coolant flow.

10:00 – 10:20 Break

10:20– 12:00 Session II

Moderator: Dr. Ramakalavathi Marapareddy

O10.04

10:20 MEASUREMENTS OF 12C + ALPHA CAPTURE CROSS SECTION AT E_CM = 3.7, 4.0, AND 4.2 MeV

Rekam Giri

Holmes Community College, Goodman, MS

The *12C(alpha, gamma)16O* reaction is one of the most important nuclear reactions in astrophysics, as it determines the carbon to oxygen ratio at the end of the helium burning in red giant stars. This ratio has significant effects for the subsequent stellar evolution and supernova explosions. We have used the DRAGON recoil separator at TRIUMF for the measurement of the *12C(alpha, gamma)16O* reaction at the energies of *E_cm* = 3.7, 4.0, and 4.2 MeV. The experiment was performed in inverse kinematics where a 12C beam was impinged on windowless helium gas target. The gamma-rays originating from the de-excitation of 16O nuclei were detected by an array of 30 BGO detectors and the 16O nuclei were detected by a double-sided silicon strip detector located at the end of the DRAGON recoil separator. The BGO detectors are also able to separate gamma-transitions to the various 16O final states. The *S* factor at *E_cm* = 3.7 and 4.2 MeV and the strength of the narrow resonance at *E_cm* = 4.0 were measured.

O10.05

10:40 ENHANCING THE VARIABLE COSMOLOGY OF DIRAC'S LARGE NUMBER HYPOTHESIS

Marvin Vining

University of Mississippi, University, MS

The laws of physics are governed by empirically observed constants; ratios can be formed where their arbitrary space/mater/time units of measurement cancel and we are left with pure numbers: notably, the ratio of electrical to gravitational force in a hydrogen atom (C1); the age of the universe in atomic units (C2); and the number of particles in the observed universe (C3). In 1937, Dirac formulated his Large Number Hypothesis that C1 ≈ C2 ≈ √C3 is a law of nature. The LNH predicted Newton's constant of gravity G should be decreasing with time as the universe expands, or if G were constant Dirac-Planck's constant ħ should be increasing with time. Experiments have thus far failed to confirm either alternative. This paper suggests the reason these experiments have failed is because they were premised upon illusory constants. For instance, doppler redshift suggests the universe is expanding, and that galaxies furthest from us are accelerating. But what if the universe appears to be expanding faster than it really is because the space/matter/time 'constants' are universally decreasing in the same ratio relative to one another? If, observed locally, 'constants' appear constant but observed universally they are really not, the variable cosmology of the LNH needs further variability. Various philosophers of science will be examined to suggest areas physicists might look to explore and confirm this theory.

O10.06

11:00 ELECTRIC DIPOLE POWER EMISSION NEAR AN ENZ MEDIUM

Zhangjin Xu and Henk F. Arnoldus

Mississippi State University, Mississippi State, MS

Power emission by an electric dipole near an interface is considered. We derive explicit expressions for the emitted power for any state of oscillation of the dipole, without making use of the material properties of the substrate, and we derive an expression for the power crossing the interface. It is shown that the power naturally splits in contributions from traveling and evanescent incident waves. Only the part with the evanescent waves contributes to the transmitted power. We then consider an ENZ material and obtain explicit expressions for the power. It is shown that only traveling waves contribute, and that no power crosses into the material. When the slightest amount of absorption is present in the medium, the evanescent waves kick in, and in such a way that the emitted power diverges when the distance between the dipole and the particle becomes small.

O10.07

11:20 AN ESCAPE RATE ANALYSIS FOR PULLING EXPERIMENTS BASED ON ENERGY LANDSCAPES IN TWO REACTION COORDINATES

Sudeep Adhikari and Kevin S. D. Beach

University of Mississippi, University, MS

The structural dynamics of biopolymers such as proteins are described in the context of their conformational energy landscapes. In optical-tweezer pulling experiments, features of the energy landscapes are extracted from the observed distribution of the critical force at which the polymer unfolds, and typically the analysis is based on a one-dimensional (1D) reaction coordinate, the extension. But a 1D analysis is inadequate when various possible folded configurations are degenerate in the end-to-end length. We present an analytical framework for the well escape rate in the context of an effective 2D landscape. We test our analysis against simulated pulling experiments and verify our ability to extract meaningful well parameters.

O10.08

11:40 THE ROLE OF CONFIGURATIONAL ENTROPY IN REAL TIME MASS SENSING

Sudeep Adhikari and Kevin Beach

University of Mississippi, University, MS

We present a theoretical framework for determining the mass deposited on a mechanical resonator subject to a flux of incoming particles of a single species. We consider the specific example of a vibrating nanostring and infer the history of mass deposition events from the frequency shifts in real time using a numerical optimization algorithm that correctly compensates for the configurational entropy. Our approach is tested against simulated data and is shown to perform well. We extend this model for a two particle system and try to comment on its applicability over a multi-particle deposition.

12:00 Divisional Business Meeting and General Session

Thursday, February 20, 2020

AFTERNOON

Room D7

1:15 – 3:15 Session III

Moderator: Dr. Jason Griggs

O10.09

1:15 DETECTION AND MITIGATION METHODS OF BLACK HOLE ATTACKS

Ramakalavathi Marapareddy, Krishna Chaitanya Nunna

University of Southern Mississippi, Hattiesburg, MS

Mobile AD HOC networks consist of independent nodes which have high mobility. These nodes are infrastructure less, self-organized. They are characterized by dynamic network i.e. networks are established at the time of requirement, multi-hop communication. They are self-configured nodes and function in distributed manner and have decentralized behavior. Due to its properties and characteristics MANETS are vulnerable to various attacks like black hole, gray hole, warm hole, jelly fish attack etc., security for the communication between nodes is a serious issue and should be handled, lot of research is going on to handle these attacks. In this paper, we are going to discuss about the black hole attack, in this attack malicious nodes will establish a path between the end nodes, after path establishment it will drop packets. To handle black hole attack there are many mitigating and detection techniques are proposed. We will give the comparison, performance evaluation, and limitations of fourteen categories of detection and mitigation mechanism of black hole attacks.

O10.10

1:35 POD ANALYSIS OF FLOW STRUCTURE IN SHOCK WAVE BOUNDARY LAYER INTERACTION OF SUPERSONIC RAMP FLOW

[1]Yong Yang, [2]Yonghua Yan, [3]Caixia Chen, [3]Cherica Scott

[1]West Texas A&M University, [2]Jackson State University, Jackson, MS, [3]Tougaloo College, Tougaloo, MS

In the present study we perform an in-depth analysis of the evolution of flow structure in shock wave boundary layer interaction (SWBLI) of a supersonic ramp flow at different Mach numbers. In the turbulent ramp flow, the large vortices in the upper boundary layer was found to play a very important role on determine the size of separation zone induced by the ramp shock wave. A clear understanding of the mechanisms of evolution of the vortex structure helps to further understand SWBLI and control of the flow separation. Supersonic ramp flows at three different Mach numbers (1.5, 2.0 and 3.0) are investigated in this study. Although many vortex visualization methods (such as Q, Lambda2 and rotex methods) can be used to show the large-scale vortices, it does not help in identifying the various physical properties in the complicated vortex structure. The proper orthogonal decomposition (POD) method is hence used in conjunction with these vortex visualization methods to investigate the flow structure in the SWBLI. The energy contribution of each mode is obtained.

O10.11

1:55 FLAW ASPECT RATIO AFFECTS UNCERTAINTY IN DETERMINING CERAMIC FRACTURE TOUGHNESS

Jason A. Griggs

University of Mississippi Medical Center, Jackson, MS

OBJECTIVES: Surface crack in flexure according to ASTM C1421 is a common method of determining the fracture toughness of dental ceramics. This study aimed to determine the relative uncertainty that can be expected in fracture toughness estimates, which measurements contribute most to this uncertainty, and the specimen and flaw dimensions that correspond to minimum uncertainty.

METHODS: The fracture toughness (KIc) for surface crack in flexure specimens was derived using MathCAD software. Coefficient relations were determined by the partial differentials of KIc with respect to each measurement: critical flaw depth (a) and half-width (c), specimen thickness (W), specimen width (B), support span (L), and failure load (P). The uncertainty of each measurement was taken to be the absolute value of its coefficient relation multiplied by the historic precision in my laboratory. Relative uncertainty was determined by summing the contributions of all measurements and dividing by the true KIc value. Failure load was determined by the combination of all other parameters. Specimen and flaw dimensions were varied to explore the effects on relative uncertainty.

RESULTS: Relative uncertainty was not affected by KIc, B, and L. W had negligible effect. Increasing flaw dimensions decreased relative uncertainty. Minimum uncertainty corresponded to $a/c<1$. Baseline relative uncertainty was 8.2%, but this could be reduced by controlling the flaw dimensions. Relative contributions due to imprecision in measurements were: a and c combined (78.4%), W(4.0%), B(1.5%), P(12.1%), and L(3.9%).

O10.12

2:15 VALIDATING THE ACCURACY OF MICRO-COMPUTED TOMOGRAPHY IN IMPLANT MEASUREMENT AND SCREENING OF SIGNIFICANT IMPLANT DESIGN PARAMETERS

Megha Satpathy, Yuanyuan Duan, David A. Felton, Jason A. Griggs

University of Mississippi Medical Center, Jackson, MS

Introduction: Micro-computed tomography (MCT) is a noninvasive technique for visualizing external and internal features in a detailed and accurate manner. The objective of this study is to evaluate the accuracy of MCT and to efficiently screen the design parameters which have significant effects on implant fatigue lifetime.

Methods: An implant assembly [Figure 1], which included the dental implant (Biomet-3i external hex), an abutment (GingiHue®) and a connector screw (Gold-Tite Square screw), was scanned using micro-computed tomography (Skyscan 1172), reconstructed using NRecon (Micro Photonics), and measured using Mimics (Materialise) and Dataviewer (Bruker). 25 design parameters were measured. The Biomet 3i system was chosen as the center of the design space based on it having the highest fatigue limit of implant systems in our previous tests.

Results: The 3D models of the implant components were created and visualized in Mimics [Figures 2 and 3]. The caliper measurements of implant height and diameter were not significantly different from the DataViewer measurements. Most of the parameters measured using Mimics and DataViewer were significantly different from one another.

Conclusion: MCT was found to be a reliable method of making linear measurements, and the 3D models had a good resemblance to the physical specimens. Although the DataViewer and Mimics software packages gave us different values of measurements, this could be rectified by assigning the appropriate pixel value in Mimics. In future, the 25 design parameters will be screened using DOE++ to evaluate their significant effects on fatigue lifetime of the implant. NIH grant R01 DE026144.

O10.13

2:35 EVALUATION OF THE PRE-OSTEOBLASTIC CELL RESPONSE ON HYDROXYAPATITE COATED PEEK AND TITANIUM ALLOY SURFACES

Kadie Nobles, Pallabi Pal, Amol V. Janorkar, Randall S. Williamson

University of Mississippi Medical Center, Jackson, MS

Introduction: Osseointegration is the direct contact between bone and implant surfaces, which if maintained, may enhance the long-term success of implants. Polyetheretherketone (PEEK) has become popular for load bearing orthopedic devices, however; studies have shown that smooth-surfaced PEEK leads to poor osseointegration. In this study, PEEK and Titanium-6Aluminum-4Vanadium (TAV) were evaluated for their effect on adhesion, proliferation, and differentiation of pre-osteoblastic cells.

Methods: Test specimen types had a hydroxyapatite (HA) coating and the configurations were as follows: surface patterned PEEK (HA-pPEEK), solid surface PEEK (HA-sPEEK), porous throughout TAV (HA-pTi), solid surface TAV (HA-sTi), and the control was uncoated TAV (ctrlTi) specimens. The specimens were split into groups and evaluated at the following time points: day 1, 7, 14, and 21. The specimens were seeded with MC3T3-E1 mouse pre-osteoblastic cells, maintained, and cells collected at each time point. Total Protein and DNA content, and ALP activity assays were performed on the specimens for each time point. Live/Dead and Alizarin Red staining were performed on day 21.

Results: The HA-sTi and ctrlTi specimens showed the most cellular proliferation, the HA-sPEEK specimens showed some mineralization but higher levels of proliferation, and the HA-pPEEK and HA-pTi specimens had high levels of mineralization. The Alizarin Red day 21 data showed evidence of this mineralization.

Discussion/Conclusion: The HA coated patterned/porous specimens achieved maturation and mineralization much faster than the non-patterned/porous counterparts. All specimen types were biocompatible *in vitro* and promoted cell proliferation.

Acknowledgements: Supported by a grant from Zavation Medical Products, LLC.

O10.14

2:55 STRUCTURAL LANDSCAPE OF DNA DAMAGE EMPLOYING MULTISCALE QM/MM DYNAMICS

Pradip K. Biswas

Laboratory of Computational Biophysics & Bioengineering, Department of Physics, Tougaloo College, Tougaloo, MS 39174

Molecular insight into electronic rearrangements and consequent structural pathways of radical DNA caused by secondary effect of radiation or free radicals is of major interest in developing DNA based biosensors and designing effective DNA cleaving molecules. Owing to extremely short life time of the intermediate states, they are mostly elusive to experimental detections. Employing a Density Functional Theory based multiscale Quantum-Mechanical-Molecular-Mechanical (QM/MM) molecular dynamics simulation technique, we were able to mimic the hydrogen transfer reaction from the DNA backbone by OH radical and study the subsequent structural pathways arising from electronic charge and spin-density redistribution. Results demonstrate that damages from oxidative reactions are restrained by base stacking and base-pair hydrogen bonding revealing the structural robustness from external damages. The methodology is readily applicable to study targeted DNA and RNA damages by radicals and radiomimetic drugs to design DNA based biosensors or DNA cleaving molecules for chemotherapy.

3:15– 3:30 Break

Thursday, February 20, 2020

EVENING

3:30 Dodgen Lecture and Awards Ceremony

General Poster Session

Immediately Following Dodgen Lecture

Divisional Posters

P10.01

INVESTIGATING ACTIN-MYOSIN MECHANICS TO MODEL HEART DISEASE

Justin Reynolds, Juliana Davis, Rexford Barron, Dana Reinemann

University of Mississippi, University, MS

Hypertrophic cardiomyopathy (HCM) is a hereditary disease in which the myocardium becomes hypertrophied, making it more difficult for the heart to pump blood. HCM is commonly caused by a mutation in the β-cardiac myosin II heavy chain. Myosin is a motor protein that facilitates muscle contraction by converting chemical energy from ATP hydrolysis into mechanical work and concomitantly moving along actin filaments. Optical tweezers have been used previously to

analyze single myosin biophysical properties; however, myosin does not work as a single unit within the heart. Multiple myosins interact to displace actin filaments and do not have the same properties as ensembles versus single molecules. We have engineered a more physiologically accurate optical trapping approach using a hierarchical cytoskeleton structure consisting of multiple myosins between two actin filaments that more closely models how myosin behaves within the heart. The model was verified using fluorescent microscopy, and we analyzed the biophysical properties of healthy myosin-actin complexes to lay the foundation for studying diseased models in the future. For the healthy myosin model, we have measured displacement profiles and force generation capacities using optical tweezers. This assay allows us to not only analyze myosin in a more physiologically relevant environment, but also to study how multiple myosin interact within cardiac muscle cells.

