UNDERGRADUATE RESEARCH SYMPOSIUM

SPRING 2019

ARTS & HUMANITIES

BIOLOGICAL SCIENCES & ENGINEERING

PHYSICAL SCIENCES & ENGINEERING

SOCIAL SCIENCES

MISSISSIPPI STATE UNIVERSITY

JUDY AND BOBBY SHACKOULS HONORS COLLEGE

APRIL 16, 2019

COLVARD STUDENT UNION

MISSISSIPPI STATE UNIVERSITY™
JUDY AND BOBBY SHACKOULS HONORS COLLEGE

WELCOME

The Shackouls Honors College is pleased to sponsor the spring 2019 Mississippi State University Undergraduate Research Symposium. Prizes for academic areas are being partially supported by Phi Kappa Phi. The Shackouls Honors College has provided summer research support to some of the students presenting with additional funding from the Mississippi State University Office of Research and Economic Development and the National Strategic Planning & Analysis Research Center (nsparc).

In recognition of Mississippi State University's Carnegie Community Engagement Classification, the Undergraduate Research Symposium is pleased to be continuing to include a Community Engagement track in the spring symposium competition, sponsored by the Center for Community -Engaged Learning. There will also be separate competitions in Public Health Research, sponsored by the Department of Food Science, Nutrition, and Health Promotion, and a Thesis Research Competition, sponsored by the Graduate School. The Theta Tau Professional Engineering Fraternity will also recognize an undergraduate engineering student with the Tomorrow Builder Award.

We view the encouragement and support of undergraduate research for all students to be part of our core mission. Just as a good liberal education broadens the mind, provides students with a common core of knowledge, and familiarizes them with the basic methodologies of the various academic disciplines, undergraduate research allows students to dive deeply into important ideas and topics in a rigorous and creative way, paving the way for future intellectual work and exploration whether in the academy, business, or other life arena. Enjoy the student posters and presentations and come away knowing more than when you entered our doors.

Dr. Seth F. Oppenheimer
Professor of Mathematics
Associate Dean for Research, Shackouls Honors College
Mississippi State University

Mississippi State University: Our State's Land-Grant Research Flagship

We are honored to welcome you to Mississippi State University's Spring 2019 Undergraduate Research Symposium. Undergraduate students are an integral part of the multi-faceted research underway at Mississippi State.

Every day, our faculty, staff, and students are conducting fundamental to applied research that provide innovative solutions, creative works, and new scholarship that address pressing local, state, regional, national, and global needs.

As a result of this work, MSU is the leading institution in our state for research that falls within its land-grant mission. Strengths across all colleges and research centers have led to our institution being categorized by the Carnegie Foundation as a "very high research activity" institution. The Carnegie Foundation has also recognized Mississippi State with its Community Engagement Classification.

Pursuing research opportunities is a critical part of academic life on our campus, and our students are recognized for their commitment to discovery, creation, and exploration in our labs, studios, library, research farms and beyond. We are pleased that members of our faculty are committed to providing undergraduates with meaningful roles in the overall research enterprise, and promoting interdisciplinary research as an important component of scholarly activity.

Undergraduate research gives our students opportunities to apply classroom knowledge to new areas of interest and helps them develop skills, collaborate with faculty and peers, and gain confidence. It is exciting to see the results of their efforts on display at today's symposium.

Again, welcome to the symposium, and thank you for your contributions to and interest in research at Mississippi State University.

David R. Shaw, Ph.D.
Vice President for Research and Economic Development

MISSISSIPPI STATE UNIVERSITY™
CENTER FOR COMMUNITY-ENGAGED LEARNING

In 2010, Mississippi State University was recognized by the Carnegie Foundation for its institutional commitment to community engagement through teaching, research, and public service with the Community Engagement Classification. Mississippi State University is one of 115 colleges and universities to achieve this elective classification in 2010 and joins the ranks of only 361 institutions nationally. To support students, faculty, and staff involved in community engagement and engaged scholarship, Mississippi State University created the Center for Community-Engaged Learning (CCEL). One of CCEL's goals is to promote intentional opportunities for the advancement, production, and publication of research focused on the scholarship of engagement. The Community Engagement track of the Undergraduate Research Symposium is an avenue to highlight the work of students towards this goal.

Every day at MSU our students, staff, and faculty create partnerships with individuals and organizations beyond our campus to discover, develop, and disseminate knowledge that ultimately improves the learning, lives, and conditions of individuals and communities across Mississippi and around the globe. These mutually beneficial partnerships between external collaborators and MSU scholars are one of MSU's greatest assets, and we applaud those involved in research that has the potential to change communities. If you are interested in learning more about community engagement, please reach out to us as we work towards becoming a nationally-recognized leader in community-engaged research, learning, and service.

Meggan Franks
Interim Director
Office of Student Leadership and Community Engagement

Theta Tau Professional Engineering Fraternity is a co-ed student organization that promotes service, professional development, and brotherhood. Our members are a diverse group from every major in the Bagley College of Engineering, and we strive to become the engineering leaders of the future. We are excited to support an individual in this year's research symposium to receive the Tomorrow Builder Award, which aims to recognize an engineering undergraduate student who uses their skills and research to help solve complex problems of critical importance to society.

MISSISSIPPI STATE UNIVERSITY™
DEPARTMENT OF FOOD SCIENCE, NUTRITION AND HEALTH PROMOTION

In Mississippi and the nation, public health research can have a dramatic impact on improving health and quality of life. At Mississippi State University, faculty, staff, and students in fields ranging from health promotion and communication to biology and landscape architecture are making valuable contributions to public health. In celebration of National Public Health Week 2019, we are pleased to sponsor the third annual Public Health Research Competition to recognize outstanding student research in a public health-related field.

We recognize and commend the student scholars and faculty mentors who dedicate their time to public health research, and we thank the sponsors who have made this competition possible: the MSU Department of Food Science, Nutrition and Health Promotion, the MSU Department of Communication, the MSU Department of Sociology, the Mississippi Public Health Association, and the Myrlie Evers-Williams Institute for the Elimination of Health Disparities.

Congratulations on your achievements!

Brittney D. Oliver, PhD, CHES
Assistant Professor of Health Promotion
Department of Food Science, Nutrition and Health Promotion
Chair, MSU National Public Health Week Committee

MISSISSIPPI STATE UNIVERSITY™
DEPARTMENT OF COMMUNICATION

LEADERSHIP EDUCATION ADVOCACY
MPHA
MISSISSIPPI PUBLIC HEALTH ASSOCIATION

MISSISSIPPI STATE UNIVERSITY™
DEPARTMENT OF SOCIOLOGY

UMMC
Myrlie Evers-Williams Institute for the Elimination of Health Disparities

MISSISSIPPI STATE UNIVERSITY™
THE GRADUATE SCHOOL

I commend each of you on your accomplishments. You have shown a commitment to research and creative discovery in your particular fields of study, an achievement worth recognition. As researchers you are gaining valuable experience, whether it be theoretical or experimental, and you are helping to expand the body of knowledge in your field. These experiences can provide glimpses into the world of post-baccalaureate studies and can be beneficial when it comes time to apply for admission to graduate school. I hope that when the time comes you will consider continuing your studies here at Mississippi State University. I assure you your work is being noticed. You should all be very proud of what you have accomplished thus far in your academic careers.

Best,

Peter Ryan, Ph.D.
Associate Provost for Academic Affairs
Interim Dean of the Graduate School
Mississippi State University

THE HONOR SOCIETY OF
PHI KAPPA PHI

The Honor Society of Phi Kappa Phi (PKP) has a long and distinguished history. Currently, there are over 300 chapters of PKP scattered all across the world, from Maine to Hawaii and the Philippines, and from Alaska to Puerto Rico and beyond. During the 1996-97 academic year, PKP celebrated the 100th anniversary of the founding of The Honor Society of Phi Kappa Phi, and we are now in the second century of its recognition of - and service to - learning. The MSU chapter will celebrate its 70th year of membership next year. PKP invites only the highest achieving students from across all disciplines to join this prestigious society. Due to PKP's prestigious recognition and support of learning, the MSU Chapter is proud to also financially support the Spring 2019 Undergraduate Research Symposium in Griffis Hall at Mississippi State University. As President, I am honored that Phi Kappa Phi has been asked and is able to support this event as I have tremendous respect for undergraduate research at MSU. This symposium displays the importance of research for success as a student and beyond!

Thanks,

Jessica Tegt

Dr. Jessica Tegt, MSU Chapter President

Spring 2019 Undergraduate Research Symposium Schedule

Poster Session: MSU Ballroom (2nd floor)

1:00 pm - 3:30 pm

Arts and Humanities (Oral Presentations): Fowlkes Auditorium (3rd floor)

These are 10 minute talks. One or two questions are allowed but time needs to be left for the next speaker to set up.

12:45 pm Brady Kruse (005): A Tribute to England: J.R.R. Tolkien's Works as the Missing Anglo-Saxon Mythology

1:00 pm Kayla Cauthen (002): A Broken Dream*

1:15 pm Colleen McInnis (006): Modern Studio Techniques Matched with Alternative Processes in the Pursuit of Identity Portraiture*

1:30 pm Jasmine Riddle (009): I am Nobody. Nobody knows me.

1:45 pm Destiny Braswell (001): True Colors

2:00 pm **BREAK**

2:15 pm David Jenkins (003): The Complexities of Minimalism: Construction and Performance Practice in Steve Reich's "Drumming, Movement 1"

2:30 pm Jane Kent (004): Hypocrisy and Humanity in J.M. Coetzee's *The Lives of Animals*

2:45 pm Hannah Phillips (007): Power in Poise: Mesmerism and Feminine Empowerment in *The House of the Seven Gables*

3:00 pm Rebecca Poynor (008): Jane and Bertha: The Madwoman Within

* ***indicates technology is needed***

Thesis Research Competition (TRC): Room 329 (3rd floor)

A competition that challenges undergraduate students to present a compelling verbal presentation of their research topic and its significance in just three minutes.

1:10 pm David Sides (203): Language Endangerment in an Urbanizing Tanzania

1:15 pm Isabella Durham (171): Evaluating the Impacts of Undergraduate Research Programs at Mississippi State University for Developing Science Professionals

1:20 pm Rebecca Weatherford (210): Restorative Justice as a Means of Post-Civil War Reconciliation: The Cases of Rwanda and Argentina

1:25 pm Raegan Ramage (199): Agriculture Industry Employer Satisfaction of Agriculture Degree Graduates

TRC continued:

1:30 pm Maleen Kidiwela (120): An Expanded Inventory of Methane Seeps on the US atlantic Margin

1:35 pm Auriana Tucker (087): Root system architecture associated with allelopathy in weedy rice

1:40 pm Mariah Warner (208): Trust in the Police: How Bad is it, and What Can We do to Fix it?

1:45 pm Jihyun Shin (200): Effects of Gender, Age, Race, and Rurality on Food Insecurity

1:50 pm Gillian Jinkins (179): Engaging the Voters from the Ground Up: Local Election Officials and Voter Outreach Programs

1:55 pm Safaa Siddiqui (079): Himera (Sicily): Estimating allostatic load and age-at-death using stress indices

2:00 pm Drew Blake (152): Political Participation and Civic Engagement in Americans Ages 18-24

2:05 pm Austin Breland (019): Investigation into Bullet Corrosion and Resulting Lead Migration

2:10 pm Victoria McCaffrey (058): Evaluation of Various Extractants for Removing CCA from Out-of-Service Pressure Treated Wood

2:15 pm Demyia Graham (041): How Cellular Metabolic State and the Chaperone Protein Hsp104 Interact to Affect the Spontaneous Formation of the Yeast Prion [URE3]

2:20 pm Erin Rowcliff (073): Investigation of Ion Specific Electrodes and Conductivity Probes as a Reliable Method for Detecting Na+ and Cl- ions in Effluent Generated from the Electrokinetic Remediation of Soils

2:25 pm Colleen McInnis (006): Modern Studio Techniques Matched with Alternative Processes in the Pursuit of Identity Portraiture

2:30 pm Rachel Booth (154): Creative Problem Solving under Pressure

2:35 pm Hudson Thames (083): Effects of Electrostatic Spray and Natural Antioxidants on Chemical Quality of Grass-Finished Beef Strips Steaks

2:40 pm Mohammed Al Otmi (098): The Use of N,N'-di (Carboxymethyl) Dithiocarbamate Chelating Resin to Remove Heavy Metals from Produced Water

2:45 pm Jasmine Riddle (009): I am Nobody. Nobody knows me.

Award Ceremony - MSU Ballroom (2nd floor)

4:00 pm

Moderator:
Dr. Seth F. Oppenheimer, Professor of Mathematics, Associate Dean for Research, Shackouls Honors College, Mississippi State University

Community Engagement Research Track Awards:
Meggan Franks, Interim Director, Student Leadership & Community Engagement, Center for Community-Engaged Learning, Maroon Volunteer Center, Mississippi State University

Public Health Research Competition Awards:
Dr. Brittney Oliver, Assistant Professor of Health Promotion in the Department of Food Science, Nutrition and Health Promotion and Chair of the MSU National Public Health Week Committee

Dr. Antonio Gardner, Assistant Professor of Health Promotion in the Department of Food Science, Nutrition and Health Promotion

Dr. Holli Seitz, Assistant Professor of Communication, Department of Communication and Director of the Message Laboratory, Social Science Research Center

Thesis Research Competition Awards:
Dr. Peter Ryan, Associate Provost for Academic Affairs, Interim Dean of the Graduate School, Mississippi State University

Theta Tau Tomorrow Builder Award:
Representative of Theta Tau Professional Engineering Fraternity

Symposium Subject Area Awards:
Dr. Jessica Tegt, Assistant Research Professor, Office of Research and Economic Development, President of The Honors Society at Phi Kappa Phi, Mississippi State University

Dr. Christopher Snyder, Professor of History and Dean of the Shackouls Honors College, Mississippi State University

This symposium would not be possible without the hard work of the judges who work under time pressure to try to determine which excellent project is just a bit more excellent than the others. If you see a judge, thank him or her.

Student Presenters

Student Presenter	Research Category	Project Number	Abstract Page #
Javad A'arabi	Biological Sciences & Engineering	013	**16**
Navin Acharya	Social Sciences	149	**16**
William Acuff	Biological Sciences & Engineering	014	**17**
Mohammed Al Otmi	Physical Sciences & Engineering	098	**17**
Emily Allen	Social Sciences	150	**18**
Kereikhan Bakhytkhanuly	Physical Sciences & Engineering	099	**18**
Mary Catherine Beard	Biological Sciences & Engineering	015	**18**
Caroline Bearden	Physical Sciences & Engineering	100	**19**
William Bell	Physical Sciences & Engineering	101	**19**
Jessica Bishop	Social Sciences	151	**20**
Benjamin Blackburn	Biological Sciences & Engineering	016	**20**
Drew Blake	Social Sciences	152	**21**
Kelson Bohna	Biological Sciences & Engineering	017	**21**
Miranda Book	Social Sciences	153	**22**
Rachel Booth	Social Sciences	154	**22**
Hannah Bostick	Biological Sciences & Engineering	018	**23**
Meredith Bradford	Social Sciences	155	**23**
Destiny Braswell	Arts & Humanities (Oral Presentation)	001	**24**
Austin Breland	Biological Sciences & Engineering	019	**24**
Maggie Bridges	Social Sciences	156	**25**
Madeleine Bunyard	Social Sciences	157	**25**
Murry Burgess	Biological Sciences & Engineering	020	**26**
Marshall Callicott	Biological Sciences & Engineering	021	**26**
Taylor Campbell	Social Sciences	158	**27**
Mary Carr	Biological Sciences & Engineering	022	**27**
Mel Carrino	Social Sciences	159	**28**
Kayla Cauthen	Arts & Humanities (Oral Presentation)	002	**28**
Sarah Caylor	Social Sciences	160	**28**
Millie Chism	Social Sciences	161	**29**
Thomas Circenis	Physical Sciences & Engineering	102	**29**
Sarah Claxton	Physical Sciences & Engineering	103	**30**
Harper Cobb	Biological Sciences & Engineering	023	**30**
Caitlynn Cochran	Social Sciences	162	**31**
Ryan Cochran	Physical Sciences & Engineering	104	**31**
Cade Cockrell	Physical Sciences & Engineering	105	**32**
Jordan Coggins	Biological Sciences & Engineering	024	**32**
Kayla Cole	Biological Sciences & Engineering	025	**33**
Allie Cowles	Social Sciences	163	**33**
Claire Crosland	Social Sciences	164	**34**
Abigail Crouse	Biological Sciences & Engineering	026	**34**
Samantha Curran	Biological Sciences & Engineering	027	**34**
Vesilla Dao	Social Sciences	165	**35**
Mayukh Datta	Physical Sciences & Engineering	106	**36**
Alex Davis	Arts & Humanities (Poster)	010	**36**
Daniel Davis	Biological Sciences & Engineering	028	**36**
Flora Dedeaux	Social Sciences	166	**37**

Student Presenter	Research Category	Project Number	Abstract Page #
Elizabeth Dell'Orco	Physical Sciences & Engineering	107	**37**
Krishna Desai	Social Sciences	167	**38**
Wellesley Dittmar	Biological Sciences & Engineering	029	**39**
Cameron Douglas	Social Sciences	168	**39**
Shawna Downs	Social Sciences	169	**40**
Brady Dunaway	Biological Sciences & Engineering	030	**40**
Andreana Durham	Social Sciences	170	**41**
Isabella Durham	Social Sciences	171	**41**
Stephanie Durr	Social Sciences	172	**42**
Jacob Easley	Physical Sciences & Engineering	108	**42**
Lauren Ellison	Biological Sciences & Engineering	031	**43**
Mayah Emerson	Social Sciences	173	**43**
Daniel A. Fajardo	Biological Sciences & Engineering	032	**44**
Rachael Feeney	Biological Sciences & Engineering	033	**44**
Isidora Fereday	Biological Sciences & Engineering	034	**45**
Ethan Fisher	Biological Sciences & Engineering	035	**45**
Jennifer Fisher	Biological Sciences & Engineering	036	**46**
Michael Folse	Biological Sciences & Engineering	037	**46**
Carly Foss	Physical Sciences & Engineering	109	**47**
Caleb Foster	Physical Sciences & Engineering	110	**47**
Zoe Fowler	Physical Sciences & Engineering	111	**48**
Nathan Frey	Physical Sciences & Engineering	112	**48**
Brandon Gerhart	Biological Sciences & Engineering	038	**49**
Mary Godley	Biological Sciences & Engineering	039	**49**
Alexander Gonzalez	Biological Sciences & Engineering	040	**50**
Desiree Goodfellow	Social Sciences	174	**50**
Demyia Graham	Biological Sciences & Engineering	041	**50**
Christine Grant	Biological Sciences & Engineering	042	**51**
Emily Haag	Biological Sciences & Engineering	043	**51**
Daniel Hall	Physical Sciences & Engineering	113	**52**
Emily Hatcher	Social Sciences	175	**53**
Chelsey Hill	Biological Sciences & Engineering	044	**53**
Jennifer Hoang	Physical Sciences & Engineering	114	**53**
Blade Hodges	Physical Sciences & Engineering	115	**54**
Marsei Hogan	Social Sciences	176	**54**
Haley Holiman	Biological Sciences & Engineering	045	**55**
Colby Horner	Physical Sciences & Engineering	116	**55**
Tianci Huang	Biological Sciences & Engineering	046	**56**
Mallorie Humble	Biological Sciences & Engineering	047	**56**
Mallie Hunt	Physical Sciences & Engineering	117	**57**
Laura Ingouf	Social Sciences	177	**57**
Hannah Irwin	Social Sciences	178	**58**
Ty Irwin	Physical Sciences & Engineering	118	**58**
David Jenkins	Arts & Humanities (Performance)	003	**59**
Gillian Jinkins	Social Sciences	179	**59**
Ben Jones	Physical Sciences & Engineering	119	**59**
Gwyneth Jones	Biological Sciences & Engineering	048	**60**
Kurt Junkersfeld	Biological Sciences & Engineering	049	**60**

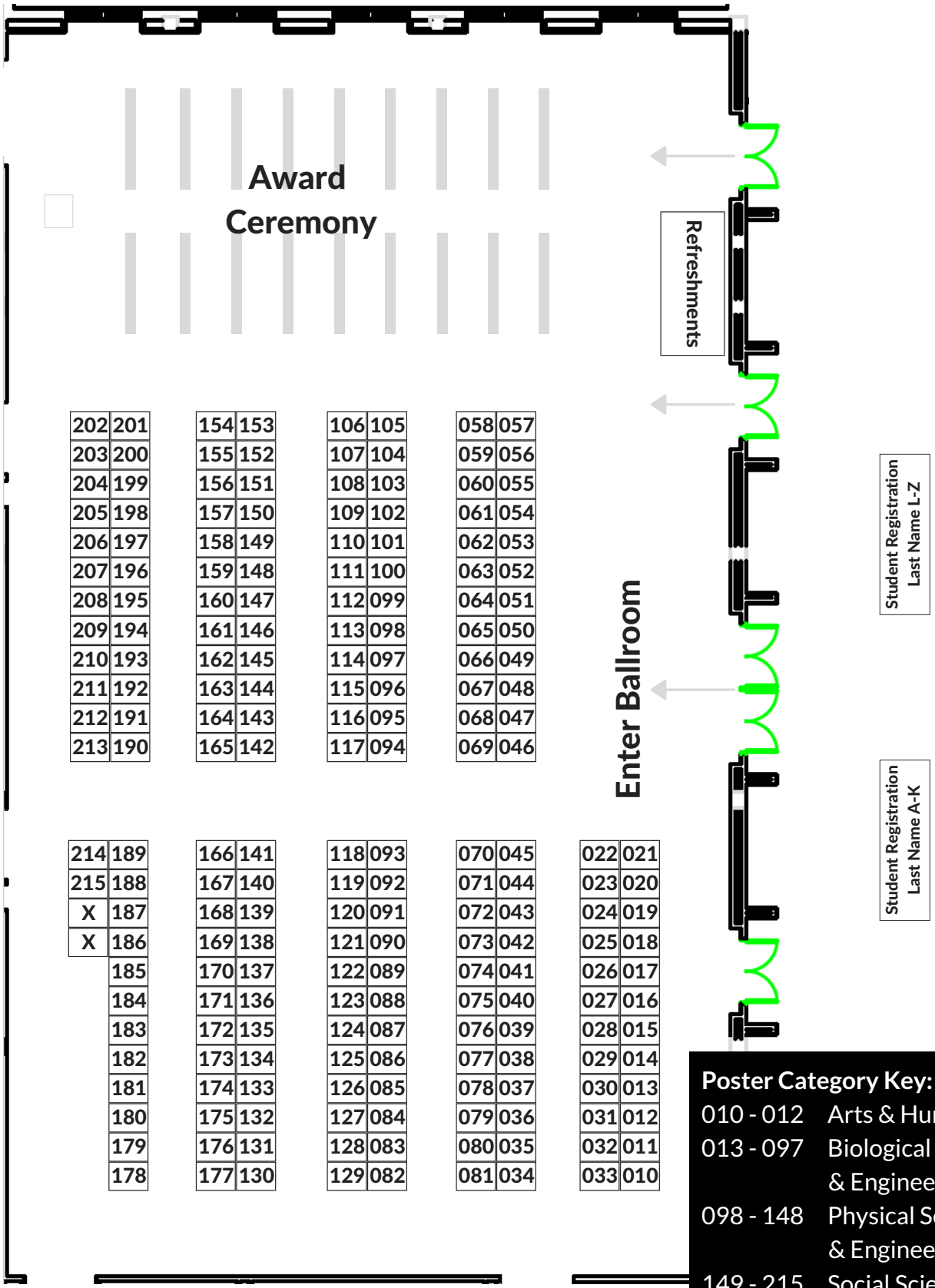
Student Presenter	Research Category	Project Number	Abstract Page #
Jane Kent	Arts & Humanities (Oral Presentation)	004	**61**
Charlotte Key	Biological Sciences & Engineering	050	**61**
Maleen Kidiwela	Physical Sciences & Engineering	120	**62**
Eunbea Kim	Social Sciences	180	**62**
Jude Kitaif	Biological Sciences & Engineering	051	**63**
Julia Knight	Social Sciences	181	**63**
Will Knotts	Social Sciences	182	**64**
David Korba	Physical Sciences & Engineering	121	**64**
Brady Kruse	Arts & Humanities (Oral Presentation)	005	**65**
Danielle Kuper	Biological Sciences & Engineering	052	**65**
Taylor Ladner	Biological Sciences & Engineering	053	**66**
Spencer Lampkin	Physical Sciences & Engineering	122	**66**
Lucia Lang	Physical Sciences & Engineering	123	**67**
Elijah Layman	Social Sciences	183	**67**
Seth Lichlyter	Physical Sciences & Engineering	124	**68**
Wenhua Lin	Physical Sciences & Engineering	125	**68**
Rhodes Lipsey	Social Sciences	184	**69**
Rebekah Lowe	Social Sciences	185	**69**
Tyler Lowe	Biological Sciences & Engineering	054	**70**
Andrew Lowery	Biological Sciences & Engineering	055	**70**
Eric Lucas	Biological Sciences & Engineering	056	**71**
Ryan Lurk	Physical Sciences & Engineering	126	**71**
Michayla Mack	Social Sciences	186	**71**
Luci Makamson	Biological Sciences & Engineering	057	**72**
Sara Butler Makamson	Social Sciences	187	**72**
Randeep Reddy Marri	Social Sciences	188	**73**
Madison Martin	Arts & Humanities (Poster)	011	**73**
Vivian Mayora	Physical Sciences & Engineering	127	**74**
Emily McCabe	Social Sciences	189	**74**
Victoria McCaffrey	Biological Sciences & Engineering	058	**75**
Martin McCandless	Physical Sciences & Engineering	128	**75**
Emili McClure	Biological Sciences & Engineering	059	**76**
Sam McDevitt	Physical Sciences & Engineering	129	**76**
Liam McDougal	Biological Sciences & Engineering	060	**77**
Colleen McInnis	Arts & Humanities (Oral Presentation)	006	**77**
Thomas Miles	Biological Sciences & Engineering	061	**78**
Ragan Mims	Social Sciences	190	**78**
Makayla Minton	Biological Sciences & Engineering	062	**79**
Blaklie Mitchell	Biological Sciences & Engineering	063	**79**
Jayla Mondy	Biological Sciences & Engineering	064	**80**
Jessie Moore	Physical Sciences & Engineering	130	**80**
Andrew Moran	Biological Sciences & Engineering	065	**80**
Buckston Morgan	Physical Sciences & Engineering	131	**81**
Obinna Muoh	Physical Sciences & Engineering	132	**81**
Olivia Murtagh	Physical Sciences & Engineering	133	**82**
Shanika Musser	Physical Sciences & Engineering	134	**82**
Allyson Nash	Social Sciences	191	**83**
Rachel Nation	Biological Sciences & Engineering	066	**83**