P10.02

APPLYING BIOMEDICAL INFORMATICS TO ESTABLISH THE RELATIONSHIP BETWEEN OBESITY AND LIVER ISCHEMIA/REPERFUSION INJURY

Hezekiah Williams

Jackson State University, Jackson, MS

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-alpha (TNF-α). Although steatotic males have exaggerated liver IRI, it is not as well known whether this also occurs in females. Obese melanocortin-4 receptor (MC4R)-deficient or lean wild-type (WT) male and 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 ($2 \pm 1\%$) in primarily the female models. After receiving and analyzing data on both males and females regarding liver IRI, the hypothesis that biomedical informatics and mission learning techniques can be used to establish the relationship between obesity and liver IRI in obese male and female rats was developed. This mission learning technique was used to classify, analyze, and identify the phases of liver IRI. Additionally, this process was executed to create a model that implements algorithms to facilitate input, middle, and outer software. This software was integrated with website tools to determine the severity of liver IRI (early- or late-onset) based on the data inputted by any stakeholder. The results are then sent to a preferred email and/or physical address. In conclusion, a link was created which takes the user to a website that establishes the relationship between the stages of liver ischemia/reperfusion injury and the origin of obesity.

P10.03

POLYMERIC FILMS FOR INTERVAL DRUG DELIVERY: IMPACT OF POLYMER CHEMISTRY ON DRUG RELEASE PROFILE

Tristan Daily, Blake Price, Thomas Werfel, Adam Smith

University of Mississippi, University, MS

Long-term controlled drug release is valuable when administering multiple medications. Due to the pulsatile dosing of pills and low bioavailability of most drugs administered orally, ideal kinetics are rarely achieved through this route. Multilayered biodegradable implants can help solve these issues. Implants are much more consistent in the slow, controlled release of a drug into the body when compared to oral administration. The current standard for biodegradable implants is a copolymer of cellulose phthalate acetate and Pluronics F-127, known as CAPP. CAPP is restricted by the ability to modulate the degradation, and consequently the drug release. Block copolymers are a material that could be ideal for use in long term drug delivery due to the ability to manipulate the rate of release by altering chemical factors like the monomeric ratios so as to not be restricted by mechanical factors like size. Poly(lactic-co-glycolic acid) (PLGA) and Polycaprolactone (PCL) are the polymers currently being used in this application, in conjunction with Pluronics F-127 to increase the solubility in water. Thus far, the films have been developed and release profiles have been determined for CAPP, however, films of PCL and PLGA have not yet been tested with time release studies. This new method of long-term drug release could have significant impact in the field of psychiatry. In many cases compliance is an issue with psychiatric medications, and many psychiatric medications require consistent dosing to be effective.

P10.04

SEQUENTIAL AND/OR INTERMITTENT RELEASE OF MULTIPLE DRUGS FROM BIOERODIBLE DRUG DELIVERY FILMS

Blake Price and Thomas Werfel

University of Mississippi, University, MS

For patients with psychiatric diseases, adherence to medication schedules, medication errors, and abuse are common issues. New forms of therapy for these patients, such as micro-dosed lysergic acid-diethylamide (LSD), where patients receive 10-20% of a full dose present further drug delivery challenges. Sequential or intermittent release of drugs from an implanted device could ensure long-term drug compliance, automate drug dosing during the life of the implant, and eliminate potential for abuse and medication errors. Therefore, we generated polymeric films composed of cellulose acetate phthalate (CAP) and Pluronic F-127 (P) polymers that can co-encapsulate a variety of drug molecules. We generated CAPP films via slow solvent evaporation technique, where CAP and P were dissolved – along with one of three model drugs Fluorescein, Rhodamine B, and Ketoprofen – in acetone and left to dry. The films slowly re-dissolve in water via surface erosion to allow controlled drug release. Drug release profiles were quantified from single layer devices. Based on the single layer release kinetics, multilayered devices were fabricated to achieve controlled, intermittent release of the model drugs. We found that the multilayered devices could successfully release fluorescein and rhodamine sequentially with a delay of 48-72 hours between release. To further tailor the films, polymer concentration, layer order, and encapsulated drugs can be varied in a modular manner. Thus, CAPP films are a promising technology for long-term, sequential and/or intermittent release of psychiatric agents from an implant, which will be further optimized for the micro-dosing of LSD in patients with treatment-resistant depression.

P10.05

POLYMERIC NANOPARTICLES FOR DRUG DELIVERY TO TUMOR ASSOCIATED MACROPHAGES

John Hendershot

University of Mississippi, University, MS

This project aims to create polymeric nanoparticles capable of targeting tumor associated macrophages. The polymeric micelles will be made of diblock and triblock polymers, synthesized using reversible addition-fragmentation chain transfer (RAFT) polymerization to ensure low polydispersity and specific nanoparticle sizes. The polymers will be made of a polypropylene sulfide (PPS) core engineered for drug loading and delivery to tumors and a hydrophilic corona containing a mixture of polymethacrylamidoglucopyranose (PMAG) and polymethacrylamidomannose (PMAM) to provide nanoparticle stability and targeting to tumor associated macrophages based on

interaction with the macrophage mannose receptor. Polypropylene sulfide (PPS) was synthesized via the anionic polymerization of propylene sulfide. Chemical composition of PPS was confirmed using 1H-NMR spectroscopy. The PPS was also analyzed using refractometry and gel permeation chromatography (GPC), where we found PPS to have a dn/dc of 0.1258 and molecular weight of 675.9 g/mol, respectively. ECT (4-cyano-4-{[ethylsulfanyl) carbonothioyl]sulfanyl}pentanoic acid) was chosen as the RAFT chain transfer agent, synthesized, and characterized using 1H-NMR spectroscopy. ECT was observed to have the correct chemical composition by 1H-NMR, though there was minor interference from unevaporated ethyl acetate and hexanes. The monomer methacrylamidoglucopyranose (MAG) was then synthesized and characterized by 1H-NMR spectroscopy as well. The MAG had the proper chemical composition, and its synthesis procedure was quickly adapted to methacrylamidomannose (MAM). Next, we will complete synthesis of our diblock and triblock copolymers of PPS, PMAG, and PMAM. These polymers will enable the production of nanoparticles capable of anti-cancer drug loading and selective delivery to tumor associated macrophages.

P10.06

EXAMINING THE VIABILITY OF COVALENTLY TETHERED BACTERIOPHAGES IN CARBOMER, POLYCARBOPHIL, AND SODIUM ACRYLATE CROSSPOLYMER MATRICES

Clayton M. Johnson, Gyan Sahukhal, Robert Lochhead, Heather Broadhead

The School of Polymer Science and Engineering, University of Southern Mississippi, Hattiesburg, MS

Crosslinked polyelectrolyte thickeners are a class of rheological modifiers that are utilized widely within the modification of aqueous formulations. These polyelectrolyte crosspolymer matrices are preferred in varying industries such as pharmaceutical and cosmetic applications. Carbomer, Polycarbophil, and Sodium Acrylate Crosspolymers are sub-classes of polyelectrolyte thickeners, and it has been hypothesized that the unique, superlative physical and rheological properties can be explained by microgel morphology. Previous studies have visualized the microstructure of these thickened, crosslinked mucilages through the immersion of *Euglena* probes. The common pond protozoans illustrated that viability is potentially maintainable within the aqueous matrix. These studies attempt to examine the viability of micro-organisms within or onto the Carbomer, Polycarbophil, and Sodium Acrylate Crosspolymers. Bacteriophages are a class of viruses that selectively infect bacteria; the bacteriophages function by binding to specific receptors and injecting their host bacteria with genetic material that replicates within the bacterium and subsequently releases multiple progeny bacteriophages. For this work, the covalent tethering of bacteriophages was conducted by utilizing carbodiimide coupling chemistry to fabricate an amide linkage between the aqueous, mucilaginous matrices' backbone and the lysine amino acid groups coated on the outer portion of the bacteriophage's capsid. The modified crosslinked polyelectrolyte thickener is then examined for bacteriophage viability within the hydrogel network. Furthermore, the data confirms that the bacteriophages successfully tether and maintain viability within the Carbomer, Polycarbophil, and Sodium Acrylate Crosspolymer matrices.

P10.07

DETERMINING THE STRENGTH OF CERAMIC FIXED DENTAL PROSTHESES USING FRACTAL GEOMETRY

Beth Shiyou, Kartikeya Jodha, Susana Salazar Marocho, Yuanyuan Duan, Jason Griggs

University of Mississippi Medical Center, Jackson, MS

INTRODUCTION. This study was part of an on-going project to validate fractal geometry of ceramic fracture surfaces as a failure analysis tool. Previous studies have shown that fractal dimensional increment (D*) measured from a broken surface can be used to estimate the fracture toughness of the material from which it is made. Two objectives of this study are (1) to validate the fractal analysis method by comparing the failure stress predicted by finite element models with failure stress estimated by using the D* value in conjunction with the critical flaw dimensions and (2) to verify that two different layers in a multi-layered structure will have the same D* value when broken.

METHODS. CAD/CAM (CEREC MCXL, Sirona) was used to fabricate two groups (n=12) of three-unit fixed dental prostheses (FDPs): (1) polycrystalline Y-TZP framework (ZirCAD, Ivoclar) veneered with lithium disilicate glass-ceramic (CAD, Ivoclar) and (2) ZirCAD veneered with fluorapatite glass-ceramic (Ceram, Ivoclar). FDPs were cemented to simulated dental preparations (Z100, 3M) and loaded monotonically until fracture in a screw-driven load frame (MTS® Sintech universal test machine).

RESULTS. Group 1 specimens failed either by delamination (n=2, mean failure load 3057±111 N), fracture between pontic and premolar (n=5, 2975±353 N), or fracture between pontic and molar (n=5, 2482±853 N). Group 2 specimens failed either by delamination (n=9, 2221±529 N) or fracture between pontic and molar (n=3, 2470±620 N).

CONCLUSION. This study is not yet complete, and additional analysis will be necessary to answer the two primary objectives.

P10.08

A 3D MODEL FOR VASCULAR CALCIFICATION

Ashley Branyon, LeAnn Ward, C. LaShan Simpson

Mississippi State University, Mississippi State, MS

In the United States, over 3 million people have been diagnosed with vascular calcification. Vascular calcification is a regulated deposition of hydroxyapatite mineral in the arteries narrowing the arterial space, making it more difficult for blood to pass through the artery. Vascular calcification was once considered a passive and degenerate process that assumed to be a factor of aging. A process once considered irreversible is now believed to potentially be preventable. Vascular calcification typically occurs in the medial or intimal layers of the blood vessels. Medial calcification can cause a degradation of elastin fibers. To date, no relevant research has been done creating a 3D model of vascular calcification that can be used to assess calcification, the degradation of elastin fiber, and how calcified arteries respond and retain drug therapies. We report a 3D arterial model of vascular calcification made of porcine renal arteries. The porcine artery underwent the process of decellularization using a combination method of Non-ionic detergents, ionic detergents, and Nuclease. We have tested 2 decellularization protocols. The decellularization protocols had promising results. DNA analysis and histology staining have shown a removal of the porcine DNA while maintaining an intact extracellular matrix. The arteries were recellularized to a calcified state using a bioreactor to create a realistic disease state using mechanical artery properties. We provide a proof-of-concept

disease model of vascular calcification that can be evaluated with assays to standardize and improve vascular calcification studies.

P10.09

COMPUTATION OF FLUID FLOW THROUGH AN ARTERIAL SCAFFOLD

LeAnn Ward

Mississippi State University, Mississippi State, MS

Diseases related to the vascular system are a leading cause of death across the world. The flow stresses present in the vasculature of the heart can affect the presence of vascular calcification. Increased calcification may cause heart attacks or death in a patient with cardio vascular disease. The flow through an artery is typically laminar, but if the artery experiences stenosis, a narrowing of the passageway, the flow than can become turbulent. Turbulent flow creates stresses on the arterial walls that may lead to further calcification and even full blockage of the artery. Turbulent and laminar flow are related to the Reynold's number. The Reynold's number in the artery can range anywhere from the tens to 4,000. It is necessary to be familiar with the conditions of blood flow in order to mimic it for testing. If a synthetic artery is developed to study calcification mechanisms, then it is necessary to simulate blood flow through it. This work proposes to use a 42Bioreactor Perfusion Circuit for this simulation. In order to develop a design for the artery to fit, it is necessary to know how the bioreactor's shape and diameter will affect flow. Experimentation would require confirmation that laminar or turbulent flow is occurring to be able to control what type of flow is being tested. The governing equation for blood flow is the Navier-Stokes. A computational model may be necessary to apply Navier-Stokes equations to every parameter.

P10.10

COMPUTER RECYCLING

HuiRu Shih, Pao-Chiang Yuan, Mia A. Griffin, Kionna J. Taylor

Jackson State University, Jackson, MS

The main purposes of the project are to reduce electronic waste, provide technology to people in the community, educate the public on the proper disposal of end of useful life computers and their peripheries, prevent dumping of obsolete computers into the landfills, save precious land space, and conserve natural resources and our living environment. The donated computers come from individuals, companies, and government agencies all over the Jackson metro area. Through different advertising methods, we let the community know that our program recycles old/unwanted computers, monitors, printers, and other hardware. We weed out donated computers that are outdated or that cannot run the latest operating system. The items that are still in relatively decent working condition will be refurbished. The refurbishing process includes cleaning, repairing, replacing, or adding parts as needed; clearing data and software; reformatting the hard drive; as well as reinstalling operating system. We have trained students to refurbish computers and to collaborate with other programs for technical assistance. The refurbished computers are adequately tested and reconfigured. Whatever parts cannot be reused or refurbished will be recycled. We make sure the computer systems and accessories are refurbished or recycled responsibly. This project has returned many high-quality, Internet-ready refurbished computer systems to the community. Most of them went to low-income families and non-profit organizations. Although we are in the 21st century, there remains a digital divide in our area. This project has helped and continues to help close the digital divide.

Graduate Posters

P10.11

INFLUENCE OF THE TYPE OF PISTON MATERIAL ON A GLASS-CERAMIC FATIGUE BEHAVIOR

[1]Katia Raquel Weber, [2]Daniel Meneguetti, [2]Paula Benetti, [1]Jason Griggs, [2]Marcia Borba

[1]University of Mississippi Medical Center, Jackson, MS, [2]University of Passo Fundo, Passo Fundo, RS, Brazil

Introduction: In vitro conditions need to be carefully chosen to simulate the intra-oral environment for dental restorations to mimic the clinical scenario.

Methods: Plate-shaped specimens of lithium disilicate glass-ceramic (1.2 mm thick) were adhesively cemented onto dentin analog substrates. Specimens were divided into three groups according to piston material (n=30): metal (M, stainless steel), composite (R, NEMA-G10, fiber-reinforced epoxy resin), and ceramic (C, lithium disilicate glass-ceramic). Fatigue testing was performed using mechanical cycling with 2 Hz frequency in 37° C distilled water. Two lifetimes (100,000 and 500,000 cycles) were evaluated, and the load was defined according to the boundary technique of Maennig. Fatigue data were analyzed using Weibull distribution and an inverse power law load-lifetime relation (ALTA PRO, Reliasoft). Failure mode was analyzed using transillumination and classified as radial or cone cracks.

Results and Discussion: Group R had a significantly higher value of crack growth exponent (n) than groups M and C, meaning the failure probability (P_f) of specimens tested with R piston was more dependent on load amplitude (Figure 1). Radial crack was predominant failure mode. The R piston material has a lower elastic modulus (E = 14.9 GPa) and higher Poisson's ratio (n = 0.31) than metals and ceramics. Therefore, it is softer and more susceptible to deformation during loading, meaning the size of piston contact area may change at different load levels.

Acknowledgment: Coordenação de Aperfeiçoamento de Pessoal Nível Superior - Brasil (CAPES-Finance Code-001), Conselho Nacional de Desenvolvimento Cientifico e Tecnologico (CNPq, nº.461178/2014-1), and NIH grant R01DE024333.

P10.12

STUDY OF ADIABATIC QUANTUM COMPUTERS BASED ON HARROW, HASSIDIM, AND LLOYD (HHL) ALGORITHM

Fariba Nofeli, Amin Amirlatifi, and Mark Novotny

Mississippi State University, Mississippi State, MS

Quantum computers are a new version of computers which utilize by quantum mechanics to compute problems that classical computers are unable to do. We are going to study a set of linear equations by quantum algorithms and compare it with classical algorithms. One of the important problems in engineering and science is solving linear equation systems, and it plays a fundamental role in these fields. The algorithm of Harrow, Hassidim, and Lloyd (HHL) can be used for quantum linear systems problem for preparing a quantum state $|x\rangle$ which is proportional to the solution of $Ax = b$. Consider a given Hermitian N NxN matrix A, and a unit vector b, and we are going to find x which satisfies $Ax = b$. Linear equations systems by using the quantum HHL (Harrow, Hassidim and Lloyd) algorithm would be possible. A quantum adiabatic algorithm (QAA) is an alternative approach to quantum optimization. QAA is able to solve CSP problems (constraint satisfaction problem) by applying a sequence of constraints to input bits, and in output we are going to set an assignment to the input bits by increasing the number of satisfied

constraints. Final eigenstates and the system will remain in the ground state. Therefore, we can create a new Hamiltonian with new properties which can be encoded as the ground state by maximizing the number of satisfied constraints solution. Therefore, this algorithm can be used for physical systems in which the Hamiltonian can be varied smoothly between initial and final Hamiltonian.

P10.13

EFFECT OF POLISHING ON THE STRENGTH OF BILAYERED DENTAL CERAMICS

Kartikeya Singh Jodha, Navleen Kaur, Susana M Salazar Marocho, Jason A Griggs

University of Mississippi Medical Center, Jackson, MS

Objectives: Bilayered systems are popular due to their better esthetics and mechanical behavior. This study aimed to investigate the effect of polishing of core material on the strength of bilayered glass-ceramics.

Methods: Rectangular beams (1.8 x 4 x ~29 mm^3) were sectioned from lithium disilicate blocks ($Li_2S_2O_5$, e.max CAD, Ivoclar Vivadent, n=13). A layer of nano-fluoroapatite powder mixed with de-ionized water (Ceram, e.max Ceram, Ivoclar Vivadent) was built on the beams. Bilayered beam specimens were grounded to final dimension of 3 x 4 x ~29 mm^3. A controlled flaw was created using Knoop indentation (25 N) on the $Li_2S_2O_5$ side followed by polishing to remove residual stresses (n=9). The $Li_2S_2O_5$ side was subjected to tension in four-point flexure (1.25 mm/min) until failure. Traditional fractography was performed to confirm the origin of failure, and the failure strength was calculated using composite beam theory.

Results: Fractography showed specimens failed either from the interface between the layers (n=6) or from the controlled flaw (n=7). Mean (standard deviation) of maximum strength calculated is shown in table. The strength ratio of flaws without residual stress (polished, 387.6 MPa) to those with residual stress (unpolished, 297.1 MPa) was 1.3. Standard deviation of maximum strength in the $Li_2S_2O_5$ layer increased by 5-10 folds for polished specimens as compared to unpolished ones.

Conclusions: Strength ratio for the polished to the unpolished specimens follows theoretical value from the ratio of geometric shape factor. The polishing of core material improved the fracture strength of bilayered system.

Acknowledgment: NIH Grant R01DE024333

P10.14

DESIGN OPTIMIZATION OF ALL-CERAMIC DENTAL CROWNS

[1,2]Rodrigo Ottoni, [2]Jason A. Griggs, [1]Pedro H. Corazza, [1]Márcia Borba,

[1]University of Passo Fundo, Passo Fundo, RS, Brazil, [2]University of Mississippi Medical Center, Jackson, MS

The project goal was to estimate the combination of factors involved in the design of all-ceramic dental crowns that provide the best mechanical behavior and adaptation. Chamfer and rounded angle preparations were produced with a dentin analogue material (G10). For extraoral scanning, an impression of the abutments was obtained, and a plaster model was produced. For intraoral scanning, abutments were directly scanned. Captured images were processed using CAD software, and the design of a second upper premolar was used to produce the crowns using lithium disilicate glass-ceramic (e.max CAD and e.max PRESS), Design of experiments (DOE) was used to estimate the experimental groups and sample size for adaptation and fracture load analysis. ANOVA and multiple linear regression statistical tests were used to investigate the significant effects for each dependent variable. Epoxy replicas were made of the hackle region to analyze the fractal dimension of the fractured crowns using a atomic force microscope. Crowns produced with extraoral scanning showed the highest fracture load ($p=0.025$), and the gap thickness of crowns produced with the heat-pressing method was smaller ($p<0.001$). The optimum design parameters achieved 100% of the desired fracture load (above 1000 N) and 40% of the desired adaptation (below 200 mm). Both Press and CAD crown specimens had the same fractal dimension ($p>0.05$), which agreed with that of previously tested uniaxial flexure specimens. The best combination of factors to achieve an optimum value of both adaptation and fracture load for the all-ceramic crowns was chamfer preparation, extraoral scanning and heat-pressing method.

P10.15

GAUGING THE VARYING LEVELS OF ENGAGEMENT FOR VIRTUAL ENVIRONMENTS AS IT PERTAINS TO FIDELITY

Daryl Jones

Jackson State University, Jackson, MS

Virtual Reality is defined as an artificial experience that stimulates the brain by manipulating sensory information. The expansion of virtual reality has been encouraged by competitive gaming. However in recent years, studies have shown that the use of Virtual Reality has proven to be a useful technique for educational purposes (Granville 2014). Modern virtual reality creations use high quality game engines in order to create sensory stimulation. A game engine is a software framework that developers use to combine graphics, physics, and audio in order to create video games. This study seeks to find a correlation between the quality of virtual reality environments and user engagement. This was done by creating a highly detailed, tropical environment using various software applications such as CrazyBump, Open Street Maps, Blender, and the Epic Games marketplace. The assets created in by these programs were integrated into Unreal Engine 4, which is a commonly used gaming engine. This trial displayed the different levels of difficulties while combing assets in order to achieve higher levels of immersion. In contrast, a less detailed version of the virtual environment was also created. Test subjects were then immersed both of the virtual environments. While in this virtual space, the subjects were given information about the Belizean ecosystem, wildlife, and water-system. The subjects were then surveyed in order to gain qualifying information about the correlation between the importance of fidelity in virtual reality and user engagement.

PSYCHOLOGY AND SOCIAL SCIENCES

Chair: Nicolas Brunet

Millsaps College

Vice-Chair: Meherun Laiju

Tougaloo College

Thursday, February 20, 2020

MORNING

Room D9

8:50 WELCOME

SOCIAL SCIENCES

O11.01

9:00 NATURAL DISASTER PREPAREDNESS AMONG UNDERGRADUATE STUDENTS IN JACKSON, MISSISSIPPI

Courtney J. Thomas

Tougaloo College, Tougaloo, MS

This paper will present the results of a survey, which examined undergraduate students' preparedness for natural disasters. Studies show that college campuses are one of the most vulnerable populations to natural disasters and are considered ill-prepared, at risk, and less capable of recovering from disaster. Previous research on natural disaster preparedness shows that college students are likely to know their risks, but are not prepared to experience a disaster. Studies show that gender, age, and ethnicity each have an association with preparedness. The hypotheses for this study were 1) there is an association between gender and natural disaster preparedness, 2) there is an association between classification and natural disaster preparedness, and 3) there is an association between the type of institution and natural disaster preparedness. A survey will be conducted to determine if there hypotheses are correct. The survey will be presented to one hundred undergraduate students. The scale will consist of 15 items, which will include demographic and natural disaster preparedness questions. Results are pending but are expected to support the hypotheses.

O11.02

9:15 HOMELESSNESS IN THE CAPITAL CITY: AN EVALUATION OF JACKSON, MS COMPREHENSIVE PLAN'S ON HOMELESSNESS

Frederick L. Hunter Jr.

Tougaloo College, Tougaloo, MS and Jackson State University, Jackson, MS

Homelessness continues to be an issue of concern faced by cities and townships as they develop and implement aspects of their city's comprehensive plans. Moreover, this social problem diminishes the availability of funds for other projects and has the potential to hurt the delivery of services by various sectors in the government. For Mississippi, addressing homelessness is a chief concern, as approximately 20% of the population lives in poverty. For Jackson, MS, the Capital City, this concern is exacerbated by the diminished tax revenue and crumbling infrastructure which places the delivery of services to this at-risk population in uncertain territory; as many of these individuals are ushered into the criminal justice system instead of into managed care programs. This conceptual paper evaluated the current comprehensive plan of Jackson, MS. to identify the gaps in service delivery to those persons experiencing homelessness and make recommendations for improvements. An evaluation of the comprehensive proposal illustrates a city that understands the benefits of linking service provides but does little to facilitate a sound relationship that will be beneficial to the reduction of homeless persons into managed care. Therefore, recommendations for improving managed care systems delivery impacting homeless persons are presented as a strategy for building a healthier community and sound comprehensive planning**.**

O11.03

9:30 EXPLORING CIVIC ENGAGEMENT IN GRADUATE COURSES AT HISTORICALLY BLACK COLLEGES AND UNIVERSITIES

Cassandra Hawkins

Mississippi Valley State University, Itta Bena, MS

Graduate students at Historically Black Colleges and Universities (HBCU) need to understand the importance of civic engagement and how it relates to the positive transformation of communities, especially minority communities. This paper demonstrates how to strategically incorporate civic engagement activities within the pedagogy of graduate courses at HBCU. By transforming the pedagogy of graduate courses, like those within the social sciences, HBCU graduate students receive necessary instruction on their course work and preparation to be involved in community engagement beyond the classroom and after their matriculation. Additionally, this paper identifies the significance of engaged scholarship among HBCU graduate students. Through the empowerment of HBCU graduate students, surrounding communities have the potential to be significantly transformed and improved. Thus, HBCU graduate students learn to integrate civic dimensions into their respective careers and to remain committed to the community engagement**.**

O11.04

9:45 ASSESSMENT OF PSYCHOLOGICAL IMPACT OF COASTAL DISASTER

Nakyah Hill, DiMaya Randle, and Shaila Khan

Tougaloo College, Tougaloo, MS

Coastal disasters have severe psychological impacts on individuals and can affect their physical health and interpersonal relationships. Trauma after disaster can cause difficulty in rebuilding healthy social connections for individuals and going back to previous normal lives. Assessment of these impacts is essential for intervention or enhancement of psychological resiliency. This study focuses on such assessments and will be done in two phases. The first phase has already been completed in which a questionnaire was developed revisiting previous assessments available in the literature. The aim was to create a questionnaire to establish an understanding of the impacts and consequences of previous natural disturbances. Some of the consulted questionnaires were: Skills for Psychological Recovery Questionnaires, Natural Hazards Questionnaire, Hurricane Preparedness Questionnaire, Validation of Posttraumatic Stress Disorder, Baseline Interview for the Hurricane Katrina Community and The Brief Trauma Questionnaire**.** These assessments included themes of changes in individual's experiences, despair, action and plan, and relationships. The developed assessment instrument includes 42 questions that contain questions on demographics (13 items), communication (4 items), plan (5 items), preparedness (6 items), and psychological/emotional impact (14 items).This will be used in a pilot study to test its validity and reliability prior to using it for survivors in general population. In addition, comments on adequateness of the developed instrument will be sought from experienced individuals who are contributors to diverse disaster management agencies. In the second phase (ongoing) this

questionnaire will be administered to the survivors of coastal disasters in different affected areas in Mississippi.

O 11.05

10:00 SOURCES OF SELF-EFFICACY AND ACADEMIC PERFORMANCE IN ONLINE LEARNING

Jennifer Miller

Tougaloo College, Tougaloo, MS

The purpose of the correlational study was to examine to what extent relationships exist between the four sources of academic self-efficacy in math and academic achievement for online undergraduate math education students. This study was based on social cognitive theory, specifically the concepts of self-efficacy and its four sources. Data was collected from 93 undergraduate math education students enrolled fully and exclusively in an online program at a major university in Arizona using an online survey comprised of self-reported cumulative grade-point average and Zientek, Fong, and Phelps's modified version of the sources of self-efficacy in mathematics scale. The multiple linear regression results indicated mastery experiences significantly and positively predicted academic achievement, which aligned with past research from traditional learning environments and the original theory. However, the results also indicated verbal persuasion was a significant negative predictor of academic achievement, but neither vicarious experiences nor physiological state were statistically significant, results that differ from both past research conducted in traditional learning environments and the original theory. The findings of this research are relevant to online education and degree programs seeking to address the higher attrition rates often experienced in online programs since academic performance is a key factor in student attrition. The future implication may be exploratory research into the online learning experience to identify potential sources of self-efficacy unique to this new learning environment.

O 11. 06

10:15 TIME MANAGEMENT AND ACADEMIC ADJUSTMENT AMONG FIRST YEAR AFRICAN AMERICAN COLLEGE STUDENTS

DiMaya Randle, and Shaila Khan

Tougaloo College, Tougaloo, MS

Time management is a valuable asset that freshman students must achieve while matriculating into college. Students' effort in learning to prioritize time causes a positive shift in their academic achievement. Nearly 33% of students entering college leave without getting an advanced degree, mostly during their first year (National Center for Educational Statistics). Students must learn different coping mechanisms to balance their academic and social life for academic achievement. Some are overwhelmed allocating time to their numerous commitments, while others can effectively manage time for course material as well as their personal life. Purpose of this study was to investigate time management's role in academic adjustment among first year college students. It was hypothesized that good time management skills will lead to a better academic adjustment. The independent variable was time management. The dependent variable was academic adjustment. A sample of 80 college fresh-person (18-19 year olds) was recruited from an HBCU institution. The materials included a demographic information sheet, 'Time Management Assessment' (TMA) and an 'Academic Adjustment Assessment' (AAA) questionnaire. The TMA questionnaire had twenty-five questions on a three point ('never' to 'always') scale with higher score indicating good time management. The AAA had twenty-four questions on a nine point scale ('doesn't apply to me' to 'apply very close to me'), with higher score indicating better academic adjustment. Pearson correlation analysis supported the hypothesis. The results showed that the participants with good time management skills also had better academic adjustments**.**

10: 30 Break

COGNITIVE PSYCHOLOGY

O11.07

10:45 WEARING EYEGLASSES OR SUNGLASSES REALLY MAKES YOU LOOK RESPECTIVELY OLDER OR YOUNGER, BUT THE EFFECT IS SMALLER THAN YOU THINK

Jonathan Sharp and Nicolas Brunet

Millsaps College, Jackson, MS

Several studies have investigated whether wearing eyeglasses makes a person appear more or less attractive, intelligent, honest, etc. No formal studies have reported how glasses influence age perception, except for a London Vision Clinic survey that found that people over 45 look five or more years older when wearing eyeglasses. To investigate the effect of eyeglasses and sunglasses more formally, we designed an experiment controlled for age and interpersonal physical differences. To that extent, we selected 50 original headshots of young adults (25 males and 25 females) from a face dataset (KDEF), which we then manipulated by digitally adding eyeglasses and sunglasses. We also applied an aging filter to each of the original and newly generated images, yielding six different conditions: young-without-glasses, young-with-glasses, young-with-sunglasses, old-without-glasses, old-with-glasses, and old-with-sunglasses. Research participant (college students; N=22) estimated the age of the face displayed by each of 300 images, shown in random order. Faces in the young-without-glasses condition were perceived (averaged across participants) as 28 years old. Wearing glasses made them look about one year older, while wearing eyeglasses did not affect age perception. Faces in the old-without-glasses condition, perceived to be 55 years old in average, wear also found to look one year older when wearing glasses. On the other hand, wearing eyeglasses made them look one year younger. Contrary to generally accepted beliefs that wearing eyeglasses makes you look a lot older, and wearing sunglasses makes you look younger, our results suggest that the effect of glasses on age perception is rather small.