Student Presenter	Research Category	Project Number	Abstract Page #
Meagan Nusz	Social Sciences	192	**84**
Allison O'Leary	Social Sciences	193	**84**
Erin O'Quinn	Physical Sciences & Engineering	135	**84**
Mmesoma Okafor	Biological Sciences & Engineering	067	**85**
Kate Parkes	Biological Sciences & Engineering	068	**85**
Mary Grace Payne	Social Sciences	194	**86**
Sara Peppers	Arts & Humanities (Poster)	012	**86**
Abbigail Petersen	Social Sciences	195	**87**
Hannah Phillips	Arts & Humanities (Oral Presentation)	007	**87**
Janiece Pigg	Social Sciences	196	**88**
Baleigh Pinder	Social Sciences	197	**89**
Rupesh Pokharel	Physical Sciences & Engineering	136	**89**
Lauren Pounds	Physical Sciences & Engineering	137	**90**
Rebecca Poynor	Arts & Humanities (Oral Presentation)	008	**90**
Dixie Priest	Social Sciences	198	**91**
Katelyn Provine	Biological Sciences & Engineering	069	**91**
Raegan Ramage	Social Sciences	199	**92**
Brennan Reeder	Physical Sciences & Engineering	138	**92**
Reilly Reeves	Biological Sciences & Engineering	070	**93**
Matthew Register	Biological Sciences & Engineering	071	**93**
Claudia Reid	Physical Sciences & Engineering	139	**94**
Jasmine Riddle	Arts & Humanities (Oral Presentation)	009	**94**
Ross Robertson	Physical Sciences & Engineering	140	**95**
Jacob Rogers	Physical Sciences & Engineering	141	**95**
Anna Rourke	Biological Sciences & Engineering	072	**95**
Erin Rowcliff	Biological Sciences & Engineering	073	**96**
Timothy Rozek	Biological Sciences & Engineering	074	**96**
Erin Rushing	Biological Sciences & Engineering	075	**97**
Gabriel Sanders	Physical Sciences & Engineering	142	**97**
Hannah Scheaffer	Biological Sciences & Engineering	076	**98**
Jaylan Sears	Biological Sciences & Engineering	077	**98**
Chirantan Sen Mukherjee	Physical Sciences & Engineering	143	**99**
Katie Shearer	Biological Sciences & Engineering	078	**99**
Jihyun Shin	Social Sciences	200	**100**
Cory Shumate	Social Sciences	201	**100**
Sam Shurden	Social Sciences	202	**101**
Safaa Siddiqui	Biological Sciences & Engineering	079	**101**
David Sides	Social Sciences	203	**102**
Katherine Slack	Biological Sciences & Engineering	080	**102**
Jacob Smith	Biological Sciences & Engineering	081	**103**
Samantha Sockwell	Biological Sciences & Engineering	082	**103**
Je'Kylynn Steen	Social Sciences	204	**104**
Ashley Stephens	Social Sciences	205	**104**
Logan Strock	Social Sciences	206	**105**
Skylar Taggart	Physical Sciences & Engineering	144	**105**
Pronnoy Tarafdar	Physical Sciences & Engineering	145	**106**
Hudson Thames	Biological Sciences & Engineering	083	**106**
Kensey Thomas	Biological Sciences & Engineering	084	**107**

Student Presenter	Research Category	Project Number	Abstract Page #
Victoria Thompson	Physical Sciences & Engineering	146	**107**
Bibek Timalsina	Biological Sciences & Engineering	085	**108**
Emily Tingle	Social Sciences	207	**108**
Kezia To	Biological Sciences & Engineering	086	**109**
Auriana Tucker	Biological Sciences & Engineering	087	**109**
Natalene Vonkchalee	Biological Sciences & Engineering	088	**110**
Mariah Warner	Social Sciences	208	**110**
Lauren Waters	Biological Sciences & Engineering	089	**111**
Megan Watson	Social Sciences	209	**111**
Rebecca Weatherford	Social Sciences	210	**112**
Jimmie Webb	Social Sciences	211	**112**
Clemmie Weddle	Social Sciences	212	**113**
Branson Wetzstein	Biological Sciences & Engineering	090	**113**
Heather White	Biological Sciences & Engineering	091	**114**
Lucas Whittenton	Biological Sciences & Engineering	092	**114**
Sydney Wicks	Social Sciences	213	**115**
Dustin Widmer	Physical Sciences & Engineering	147	**115**
Olivia Williams	Biological Sciences & Engineering	093	**116**
Victoria Williams	Biological Sciences & Engineering	094	**116**
Bayley Wilmoth	Biological Sciences & Engineering	095	**117**
Dianna Wilson	Social Sciences	214	**117**
Tori Wilson	Physical Sciences & Engineering	148	**118**
Emma Winterhalter	Social Sciences	215	**118**
Justin Yow	Biological Sciences & Engineering	096	**119**
Tony Zbysinski	Biological Sciences & Engineering	097	**119**

Poster Map

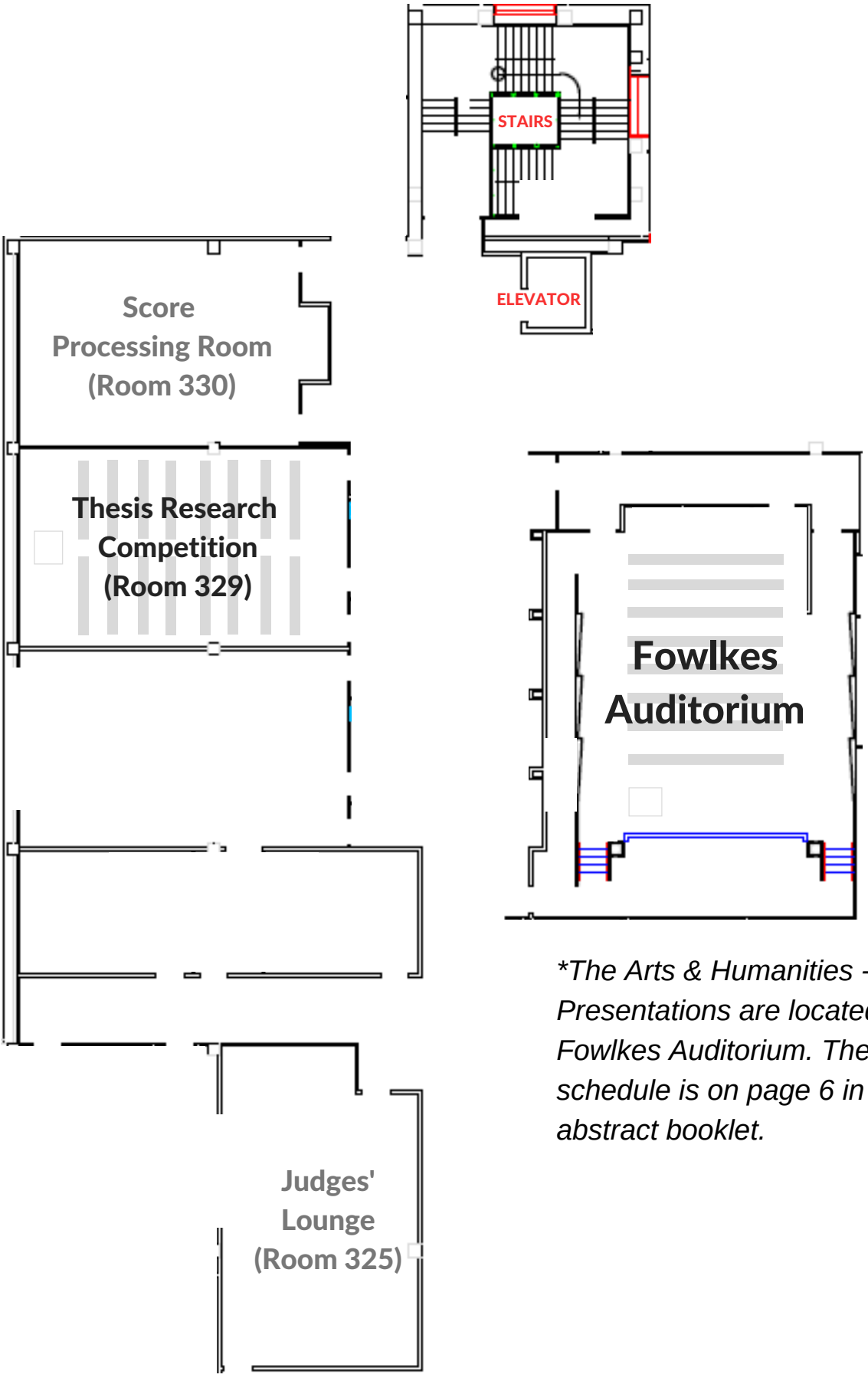
Colvard Student Union - MSU Ballroom (2nd Floor)



Poster Category Key:

010 - 012	Arts & Humanities (AH)
013 - 097	Biological Sciences & Engineering (BSE)
098 - 148	Physical Sciences & Engineering (PSE)
149 - 215	Social Sciences (SS)

Colvard Student Union (3rd Floor)



**The Arts & Humanities - Oral Presentations are located in Fowlkes Auditorium. The talk schedule is on page 6 in the abstract booklet.*

Abstracts

013
Name: Javad A'arabi
Major: Biological Sciences/Microbiology
Faculty Advisor, Affiliation: Chinling Wang, Department of Basic Sciences
Project Category: Biological Sciences and Engineering
Co-Author(s): Hsin-Yi Lu, Wenyuan Yang, Yue-Jia Lee
Other Competition(s): Community Engagement Research Track, Public Health Research Competition

Adopting Lactobacillus Species and Organic Acids as Alternative Treatments to Necrotic Enteritis
Necrotic enteritis (NE), caused by *Clostridium perfringens* (CP), is a re-emerging disease that costs a six-billion-dollar deficit to the global poultry industry. Low level usage of antibiotics added to animal feed as a growth promoter has been shown to be an effective measure to control disease. Due to the extensive belief of antibiotic resistance bacteria transferring to humans, many poultry companies have removed growth promoters from poultry feed, resulting in an increase incidence of necrotic enteritis. Therefore, an alternative treatment without using antibiotics to treat this disease is critical for the survival/profitability of the poultry industry. *Lactobacillus* species have been shown to improve the gut integrity of humans and animals to compete against pathogens. The hypothesis was that the use of beneficial bacteria can inhibit the growth of harmful bacteria in the chicken gut. The objective of this study was to evaluate the effectiveness of probiotics bacteria, *Lactobacillus johnsonni* and *Lactobacillus salivarius*, to protect chickens against CP. In the experimental design, broiler chicks were divided into four groups: A) positive control, B) *L. Johnsonni* treatment, C) *L. salivarius* and D) negative control. Groups A to C were challenged with CP. The results showcased that the *L. johnsonni* or *L. salivarius* supplement did not protect birds against the CP challenge. Orally giving probiotics daily seems to introduce stress to the birds and increase the susceptibility of CP, resulting in higher mortality and intestinal lesions than the positive control group (challenged but no probiotics). The conclusion is that neither *L. johnsonii* nor *L. salivarius* protects chickens against the CP challenge. A different methodology of administering the probiotics to avoid stress to chickens, such as mixing in feed, water, or a mixture of beneficial bacteria and organic acids, should be considered for future studies.

149
Name: Navin Acharya
Major: Computer Science
Faculty Advisor, Affiliation: Dr. Tanmay Bhowmik, Department of Computer Science and Engineering
Project Category: Social Sciences
Co-Author(s): Sayem Mohammad Imtiaz

Predicting Vulnerability for Software Requirements
In the modern software intensive world, as we continue to see and abundance of security breaches with potentially disastrous consequences, the software development community is increasingly leaning towards a proactive approach regarding security. It is long established that fixing a vulnerability identified later in the development life cycle is much more expensive. Consequently, there is a need for preventive mechanisms that can predict vulnerabilities as early as during requirements engineering activities. In this research, we are developing a novel framework providing an automated support to predict vulnerabilities for software requirements. In order to predict vulnerabilities, however, we need a rich database of existing security incidents encountered for various software systems. To that end, I am working with Dr. Tanmay Bhowmik in the Department of CSE and creating such a database. In particular, I am looking into online resources, such as code repositories and issue tracking systems, and collecting data about specific vulnerabilities, requirements from which they originated and the source code that realized those vulnerability prone requirements. Our ultimate goal is to leverage machine learning techniques capitalizing on this database and predict vulnerabilities at a very early stage of the development life cycle, thereby minimizing the risk of security breaches.