O11.08

11:00 ATTRIBUTING CONSCIOUS MENTAL STATES: AN EMPIRICAL INVESTIGATION

Gregory Johnson and Alana Knowles

Mississippi State University, Starkville, MS

On what basis do we attribute conscious mental states to others? One answer, defended by John Stuart Mill, is that since others "have bodies like me" and "exhibit acts . . . which in my own case I know by experience to be caused by feelings," other people must have similar conscious mental states to me (1865, p. 208). Despite its intuitive plausibility, this position is often rejected (Knobe&Prinz, 2008; Arico et al., 2011; Buckwalter& Phelan, 2014). We, however, defend an account that is similar to Mill's. We propose that the primary factors used when making phenomenal state ascriptions are the appropriate display of functional and emotional cues and having the appropriate physical composition.

To test this account, we gave four groups of participants a vignette followed by 3 to 5 questions. For three of the groups, the vignette

described an alien-human encounter and the participants had to judge the likelihood (on a 7-point scale) that the human would attribute a non-phenomenal mental state (a belief) and a phenomenal mental state (pain) to the alien. The fourth group, as a control, read a vignette about a similar interaction between two humans. Statistical analysis using ANOVA reveals that, as (1) appropriate functional and emotional cues and then (2) humanoid features are added to the alien, people are more willing to attribute phenomenal mental states to it. Attributions of non-phenomenal mental states are also dependent on the appropriate functional and emotional cues and humanoid features, but to a lesser degree.

O11.09

11:15 STIMULUS REPETITION INCLUDES A STRONGER REGENCY EFFECT IN RHESUS MACAQUE MONKEYS

Nicolas Brunet

Millsaps College, Jackson, MS

To learn more about how familiarity with visual stimuli affects temporal processing in non-human primates (NHPs), a two-alternative forced choice task (2AFC) was used, where for each session the animal faced visual stimuli that were either novel, or used during a previous session. For two thirds of the trials, a dynamic cue was displayed that contained unambiguous information that could be used by the animal to select the correct target, leading to reward. For one thirds of the trials, however, the cue was ambiguous, and reward given at random upon completing the trial. For those "impossible" trials, the animal relied more on information provided at the end (linked to one of two targets) than at the beginning (linked to the other target) of the dynamic cue. This behavior is consistent with the recency effect that is reported by numerous serial position studies. Interestingly and counterintuitively, this recency effect became stronger for sessions where the primates were already familiar with the stimuli. In other words, despite having rehearsed with the same stimuli in a previous session, the animals relied even more on a decision strategy that did not yield any benefits during a previous session. This repetition-induced bias might be explained by representational momentum, an error in visual perception associated with movement.

O11.10

11: 30 AGE-RELATED CHANGES IN THE FACE DECREASE OUR ABILITY TO READ FACIAL EXPRESSION OF EMOTIONS

Angela Jimmy, Carolina Teague, and Nicolas Brunet

Millsaps College, Jackson, MS

The ease, with which we read facial expressions of emotion, is an important social ability. Previous studies have found that it is more difficult to identify an emotional facial expression displayed by an older than a younger face. An obvious explanation is that age-related changes such as wrinkles and folds makes it harder to judge the emotion. Another explanation is that older persons might have less flexible facial muscles, making it more challenging for them to display an interpretable expression. To narrow down potential explanations, we put a stimulus set together controlled for muscle flexibility. To that extent, we used images of young adults, instructed to display fear, anger, happiness, surprise or to make a neutral expression (selected from the Karolinska Directed Emotional Faces dataset). For each original image, which we used for the "young" condition, we made a new version, using an aging filter (FaceApp), which we then used for the "old" condition. After randomly mixing all images and all conditions, we asked participants (recruited among college students; N = 27) to identify the emotion displayed by each image. Our results show that participant's ability to identify anger and surprise was more impaired when judging older faces. This was not the case for neutral faces or faces expressing happiness or fear. Since the ability or inability, to display appropriate facial expression was not a factor in our study, the reduced accuracy to decode older faces was solely caused by age-related changes in the face.

O11.11

11:45 AFFECTIVE PRIMING EFFECTS OF FACIAL EXPRESSION, POTENTIALLY SIGNALING DANGER, DISAPPEAR WHEN ONLY THE EYES AND SURROUNDING AREA ARE VISIBLE

Celina Morrison and Nicolas Brunet

Millsaps College, Jackson, MS

We previously reported (J. of the M.A.S., Vol. 64, P3.45) 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. This suggests that negative signals perceived from multiple sources, in rapid succession, sensitizes alertness. We concluded that facial expressions and the way they are perceived by others, might have evolved to signal danger. To examine whether this priming effect would still be present if participants only viewed images showing the area around the eyes instead of the whole face, we collected additional data. Our preliminary results show that the priming effects, observed when participants (recruited among college students; N=20) viewed the whole face, disappeared when only the eyes, and surrounding region, are visible. The inability to recognize the emotion when faces are only partly exposed would be an obvious explanation; this was however not the case because the valence ratings indicate that the participants did not have trouble to distinguish between positive and negative valence. Taken together, those results suggest that, although emotion still can be inferred from faces where only the eyes area are visible, the faces are insufficiently exposed to function as an efficient visual warning signal.

12:00 General Session

Thursday, February 20, 2020

EVENING

3:30 Dodgen Lecture and Awards Ceremony

General Poster Session

Immediately Following Dodgen Lecture

P11.01

ITEM-SPECIFIC STUDY TASKS REDUCE FALSE RECOGNITION FOR HOMOGRAPH AND MEDIATED CRITICAL LURES.

Laura A. Pazos, Kendal A. Smith and Mark J. Huff

University of Southern Mississippi, Hattiesburg, MS

The Deese-Roediger-McDermott (DRM) paradigm presents study lists of directly related words (e.g., *bed, rest, tired*, etc.) that converge upon a single, non-presented critical lure (e.g., *sleep*). At test, false recognition of this critical lure has been found to exceed correct recognition rates of items studied (Roediger & McDermott, 1995). To reduce the DRM false memory illusion, study tasks that emphasize distinctive or item-specific features of list words have been shown to reduce false recognition of critical lures relative to a read-control task or focusing of the related features of list words (Huff &Bodner, 2013). In the present experiments, we examined whether an item-specific study task would further reduce false recognition of critical lures for two list types that differ in relatedness. Experiment 1 utilized homograph lists in which two meanings were presented in a study list

(e.g.,*trip, autumn, stumble, harvest,*etc.) that both converged upon a single critical lure (e.g., *fall*). Experiment 2 used a set of mediated lists which involved a list of words (e.g., *tub, meteor, hinge*, etc.) that were indirectly related to a critical lure (e.g., *clean*) through an unstudied list of related words (e.g., *bath, shower, squeak***,** etc.). For both list types, the item-specific task both increased correct recognition for the studied list words and decreased false recognition of the critical lure relative to either the read-control or relational task. The results of these experiments highlight the benefits of item-specific study for enhancing memory accuracy, particularly when both correct and false recognition are assessed.

P11.02

EXAMINING THE RELATIONSHIP BETWEEN CHRONIC DISEASE STATUS AND THE USE OF MOBILE HEALTH APPS AMONG YOUNGER VS OLDER ADULT RESIDENTS OF MISSISSIPPI

Stephanie Mohmed, Kravon Willis, Jennifer Lemacks, Tammy Greer, and Sermin Aras

William Carey University College of Osteopathic Medicine, Hattiesburg, MS, East Central Community College, Decatur, MS

University of Southern Mississippi, Hattiesburg, MS

According to the Centers for Disease Control and Prevention, Mississippi ranks either 1st or 2nd in the nation for deaths attributed to chronic illnesses such as diabetes, heart and kidney diseases. Mobile health applications can be an effective tool in chronic disease management; however, there has been little study of the use of these apps among Mississippi adults. The purpose of this research was to determine the relationship between chronic disease status and the use of mobile health apps among adult residents of Mississippi, and to determine whether that relationship differs by age. Data were collected via survey from Mississippi residents, 18 years of age or older, who were recruited from community outreach events. Demographic variables including age, gender, income, and education level were examined. Results were analyzed with SPSS 20. A moderated multiple regression was computed with chronic disease status regressed onto the app use variables, age, and the interaction of the app and age variables. The sample of participants (n = 405) was mostly female (78%) with an average age of 43 years. 128 participants reported having one or more diseases with an average disease score of 1.7, and 119 participants reported using a mobile health app. Analysis showed a significant inverse correlation between health app usage and disease score (r=-.184, p=.044). When controlling for age, disease status was not a significant predictor for health app use. Further study is needed to identify the specific needs of Mississippians with respect to technology use and health management.

P11.03

EARLY–LIFE REM SLEEP DEPRIVATION ALTERS LEARNING AND SOCIAL BEHAVIOR IN YOUNG ADULT RATS

Kelly Corley

University of Mississippi, Oxford, MS

Our earlier studies demonstrated that early life REMS-deprivation negatively impacts the maturation of hippocampal Long-Term Potentiation (LTP) stability. The purpose of this study is to determine if there is an association between early life REMS-deprivation and behavioral changes in young female adult rats. We used Novel Object Recognition (NOR) and Novel Placement Recognition (NPR) to examine different aspects of learning behavior. An Open Field Test (OPT) was conducted to measure anxiety levels, and, social behavior was examined through play behavior videos. Our previous data in male rats showed that the deprived rats had less interest in the novel object during the NOR testing than rats in the control group. Instances of play behavior were significantly lower as well in the deprived rats. Results from the males also demonstrated that there were no significant differences between the REMS-deprived group of rats and the control group in the NPR and OF testing. However, hippocampal LTP in female REMS-deprived rats was shown to be reduced compared to controls less than what was observed in males. Thus, we may find disparate behavioral results in the females. We expect our data to show that postnatal REMS-deprivation will alter normal learning and social behaviors when the rats become young adults and have lifelong consequences on brain maturation.

P11.04

ASSESSMENT OF NOVEL, CANDIDATE ANALGESICS COMPARED TO OXYCODONE IN THERMAL ANTINOCICEPTION, ELECTRONIC VON FREY, AND SELF-ADMINISTRATION

T. Rose Le, Heather L. Hembree, Hayley M. Schrock, C. Austin Zamarripa, Kevin B. Freeman, Thomas E. Prisinzano, and James Cook

University of Mississippi Medical Center, Jackson, MS, University of Kansas, Lawrence, KS, University of Wisconsin-Milwaukee, WI

Objective: Prescription opioids (e.g., oxycodone) are highly efficacious in their treatment of pain; however, they are limited by their side effects such as abuse liability. Novel analgesics without the side effects associated with opioids are critically needed. Here, we investigate the antinociceptive effects and abuse liability of drugs among different classes (e.g., kappa opioids and benzodiazepines) combined with or compared to oxycodone.

Methods: For the antinociceptive studies, male and female Sprague-Dawley rats received either intravenous oxycodone alone (von Frey) or a series of agonists (i.e., oxycodone, experimental drug 1, and experimental drug 2; hotplate), and cumulative dose-effect curves were determined. For the self-administration study, male Sprague-Dawley rats received oxycodone alone, or as a mixture with the kappa agonists U50,488h, nalfurafine, or triazole 1.1.

Results:For the von Frey assay, oxycodone produced a dose-dependent increase in total gram force applied to the hindpaw surface. For the hotplate assay, oxycodone and experimental drug 2 produced dose-dependent increases in latency to emit nociceptive response, while experimental drug 1 did not. For self-administration, oxycodone combined with each kappa agonist produced a dose-dependent decrease in injections earned per session.

Conclusion:These studies demonstrate different preclinical strategies that are used to determine the therapeutic and side-effect profiles of candidate analgesic drugs.

P11.05

DRIVER PERFORMANCE AND ATTENTION: THE EFFECTS OF AUTOMATION ON DRIVER ALERTNESS

Sykina Butts

Delta State University, Cleveland, MS

Vehicles with semi-automated systems assist motorists with driving tasks such as lane keeping and steering. Past studies suggest that this assistance may lead to motorists becoming cognitively disengaged from the primary task of driving. The purpose of this study is to evaluate the effects of semi-autonomous systems on the alertness of motorists. In an on-road study, we measured the attention span of participants when they drove vehicles with semi-automated systems,

such as the 2018 Cadillac CT6's Super Cruise and the 2019 Nissan Rogue's Pro Pilot Assist. We tested 25 participants between the ages of 21-65 using the Detection Response Task (DRT). The DRT provided a vibration stimulus every 3 to 5 seconds and recorded the participants' response time to the vibration in milliseconds. We compared the participants' response time to the DRT in both automated and manual mode using a paired-sample T-test and found that there was not a significant difference in reaction times between conditions.

P11.06

THE EFFECTS OF BULLYING, COMPASSION FATIGUE AND PET ATTACHMENT ON VETERINARIAN MENTAL HEALTH

Regina L. Rhodes, Lin M. L. Agler, and Kenji. Noguchi

University of Southern Mississippi, Hattiesburg, MS

Veterinarians are up to four times more likely to die by suicide than the general public (Witt, Correia, &Angarano, 2013). Depression is often the precursor of suicide. The purpose of the current study was to examine bullying, compassion fatigue, and pet/animal attachment as contributing factors to depression in veterinarians as well as how these factors may interact with one another to influence depression. The participants were veterinarians recruited online via a closed Facebook group called Not One More Vet as well as an open Facebook page called VetGirl. The survey link posted on Qualtrics was also emailed to some private, non-profit, and shelter veterinarians. Several surveys were used to measure veterinarians' negative experiences of being bullied, compassion fatigue, burnout, depression, and levels of animal attachment: (1) a 7 Point Likert Scale that consists of 20 items to assess negative and positive experiences with clients (developed by the researcher of the current study); (2) a modified Copenhagen Burnout Inventory consisting of 19 items (Kristensen, Borritz, Villadsen, & Christensen, 2005); (3) the Depression, Anxiety and Stress Scale-21 (DASS-21) that has 21 items (Lovibond, S.H. &Lovibond, P.F., 1995); (4) a modified version of the Professional Quality of Life Scale (PROQOL) Version 5 that has 30 items (Stamm, 2010); (5) a Revised Pet Attachment Questionnaire which is comprised of 26 items (Zilcha-Mano, Mikulincer, & Shaver, 2011); (6) an Animal Attitude Scale that consists of 20 questions (Herzog, Grayson & McCord, 2015). Data collection is currently ongoing. Research findings will be discussed later.