014
Name: William Acuff
Major: Biological Engineering
Faculty Advisor, Affiliation: Janice Chambers, Department of Basic Sciences, Center for Environmental Health Sciences
Project Category: Biological Sciences and Engineering
Co-Author(s): Dr. Steven Gwaltney
Other Competition(s): Public Health Research Competition

Reactivation Effects of Novel Oximes on Rat Brain Acetylcholinesterase Inhibited by Metabolites of Phorate
Organophosphates (OPs), used as certain insecticides and nerve agents, pose a grave threat to military personnel and civilians alike due to their ability to inhibit acetylcholinesterase (AChE). The OP insecticide phorate (rat oral LD50 1.4-3.7 mg/kg) is particularly toxic. However, due to its agricultural nature, it is less vigilantly monitored than nerve agents, leading to easier access for nefarious uses. In vitro studies of phorate indicate that its metabolites, namely phorate-oxon (PHO), phorate-oxon sulfoxide (PHOxSx), and phorate-oxon-sulfone (POSn) are the potent AChE inhibitors that cause toxicity. Additionally, phorate exhibits a lengthy delay of toxic signs in vivo; this property could be used by terrorists to cause panic in an exposed population. Traditionally, oxime drugs such as 2-PAM, in combination with atropine, have been used to treat OP poisoning. However, PHO is hypothesized to potentially inhibit AChE with an unusual ethoxy leaving group, yielding a phosphylated AChE that might not be readily reactivated by 2-PAM. Computational modeling is being used to determine the plausibility of this hypothesis. Additionally, the traditional oxime drug, 2-PAM, cannot penetrate the blood brain barrier. Recently MSU's novel substituted phenoxyalkyl pyridinium oximes (US patent 9,277,937) have been shown to reactivate inhibited AChE in the brain in animal tests. Preliminary in vivo results show an increase in survivability compared to 2-PAM when novel oximes were administered following lethal doses of phorate in rats. Additionally, our in vitro results show varying levels of AChE reactivation in rat brain preparations inhibited by PHO, PHOxSX, or POSn. These results help broaden understanding of these novel oximes' therapeutic potential in relation to phorate and could lead to more effective antidotes to protect against potential phorate exposure. (Support: NIH U01 NS083430)

098
Name: Mohammed Al Otmi
Major: Chemical Engineering
Faculty Advisor, Affiliation: Maryam Mirabolghasemi, Swalm School of Chemical Engineering
Project Category: Physical Sciences and Engineering
Other Competition(s): Thesis Research Competition (TRC)

The Use of N, N'-di (Carboxymethyl) Dithiocarbamate Chelating Resin to Remove Heavy Metals from Produced Water
Oilfield produced water usually contains high concentrations of heavy metals and poses a serious health and environmental risk. Due to these risks, it is not possible to re-use or discharge large volumes of produced water before treating it to acceptable concentration ranges approved by environmental agencies. Treatment methods include membranes desalination, solvent extraction, co-precipitation, and adsorption. Adsorbing resin N,N'-di (carboxymethyl) dithiocarbamate has shown significant capabilities in removing divalent heavy metals like lead, copper, and nickel from water. This study will closely examine this resin, its synthesis process, and its effectiveness in removing heavy metals. We tested this resin on solutions with a heavy metals composition similar to that of oilfield produced water. Conductivity and Atomic Absorption Spectroscopy (AAS) tests were conducted to measure the adsorption of heavy metals from the tested solutions. Our findings show removal efficiencies lower than those reported in the literature for normal concentrations of single ion solutions... We further examined the selective adsorption of multi-ion solutions and found that the resin shows a greater affinity for nickel compared to lead and copper. This study may benefit water treatment experts because, to the best of our knowledge, no other study presents the quantified performance and the economic potential of the aforementioned resin for treating oilfield produced water.

150
Name: Emily Allen
Major: Educational Psychology
Faculty Advisor, Affiliation: Dr. Nicole Leach, Counseling, Educational Psychology, & Foundations
Project Category: Social Sciences
Co-Author(s): Maddy Bunyard, Brooke Giddens, Swayze McDearman

Online Versus Traditional Student Success
Online distance education has become more popular in today's world. Many people are questioning whether the online courses have the same effect on student satisfaction as the traditional classroom approach. This research study was conducted to determine whether the traditional classroom approach or the online distance education approach yields a higher satisfaction in education received. The intended sample for this study includes junior and senior level students from the elementary education major at a public, southern university. Statistics show that southern schools lack when it pertains to proper education, so targeting the southern area will provide new research for educational purposes. The data are ranked on a five-point Likert scale. We hypothesize that the traditional classroom approach will have higher success rates among university students because of the physical interactions between the instructors and students in an educational environment. In contrast, the Distance Education program is strictly online, resulting in students having to rely on technology to contact and interact with professors. Preliminary results suggest that students rank their traditional classroom experiences as being more effective to their education. Results from this study suggest that those in the education field will become more aware of ways to increase student satisfaction as the level of technology in the classroom increases.

099
Name: Kereikhan Bakhytkhanuly
Major: Aerospace Engineering
Faculty Advisor, Affiliation: Donghoon Kim, Ph.D., Aerospace Engineering
Project Category: Physical Sciences and Engineering
Co-Author(s): Kyle Ryker

Simulation and Analysis of a Mass-Driven Spherical Aerial and Ground Autonomous System
As observed in current spherical unmanned aerial vehicles (SUAVs), the benefit of a spherical shell is to protect electric parts from damage by environmental obstacles. The proposed SUAV, however, will also have a feature of operating on the ground. The design of a proposed spherical aerial and ground platform will combine principles of a spherical rolling robot and a UAV. With this in mind, this system is capable of replacing the two by being more versatile, hence, cost-efficient. The rolling motion on the ground as well as maneuvering in the air will be performed by internally changing the center of gravity (CG), which will produce momentum to drive the vehicle's omnidirectional motion. An actuator (mass shifting mechanism) will be considered to conduct CG variation. The proposed vehicle design is supported by MATLAB numerical simulations allowing its behavior to be predicted and analyzed. As noted before, the platform proposed can replace the need for both capabilities of ground and aerial vehicles. Having functionality both on the ground and in the air, this vehicle is capable of completing several tasks on complex missions more efficiently.

015
Name: Mary Catherine Beard
Major: Biological Engineering
Faculty Advisor, Affiliation: Lauren B. Priddy, Ph.D., Department of Agricultural and Biological Engineering
Project Category: Biological Sciences and Engineering
Co-Author(s): Leah K. Horstemeyer, M.S.

Autoclaving Poloxamer 407 Thermoresponsive Hydrogels for Surgical Applications
Poloxamer 407, commonly known as P407, is a temperature responsive hydrogel that is unique in its ability to remain in liquid form until it reaches body temperature, making the hydrogel an ideal candidate for biomedical applications. When

loaded with antibiotics or other therapeutics, the gel can act as a controlled, targeted drug delivery system at the site of implantation. Previously, we have utilized P407 as an *in vivo* delivery vehicle for the treatment of osteomyelitis and observed that autoclaving changed the thermal responsiveness of the gel. This study aimed to investigate how autoclaving affects the water content and rheological properties of P407. Hydrogel concentrations of 30, 35, and 40 percent weight per volume (w/v) were autoclaved at temperatures of 100, 121, and 134 degrees Celsius for 20, 30, and 45 minutes and weighed to determine the percent weight (water) loss of the gel samples. Data indicated that water content in the hydrogel decreased with increases in both autoclave temperature and time. Additionally, the 30 percent gel was more susceptible to water loss than the 35 and 40 percent formulations. Rheological experiments involving temperature, shear, and oscillatory sweep are being conducted to analyze the viscoelastic behavior of autoclaved and non-autoclaved samples during and after the gelation process. Preliminary data indicated that autoclaving may decrease gelation temperature and increase the elasticity of the gel. In summary, autoclaving Poloxamer 407 changed the behavior of the hydrogel in regards to gelation temperature and mechanical properties, which would in turn affect the hydrogel's utility as an effective and sustainable drug delivery system *in vivo*.

100
Name: Caroline Bearden
Major: Industrial Engineering
Faculty Advisor, Affiliation: Lesley Strawderman, Industrial and Systems Engineering; Reuben Burch, Industrial and Systems Engineering
Project Category: Physical Sciences and Engineering
Co-Author(s): Aaron Duvall

How to Predict the Best Possible Practice
In the world of college athletics, wearable technology is becoming increasingly popular. Polar is one type of wearable technology that the athlete straps across his or her chest during practice or a game. The device captures metrics such as maximum heart rate, minimum heart rate, and training load Coaches can use this information to modify practice regimen to better train athletes prior to competition, as well as to monitor their exertions during competition. In this project, I considered data from Polar devices worn by the MSU women's soccer team during the fall 2018 season. In addition to compiling player profiles post-season, I have used data analysis methods such as correlation to find the relationship between practice performance and competition performance. Long term, I would like to develop a way that coaches could use the recorded data from the device to design the best possible future practice that could improve competition performance.

101
Name: William Bell
Major: Aerospace Engineering
Faculty Advisor, Affiliation: Donghoon Kim, Department of Aerospace Engineering
Project Category: Physical Sciences and Engineering

Developing a Robust Crack Detection System for Deployment on a UAV Platform
The nation's infrastructure is vast and aging, and inspectors are struggling to keep up with inspection duties that are crucial to maintenance and repair duties. To augment inspectors' ability to quickly and wholly evaluate structures' health, engineers are looking to deploy state of the art computer vision technology to detect structural damage automatically. Convolutional neural networks (CNNs), a type of deep learning model, have been deployed in several industries to match human performance in object detection and classification. In this work, a CNN is designed and trained for deployment on an unmanned aerial vehicle (UAV) platform. In the case of a large structure, the mobility and precision-flying of UAVs provide inspectors with access to the entire structure without need for specialized equipment, vehicles, or training beyond operating and flying the UAV. To create a robust crack detector, the data-set used for training the CNN is made to be large and diverse using a few methods of data augmentation including recoloring, rotation, blurring, and illumination changes. The CNN is created in the Python coding language using TensorFlow and Keras libraries that expedite building and testing complex neural networks, so a good model with optimal hyperparameters is created. Using these resources and

techniques for data augmentation, the CNN is expected to perform well in a range of conditions encountered in field testing despite the limited size of labeled training data available for crack detection applications. Future experimentation will provide results to determine if this is the case.

151
Name: Jessica Bishop
Major: Educational Psychology
Faculty Advisor, Affiliation: Kasia Gallo, Counseling, Educational Psychology, and Foundations
Project Category: Social Sciences

The Role of Child Life Specialists in Coping Skills Development
Hospitalization can be a difficult, frightening experience for children and their families. In an effort to make the experience as comfortable as possible, child life specialists are devoted to addressing the psychosocial aspect of medical care and long-term hospitalizations. While not all hospitals have child life programs, those that are in place appear to positively impact patients and their families. This paper examines fifteen empirical studies to understand the influence of child life specialists on coping skills development within patients and their families.
Participants included patients under the age of 18 and child life specialists at hospitals in various locations. Different methodologies were used to assess child life programs and their effects. Self-report questionnaires and interviews were used to measure the perceptions of child life specialists' impact on patients' hospital experiences. The questionnaires and interviews focused on assessment processes, the perception of pain and distress, satisfaction with the program, roles of child life specialists, and patient affect. Researchers examined a model child life program using 21 outcome variables related to stress coping, adjustment, and surgical recovery.
Results suggest that the presence of child life programs positively impacts the collaboration of the medical team and the overall hospital experience across multiple domains. Additionally, child life specialists reduce the distress of patients and their families. These findings have implications for medical teams, child life specialists, and patients' families to learn what techniques and services of child life programs are most effective in providing the best care for patients.

016
Name: Benjamin Blackburn
Major: Biochemistry
Faculty Advisor, Affiliation: Dr. Ashli Brown, Biochemistry
Project Category: Biological Sciences and Engineering
Co-Author(s): John Buol, Cedric Reid, Darrell Sparks, Dan Reynolds, Ashli Brown

FTIR spectroscopy coupled to chemometrics for the classification of auxin herbicides
In the recent years, the agricultural sector has developed multiple genetically modified crops capable of withstanding applications of Auxin and Dicamba Herbicide. Companies have developed formulations of Dicamba, each with their own side chains, such as esters, salts, amines and acids. Recently, off-target damage to crops has become an issue in the United States. These exposures of herbicide are often at various concentrations, however, even exposure at relative low concentrations can lead to visible damage such as leaf deformity. A problem plaguing regulatory labs is that they cannot determine which variant of Dicamba caused the plant damage. Therefore, we have begun to investigate the use of Fourier transform infrared spectroscopy (FT-IR) and preliminary data looks promising. A Thermo Nicolet 6700 FT-IR Spectrometer coupled to chemometric software (Unscrambler X) was used to produce classification models capable of identifying specific 2,4-D and Dicamba formulations present in damaged crop tissue. During the 2017 and 2018 growing season soybeans and cotton were treated with various concentrations of the different 2,4-D and Dicamba formulations. Three subsamples of cotton and soybeans were collected after eight hours post-treatment. Samples were homogenized; infrared spectroscopy spectra were generated, and then analyzed by principal component analysis (PCA) and linear discriminant analysis (LDA). Joint PCA-LDA models were only capable of classifying 2,4-D and dicamba formulations in damaged tissue with up to 36% and 40% accuracy, whereas LDA alone produced models with 77 to 80% and 80 to 85% accuracy respectively. This research suggests that with further refining, chemometric analysis of spectral data from damaged crop

tissue may be an economical, efficient, and promising application to support management of crop injury cases following off target movement.

152
Name: Drew Blake
Major: Political Science
Faculty Advisor, Affiliation: Thessalia Merivaki, Political Science
Project Category: Social Sciences
Other Competition(s): Thesis Research Competition (TRC)

Political Participation and Civic Engagement in Americans Ages 18-24
Young Americans do not participate in elections as much as older Americans. Scholars argue that this is due to low political interest, low information, or difficulty in registering to vote. Civics education while in high school, as well as increased access to elections constitute possible solutions to lagging youth participation. This project investigates the impact of civics education, voter registration, and voter access rules on 18-24-year olds' propensity to register to vote and vote. Using public opinion data from the Center for Information and Research on Civic Learning and Engagement's 2012 survey, we test the relationship among young voters of the same age, rather than the same age group, and voting behavior in the 2012 presidential election. Preliminary findings strongly indicate the positive impact of civics in increasing young voters' likelihood to participate in elections.

017
Name: Kelson Bohna
Major: Industrial Engineering
Faculty Advisor, Affiliation: Wenmeng Tian, Industrial Engineering
Project Category: Biological Sciences and Engineering
Co-Author(s): Weitong Chen, Lauren Priddy
Other Competition(s): Community Engagement Research Track

Investigation of Alkali Treatment Effects on 3D Printed Scaffolds Geometric Accuracy based on Automatic Image Segmentation
Bone grafting is a process that is both expensive and limited by raw material availability. There is an urgent need for customized bone scaffold production using an alternative process. 3D printed polylactic acid (PLA) scaffolds are a promising alternative due to the high geometric flexibility, biocompatibility, and mechanical properties. Previous studies have shown that nano-hydroxyapatite (n-HA) coating would enhance the hydrophilicity of PLA scaffolds and encourage cell attachment on the scaffolds. A surface modification process is used on the PLA by soaking the scaffolds in an alkali treatment to enhance the n-HA coating. However, the alkali treatment will greatly affect the porosity structure of the scaffolds, and the effects on the scaffold geometry are not well understood. The goal of the current research is to automatically quantify the effects of alkali treatment to PLA scaffold geometry based on image processing techniques. By leveraging image segmentation methods, an automatic dimensional measurement algorithm based on SEM images is developed. The results of this study can serve as a significant step for design and optimization for 3D printed scaffold geometric accuracy control.

153
Name: Miranda Book
Major: Educational Psychology
Faculty Advisor, Affiliation: Nicole Leach, PhD, Department of Counseling, Educational Psychology, and Foundations
Project Category: Social Sciences
Co-Author(s): Tristin Courtney

Correlation Between Procrastination and Academic Achievement Across Classification
There is very little research regarding if procrastination effects academic achievement across classification of college students. The purpose of this research study is to determine if classification moderates the effects of procrastination on academic achievement. It is hypothesized that there is a significant negative relationship on the effects of procrastination for underclassman compared to upperclassman in regards to their academic achievement. The participants for this research study are 25 students from each classification. The research will consist of students ages 18-22 from all ethnic backgrounds and majors attending classes in Old Main Academic Center. The consenting participants will complete a 39-question survey scale. The results of the surveys show that freshman procrastinated the most overall. There was a slight decrease in procrastination of sophomores. However, procrastination scores seem to rise again with juniors and decrease with seniors. Academic achievement seemed to follow the same trend as procrastination. It can be concluded that there was an up-and-down trend of procrastination scores and academic achievement across classification instead of a constant decrease that was hypothesized.

154
Name: Rachel Booth
Major: Psychology
Faculty Advisor, Affiliation: Andrew F. Jarosz, Psychology
Project Category: Social Sciences
Co-Author(s): Sarah K.C. Dygert
Other Competition(s): Thesis Research Competition (TRC)

Creative Problem Solving under Pressure
Working memory capacity (WMC) aids analytic problem solving by allowing individuals to simultaneously process and store information (see Wiley & Jarosz, 2012, for review). However, evidence suggests that WMC is not advantageous for creative problems. Wiley and Jarosz posit that high WMC hinders individuals from overcoming fixation and reaching a novel solution during creative problem-solving tasks (Ricks, Turley-Ames, and Wiley, 2007). Thus, counterintuitively, situations that compromise WMC may benefit performance on these particular problems. One such situation is "choking under pressure," a phenomenon in which an individual feels the need to perform well on a task, reducing WMC resources and causing them to underperform relative to their actual abilities on the task (Decaro, Thomas, Albert, & Beilock, 2011). Therefore, if pressure lowers WMC it should harm analytic problem solving (which relies on WMC) but benefit creative problem solving. The authors will test 160 native English speakers on an array of problem solving and WMC tasks. First, participants will complete a baseline complex WMC task, the symmetry span, then the pressure manipulation will be administered. They will then complete the symmetry span again to measure the impact of pressure on WMC. Finally, participants will complete two creative tasks, the Remote Associate Test (RAT), a measure of creative problem solving, and an unusual uses task, a measure of divergent thinking, followed by a modular arithmetic task as a measure of analytic problem solving. It is predicted that, compared to the control condition, pressured participants' modular arithmetic performance will decrease while RAT performance will increase. Divergent thinking performance, which is not a problem-solving task, should remain constant. These results would lend credence to the theory that a lack of WMC benefits creative problem solving, contribute to a mechanistic understanding of creative problem solving, and further differentiate creative problem solving from analytic problem solving.

018
Name: Hannah Bostick
Major: Biochemistry (Pre-Vet)
Faculty Advisor, Affiliation: Dr. Florencia Meyer, Biochemistry, Molecular Biology, Entomology and Plant Pathology
Project Category: Biological Sciences and Engineering
Co-Author(s): Victoria Jefferson
REU/Research Program: URSP-Undergraduate Research Scholars Program

Genomic Analysis of Bovine Herpesvirus 1 ORF-M Expression
Bovine Herpes Virus 1 (BoHV-1) is a major cause of Bovine Respiratory Disease (BRD). BRD can be fatal and continues to be one of the biggest economic plagues of the cattle industry. When originally sequenced in 1996, the genome was found to be 140kb with 67 open reading frames (ORFs) on both forward and reverse strands. Previous work in our lab discovered 92 peptides that were mapped to un-annotated parts of the viral genome. 12 of them produced an mRNA transcript, indicating the potential for protein coding. Using RT-PCR, we analyzed the expression pattern of ORF-M RNA using primers designed close to the beginning of the suspected 5' terminus. The 5' terminus was determined in our lab in the past. The 3' end of ORF-M has remained elusive. A time course analysis of viral ORF-M expression revealed that it is likely a late gene only being expressed 12-24hpi.
In the future, viral mutants in this gene will be developed. To this extent, we will use the plaque assay technique. Optimization of the procedure was performed on a new viral stock. The optimization included cell confluency, reagents' temperature and other manipulations. The end result was a perfected plaque assay technique.

155
Name: Meredith Bradford
Major: Educational Psychology
Faculty Advisor, Affiliation: Dr. Nicole Leach, Department of Counseling, Educational Psychology, and Foundations
Project Category: Social Sciences
Co-Author(s): Sarah Grace Senn, Savannah Shirley
REU/Research Program: Educational Psychology Undergraduate Scholars Program

Parenting Styles and their Effects on Adolescent Adjustment
The different styles of parenting, along with the way parents discipline, are thought to be an indication of the general attitudes of parents towards their children and towards parenting in general (Fletcher, Steinburg, & Sellers, 1981). These differences in common parenting practices are called parenting styles. This research aims to evaluate the correlation between different parenting styles on adolescent development in social adjustment (drinking, partying, GPA) into college age and young adulthood. Approximately 75-100 Mississippi State Educational Psychology Undergraduate students were surveyed using "stratified systematic sampling" method. Participants completed the following measures: Parental Authority Questionnaire, Rosenberg Self-Esteem Inventory, and The Manifest Anxiety Scale. The subjects were expected to indirectly benefit from this study by possibly learning more about why they may have adjusted to college or young adulthood the way that they did, based on how they were parented. Parents continue to have a persuasive sway on their children, as they move beyond adolescence and into emerging adulthood and encounter the developmental transition to college. Multiple studies on this topic are self-reported. Cross sectional studies are also used and there is no possibility to test the causal hypothesis. Our research aims to target the causal hypothesis of our results. The significance of our findings led to the conclusion that although gender was the only variable to predict the GPA of our participants, there were significant findings in other areas including levels of self-esteem and anxiety.

001
Name: Destiny Braswell
Major: Art/Fine Arts
Faculty Advisor, Affiliation: Dominic Lippillo, Photography
Project Category: Arts and Humanities (Oral Presentation)

True Colors
Vanity has become inescapable part of an average American's life. Photography is also an aspect of life that is inevitable to see every single day. Everywhere we look we see photos: Magazines, social media, the fashion runway; all of these elements have an influence on how we view ourselves as well as how we view others.
Because there are standards of beauty that are set in place and are pretty rigid, this effect, more times than not, has a negative effect on self-esteem. With my work, I plan to explore emotions by way of video and I plan to convey them through the use of changing auras and colors as well as sound effects, lyrical voiceovers and song. According to my research, aura is the electromagnetic field that a person of object gives off at any given time. This can be a living thing or inanimate object.
What would happen if I blatantly and defiantly defied these rules in public? Would I be rejected? Treated differently? Would I still be scorned, despite having the same personality, the same skin and yet the only difference is my outer appearance? For my project, I will be going out into the public dressed as different characters at different times and note the effect that it has on myself as well as others.

019
Name: Austin Breland
Major: Chemical Engineering
Faculty Advisor, Affiliation: Dr. Mark Bricka, Dave C. Swalm School of Chemical Engineering
Project Category: Biological Sciences and Engineering
Other Competition(s): Thesis Research Competition (TRC)

Investigation into Bullet Corrosion and Resulting Lead Migration
Within the United States, small arms ranges operate for military, law enforcement and civilian training as well as recreational purposes. Range operations primarily involves the use of lead bullets and their use results in lead accumulation in the soil surface and subsoil following their discharge. This study focuses on the lead mobility and lead-soil interactions in range soils. Numerous conditions, such as rainfall, soil humidity, soil organic content, and oxygen content, are postulated to impact lead corrosion and subsequent migration. Bullets were subjected to exposure of these factors to understand their effects on lead mobility in the soil. A total of 210 copper-lead bullets were analyzed over the period of a year. Outliers were identified through application of the Generalized Linear Model (GLM) for data analysis. The resulting graphical representations for the data of each condition tested were used in pinpointing outlying data points. Following removal of outliers identified by GLM, averages of replicate samples for the conditions and soils were then evaluated through use of the Analysis of Variance (ANOVA) model for statistical analysis. This led to the development of relationships between the effects of the conditions and soils on bullet weight loss over time. The results of the analysis show that the difference in corrosion rate of the bullets due to the soil type is not as significant as the condition to which the bullet was subjected. It was determined that the variance of most organic and oxygen conditions did not produce trends that indicate differences in corrosion rates between the conditions; however, clear and noticeable corrosion rate trends appeared across most of the various moisture conditions.

156
Name: Maggie Bridges
Major: Sociology
Faculty Advisor, Affiliation: Lindsey Peterson, Sociology
Project Category: Social Sciences
Other Competition(s): Public Health Research Competition

Literature Review on the Racial Disparity in Maternal Mortality Rates
America continues to have one of the highest maternal mortality rates out of all the developed nations. African American women in particular are 243% more likely to die due to pregnancy-related causes than white women. This racial disparity in maternal mortality rates has been proven to hold true even when controlling for factors such as physical health, access to prenatal care, income, education level, and socioeconomic status. Knowing of this clear link between race and maternal mortality rates, I conduct a literature review to further analyze the specifics of how exactly race shapes pregnancy-related health outcomes as well as what can be done to reverse these trends. Both quantitative and qualitative data were examined. As for social causes of this racial disparity, there tends to be a general consensus that African American women experience a negative physical effect from having to undergo years of both individual and structural level racism - a process often referred to as "weathering" (NCBI 2017). Additionally, healthcare staff often lack an understanding of how race affects both their patients and themselves, leading to them holding implicit racial biases which affect their patient care as well as patient outcomes. One of the most mentioned solutions to this racial disparity was to further educate medical staff on race itself so that they could at least be aware of the effect that it has in the clinical setting. However, since this is only an individual level solution, more research is needed on potential institutional level solutions.

157
Name: Madeleine Bunyard
Major: Educational Psychology
Faculty Advisor, Affiliation: Katarzyna Gallo, Counseling, Ed Psych, & Foundations
Project Category: Social Sciences

The Effects of Involvement in Extracurricular Activities on Academic Achievement
Much research is currently being done on how students best succeed in a school setting. This literature review focuses on how involvement in extracurricular activities positively impacts academic achievement. Fifteen articles were reviewed and compiled for this review. In the studies, the participants' ages ranged from early middle school to seniors in college. Many factors measured in the studies included level and breadth of involvement, thinking styles, level of satisfaction, academic achievement and socioeconomic status. Academic achievement was measured by GPA, ACT scores, and standardized test scores across all age groups based on the appropriate level. All other factors were measured in a variety of ways including self-reported questionnaires, teacher evaluations, and parent reports. Results across all studies concluded that involvement in extracurricular activities positively correlated with higher levels of academic achievement. Researchers believed that this positive correlation is due to the levels of self-worth that are increased while being involved in other activities besides academics. Higher levels of teacher encouragement also showed higher levels of engagement from students in extracurricular activities as well as in the classroom. The studies that analyzed socioeconomic status revealed students who had a lower socioeconomic status showed lower levels of involvement and academic achievement overall. These findings suggest that students showing lower levels of socioeconomic status may not be receiving the same opportunities of involvement of academic achievement because of their status. Results from these studies indicate there should be more awareness in terms of opportunities for students and how teachers can be more involved in the process.
Keywords: involvement, extracurricular activities, academics, socioeconomic status

020
Name: Murry Burgess
Major: Wildlife & Fisheries Science/Aquaculture & Fisheries Science
Faculty Advisor, Affiliation: Carolina Baruzzi, Wildlife, Fisheries, and Aquaculture
Project Category: Biological Sciences and Engineering
Co-Author(s): C. Schmidt, C. Baruzzi, A. Dykstra, M. Boggess, M. Lashley

Coyote activity overlap with prey and nonprey species
Camera traps are commonly used in wildlife studies to gain information about predator-prey interactions. This study aims to determine if coyote (*Canis latrans*) activity patterns overlap more with prey than nonprey species. Coyote dietary studies conducted in the Southeast report white-tailed deer (*Odocoileus virginianus*), rabbit (*Sylvilagus spp.*), and other small mammals such as mice as commonly consumed; therefore, we categorized those species as prey. Armadillo (*Dasypus novemcinctus*), raccoon (*Procyon lotor*), and wild turkey (*Meleagris gallopavo*) are not commonly reported in coyote diet studies; therefore, we considered those species nonprey for this analysis. Trail cameras were deployed in an upland hardwood forest in Marshall County, Mississippi, from July to November 2017, and an activity overlap analysis was performed on coyotes with the prey and non-prey species detected. Coyote activity patterns tended to overlap more with prey (average Δ=0.64) than nonprey (average Δ=0.53; se=0.02). Our data suggests that coyotes may adjust activity to overlap with their prey. Therefore, the degree of overlap may be useful information to infer average coyote diet composition. However, caution should be taken with inferences, because coyotes are generalist predators and may change diet composition rapidly to exploit newly available prey.