P11.07

PREVALENCE OF PREVENTABLE CHRONIC DISEASES IN MISSISSIPPI: RESULTS FROM A COMMUNITY SURVEY

Raegan Bishop, Tammy Greer, Jennifer Lemacks, SneharikaLingampally, and Sermin Aras

University of Southern Mississippi, Hattiesburg, MS

Obesity, hypertension (HTN), and diabetes (DM) are the most common and costly preventable chronic diseases within the United States. Health disparities typically exist among minority populations. The purpose of this study was to assess the prevalence of obesity, HTN and DM among a sample of Mississippi residents. A 117 items survey measured participants' demographics, disease status, perception of weight, dietary intake, physical activity, psychosocial status, access to groceries, built environment, mobile accessibility and use of health apps. Participants were recruited from various community outreach events in Mississippi and surveys were administered by both paper and online. A near equal number of white, African American and Native American participants (N=398) completed the survey. Participants reported rates of obesity (34%) and HTN (35%) that were similar to national averages (39.6% and 32%, respectively) but DM rates (35%) that were much higher than the national (9.4%) and Mississippi averages (14.2%). Disease rates were highest among Native Americans for DM (48%) and obesity (42%), but HTN (33%) was highest among African Americans. Most participants reported immediate family medical history of HTN (76%) and diabetes (62%). Although this study relied on self-reports that may have introduced inaccuracies, this information is not likely to be over reported. These results indicate that prevalence rates may be much higher in some populations than we would expect based on state and national disease prevalence.

P11.08

REVIVING THE BLACK MECCA OF MISSISSIPPI: THE PRESERVATION OF HISTORIC FARISH STREET BUSINESS DISTRICT

Frederick L. Hunter

Tougaloo College, Tougaloo, MS

Once the epicenter of Jackson's African American community, Farish Street represented the self-sufficient and resilient nature of African-Americans as they were faced with segregation and discrimination. An oasis where African American consumers could come shop, eat, enjoy entertainment, make funeral arrangements, and worship. The ideal retreat to the backdrop of a city nested within Jim Crow's South, where segregationist policies were widely enforced. With the end of the enforcement of Jim Crow laws in Mississippi came the desegregation of public spaces which provided African-Americans access outside of Farish Street. Ultimately, this led to the death of a once vibrant area of black-owned and operated businesses.

For more than 20 years, the City of Jackson, in collaboration with a number of community partners, and local and federal government agencies, have attempted to reimagine and redevelop this district. In the process of re-imagining the Historic Farish Street business district, a number of miscalculated missteps have plagued revitalization efforts.

This project specifically focuses on two tasks. First, providing an overview of the prior revitalization efforts of the Historic Farish Street business district to access the feasibility of prior restoration plans. Second, this project will present an alternative plan that considers prior efforts and the current usage of the space as we consider the local economy and businesses that are spatially located throughout downtown Jackson (both new and old). Recommendations will embody prior efforts and seek to maintain the historic character of "The Black Mecca of Mississippi—The Farish Street business district."

P11. 09

PERCEPTIONS TOWARDS THE CRIMINAL JUSTICE SYSTEM AND THE ROLE OF MEDIA AMONG AFRICAN AMERICAN COLLEGE STUDENTS

Quentella Johnson and Shaila Khan

Tougaloo College, Tougaloo, MS

The criminal justice system was designed to protect the innocent and rightfully convict those who have committed a crime. However, within the African American community, the criminal justice system does not always systematically work in their favor.

Over the past few years, African Americans have faced so much injustice that they started a movement through social media called Black Lives Matter. This movement involved a primary focus on how the criminal justice system has been failing to convict and protect them, especially among African American males. Within the African American community, some rely on social media to make judgments and develop their perception.

It would be relevant to study the role of social media and the perceptions individuals, develop toward the system because the perception they gather as a community can hinder the actual duties of the system and act as a distraction to fixing the flaws within the system. The purpose of the present study is to investigate, whether perception towards the criminal justice system has any impact based on the role of social media among African American college students. It is hypothesized that social media has a negative effect on African American college students' perception of the system. The second hypothesis is that there would be a significant difference in scores between age and gender on the perception of the criminal justice system.

P11.10

MUSLIM AMERICANS AND THE BARRIERS TO THEIR WILLINGNESS TO RECEIVING MENTAL HEALTH TREATMENT

Nuha Farah

Jackson State University, Jackson, MS

The current study seeks to investigate the potential barriers that could be contributing to the underutilization of mental health services among Muslim-Americans residing within the Southern United States. Employing the use of the Theory of Planned Behavior, the present study will incorporate the ways in which attitudes, intentions, perceived social/cultural norms, and perceived behavior control play a role in persuading or dissuading a Muslim-American individual seeking mental health services. The questions that will be explored throughout this study will be (1) What are the barriers and facilitators to Muslim-American's mental health; (2) Do Muslim-Americans have access to mental health resources; (3) Are the available mental health resources adequate; (4) Are Muslim-Americans open to receiving mental health treatment; and (5) Do Muslim-Americans value mental health treatment? Some of the hypotheses that will be investigated will be: (1) Muslim Americans who have a negative attitude about mental health will be less likely to receive treatment; (2) Those who have less access to mental health resources will be less likely to be willing to receive treatment; (3) Those who report high mental health stigma will report less intentions to seek mental health treatment and (4) those who have high religious/cultural beliefs and attitudes would be less likely to engage in mental health treatment. The key respondents of the study will be Muslim-Americans, eighteen years and older, living in the South who will be surveyed via an online database such as Qualtrics. This study will evaluate and explain Muslim's attitudes towards mental health treatment.

P11.11

PARENT PERSPECTIVES ON PREKINDERGARTEN EFFECTIVENESS

Catherine Cherie Rayborn

University of Southern Mississippi, Hattiesburg, MS

Over the years, many researchers have conducted studies to establish the level of effectiveness of prekindergarten programs. When reviewing the literature, the parent's frame of reference became a factor of interest also. The reviewed research utilized randomized control trials (RCT) as each student advanced into their subsequent school years and beyond to track the level of sustained success. Research in the longitudinal study found that students in the group were less likely to become incarcerated or even unemployed in their adulthood. The claim of the study detailed that students who have attended prekindergarten programs and have learned early academic and social skills will profit by utilizing these skills throughout their life. The importance of the parent's viewpoint concerning the beneficial nature of early education was considered in the research review to arrive at the opinion of parents many years after their student's completion of prekindergarten. While using a meta-analysis approach to review the literature on parent perspectives of PreK programs, the qualitative study outlines the process in which pinpoints comparable findings up until third grade. Many studies show that parents perceive students who complete prekindergarten as having gained an advantage over their peers who have not completed an early education program. However, minimal data exists in the research reviewed on parent's opinions of prekindergarten effectiveness studied after third grade.

P11.12

MENTAL HEALTH STIGMA IN AFRICAN AMERICAN AND LATINO COLLEGE STUDENTS

Aaron Douglas and H. Anwar Ahmad

Jackson State University, Jackson, MS

Introduction: According to the National Alliance of Mental Illnesses, mental health is a critical issue among minority students in college. With stress, anxieties, and meeting expectations along with transitions to college life, if not adequately managed could lead to serious conditions and ultimately suicide. The two most affected communities with mental health disparities are African Americans and Latinos. College going minority population face significantly different challenges diminishing their chances of graduation and success, compared to the mainstream Caucasians. Some of these challenges include, but are not limited to low socio-economic background, poor schooling, financial aid, and inability to seek adequate guidance and counseling while facing/addressing these issues during the college tenure.

Method: For the present study, secondary data from various sources including census data, CDC, Dept. of Education, etc. will be collected. Such data will be organized in an Excel spreadsheet. Once the variables of interests are identified, adequate tools and statistical methodologies will be explored for data analysis.

Results: We will test various hypotheses to determine some of the relationships and associations between different identified contributing factors that affect minority student's mental health issues and their college graduation success. The objective of this examination is to inspect potential hidden convictions identified with shame concerning those with dysfunctional behavior and emotional wellness treatment among Latino and African American undergrads.

Discussion: Once the data is analyzed, results will be compiled and presented at various scientific forums along with subsequent manuscript development for peer reviewed publication

SCIENCE EDUCATION

Chair: Sarah Lanier

Mississippi State University

Vice-Chair: Joella Lambert

University of Mississippi Medical Center

Thursday, February 20, 2020

MORNING

Room D4

8:20 WELCOME

O12.01

8:45 EFFECTIVE APPROACH OF TEACHING STEM GATEKEEPER COURSES

Abu O Khan.

Jackson State University, Jackson, MS

Education researchers have developed and tested various approaches of effective teaching over a long period of time. These methods vary in their acceptance of differing but well-established philosophy of education (learning and teaching) and range from traditional 'instructor-based' teaching to restructured 'learner-based' teaching. The later approach includes different methods ranging from pure hand-on learning using physical means to learning through purely technology-based simulations. The prevailing consensus is that 'learner-based' teaching methods are more effective than traditional methods. The philosophical basis, as explained by the originator(s) of each method, and majority of publications using field application data collected by the originators as well as subsequent users reiterate the success of all approaches with an optimistic vision. Most of the approaches assumes an ideal and over-generalized structure of learning by humankind often ignoring the wide individual variations in surrounding determining factors. An instructor often feels at a loss in adopting an effective approach of teaching, especially in a class with students having significant differences in socio-economic, psychological and previous academic backgrounds. This presentation will summarize success/failure of different approaches and will provide a comparative overview as observed in teaching undergraduate lecture and laboratory STEM courses over a 20-year period. The approaches discussed include: traditional lecture-power-point method, hands-on-activity-based learning, problem-based learning, purely technology-based learning using simulation, and discovery-based and guided discovery-based learning. An effective teaching method for an instructor must provide due consideration for individual variations in students' surroundings which ultimately affects performance in various stages of learning outcomes in Bloom's taxonomy.

O12.02

9:00 EVALUATING THE BENEFIT OF ANIMAL DISSECTION IN SECONDARY SCHOOLS TO CAREER AND COLLEGE PREPARATION IN MISSISSIPPI

Nicole Musselwhite

University of Southern Mississippi, Hattiesburg, MS

School districts are continuously adjusting secondary school curriculum to meet current educational standards and prepare the future generations for the 21st century workforce. With the most recent 'Mississippi Succeeds Report Card' giving Mississippi a "C" average for education performance for the 2018-2019 school year, the discussion of curricular development and revision has never been more relevant, specifically in the field of science. Only 56% of Mississippi students met the minimum proficiency standard in biology, and only 37% of students met college and career readiness standards; yet, the state faces a vast deficit in science-related careers, especially in the medical field. The purpose of this study was to evaluate the usefulness of animal dissection in secondary school biological curriculum from the viewpoint of medical students. An online survey was conducted of current, regional medical students to determine if this traditional lesson was beneficial to their vocational preparation. The preliminary data suggested that most medical students had exposure to animal dissection in prior to higher education, early exposure to animal dissection did not deter students from entering the medical field, and those with prior experience with dissection had a better foundation for their professional education. Animal dissection does play a role in career and college preparation for those interested in the medical field, a discipline that needs to lure future practitioners in order to meet the needs of Mississippians. Educators should take such studies into consideration as the discussion of science curriculum revision in secondary school continues.

O12.03

9:15 TEACHER TEAMING TO ENHANCE MIDDLE SCHOOL STUDENT INQUIRY-BASED SKILLS IN STEM

[1]Brandy Burnett and [2]Donna M. Gordon

Golden Triangle Early College High School, Mayhew, MS, and Mississippi State University, Mississippi State, MS

Student success was positively influenced by the willingness of teachers to collaborate and work together as teams instead of individuals separated by subject area. A cohesive flow of collaboration in different classrooms with the same goals models real world working situations. For the past three summers, teams of middle school Science, Math, English/Language Arts (ELA), and Technology teachers were recruited from school districts located in central Mississippi to participate in a National Science Foundation sponsored workshop held on the campuses of East Mississippi Community College and Mississippi State University. Throughout the workshop, middle school teachers were challenged to step outside of their comfort zones by working together with their fellow teachers from other disciplines. Guided by lead teachers, teams were introduced to grade-specific curricula mapped to 2018 Mississippi College and Career Readiness Standards that was developed around a central science concept which was carried into Mathematics and ELA content. By using instructional time from a variety of subjects, teachers learned the importance of scaffolding lesson difficulty to provide students with opportunities to research, practice skills, and apply learned material in a real life setting. This cross-discipline approach focused on promoting student mastery in STEM, enhancing student confidence and communication skills, and promoting growth of the overall learner. An example of how a common theme can be used to link lessons across subject areas will be shared with the audience.

This work was supported by a grant awarded through the Research on Learning Division of the National Science Foundation under number 1614861.

O12.04

9:15 TEACHER TEAMING TO ENHANCE MIDDLE SCHOOL STUDENT INQUIRY-BASED SKILLS IN STEM

[1]Brandy Burnett and [2]Donna M. Gordon

Golden Triangle Early College High School, Mayhew, MS, and Mississippi State University, Mississippi State, MS

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This work was supported by a grant awarded through the Research on Learning Division of the National Science Foundation under number 1614861.

9:30 Break

10:00 Business Meeting

O12.05

10:15 IMPROVED LEARNING STRATEGIES FOR BIOLOGY CLASSES

Johnny L. Mattox

Blue Mountain College, Blue Mountain, MS

Several effective strategies incorporated into Biology classes can be used to improve student learning. The concept of metacognition can be introduced and explained to the students so that they gain insight into how they learn most effectively. In conjunction with introduction of metacognition, the learning cycle can be introduced which includes previewing the material, always attending class, reviewing and rereading the material covered in class each day, and using assessment to track the progress made. Spending time each day using the study cycle as well as studying with one's peers has been found to be a most effective strategy for improved learning along with attempting to teach the material oneself.

O12.06

10:30 PROJECT SCORE (Student-Centered Outcomes Research Experiences)

[1]Marie Barnard, [2]Erin Dehon, [2]Caroline Compretta, [1]Allison Ford-Wade, [3]Whitney White, and [2]Rob Rockhold

[1]University of Mississippi, Oxford, MS, [2]University of Mississippi Medical Center, Jackson, MS, and [3]Tuscaloosa VA Medical Center, Tuscaloosa, AL

Compared to youth in other states, Mississippi youth report engaging in significantly riskier health behaviors. Existing education, prevention, and intervention efforts to improve health outcomes have been developed largely without youth input. Project SCORE (Student-Centered Outcomes Research) engages high school and graduate health sciences students from communities with significant health disparities in the development of relevant health behavior research questions by training them in basic research methodology, including problem identification and the development of good research questions. Students develop a health promotion research agenda and execute projects to answer these questions.