021
Name: Marshall Callicott
Major: Forestry/Environmental Conservation
Faculty Advisor, Affiliation: Dr. Courtney Siegert, Department of Forestry
Project Category: Biological Sciences and Engineering
Co-Author(s): Dr. Heidi Renninger, Dr. Juliet Tang, Dr. John Riggins

Combined Effects of Bark Beetle and Termite Damage On The Decomposition of Wood And Cycling of Nitrogen
Forest ecosystems in Honduras have evolved over many years to rebound from insect related mortality, however with the recent country wide outbreaks of southern pine beetle the resilience of these forests is under closer observation. Insect related tree mortality continues to challenge observing scientists who desire to understand overall stand health and future productivity of a forest ecosystem. Although mechanisms of insect-induced tree mortality are adequately understood, limited research exists on the impacts of the physical and chemical decomposition of woody debris on ecosystem processes. The combined interactions of fungi, invertebrates, biogeochemical cycles, and climate on the processes of decomposition are complex and multifaceted. To adequately address this our study applied multiple treatments of healthy alive wood and bark beetle killed wood with three different barrier treatments to control the influence of external fungi and invertebrates with no barrier, aboveground barrier, and full barrier treatments. This study aimed to analyze the carbon nitrogen results of the altered wood and underlying soil samples using a combustion analyzer in addition to analyzing decomposition and mass loss metrics over a 1 year time period. The overall wood respiration was 10% greater from green alive trees as compared to the bark beetle killed trees. Changes in density for tissue types between the bark beetle killed trees and the green alive trees revealed a 20.48% increase in mean density for bark samples, a 17.91% increase in mean density for sapwood samples, and a -1.85% decrease in mean density for heartwood samples (74.24 vs. 67.31 gC m^{-2} d^{-1}). The carbon nitrogen analysis of the soil samples revealed an inverse effect of the barrier treatments, full barrier, half barrier, and no barrier on the carbon to nitrogen ratios decreasing from full barrier to no barrier. Data for the carbon nitrogen ratios of wood samples is being collected.

158
Name: Taylor Campbell
Major: Human Sciences/Apparel Textiles & Merchandising
Faculty Advisor, Affiliation: Charles Freeman, School of Human Sciences; Joe Wilmoth, School of Human Sciences
Project Category: Social Sciences
Co-Author(s): Burtanica Roby, Madison Sessions, Maurice Smitherman, Kalli Waldrop, Demia Wilkins

Relationships between toys, play structure, and college student loneliness
Play is important for building social competence and confidence in dealing with peers. Research indicates this life skill is essential for functioning in school years and beyond (Howes, 1992; Howes and Matheson, 1992; Raver, 2002; Singer and Singer,2005). Among adolescents and adults, lower self-efficacy or social competence has emerged as a risk factor for depressive symptoms, social phobias, low self-esteem, and loneliness (Williams & Galliher, 2006). Play contributes directly to children's educational and development, but it is toys that stimulate and prolong play. If children are to discover what they are good at, what they like, and what they are like, then they will need variety in their play, and a broad assortment of toys to make it possible (Goldstein, 2012). The purpose of this research is to investigate the relationship between childhood toys and play structure and college student loneliness. We will measure the following variables of unstructured and structure toys/play and college student's high or low level of loneliness. These variables will be evaluated by a "t" test to determine the difference in loneliness depending on the type of toys most often used (structured and unstructured). Ten each of structured and unstructured toys popular during the childhood of the students will be listed, and the UCLA Loneliness Scale will measure the level of loneliness. The survey will be distributed to college students 18-24 years of age to distinguish the kind of toys they played with as a child and its relationship to the level of loneliness as a college student. We anticipate that students that used toys in unstructured play will have lower scores on the loneliness scale.

022
Name: Mary Carr
Major: Biological Sciences
Home Institution: Mississippi University for Women
Faculty Advisor, Affiliation: Justin Thornton, Biological Sciences
Project Category: Biological Sciences and Engineering
Co-Author(s): Rachel Fowler, Katelyn Jackson, Yoonsung Hu, Keun Seok Seo, Justin Thornton

Expressing Pneumococcal Proteins for Possible Inclusion in a Vaccine Targeting Colonization
Streptococcus pneumoniae (pneumococcus) is the leading cause of community-acquired pneumonia and also the most common cause of otitis media in young children. Illnesses due to *S. pneumoniae* are not only responsible for a large economic burden, but also account for more than 800,000 deaths of young children per year, primarily in developing countries. Current conjugate vaccines that protect against pneumococcal disease are composed of capsular polysaccharides. While these vaccines have been successful preventing invasive disease caused by vaccine capsule types, serotype replacement is becoming more common, rendering these vaccines less effective. Because of this, researchers are currently developing protein-based pneumococcal vaccines. *We hypothesize that vaccination with pneumococcal adhesions which are poorly immunogenic during natural infections will provide supplemental immunity for preventing pneumococcal adherence and colonization, the prerequisite for all pneumococcal disease.* This hypothesis is based on the fact that humans are repetitively colonized over the course of their lives with pneumococcus despite mounting strong antibody and memory responses to certain protein antigens. Therefore our novel plan is to target surface proteins that do not illicit strong immune responses and yet are possibly involved in colonization. Using previously published Tn-seq data, we selected a panel of genes known to be important for colonization and are currently attempting to express these genes in either a *Staphylococcus aureus* or *Escherichia coli* expression system. The products of these genes are analyzed using SDS page. Once successfully expressed, they will be used to probe membrane fractions from epithelial cells via far-western technique to identify specific interactions with host cell receptors. They will also be probed with pooled human serum to determine those that fail to elicit strong antibody responses. Proteins with low immunogenicity and specific interactions with host receptors will be candidates for an anti-colonization vaccine that will be a giant step forward for prevention of invasive disease.

159
Name: Mel Carrino
Major: Human Sciences/Human Dev & Family Studies
Faculty Advisor, Affiliation: Charles Freeman, School of Human Sciences; Joe Wilmoth, School of Human Sciences
Project Category: Social Sciences
Co-Author(s): Kendall Kerley, Rachel Spigner, Antonia Robinson, Katlyn Robinson, Rontier Whitfield

How sleep affects G.P.A.
The purpose of this research study is to investigate the relationships between a college students' GPA and sleep habits. Prior research indicates that sleep quality and quantity are closely related to student learning capacity and academic performance. Based on these results, we hypothesize that a student's quality of sleep as well as their length of sleep leads to a higher GPA. We measured the quantity and quality of sleep per night by using the Pittsburgh Sleep Quality Index. We anticipate results to support the prior research mentioned above. We can utilize our research to have a positive academic impact on current and future college students so they can improve their GPAs.

002
Name: Kayla Cauthen
Major: Art/Fine Arts
Faculty Advisor, Affiliation: Dominic Lippillo, Photography
Project Category: Arts and Humanities (Oral Presentation)

A Broken Dream
This research proposal pertains to the antebellum house, Longwood. The house was designed to be a four floor futuristic dwelling. Due to Civil War, many of the workers returned to their homes. The lack of labor caused the construction of Longwood to be halted. The halt in construction left the home in an incomplete state. Due to lack of funds and labor, the large building was never completed.
The purpose of this research is to capture pictures of the uncompleted building as it is today and compare the images to the idea it could have been. This comparison will allow for a deeper understanding of past to present time of Longwood as well as the ability to educate people on the importance of historic homes.
The process of capturing the dwelling involves multiple sessions of descriptive photos that depict the building as it stands today. The photos have been gathered over a period that began on January 5th and is still ongoing. The pictures depict the incompletion of each floor as the building transitions from the basement, which is complete, to the top floor with bear framework.
Throughout the research letters between Haller Nutt, the owner of Longwood, and Samuel Sloan, the architect, were presented. These letters contain plans for the finished house, lists of items per room, and detailed floor plans. Scans of the letters will be layered over several of the images to contrast what the building could have looked like and what it looks like now.
To summarize, this research will use the taken photos to compare against the past letters, floor plans, and images of Longwood. Longwood is a historically rich structure that with more research has the ability to teach about antebellum architecture and design.

160
Name: Sarah Caylor
Major: Sociology
Faculty Advisor, Affiliation: Keyna Cistrunk, MFIP
Project Category: Social Sciences

I have at least one friend in the neighborhood that I can depend on; Investigating the effects of community engagement on food insecurity in a rural Mississippi community.
The 1,300 residents of Vardaman, Mississippi have access to one small local supermarket, 2 restaurants, and 3 gas stations for all their food needs. If the only grocery store is picked over or does not carry items residents want, they must drive

between 30-60 minutes to the next full-service supermarket. In this research, I analyze whether an individual's sense of community is correlated with their level of food insecurity. In this study, I construct my own measure for food insecurity that focuses on number of purchases a month, miles to the store, time it takes to get to the store, whether residents can buy what they want, barriers to getting the food people want, and dependence on social services. In a recent paper titled, "Changing Times in Rural America," Sarah Whitely presents a qualitative framework for how community involvement can affect food insecurity. My research objectives are to utilize Whitley's framework for analyzing community involvement to help me construct a sense of community from my qualitative survey instrument. Participants of my study are 49 residents of rural Vardaman, MS who agreed to be surveyed about food access, food patterns, sense of community, and participant background information such as age, gender, race and income. The results from this survey add to the current body of knowledge concerning food insecurity in Mississippi. I hypothesize that residents with a more indicators of sense of community are less likely to be food insecure; I also suspect that residents who carpool to the grocery stores are more integrated that those who mainly take their own car.

161
Name: Millie Chism
Major: Agricultural Information Science
Faculty Advisor, Affiliation: Carley Morrison, School of Human Sciences
Project Category: Social Sciences
Co-Author(s): Rachel Hendrix

Alumni Perceptions of Workforce Readiness
The purpose of this study was to examine alumni workforce readiness from graduates of Mississippi State University School of Human Sciences. Workforce skills are important for success in today's workplace. We sought to see how prepared alumni felt when entering the workforce after graduation, currently, and what they think is expected of them in the workplace. All of our participants are currently employed in the agricultural industry. The findings indicate that alumni felt most confident in their ability to act responsible at the time of graduation, they currently have high confidence in managing several tasks at once, and feel that presenting information verbally to others is expected of them the most by employers. Alumni stated that they felt least confident in their abilities to understand how work flows through the system at the time of graduation, writing formal reports now, and feel that interpreting charts and graphs is least expected of them by employers. Finally, rankings of skill importance revealed that participants believed that demonstrating motivation and perseverance is the most important skill that is desired.

102
Name: Thomas Circenis
Major: Aerospace Engineering
Faculty Advisor, Affiliation: Dr. Adrian Sescu, Aerospace Engineering; Dr. Scott Rush, FWRC-Wildlife, Fisheries & Aquaculture
Project Category: Physical Sciences and Engineering
Other Competition(s): Community Engagement Research Track

Analysis of the Aerodynamics of Southern Flying Squirrels
Gliding is one of the most varying fundamental methods of flight, with uses including conservation of energy in flight, fleeing from predators, scavenging for food, and transportation. Using measurements from dead specimens in a good aerodynamic condition, a southern flying squirrel is modeled. Live observation of these squirrels provides insight into their flight and supplements the measurements of the dead specimens. The squirrel's aerodynamic properties are tested at various angles of attack in a wind tunnel. From this measurement and testing, the squirrel's aerodynamic capabilities and glide performance are analyzed and compared to results for other gliding animals.

103
Name: Sarah Claxton
Major: Chemistry
Faculty Advisor, Affiliation: Dr. Nicholas Fitzkee, Chemistry
Project Category: Physical Sciences and Engineering

Quantification of AuNP-protein interaction using NMR

The application of gold nanoparticles (AuNP) is an increasingly prominent research field that covers a wide range of techniques, including biosensing, drug and gene therapy, and bioimaging. When exposed to biological fluids, AuNPs will interact with proteins in solution, and these proteins will compete to bind to the AuNP surface. While it is currently impossible to predict the outcome of competitive binding, emerging information regarding this idea could potentially aid scientists and researchers to develop targeted nanoparticle methods. NMR has been the primary means of studying this biological interaction; specifically, 2D ^{1}H-^{15}N HSQC and CPMG NMR methods were used to visualize the protein interaction kinetics with nanoparticles. A ^{1}H-^{15}N HSQC technique was used to quantify AuNP binding versus time for a mixture of GB3 and Ubiquitin, two small model proteins. GB3 and Ubiquitin signals were sampled at 15-minute time points and an external standard was used to quantify absolute binding to the AuNPs. Our results suggest a mechanism by which nanoparticle surface character may change over time, and this may be an important consideration in the design of nanoparticle-based therapeutics.

023
Name: Harper Cobb
Major: Animal and Dairy Sciences (Pre-Vet)
Faculty Advisor, Affiliation: Thu Dinh, Animal and Dairy Sciences
Project Category: Biological Sciences and Engineering
Co-Author(s): Dishnu Sajeev, Hudson T. Thames, Seongbin Park, Shecoya B. White, Jean M. N. Feugang, Thu T. N. Dinh
Other Competition(s): Community Engagement Research Track, Public Health Research Competition

Reduction of *Salmonella* in Pork Trimmings

The objective of the current study was to determine the efficacy of dipping pork trimmings in acetic acid on *Salmonella* reduction.

Pork loins were purchased from a commercial purveyor and trimmed of external fat and connective tissues, leaving only the *longissimus* muscle, which was further cut into 2.5 cm (W) × 2.5 cm (L) × 1.3 cm (H) cubes. Pork cubes were randomly assigned to a negative control (no inoculation, no dipping; NEG), a positive control (inoculation, no dipping; POS), acetic acid dipping at 21 °C (ACC) and acetic acid dipping at 50 °C (ACH) with a 15-, 45-, or 75-s dipping duration. Two inoculation levels, 10^8 lux-modified or 10^5 nalidixic acid-resistant *Salmonella Typhimurium* cells, were used *for in vivo* bioluminescence imaging or plating on XLD agar (black colony with a metallic sheen), respectively. The common logarithm of light intensity (lux) and colony-forming unit (CFU) were analyzed by SAS v9.4 (SAS Institute Inc., Cary, NC) at a statistical significance level of 0.05.

At 10^8 inoculation level and 15-s dipping, ACC and ACH reduced *Salmonella* by 1.8 and 1.6 log, respectively ($P < 0.001$) without treatment difference ($P = 0.207$). At 10^5 inoculation level with three dipping durations, the ACH treatment reduced *Salmonella* by 0.9 log more than the ACH treatment ($P < 0.001$). The 75-s dipping duration was most effective, providing a reduction of 0.7-log more than the 15-s duration ($P = 0.001$). No 2-way treatment × time interaction was observed ($P = 0.104$).

It is recommended to dip pork trimmings into 3% acetic acid solution at 50 °C for at least 75 s to ensure the safety of further processed pork products. However, further research is needed to ascertain changes in meat quality.

Keywords: *salmonella reduction, pork trimmings, pathogen contamination*

162
Name: Caitlynn Cochran
Major: Educational Psychology
Faculty Advisor, Affiliation: Nicole Leach, Educational Psychology
Project Category: Social Sciences
Co-Author(s): Madeline Castle

Effect of Family Dynamics on Graduation Rates and the Amount of Times a Student's Major is Changed
Studies show that there is a correlation between family dynamic and length of time it takes college students to graduate. It is also evident that there is a correlation between length of time it takes a college student to graduate and the amount of times they change their major. However, there is very limited research on the correlation between family dynamic and the amount of times a college student will change their major. This study examines that very thought. It is hypothesized that a student's family dynamic will effect the amount of times they change their major, consequentially effecting the length of time it takes them to graduate. The population surveyed are individuals who have completed their undergraduate degree at a large, southern, public university. Genders, ages, ethnicities/races, and incomes of those surveyed vary. Participants were distributed an online survey via email through the institution. The survey was distributed randomly. Basic demographics were gathered through questions including, gender, age, race, ethnicity, and household income, then later asked questions regarding family dynamic, date of enrollment and date of graduation, and information regarding the amount of times a student changed their major. Preliminary results suggest, that family dynamics will have an impact on both the amount of times a student changes their major and the length of time it takes that student to graduate. Based on the preliminary results, it is seen that student's with a nontraditional family dynamic could benefit from exposure to all major opportunities prior to their enrollment.

104
Name: Ryan Cochran
Major: Mechanical Engineering
Faculty Advisor, Affiliation: Dr. Shane Brauer, Bagley College of Engineering, Mechanical Engineering Department
Project Category: Physical Sciences and Engineering

A Method for Improving the Structural Integrity of Additively Manufactured Parts
Additive Manufacturing (AM) is a unique method of manufacturing that builds parts one layer at a time using materials such as polymers and metals. A benefit to AM is how quickly an idea can be produced; conversely, a common detriment is the reduced strength of the produced part. The layer deposition process inherently introduces defects in the form of stress concentrations, voids, and layers that are not fully fused. Anisotropy in the strength of the part is another inherent trait that follows the direction in which the part was printed. Methods to reduce the detriments of AM are still in their infancy, especially for polymeric parts. This work aimed to develop a method that improved the mechanical properties by exploring the effects of annealing Polylactic Acid (PLA) parts that were additively manufactured using a PRUSA FDM 3-D Printer. Tension samples were annealed for 6 hours at various temperatures above the glass-transition of PLA and tested at rates of 0.001 s^{-1} and 0.1 s^{-1}. Ultimate Tensile Strength (UTS), Yield Strength, and Elongation to Failure for unannealed tensile samples were measured for 3 infill cases of 30%, 70%, and 100%. Optimal results for annealed samples revealed a slight decrease (7.071%) in UTS, a slight (4.805%) decrease in Yield Strength, and a significant average increase (72.42%) in Elongation at Failure.

105
Name: Cade Cockrell
Major: Aerospace Engineering
Faculty Advisor, Affiliation: Dr. Donghoon Kim, Department of Aerospace Engineering
Project Category: Physical Sciences and Engineering

Energy Efficiency for Indoor Environments
Efficient energy has quickly become one of the world's largest concerns with worries of limited fossil fuel resources, pollution, and costly utility bills. With air conditioners being one of the largest energy consumption units installed in residential and commercial buildings, having control over them will significantly benefit businesses or the average home owner. Coupled with a CO_2 sensor, communication between an autonomous vehicle and the main air conditioner unit allows for smarter operation of air conditioning systems and will result in a more comfortable, energy efficient environment. Currently, to heat/cool a home or business large amounts of cool or hot air is dumped into rooms to achieve the desired temperature when there is a more precise way to allocate air being delivered from the unit. Communication between sensors and the unit could provide data such as how many occupants are in a given room, CO_2 emissions from each room, and constant monitoring of humidity levels and temperature ranges. Given this data, a unit could be controlled by an attached receiver that would take the data as input and use it to adjust air flow and temperature levels. With capabilities to create models intended to simulate rooms filled with people, useful data can be utilized to develop a base model. On a small scale, this procedure will be precisely developed and implemented on a larger scale such as a university building or large business building. This project has the potential to save businesses and common home owners large amounts of money that would otherwise be used on wasted energy.

024
Name: Jordan Coggins
Major: Biochemistry
Faculty Advisor, Affiliation: Dr. Justin Thornton, PhD, Department of Biological Sciences
Project Category: Biological Sciences and Engineering
Co-Author(s): Natalene Vonkchalee, Allison Matthews, Andrew Camilli, Keun Seok Seo, Jason Rosch

TnSeq Identification of Potential Azithromycin Uptake Mechanism by *Streptococcus Pneumoniae*
Background: *Streptococcus pneumoniae* (pneumococcus) is a Gram-positive bacterium that asymptomatically colonizes the human nasopharynx and is also capable of causing invasive disease including pneumonia and meningitis. Antibiotic resistance in pneumococcus is increasing and, therefore, finding novel ways to treat infections is essential. Due to the inability of many antibiotics to freely diffuse through the bacterial cell wall, we hypothesized that certain antibiotics may be imported by specific transporters normally used to transport other small molecules.
Methods: To test this hypothesis, a *magallan6* transposon mutant library of strain D39 was utilized to screen for mutants capable of growing on various antibiotics. Several pneumococcal mutants were isolated that were capable of growing at concentrations of azithromycin well above the minimum inhibitory concentration (MIC) for this species (~0.5µg/ml).
Results: Azithromycin resistant mutants with the transposon insertion grew at concentrations >20µg/ml as determined by 24-hour growth curves. Chromosomal DNA flanking the transposon insertion sites was sequenced and revealed SPD_0250 (pullulanase-SpuA) as the disrupted gene in multiple azithromycin-resistant clones. SpuA works in unison with solute binding protein MalX (SPD_1934). Both are critical in the exogenous depolymerization of glycogen and transport of its breakdown products: maltotriose, maltodextrins, and glucose, respectively. MalT (SPD_0661) is a secondary PTS transporter that is more specific of the transport of maltose and maltotriose, unlike MalX.
Conclusion: This sugar transport mechanism could be involved in azithromycin transport into pneumococcus. Marker-less deletion mutants are currently being created for SpuA, MalX, and MalT to investigate their azithromycin sensitivity. This research will be extended to identify transporters for additional classes of antibiotics. Identifying compounds that can induce expression of such antibiotic transport/modification systems will allow us to dramatically increase the concentration of the antibiotics within bacteria, thus overriding resistance mechanisms and resurrecting antibiotics rendered ineffective against many drug-resistant pathogens.

025
Name: Kayla Cole
Major: Chemical Engineering
Faculty Advisor, Affiliation: Mark Bricka, Chemical Engineering
Project Category: Biological Sciences and Engineering
Other Competition(s): Community Engagement Research Track

Design and Operation of an Electrokinetic System for the Investigation of the removal of Sodium Chloride from Contaminated Soil

The focus of this research is to investigate the electrokinetic remediation (EK) of soil contaminated with sodium chloride (NaCl). In this study 3 soils will be spiked with NaCl and will be evaluated. To conduct this research and EK laboratory system had to be design, fabricated, and operated. This presentation will focus on the design and operation of this EK system. The system will be operated at a constant pH, current, and hydraulic head. The EK system is composed of three major parts: the anode half shell, the cathode half shell, and the center compartment. A total of 8 system were constructed and will be operated to investigate the NaCl rate of transport. In this presentation, the theory of EK remediation will be discussed as well as the details of the system that will be used to investigate the NaCl transport.

163
Name: Allie Cowles
Major: Human Sciences/Food Nutrition & Dietetics
Faculty Advisor, Affiliation: Terezie Tolar Mosby, EdD, MS, RDN, LD, FAND, Food Science, Nutrition and Health Promotion
Project Category: Social Sciences
Co-Author(s): Nicole Reeder, Samantha Sockwell, Ahmed Saddam, Terezie Mosby
REU/Research Program: Undergraduate Research Scholar
Other Competitio(n): Public Health Research Competition

Assessing adequacy of folate intake in young adults at Mississippi State University

Folate consumption plays an integral role in the formation of an infant's neural tube, and adequate folate consumption by women of childbearing age has been reported to decrease birth defects. Folic acid is found in fortified foods such as cereals and whole grain bread, and folate is naturally found in foods such as beans, lentils, avocados and broccoli. The purpose of this study was to assess whether young adults in Mississippi are meeting the Recommended Dietary Allowance of 400 mcg per day. Women of childbearing age who are planning to become pregnant should be advised to consume 800 mcg per day.

College students enrolled at Mississippi State University (n=130 males, n=533 females, mean age 20.46±2.92 years) completed the National Institutes of Health Diet History Questionnaire II. Their body fat percentage was measured using a Bioelectric Impedance Analysis scale (TBF-300A Tanita).

There were significant differences in folate consumption between men and women (males= 462.20±325.29 mcg/day, females= 356.18±281.55 mcg/day), demonstrating that males are meeting the RDA, but females are not. In addition, Caucasian individuals had a significantly lower intake of folate compared to African American and Asian individuals (Caucasian=358.53±220.47, African American=407.22±432.21, Asian=557.73±292.08).

The findings of this study demonstrate the need to continue to stress the importance of folate intake for women of childbearing age, particularly young Caucasian women in Mississippi.

164
Name: Claire Crosland
Major: Human Sciences/Human Dev & Family Studies
Faculty Advisor, Affiliation: Charles Freeman, School of Human Sciences; Joe Wilmoth, School of Human Sciences
Project Category: Social Sciences
Co-Author(s): Rip Kirk, Brooklyn Meadows, Mary Adele Rackley, Brittney Trosclair

Study Methods Among College Students
Our research project aims to identify what study method is most used and most effective among college students. We compared the use of electronic application study methods and written study methods. The variables that we considered were the sex, classification, preferred study method, GPA, satisfaction, and preparedness of college students when studying. There was ample research available about freshmen college preparedness, however we were limited with upperclassmen research. We anticipate that students who use either a combination of written and electronic or only written study methods will feel more prepared and result in a higher GPA.

026
Name: Abigail Crouse
Major: Animal and Dairy Sciences (Pre-Vet)
Faculty Advisor, Affiliation: Jamie Larson, Animal and Dairy Science
Project Category: Biological Sciences and Engineering
Co-Author(s): Lacey Dysart

Effects of Exogenous Estradiol on Reproductive Characteristics of Cattle
Estrus synchronization is an important reproductive management tool for cattle producers. Gonadotropin releasing hormone (GnRH) is currently used to stimulate ovulation in synchronization protocols. Recent research indicates that GnRH may cause an immature follicle to ovulate. Adequate preovulatory estradiol is important to follicular development. The effect of administering exogenous estradiol benzoate (EB) on follicular blood perfusion and onset of standing estrus was evaluated. A group of 47 *Bos Taurus* cows were synchronized using a 7-day Cosynch + CIDR protocol. On day -9, cows were administered GnRH and a source of progesterone (CIDR). On day -2, cows were administered prostaglandin F_{2a} (PGF) and CIDRs were removed. Estrotect patches were placed on the rump to detect standing estrus. On day -1, half of the cattle were given an injection of estradiol benzoate (1 mg/2 mL). Ultrasound images of each ovary and blood samples were collected on days -1 and 0. ImageJ software was used to analyze follicular blood perfusion by counting and averaging the number of pixels from three images of each ovary. Blood samples were analyzed for concentrations of estradiol using radioimmunoassay. Procedure GLM of SAS 9.3 was used to analyze the relationship between concentrations of estradiol in blood serum and follicular blood perfusion. Frequency of SAS 9.3 was used to determine that treatment with estradiol increased ($P = 0.027$) blood perfusion of the left ovary and increased ($P < 0.001$) incidence of standing estrus from 8 of 23 cows in the control group and 21 of 24 cows in the treatment group. This provides insight into the role of EB in synchronization protocols.