O12.07

10:45 ALIGNING PROFESSIONAL DEVELOPMENT FOR BIOLOGY INSTRUCTORS AT COMMUNITY COLLEGES WITH INSTRUCTOR NEEDS AND ADMINISTRATIVE GOALS

Sarah Lanier

Mississippi State University, Mississippi State, MS

Professional Development is necessary for continuing education for instructors at community colleges. Community college administrators must balance the needs of their students with various faculty needs as well. A review of scholarly literature has been conducted to determine how well faculty, including full-time, adjunct, and dual enrolement faculty meet their professional development goals and how these goals align with the goals of the community college itself. A brief discussion of methods to further study where gaps in the literature appear will also be undertaken

O12.08

11:00 IS IT RESEARCH IF IT'S FUN? EXTENDING THE STEM EXPERIENCE FOR JROTC STUDENTS FOLLOWING A RESIDENTIAL UNIVERSITY SUMMER CAMP

Renee M. Clary, Caleb Carlton, Stephen Williams

Mississippi State University, Mississippi State, MS

Each summer, 6 cycles of 60 JROTC students from Mississippi, Louisiana, and Alabama experience a one-week residential leaderSTATE STEM summer camp at Mississippi State University. These JROTC cadets, typically rising juniors, participate in a fitness regimen, introduction to leadership skills, and a STEM overview that focuses upon the geosciences. For the JROTC students in Jackson, MS public schools, a follow-on research project is assigned in the fall. Students are tasked with selecting a research topic, learning about the science, interviewing a geoscientist, investigating career opportunities, and designing a creative presentation to showcase their research results. Winning teams are selected at each of the 7 Jackson, MS schools, and invited to participate in a leaderSTATE STEM Day at Mississippi State University in December. At STEM Day, winning teams compete for the top creative research presentation in front of several guest judges, and the top team's creative research presentation is showcased at the Mississippi Academy of Sciences. Past group research topics included solving world hunger through soil, fault zones that can impact Mississippi, local water contamination, forecasting the weather, and oceanography. Several high school participants expressed interest in sustainable decisions as well as a greater awareness for disaster preparedness. We propose that creative presentations for research do not diminish the research, but serve to engage students in the process.

O12.09

11:15 A STEAM APPROACH FOR HIGH SCHOOL RESEARCH: LEVERAGING CREATIVITY WITHIN THE MSU LEADERSTATE STEM PROGRAM

Renee Clary

Forest Hill High School, Murrah High School, Wingfield high School, and Provine high School

On December 7, 2019, finalist JROTC teams from Jackson, MS schools attended the Mississippi State leaderSTATE STEM Day on

MSU's campus. These teams were the school winners of the leaderSTATE follow-on Fall 2019 research project. Each team chose, researched, and creatively showcased their findings. From the finalist teams, guest judges at Mississippi State University selected the top teams. The winning teams' topics include soils, climate change, and volcanoes. Winning teams represent Forest Hill, Murrah, Wingfield, and Provine high schools in Jackson, MS.This work was supported by a grant awarded through the Research on Learning Division of the National Science Foundation under number 1614861.

12:00 General Session

Thursday, February 20, 2020

AFTERNOON

Room D12

2:00-3:15

Workshop

"INNOVATIVE WAYS OF INTRODUCING CELL BIOLOGY INTO A CLASSROOM USING THE FOLDSCOPE MICROSCOPE"

Brandy Burnett, MS and Donna M. Gordon, PhD

Mississippi State University, Mississippi State, MS

Cell Biology is one of the most diverse topics in the new 2018 Mississippi College and Career Readiness Standards for Science. Students are required to have a strong working knowledge of various cell types and organelle structures in order to understand how both simple and complex organisms work to maintain life. What better way for students to understand the importance of these structures than by having a chance to explore cells at the microscopic level. Forget textbooks and worksheets, the FoldScope is an easy to use, inexpensive way to give students an opportunity to be actively involved in their learning. This session will provide teachers a chance to become familiar with the capabilities of the 'paper-based' microscope and to create easy to view slides from readily available materials. Ideas on ways to include the FoldScope into your classroom will be discussed as they relate to the current curriculum standards. Empower your students to learn and explore by giving them an easy to use piece of scientific equipment that will boost their self-efficacy and academic confidence through independent learning.

The workshop will be lead by Brandy Burnett, a teacher at the Golden Triangle Early College High School along with Dr. Donna Gordon, an Associate Professor of Biological Sciences at Mississippi State University. As a teacher that integrates hands on student learning experiences into her science classroom, Ms. Burnett will share with the audience her experience using the FoldScope microscope and approaches to include topics related to cell biology into the school science curricula. At the end of the workshop, one high school teacher in attendance will be randomly selected to receive a FoldScope Basic Classroom kit as a door prize.

Thursday, February 20, 2020

EVENING

3:30 Dodgen Lecture and Awards Ceremony

General Poster Session

Immediately Following Dodgen Lecture

Divisional Posters

P12.01

A PRELIMINARY STUDY ON AN INVESTIGATION OF THE IMPACTS OF TRADITIONAL, VIRTUAL, AND HYBRID BIOLOGICAL LABORATORIES ON COLLEGE STUDENTS' ACHIEVEMENT AND MOTIVATION TO LEARN BIOLOGY

Shavonda Jackson

Alcorn State University, Lorman, MS

Online courses operate differently than traditional courses, thus, they require teaching techniques and assessment techniques specifically geared for this educational experience (Chiasson, 2015). 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 (Hallyburton & Lunsford, 2013). A number of empirical studies have been highly influential regarding the impact and effects of educational technology in regards to virtual laboratories. However, very few studies focus on the impact of hybrid laboratories on student achievement and motivation to learn biology. Motivation and attitude are important factors in sustaining student engagement and interest in biology. With an increase in the number of colleges and universities offering hybrid courses, it is important to determine the effectiveness of these laboratory courses before widespread adoption occurs (Reece, 2015).

The aim of this study is to provide an objective analysis of findings of the impact of the instructional laboratory environment on student learning in a freshman general biology laboratory course. This study will combine the assessments of biology students' overall laboratory scores, gain scores, and their motivation to learn in the learning environment via survey questions. The beginning and end of the semester course surveys will be administered to determine student's motivation or their perception of the hybrid lab environment. The information acquired may help determine the feasibility of replacing traditional and virtual labs with the new and emerging hybrid biological labs.

P12.02

MAKING RESONANCE TRANSPARENT: IMPLEMENTATION AND EVALUATION OF CHEMISTRY CARD GAMES TO TEACH RESONANCE

Theresa Gaines

Delta State University, Cleveland, MS

Organic chemistry is a notoriously difficult course with high attrition rates. To mitigate some of the trouble students have, chemistry card games have been used to help students learn and apply new content. Despite the prevalence of chemistry games in the classroom, the efficacy of chemistry games as learning tools are not well studied in the literature. With this dearth of game assessment, it is impossible to know if these games provide a meaningful experience. A play experience is described as meaningful when that experience has a quantifiable outcome—either a change in player's attitude towards the material or an acquisition of knowledge. The purpose of this pilot is to measure acquisition of knowledge and changes in student attitudes with respect to a new game focused on the concept of resonance. When it comes to drawing resonance structures, students

struggle with mastering two main tasks: drawing appropriate curved arrows and drawing appropriate alternative Lewis structures. These tasks are the foundation for communicating electron delocalization (resonance) and are a vital problem solving tool in organic chemistry. In this work, a new resonance game designed to help students master these two tasks will be assessed. Acquisition of knowledge will be measured in second semester organic chemistry students through use of a pre-test and a post test. Semi-structured qualitative interviews will also be held to probe perceptions about the game, resonance and chemistry. These interviews will be used to create surveys that will be used in a later study.

P12.03

ROLE PLAYING AS A METHOD OF TEACHING

Theresa Gaines

Delta State University, Cleveland, MS

In secondary learning institutions, the study of chemistry can seem a bit frightening. Especially if, possible career interests are not made known available or the material being confusing. Chemistry education or ChemEd has been and is a developing subject matter for some time now. Educators make it their duty to find new and innovative methods to teach chemistry to students that attend secondary institutions. Most students that are taking these chemistry courses want to eventually pursue a career that requires the knowledge of chemistry and its methods. Most of these students may have an idea of what they want to do, while others, are hoping to find a specific interest before time runs out.

The purpose of this project is to experiment on how educators can correlate laboratory experimental activities with real-world scenarios by introducing methods of role play. The experiment being conducted will use organic chemistry students that will practice distillation methods to harvest aromatic oils from specimens chosen by the instructor based on a skit with an aim to encourage, introduce and influence real world chemistry career opportunities to students. The results are to show that students that the chemistry information being taught and studied can and will be used in future science (chemistry) careers and to help provide insight on possible careers that use the methods being introduced.

P12.04

EXPLORING AND UNDERSTANDING FOSSIL RESOURCES: PALEONTOLOGICAL SCIENCE EDUCATION OUTREACH ACTIVITIES CONDUCTED BY DELTA STATE UNIVERSITY SCIENCE FACULTY

Robert Kagumba and Nina Baghai-Riding

Delta State University, Cleveland, MS

A Paleontological Outreach and Education Grant received from the Paleontological Society has inspired K-12 students, teachers, Delta State University students and educators about the diversity, abundance, and preservation of fossil resources throughout northern Mississippi. During the Fall 2019 semester, participants analyzed fossil exhibits at the Mississippi Museum of Natural Sciences, Pink Palace Museum and Mississippi Petrified Forest. At Nonconnah Creek, participants collected Paleozoic to Late Pleistocene fossils along gravel bars and Late Pleistocene acorns and hickory nuts from organic rich, low horizon, inner riverbank sediments. Additionally, participants learned how to do various hands-on paleontological activities during a one-day workshop: casting sieving, creating acetate peels from coal ball specimens, investigating virtual website tours of paleontological sites, determining past climates using leaf margins from fossil leaves, developing a geological timeline, and more. Overall, participants gained insight into multiple areas of paleontology and discovered how paleontology integrates and embraces many disciplines including geology, environmental science, evolutionary biology, and systematics. The fieldwork and museum experiences have fulfilled several K-12 science education benchmarks. These opportunities also increased networking opportunities with other professors and professionals from other local institutions including Mississippi Valley University, Mississippi State University, University of Memphis, Mississippi Office of Geology, and Mississippi Museum of Natural Science. Other field trips are being established; one is planned to the Late Cretaceous, Blue Ridge fossil site, near New Albany, Mississippi, which contains an abundance of well-preserved invertebrate fossils.

P12.05

A NOVEL COMPETENCY ASSESSMENT MODEL FOR USE WITH STEM TEACHERS UTILIZING FLIPPED CLASSROOM PEDAGOGICAL TECHNIQUES

[1]Marie Barnard, [1]Wesley P. Sparkmon, [2]Caroline Compretta, [2]Erin Dehon, [2]Judy Gordy, [3]Edgar Meyer, [2]Andrew Notebaert, [2]Alex Roth, [2]Stephen Stray, [2]Juaynce Taylor, [2]Shelley L. Thompson, [2]Donna Sullivan, [2]Rob Rockhold

[1] University of Mississippi, Oxford, MS, [2]University of Mississippi Medical Center, Jackson, MS and [3]University of Arkansas for Medical Science, Little Rock, AR

Flipped classroom techniques have been identified as a promising method to enhance student engagement in science courses. The Science Teaching Excites Medical Interest (STEMI) project aims to prepare secondary STEM teachers with the skills necessary to develop and implement flipped lessons on health-related topics. Effective evaluation of teacher professional development programs requires a clear delineation of the competencies to be gained. In order to evaluate the impact of STEMI on teacher quality, a competency model was developed. Competencies were elicited via participatory evaluation techniques. Six domains and multiple competencies for each domain were identified. Domains included Attitudes Toward Flipped Learning and Teaching in STEM; Knowledge Application; Knowledge Implementation, Evaluation, and Dissemination; Learning Environment Management; Technology Skills; and a Health-Related Content-Knowledge domain. A total of 27 competencies were identified within these domains. Assessments are mapped to the competencies to capture individual growth in each of the competencies throughout program participation and construct individualized competency radar graphs, a novel tool for assessing competencies and providing feedback to guide tailored professional development. Individual radar graphs demonstrate specific areas of competency improvement during a two-year STEMI participation period. This research was supported by a Science Education Partnership Award (SEPA) grant, Grant Number 8 R2 5GM129212-04 from the National Institutes of General Medical Sciences (NIGMS), National Institutes of Health (NIH). The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

Friday, February 21, 2020

MORNING

Room D4

9:10 Welcome

O12.10

9:30 ENGAGING RURAL STUDENTS IN INFORMAL STEM LEARNING

Leslie M. Burger, Katherin I. Echols, Sarah B. Lee, Vemitra White, Teresa Gammill

Mississippi State University, Mississippi State, MS

Informal learning programs in science, technology, engineering, and math (STEM) have the potential to reach into rural communities and provide a bridge to greater STEM literacy. However, anecdotal information suggests participation in and access to informal STEM learning opportunities in Mississippi – a state with among the lowest STEM-career readiness in the nation – is unequally distributed among geographic regions and sociocultural environments. In response to this situation, an informal STEM summit sponsored by the National Science Foundation was held in July, 2019 at Mississippi State University. Thirty-nine informal STEM practitioners, experts, and vested stakeholders from Mississippi met to discuss barriers and potential solutions to broadening participation in informal STEM learning opportunities among underserved, rural Mississippi, K-12 students. Key outcomes from the summit include the need for greater networking and communication among informal STEM education providers, more engagement from STEM-based industries and organizations, intentional collaborations with rural community organizations and leaders by informal STEM leaders, and additional trained STEM educators with responsibilities for rural students. Formation of a Mississippi STEM Consortium is planned to enhance awareness of the identified needs, increase STEM stakeholder participation in efforts to provide solutions, and strategically address engagement of more rural Mississippi students in informal STEM learning.

9:45 Break

10:00 Mini-Symposium

"THE HISTORY AND FUTURE OF BASE PAIR – A MODEL FOR HIGH SCHOOL RESEARCH MENTORSHIP"

Goals: This mini-symposium will provide an assessment of the 27 years of the Base Pair biomedical research mentorship program offered by the University of Mississippi Medical Center (UMMC) for high school students and teachers. The program will feature the Lead Teacher for the Base Pair program at Murrah High School who will provide key highlights of the curriculum structure and teaching methodology used to prepare high school students for in-depth authentic research experiences in an academic health sciences center. It will also bring together key faculty from several Mississippi Institutions of Higher Learning for a panel discussion to explore educational opportunities for the expansion to higher education institutions other than UMMC**.**

10:00 Welcome and Introduction

Rob Rockhold, PhD

10:05 Base Pair: Program Structure and Key Outcomes

Rob Rockhold, PhD

10:20 Inside Base Pair Looking Out: "The Student's Perspective"

Jeffrey Caliedo and Evan Morrisey

10:40 Preparation of High School Students for Research Experiences-A Teacher's Guide

Jeff Stokes

11:00 Hosting a High School Student in your Lab: Faculty Realities and Rewards

Lir-Wan Fan, PhD, Stephen Stray, PhD, Donna Sullivan, PhD, Parminder Vig, PhD, and Jan Williams, PhD

11:20 Statewide Expansion of Base Pair: An Instutional SWOT Analysis

Marie Barnard, PhD, Janet Donaldson, PhD, George (Trey) Howell III, PhD, Kevin McKone, PhD, and Tim Ward, PhD

11:50 Audience Questions and Summary

Rob Rockhold,PhD

ZOOLOGY AND ENTOMOLOGY

Chair: Alex Acholonu

Alcorn State University

Vice-Chair: Julius Ikenga

Mississippi Valley State University

Thursday, February 20, 2020

MORNING

9:30-11:30 Divisional Poster Session (Poster Area)

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

P13.01

A COMPARATIVE ANALYSIS OF HEALTH DISPARITY IN AFRICAN AMERICAN ADULT POPULATION IN MISSISSIPPI AND NEW JERSEY

Debarshi Roy, Martha Ravola, Sanya Ravoori, Sofia Ievleva, Jabari Thompson, Justin Nash, Archie Taylor

Alcorn State University, Lorman, MS

Introduction: Health disparities in the United States are among the most critical denominators of health status, health care affordability and accessibility. It is important to examine the social, economic and environmental factors promoting this disparity. Despite similarities in ethnicity, geographical and environmental factors account for differences in the manner in which health risks vary.

Methods: Different counties of Mississippi and New Jersey have been selected and data collected include poverty rate, healthcare status and access, percentage of obese and diabetic population, employment rate, per capita income etc. Data was received from government websites.

Results: MS and NJ are polarized in socio-economic indicators such as poverty (MS: 19.6% and NJ: 8.2%) and unemployment (MS: 5.2% and NJ: 3.2%). Jefferson County of MS has a 1.6 fold higher obesity rate, 1.8 fold higher diabetes rate and a 2.5 fold lower income per household compared to Madison County indicating a distinct health disparity. In contrast, Camden County has a 1.20 fold higher obesity rates, 1.26 fold higher diabetes rate and a 10 fold lower per household income rate compared to Essex County in NJ.

Discussion: Our analysis suggests that despite a contrasting household income, NJ has a lesser health disparity compared to MS. Health disparity in MS could be due to lack of healthcare access, higher minority population, diet pattern etc. Our analysis would be

important to modify the health policy in the state and provide better health access and healthy life style.

P13.02

AN INVESTIGATION OF THE EFFECTS OF *Amaranthus retroflexus* EXTRACTS ON Bacillus subtilis AND *Escherichia coli*

Nikolas Shanklin and Jennifer Laifa

Mississippi Valley State University, Itta Bena, MS

The antibiotic-resistant bacteria can cause illnesses and death. According to the order that was released by the President in 2014 combating antibiotic-resistant bacteria was to be treated as a national security priority. Plant organs can be used as alternative in treating illnesses caused by the antibiotic-resistant bacteria. The study was on the effects of *Amaranthus retroflexus* extracts on two bacteria, *Bacillus subtilis* and *Escherichia coli*. We hypothesized that the growth of *B. subtilis* and *E.coli* would be inhibited by the extracts from *A. retroflexus*. The seeds of *A. retroflexus* were collected from United States Department of Agriculture in Stoneville, MS. The seeds were dried, ground and shaken in acetone for 72 hours. Another set of ground seeds were shaken in water, ethanol, methanol. Solvents were evaporated and the crude extracts were screened for antibacterial activities using a modified Kirby-Bauer disk method. The results revealed that *A. retroflexus* was active against *B. subtilis*. The zones of inhibition were 19 mm. The extract that was shaken in acetone was not effective in inhibiting the growth of *E.coli*. *A. retroflexus* can be used as an alternative to the antibiotics.

P13.03

ROLE OF GRPS IN REPRODUCTIVE FITNESS OF AMBLYOMMA AMERICANUM TICK AND MAINTENANCE OF MICROBIOME IN OVARY

Madison Woodard

University of Southern Mississippi, Hattiesburg, MS

Glycine rich proteins (GRPs) are known to be diverse in function, and they are found in many different cellular processes and structures. Ticks secret a variety of glycine rich proteins, and many of these proteins are vital for attachment of ticks to the host skin. In the ovaries, the exact role of GRPs has not been fully understood, but they are thought to be essential in reproduction and development. In this experiment, differentially expressed glycine rich proteins in tick ovaries were profiled and confirmed. These glycine rich proteins were previously reported in transcriptome analysis using quantitative real-time PCR. We analyzed the temporal expression of seven housekeeping genes and 20 differentially expressed molecules selected from a previously published Amblyomma americanum transcriptome of the ovaries. Out of seven housekeeping genes, actin was used to normalize expression of 20 selected GRPs. Each gene family was expressed throughout the ovarian developmental process, but the expression of specific genes differed at each time points. These data provide insight into the expression and functions of tick glycine proteins expressed in reproductive fitness. So far, the temporal transcriptional expression analysis indicates significant expression at Day 1 in GRP AamerSigP-41913, AamerSigP-39259, Aam-36909, AamSigP-40863, Aam-39539, and Aam-3099. GRP Aam-3099 showed significant expression at all days with the greatest expression at Day 3. These results are significant because the expression shows that the GRP plays a role in development. To further understand the role of vital GRPs in maintenance of microbiome, transfer reverse genetics will be applied.

P13.04

GROWTH INHIBITORY ACTIVITIES OF METHYL PALMITATE ON HT-29 COLON CANCER CELLS

Angela Ikenga and Daniel Oyugi

Mississippi Valley State University, Itta Bena, MS

Colon cancer is the third leading cause of cancer death in the United States, and has the least five-year survival rates among other types of cancers. An estimated 110,000 new cases will be diagnosed in 2019. Although numerous drugs and other treatment options have been directed to cure the cancer, incidence rate have continued to increase while survival rates have decreased. Moreover, the currently available treatments are accompanied by serious side effects. Therefore, new treatment options are necessary. In this study, growth inhibitory activities of Methyl Palmitate, a secondary metabolite in an edible herbal plant, *Vernonia amygdalina,* was investigated in colon cancer cell line (HT 29), *in vitro*. Viability was measured using MTT assay after a 48 hr drug treatment. Our results show a concentration-dependent reduction in viable cells, with high concentrations (1 mM-100 mM) causing 75%-95% loss of viability compared to low concentrations (0.0001 mM-0.1mM) (25%-65%). These results provide biological basis for understanding the effects of the compound on cell growth and proliferation.

P13.05

CYTOTOXIC ACTIVITIES OF METHYL PALMITATE ON HCT-116 COLON CANCER CELLS

Charity Davis and Daniel Oyugi

Mississippi Valley State University, Itta Bena, MS

According to American Cancer Association, Colon cancer is the third most commonly diagnosed cancer in the US. Although incidence rates have slightly declined, an estimated 110,000 new cases will be diagnosed this year. Many drugs and other treatments have been accompanied by serious side effects. Therefore, new treatment options are necessary. In this study, cytotoxic activities of Methyl Palmitate, a compound found in a tropical plant, *Vernonia amygdalina,* was investigated in colorectal cancer cell line, HCT-116, *in vitro.* Cells in log phase growth were treated with various doses ($1.0e^{-4}$ mM -$1.0e^{-2}$ mM) of Methyl Palmitate for 48hr and processed for cytotoxicity assay using MTT reagent. Replicate measurements obtained on a microplate photometer were used to generate sigmoidal dose-response curve, and half-maximal Inhibitory Concentration (IC_{50}) determined. Further, mechanism of cell death was examined using DNA-specific stain, Hoechst 33342; and membrane-impermeant necrosis-specific stain, Propidium Iodide, on an epifluorescence microscope. Images of triplicate treatments were acquired at 40x objective magnification. Cell exposure to Methyl Palmitate resulted in greater growth inhibition (50-95%) at higher doses (100mM-1mM) compared to 48-49% at lower doses (0.01mM-$1.0e^{-4}$ Mm). This represents IC_{50} 3.35e-^{4} Mm on dose-response curve. Examination of death mechanism by Hoechst and Propidium Iodide revealed loss of cell content, punctate membrane, retracted cytoplasm and condensed chromatin, as well as fragmented nucleus, suggesting apoptosis as the underlying pathway by which Methyl palmitate retards growth of HCT-116 cells. Further studies on the potential role of Methyl Palmitate on pro-apoptotic genes and cell cycle control proteins will be necessary.

P13.06

ANTIPROLIFERATIVE AND APOPTOTIC EFFECTS OF ERGOSTEROL IN MIAPACA-2 CELLS

Chelsea Love and Daniel Oyugi

Mississippi Valley State University, Itta Bena, MS

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 cased will be diagnosed in 2019. Although numerous drugs and other treatment options have been directed to cure the disease, incidence rate have continued to increase while survival rates have decreased. Moreover, these treatments are normally accompanied by serious side effects. Therefore, new treatment options are necessary. In this study, antiproliferative and apoptotic effects of Ergosterol, a secondary metabolite in an edible herbal plant, *Vernonia amygdalina,* was investigated in pancreatic cancer cell line (MIAPACA-2), *in vitro*. Cells were cultured and exposed to various concentrations ($1.0e^{-6}$ Mm-10Mm) of Ergosterol for 48 hr, and further processed for viability and apoptosis analyses. Cell viability was measured in eight replicates on a microplate reader using MTT assay and IC_{50} value computed. Apoptosis was detected by fluorescence staining using Double Stain Apoptosis Detection Kit (Hoechst 33342 and Propidium Iodide (PI)) and images acquired on an epifluorescence microscope. Our results indicate a 75%-90% loss of viability at 0.01Mm-10Mm compared to 11%-46% at $1.0e^{-6}$ Mm-$1.0e^{-1}$ Mm, representing IC_{50} value of $1.662e^{-6}$ Mm. Fluorescence staining analysis revealed marked cell shrinkage, membrane and nuclear collapse and fragmentation, as well as condensation of chromatin. These observations suggest that Ergosterol inhibits proliferation of MIAPACA-2 cells in a concentration-dependent fashion, exerting its activities by triggering apoptotic death.

P13.07

FIRST MOLLUSCAN PRXamide NEUROPEPTIDES AND THEIR RECEPTORS IN THE GRAY GARDEN SLUG

[1]Seung-Joon Ahn and [2]Man-Yeon Choi

[1]Mississippi State University, Mississippi State, MS and [2]USDA, Stoneville, MS

Neuropeptides that are produced from central nervous system (CNS) are involved in a variety of physiological events including detection of light, odorants, peptides, lipids, neurotransmitters, hormones, etc. PRXamide peptides are one of major neuropeptide families in insects, and play a role in pheromone production, diapause, muscle contraction, water balance, feeding behavior, pigmentation, and ecdysis in insects. The family peptides include pheromone biosynthesis activating neuropeptide (PBAN), diapause hormone (DH), pyrokinin (PK), CAPA, and ecdysis trigging hormone (ETH), etc. PRXamide peptides have been identified from a broad range of animal groups from Arthropod to Mammal, and characterized with a conserved PRXamide sequence in C-terminal ends that is a crucial motif to activate corresponding G protein-coupled receptors (GPCRs). The family peptides have been well documented with specific hormonal signal transductions in insects, but it has not been demonstrated in Mollusca to date. We identified and characterized the first molluscan PRXamide peptides and GPCRs from the gray garden slug, *Deroceras reticulatum* (Gastropoda) which is a serious pest slug in the Pacific Northwest. The receptors were heterologously expressed in Sf9 cells, tested with various PRXamide peptides, and measured their binding activities. Our research results provide an insight in the evolutional process with the PRXamide peptides and their receptors in the animal system.

P13.08

AN INVESTIGATION OF COMMUNITY MEMBERS' PERCEPTIONS ON THE AWARENESS OF THE PRESENCE OF COPPER AND LEAD IN DRINKING WATER AND SOIL

Jennifer Laifa

Mississippi Valley State University, Itta bena, MS

The study was based on the understanding of the community's awareness of the presence of copper and lead in drinking water and soil. The hypothesis of the study was that the awareness of the respondents to the presence of copper and lead in drinking water and soil is independent of age and gender of the respondents, and how long the respondents have been living where they live. The questionnaire was distributed to the community members. The results indicated that 51 % of the females and 49 % of males participated in the study. There were 95 % of respondents who drink water bought from the store. The results from the present study also showed that 63 % the respondents drink water from the household taps. More than 50 % of the respondents did not know that traces of lead and copper had recently been found in the drinking water. Sixty six and sixty eight percent of the respondents did not know if lead and copper had been found in the soil. Using the Chi square test the results indicated that the gender, duration of stay and the awareness were independent. In conclusion, there is a need for the community members to be more aware of the annual data on drinking water which is available for the public to view and know the status of the drinking water.

P13.09

FLORISTIC TYPES OF HONEY PLANTS IN THE MISSISSIPPI RIVER VALLEY

Elena Kostyleva and Shavonda Jackson

Alcorn State University, Lorman, MS

Floristic types of honey plants are determined by the climate and requirements of agricultural production dictating the cultivation of the most profitable crops. The purpose of this work was identifying modern floristic types of honey plants in the state of Mississippi. The results of our botanical survey show that the areas previously occupied by rich floodplain forests are now increasingly used for agricultural purposes. Long hot summers and mild short winters of the territory make possible a long beekeeping season, however, during most of summers small amounts of honey are produced if indigenous sources are scarce and there are no agricultural lands nearby. At the same time, in spring, nectar and pollen are available from most woody sources (51 spp. registered), where maples, alder, persimmon, blueberry, cersis, black locust, horse chestnuts, feral privet, willows, poplar and oxydendrum grow. Shrubby (42 spp.) and herbaceous (89 spp.) honey plants are also diverse and include dandelion, mustards, thistle, honeysuckles, huckleberry, blueberry, sumac, Alabama supplejack, vetches and blackberries. The best sources of nectar are located in humid areas and river valleys where bees gather nectar from hollies, buckwheat and tulip trees, tupelo. Important sources of honey at the end of summer and fall include asters, bur-marigolds, bonesets, sneezeweeds, sunflower, goldenrod, mints and vervains. Agricultural areas also provide good beekeeping opportunities. Dairy farming requires an appropriate forage base which is also a productive source of honey for bees, in particular, legumes, mainly clovers, and in some places – cotton and vegetable crops, mostly cucurbits.

Thursday, February 20, 2020

AFTERNOON

Room D2

12:50 Welcome

O13.01

1:00 WATER QUALITY STUDIES ON THE POND NEAR ALCORN STATE UNIVERSITY MAINGATE

Alex D. W. Acholonu, D'Metria Booth, Antonyia Grissom, Bethani Pittman, Caitlyn Marshal, Chinaza Okafor

Alcorn State University, Lorman, MS

A pond is one of the freshwater bodies of water and because it does not flow like rivers, it is described as a lentic freshwater body. This is a study on a lentic body of water, a pond, located on the campus of Alcorn State University close to the University main gate. Our previous studies on water pollution have involved lotic bodies of water, namely, rivers and creeks. The purpose of this study is to determine the quality of the pond near the Alcorn State University main gate. It is also to find out if it meets the Mississippi Water Quality Criteria (MSWQC). Water samples were collected two times during February and March of 2016 from 3 different locations about 50 meters apart. The samples were taken to the Biology laboratory and tested chemically according to the methods indicated in the LaMotte water pollution detection kits supplied by Carolina Biological Supply Company. There were 10 tests conducted and the results were averaged, recorded and analyzed. Also, the water samples were cultured in nutrient agar and MacConkey agar to detect coliform bacteria. The physical characteristic as were also checked and they showed that the water was colorless, odorless and transparent (not turbid). The chemical tests showed that the pond water met the MSWQC with the exception of alkalinity, carbon dioxide, hardness and phosphate. Although the water met most of the MSWQC, the biological tests showed that the water contained coliform bacteria and is therefore polluted.

O13.02

1:15 COMPARISON BETWEEN THE WATER QUALITY OF OTAMIRI RIVER IN IMO STATE, NIGERIA AND MUD ISLAND CREEK IN NATCHEZ, MISSISSIPPI

Alexander D. W. Acholonu

Alcorn State University, Lorman, MS

Water quality deals with the physical, chemical, and biological characteristics of water. The purpose of this study is to determine the water quality of the Mud Island Creek the Otamitri River and compare the two. It is also to find out if the two met the Mississippi Water Quality Criteria (MSWQC). Water samples were collected from three sites along the Mud Island Creek 50 meters apart in March 2018. They were brought to Alcorn State University Laboratory and tested chemically according to the methods indicated in the LaMote water pollution detection kits. During the Month of March 2017, water samples were collected from Otamiri River and were taken to the Alcorn State university Laboratory in Mississippi and tested as indicted for the Mud Island Creek. The two data were recorded and compared. Ten parameters were tested. The biological profile for both was carried out by using Nutrient agar and MacConkey agar and confirmed by Lauryl Tryptose Broth Fermentation test. For the Mud Island Creek, Alkalinity, Carbon dioxide, Hardness, and Phosphate exceeded the MSWQC. For the Otamiri River, Alkalinity, less than Mud Island Creek; Carbon dioxide, a little more than the Mud Island Creek; Hardness, much less than the Mud Island creek; Phosphate, much higher than the Mud island Creek exceeded the MSWQC. The biological profile for the Otamiri River showed that coliform bacteria ware absent. For the Mud Island Creek, it was positive. In general, the quality of Otamiri River was better than that of the Mud Island Creek.

O13.03

1:30 ASSESSING NATIVE BEE (HYMENOPTERA: APOIDEA) DIVERSITY IN WETLAND PLANT COMMUNITIES OF THE MISSISSIPPI DELTA

[1]Sharilyn T. James, [1]J. Brian Davis, [2]Katherine A. Parys, [3]Marcus Lashley

[1]Mississippi State University, Mississippi State, MS, [2]USDA-ARS, Starkville, MS, and [3]University of Florida, Gainesville, FL

The Mississippi Alluvial Valley (MAV) once contained nearly 9.7 million hectares of bottomland hardwood forest and associated habitats, including herbaceous and scrub-shrub wetlands. Over eighty percent of the MAV forest was eliminated or modified for agriculture, flood control, and urban expansion. Fragmentation and loss of herbaceous and riparian-forested plant communities of the region could negatively impact native bee populations. Wetland plant communities adjacent to agricultural croplands likely provide vital nesting and foraging resources for native bees, but virtually no historical documentation exists for bees in these MAV landscapes. Therefore, we studied native bee species abundance and richness in wetlands enrolled in the Wetlands Reserve Program (n=14, WRP) and on National Wildlife Refuges (n=4, NWR) of the Mississippi Delta from June to November of 2017. We used three standardized collection methods at each site: bee bowls, vane traps, and a malaise trap. We placed traps along a line transect, located within 1200 meters from designated wetland types.

We collected approximately 25,000 specimens across 18 research sites; an estimated 3,500 specimens were captured in bee bowls. On average, bee bowls on WRP sites captured a greater number of native bees than those on NWRs. Halictidae represent most of the native bees captured with bee bowls. Specimen and data processing are ongoing but indicate that the number of native bees captured in traps located within wetlands increases with habitat complexity and floral availability.

O13.04

1:45 ASSOCIATION OF MYCOTOXIN IN CORN SMUT (USTILAGO MAYDIS) GALLS IN FIELD AND MARKET FOOD PRODUCTS

Hamed K. Abbas

US Department of Agriculture - Agricultural Research Service, Stoneville, MS

The corn smut fungus, *U. maydis*, causes galls from infected kernels in damaged immature corn ears. In Mexico smutty kernels are sold as delicacies under names like huitlacoche or cuitlachoche, either in cans or sometimes fresh in markets. This study was initiated to compare smutty kernels, uninfected kernels in the same ears and uninfected ears for the presence of mycotoxins. We also tested commercial products found in cans purchased in US and Mexican groceries and fresh in Mexico. Testing for aflatoxin showed that levels were much higher in non-smutty kernels of smutty ears than unaffected ears (99-fold) or in the galls themselves. The galls were also lower in aflatoxin than unaffected ears by more than half. Fumonisin (Fum) levels in smut galls showed a similar pattern to aflatoxin but not as dramatic. Smutty kernels were 4-fold lower in Fum than in asymptomatic kernels of smutty corn ears. Fum levels in non-smutty ears were not significantly different from levels in smut galls. Toxigenic fungi such as *Aspergillus flavus* and *Fusarium spp*. were isolated from smut

galls. Our findings appear to be consistent with the hypothesis that the damage to ears caused by *U. maydis* smut formation allows other toxigenic fungi to infect asymptomatic kernels of smutty corn ears. As a result, smut galls appear relatively safe for human consumption with respect to mycotoxin contamination, but low levels of mycotoxins were found in field or commercial samples, indicating that commercial preparation of smut galls should be monitored for mycotoxins.

O13.05

2:00 INTERCROPPING SYSTEMS AS SUSTAINABLE AGRICULTURE PRACTICE in SOUTHWEST MISSISSIPPI

Keith Robinson, Frank Mrema, Lashunda A. Hodges, Leonard Kibet, Alex D. W. Acholonu

Alcorn State University, Lorman, MS

The sustainable agricultural intercropping system was studied to better understand a system that will provide fresh food produces among small-scale rural communities experiencing food insecurity in Southwest Mississippi. Secondary data from peer-reviewed articles, questionnaire surveys, farm visits, and personal communication are among the methodological approach used in this study. The review revealed that many Mississippians experience the highest food insecurity rate of nearly 24%, Claiborne and Jefferson counties ranking the highest with a rate of 34% and 36% respectively. Most of the intercropping studies reviewed were from the USA (38%), China (38%) and Ethiopia (25%). While the questionnaire survey showed that 36% of all respondents have incorporated intercropping in food production, about 12% of studied mixed and row intercropping in USA were mainly for soil conservation. Furthermore, this study showed that intercropping system with specialty mushrooms is at the infancy stage in Mississippi, performed only on trial plots. On the other hand, farmers in southwest Mississippi have access to fresh wild edible mushrooms from the family forests that can be harvested and improve considerably food security. Among the wild mushrooms, Chanterelles are easily being identified and collect by small-scale farmers. The study emphasizes that farmers need to be educated more on how to identify the edible mushrooms from the family forests. The study recommended alley intercropping, mixed intercropping and row intercropping systems as sustainable small-scale agricultural practices to increase fresh food production in southwest Mississippi because of yield increase, nutrient amelioration and diversification of specialty crop production.

O13.06

2:15 ENHANCING YEAR-ROUND OUTDOOR MUSHROOM PRODUCTION AND UTILIZATION

Worlanyo Segbefia and Patrick Igbokwe

Alcorn State University, Lorman, MS

Field experiments conducted in Claiborne and Jefferson counties were used to determine the effect of year-round row-intercropping on shiitake (Lentinula edodes) and oyster (Pleurotus ostreatus) mushroom growth, yield potential, soil and water quality, product development and consumer acceptance. Both outdoor and indoor-grown shitake mushroom growth and yield potentials were also compared. Findings indicate that the ready to fruit shiitake and oyster mushroom blocks introduced outdoors were unproductive during the first growing season until adequate overhead sprinkler irrigation and partial shading from companion vegetables and herbs were provided during the rest of the growing seasons. Both productivity and profitability were greater for Shiitake mushroom compared to Oyster mushrooms. The average marketable mushrooms from each block for the three-year study periods were significantly higher (17.59 lbs) for shiitake mushrooms compared to 12.56 lbs reported for oyster mushrooms. However, both mushrooms can be grown year-round outdoors in Southwest Mississippi if proper strain(s) for each growing season are introduced into field plots and growth factors are not limiting. Consumer acceptable recipes can be developed with freshly harvested field-grown shiitake mushrooms.

O13.07

2:30

A PRELIMINARY STUDY ON AN INVESTIGATION OF THE IMPACTS OF TRADITIONAL, VIRTUAL, AND HYBRID BIOLOGICAL LABORATORIES ON COLLEGE STUDENTS' ACHIEVEMENT AND MOTIVATION TO LEARN BIOLOGY

Shavonde MacDaniel

Alcorn State University, Lorman, MS

Online courses operate differently than traditional courses, thus, they require teaching techniques and assessment techniques specifically geared for this educational experience (Chiasson, 2015). 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 (Hallyburton & Lunsford, 2013). A number of empirical studies have been highly influential regarding the impact and effects of educational technology in regards to virtual laboratories. However, very few studies focus on the impact of hybrid laboratories on student achievement and motivation to learn biology. Motivation and attitude are important factors in sustaining student engagement and interest in biology. With an increase in the number of colleges and universities offering hybrid courses, it is important to determine the effectiveness of these laboratory courses before widespread adoption occurs (Reece, 2015). The aim of this study is to provide an objective analysis of findings of the impact of the instructional laboratory environment on student learning in a freshman general biology laboratory course. The information acquired may help determine the feasibility of replacing traditional and virtual labs with the new and emerging hybrid biological labs.

2:45 Divisional Business Meeting

Thursday, February 20, 2020

EVENING

3:30 Dodgen Lecture and Awards Ceremony

General Poster Session

Immediately Following Dodgen Lecture

Friday, February 21, 2020

MORNING

Room D2

Co-Sponsor Symposia with Agriculture and Plant Science

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HISTORY AND PHILOSOPHY OF SCIENCE

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Aras, Sermin
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ZOOLOGY AND ENTOMOLOGY

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Acholonu, Alexander
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Love, Chelsea
Man-Yeon, Choi
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Pittman, Bethani
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Seung-Joon, Ahn
Shanklin, Nikolas
Taylor, Archie
Thomas-Shier, W.
Thompson, Jabari
Woodard, Madison

In Memoria

Dr. Gregorio B. Begonia
(June 11, 1949-August 16, 2019)

Dr. Gregorio Begonia passed away August 16, 2019. Dr. Begonia was a tenured Professor in the Department of Biology, in the College of Science, Engineering and Technology at Jackson State University (JSU).

The MAS and the Division of Agriculture and Plant Sciences, extends condolences to the Family, Friends and Colleagues of Dr. Greg Begonia. He was born in Philippines. He completed his early education in the Philippines, followed by his B.S. degree from the University of Philippines at Los Baños (UPLB). Then he worked as a Scientist at the National Institute of Science and Technology of the Philippines (UPLB). After earning his Master degree from UPBL on a full SEARCA Scholarship, he awarded a full EDPITAF-World Bank Scholarship to study at Mississippi State University (MSU), where he obtained his PhD. Degree.

Dr. Begonia lived in Mississippi for 34 years with his wife, Dr. Maria F. Begonia. Dr. Begonia while at JSU, served ten years as Chair of the Department of Biology, and a few years as an Associate Director of the Title III-funded Environmental Science, PhD Program.

Dr. Begonia was an Academician and Scientist and had four decades of combined teaching, research and service experiences at the University level, shown by his scientific publications. He spent seven years as a Visiting Professor, Postdoctoral Fellow/Research Associate at the University of Illinois at Urbana-Champaign, IL, University of Missouri at Columbia, Mo and MSU.

Since Joining JSU in 1992, "He challenged minds and changed lives of more than one thousand students and public school science teachers by advising, mentoring and teaching undergraduate and graduate Biology and environmental science course". His research in various facets of plant physiology and biochemistry, such as the studies of phytoremediation of environmental contaminants, using vegetation to remove toxins and pollutants from water, soil, etc. were beneficial for environmental assessment and management. He secured funding as PI, Co-PI, or Collaborator for research, Instrumentation, and training grants from several funding agencies.

Dr. Begonia published numerous articles in various peer-reviewed scientific journals. He was member of several professional/scientific organizations. He served as a member and/ or Chair and Board Member, review panelist, reviewer for research proposals and manuscripts. He was a long time member of the Mississippi Academy of Sciences (MAS). He served on editorial board for the journal of the Mississippi Academy of Sciences for over 25 years. Greg had not missed our annual meeting in the past 30 years. His students have presented their research findings at the meeting and published their work in the journal. Dr. Begonia loved gardening, watching sports, dancing, reading, and traveling with his family. His wife Maria, his two sons, Michael and Mark, daughters-in law and grandson Ethan will miss him. The family request that memorial donations in honor of Dr. Gregorio B. Begonia to be made to St. Paul Catholic Church Capital Campaign at www.stpaulcatholicchurch.com .

Neuroscience Research & Innovation Symposium

Thursday, March 19, 2020

10 AM – 4 PM

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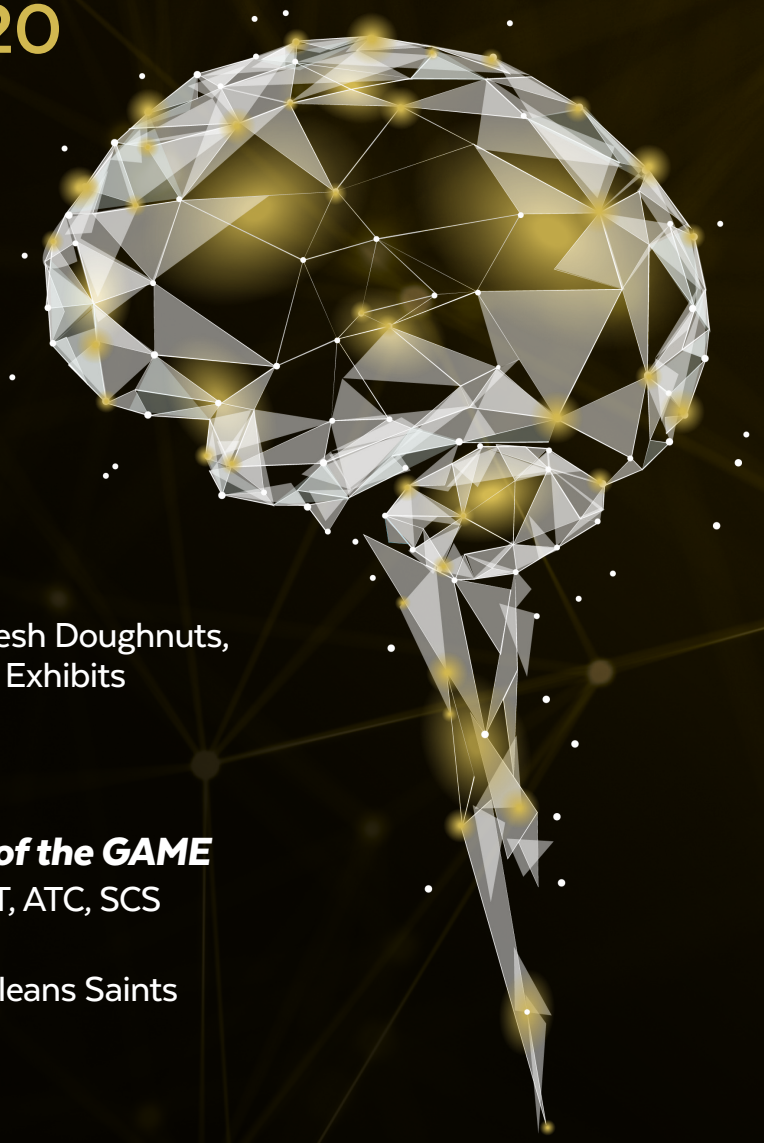

Schedule:

10:00 AM	Neuro Café AM – Coffee and Hot Fresh Doughnuts, Research Poster Presentations, and Exhibits
11:15 AM	Session I: **NERD** Talks
NOON	Luncheon & Keynote Speaker **NeuroHealth: *An integral part of the GAME*** Presented by: Beau Lowery, PT, DPT, ATC, SCS UMMC Alumni Director of Sports Medicine, New Orleans Saints
1:30 PM	Session II: **NERD** Talks
2:15 PM	Session III: **NERD** Talks
3:00 PM	Neuro Café PM – Ice Cream Bar, Research Poster Awards, and Exhibits

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