027
Name: Samantha Curran
Major: Biochemistry
Faculty Advisor, Affiliation: Dr. Shien Lu, Department of Biochemistry, Molecular Biology, Entomology, Plant Pathology
Project Category: Biological Sciences and Engineering
Co-Author(s): Sonya Baird
REU/Research Program: CALS Undergraduate Research Scholars Program

Characterization of antifungal activity of endophytic bacteria of soybean against the charcoal rot pathogen Macrophomina phaseolina
Antimicrobial bacteria can be used to protect plants from infections of pathogenic fungi such as *Macrophomina phaseolina*, which causes charcoal rot disease of soybeans. This disease is responsible for an increased death toll of

soybean plants grown in Mississippi, causing the yield of soybeans plants to plummet. Endophytic bacteria 3E5-1 and 3E7-1 were both isolated from soybean plants infected with charcoal rot disease. The initial bioassay screening showed that both 3E5-1 and 3E7-1 inhibited growth of *Macrophomina phaseolina* on nutrient broth yeast extract agar (NBY) as well as potato dextrose agar (PDA). The results produced indicated that both isolates tested positive for antifungal characteristics thus calling for further testing. Therefore, further bioassays are under way to evaluate the antifungal spectra of the two bacterial isolates and to determine whether these isolates have any activity against common bacterial pathogens of plants. In order to determine identities of the isolates 3E5-1 and 3E7-1, the bacteria were cultured in NBY broth for DNA extraction. The DNA extraction then allowed polymerase chain reaction (PCR) with 16S rDNA primers, 27F and 1492R. Following PCR, 16S rDNA sequence analysis was performed for both isolates. Isolate 3E5-1 was found to be a member of the *Bacillus* genus and most likely from either the *Bacillus cereus* species complex or Bacillus *thuringiensis* species complex. For bacterial isolate 3E7-1 the 16s rDNA sequence analysis revealed the isolate belongs to the *Pseudomonas plecoglossicida* complex. To further determine their taxonomic position, specific primers glpF/R and ilVDF/R for *Bacillus* and PsEG30F/PseEG790R for *Pseudomonas*, respectively, will be used for PCR reactions. Phylogenetic analysis of the resulting sequences will be conducted for determination of their identities. This resulting data will provide insights to development of biologically-based management of plant diseases.

165
Name: Vesilla Dao
Major: Psychology
Faculty Advisor, Affiliation: Cliff McKinney, Psychology Department
Project Category: Social Sciences
Co-Author(s): Erica Szkody

The Effects of Coping Styles on Depression: Examining Differences Between Asian and Western Cultures

As the United States becomes more populated, an exponential increase in Asian American population arises, which furthers the need for an understanding of cultural differences. Asian cultures and Western cultures are fundamentally different from one another in that Asian cultures value collectivism and filial piety. Collectivism drives individuals to continually enact the mindset of benefitting the group overriding oneself. Filial piety - respect and obedience for parents - and collectivism are challenged when Asian Americans progress into college because college encourages them to act independently, furthering oneself away from parental connections. As difficulties arise, individuals will eventually attempt to cope in response to stress. Usually, approach coping, a direct focus on stress and the source of stress, predicts reduction of depression, but Asians are more inclined to practice avoidant coping (e.g., focus away from stress and the source of stress). Maladaptive coping strategies such as problem avoidance and social withdrawal increase the likelihood of higher depressive symptoms. Within Asian American populations, approach coping does not predict a decrease in depression. For this study, we conducted a multiple group analysis using Amos and performed a regression analysis of coping to predict depression for both Asian and non-Asian populations. Data was analyzed from the National Longitudinal Study of Adolescent to Adult Health. The association between coping styles on depression symptoms of emerging adults from Asian descent (n = 274) were compared to emerging adults of non-Asian descent (n = 5275; Wave 3). Non-Asian individuals demonstrated a positive association between avoidant coping and depression symptoms, whereas Asian individuals demonstrated a negative association between avoidant coping and depression symptoms. Differences in the relationships of coping to depression pathways suggest that the detrimental associations of avoidant coping may be culture specific.

106
Name: Mayukh Datta
Major: Chemical Engineering
Faculty Advisor, Affiliation: Neeraj Rai, Dave C. Swalm School of Chemical Engineering
Project Category: Physical Sciences and Engineering
Co-Author(s): Zachary Windom, Dr. Neeraj Rai

Understanding Condensed Phase Structure and Dynamics of Herbicides using First Principle Molecular Dynamics Simulation
Glyphosate (*N*-phosphonomethyl glycine), a common herbicide that readily binds to soil constituents yet is easily soluble in water, has come under a lot of scientific scrutiny and is thought to be carcinogenic. Therefore, to design efficient separation processes and to aid epidemiological studies of the effect of glyphosate on humans, the conformational flexibility and structural characteristics of glyphosate in aqueous solution must be understood. This work utilizes ab initio molecular dynamics (AIMD) simulations to study the behavior of the glyphosate molecule in aqueous phase under equilibrium conditions. Previous metadynamics simulations suggest that beyond a certain torsion angle, the carboxylic group in the glyphosate molecule is completely deprotonated. Therefore, to determine the structural stability of glyphosate at equilibrium conditions, this study determines the dihedral profile of glyphosate with a normal NVT simulation. The gathered data is analyzed to produce plots of radial distribution function, spatial distribution function, and hydrogen bond analysis. Lastly, to further understand the deprotonation of the carboxylic group, infra-red (IR) spectra calculations will be performed to see if the carboxylic group "stretch" is significant while the dihedrals are left unperturbed.

010
Name: Alex Davis
Major: Music Education/Vocal Voice Emphasis
Faculty Advisor, Affiliation: Dr. Shrinidhi Ambinakudige, Geology
Project Category: Arts and Humanities (Poster)

"Tracking the Soundscape: A GIS analysis of major music genres of the United States"
Music is a finely crafted tool used to show the cultural and social background of a society in time and space. More specifically, the musical genres of the United States all have a unique origin. Along with their distinctive beginnings, each genre had a path in which it spread. Even though its movement can never truly be attached specifically to a singular route, it can be tied to a general flow and direction. To give a visual representation, I will use geocoding and spatial analysis in a Geographic Information System (GIS) to chart the likely path wherein the different genres of music traveled.

028
Name: Daniel Davis
Major: Forestry/Wildlife Management
Faculty Advisor, Affiliation: Brian Davis, Department of Wildlife, Fisheries, and Aquaculture
Project Category: Biological Sciences and Engineering
Co-Author(s): Richard M. Kaminski
REU/Research Program: College of Forest Resources Undergraduate Research Program
Other Competition(s): Community Engagement Research Track

Nesting Biology of wood ducks and hooded mergansers at Noxubee and Yazoo National Wildlife Refuges, Mississippi
Artificial nesting structures (ie, nest boxes) for wood ducks (*Aix sponsa*) have been used for decades in North America. In some parts of the wood ducks' range, hooded mergansers (*Lophodytes cucullatus*) also use nest boxes. We investigated dual nesting by these species and potential negative consequences to the host species (ie, wood duck or hooded merganser) when interspecific eggs were laid. We monitored wood ducks and hooded mergansers at Noxubee and Yazoo National Wildlife Refuges from 1994-1997. At Noxubee we found 460 unique nests in 122 nest boxes, and 356 (77%) nests were successful. Of the successful nests, 87 (~25%) contained eggs of both duck species. At Yazoo, we found 423 nests in

77 nest boxes, and 259 nests (61%) were successful. Of the successful nests, 25 nests (~10%) contained eggs of both species. Pooled collectively across both box types, refuges, and years, the proportion of non-host eggs in a clutch being incubated by the host ranged from ca. 15-25%. By modeling potential costs of being parasitized interspecifically with clutches of 12 and 14 host wood duck eggs, and no hooded merganser eggs, 9.43 and 10.8 wood duck eggs hatched, respectively in those nests. When 1-5 hooded merganser eggs were present in those wood duck nests, hatching of wood duck eggs only declined by 1.3 and 1.5 eggs, respectively. When hooded mergansers were host and had a clutch size of 15 eggs, and no wood duck eggs present, mergansers hatched 14.6 eggs. However, when 1-5 wood duck eggs were present in these nests, 5.3 to 10.3 fewer merganser eggs hatched across this range. Clearly, further work is needed to investigate causes of these potential declines, particularly the consequences to hooded mergansers upon being parasitized by wood ducks.

166
Name: Flora Dedeaux
Major: Communication/Broadcasting
Faculty Advisor, Affiliation: Holli Seitz, Communication
Project Category: Social Sciences
REU/Research Program: ORED Undergraduate Research Program
Other Competition(s): Public Health Research Competition

Anti-Vaccine Persuasion Strategies on YouTube: A Comparison of HPV and MMR Vaccine Videos
Objective. According to the World Health Organization, “vaccine hesitancy” is one of the top 10 global health issues for 2019. Prior research has examined types of misinformation in YouTube videos relating to the HPV vaccine (Ekram, Debiec, Pumper, & Moreno, 2018 and Briones, Nan, Madden, & Waks, 2012); however, our research compares some of the differences and similarities in the persuasion techniques used in anti-vaccine videos for HPV and MMR vaccines.
Method. We collected 25 of the “most relevant” videos on YouTube from each of the search terms “HPV vaccine” and “MMR vaccine” in February 2018. Metadata were collected for each video. Each video was watched and manually coded for sentiment towards vaccines, presence of misinformation, presence of possible conspiracy theories, types of persuasive strategies, production quality, and general format, including whether the video was a formal interview, first hand account, news story compilation, etc.
Results. Preliminary results show that the videos are wide ranging in production style, quality, and general message. However, similarities can be seen between the MMR and HPV vaccine videos. Production styles for both vaccines included emotionally charged before and after pictures/videos, interviews with and without the vaccine injured person present, informational videos, and news stories. Preliminary results suggest that anti-vaccine persuasive strategies include use of emotional music, use of home photos and videos, one-on-one interviews with distressed mothers, use of the title “Dr.” in interviews, and others. Differences between the two types of vaccine videos (MMR and HPV) will be presented in the final results.
Conclusions. This work adds to an existing body of knowledge about user-generated content involving vaccines and specifically the spread of anti-vaccine sentiment through media. Knowledge of prevalence and types of anti-vaccine persuasive strategies can be used to inform future health communication efforts and the prevention of the spread of misinformation.

107
Name: Elizabeth Dell'Orco
Major: Industrial Engineering
Faculty Advisor, Affiliation: Dr. Lesley Strawderman, Industrial & Systems Engineering; Dr. Reuben Burch, Industrial & Systems Engineering
Project Category: Physical Sciences and Engineering

Fueling Station Log-In System Project
The Industrial & Systems Engineering department aims to tackle nutrition tracking by creating optimal processes that are as time and cost efficient as possible. Nutrition tracking is important for athletes to ensure they receive appropriate levels

of nutrients each day to support athletic performance. By tracking the number of calories and grams of cholesterol, protein, and fat consumed daily by MSU's student athletes, further action can be taken to optimize athletic performance. We are developing a nutrition tracking software program using Microsoft Access to provide an interactive, restricted interface when student athletes are ordering food menu items at the fueling station. Partnering with Pamela Bartz, Director of Sports Nutrition at MSU, we are creating a database that allows athletes to order certain menu items and tracks intake values of calories, cholesterol, protein, and fat. This database will also include ingredient flags for common allergens such as: peanuts, dairy, soy, gluten, etc. Once the order is completed, the athlete's food request will be pushed to and prepared by the fueling station employee. Reports will be generated to track daily and weekly nutrition values of the athletes.

Once complete, the database will include all the food menu items that are available for order at the fueling station. The student athlete will enter their NetID and receive personalized menu options, separated into the categories: cholesterol, protein, fat, dairy, pre-workout, post-workout, and hydration. The menu options available for order will be based on the athlete's daily nutritional needs indicated by the nutritionist. These daily values will be adjustable, considering different diets may be consumed in-and-out-of-season. Once the student athletes place their order, the fueling station employee will prepare said order. Daily and weekly nutrition reports will be generated from the orders. This database will allow for closer supervision of nutritional intake of student athletes by superiors such as: position coaches, strength and conditioning coaches, athletic trainers, nutritionists, etc. This database will also track inventory levels of menu items and indicate when a new order needs to be placed.

As part of the software development process, we have researched nutrition platform interfaces and systematic designs to make interaction with the database as efficient and user-friendly as possible. The database is expected to be implemented for the Fall 2019 athletic season. In this poster presentation, the initial design of the program will be presented, along with the details of the database design and structure. Included will be the food menu items available to athletes, calorie, cholesterol, protein, and fat values corresponding to the items, and common allergens.

167

Name: Krishna Desai
Major: Political Science
Faculty Advisor, Affiliation: Dr. Melanie Loehwing, SSRC Civic Life Lab; Dr. Brian Shoup, SSRC Civic Life Lab
Project Category: Social Sciences
Co-Author(s): Georgiana Swan
REU/Research Program: ORED Undergraduate Research Program
Other Competition(s): Community Engagement Research Track

Rebuilding Main Street: Civic Gaming and Deliberation in our Communities

Political discussion in contemporary American society is characterized by significant polarization and incivility. We use a civic game called "Rebuilding Main Street" as a way to study how individuals make community decisions in a semi-controlled environment. We believe that this game will allow researchers to study polarization and political discourse from a number of different perspectives including how variables like gender, education level, and political ideology impact how community members talk to one another about complex public issues. As an example of the game's applications we present the preliminary findings from a pilot study conducted in the Fall of 2018. This study, conducted at the Social Science Research Center's Civic Life Lab, analyzes whether mindfulness exercises can impact the quality of deliberation among randomly selected participants. In recruiting participants, our target group was undergraduate students who expressed interest in board games and political discussion. Over the course of the study, we divided the students into two groups and moderated and recorded the game sessions. At this stage, we are in the process of transcribing these conversations and coding them using a deliberation coding scheme created by Stromer-Galley (2007). We are coding the transcriptions in order to determine how various factors affect the quality of deliberation.

029
Name: Wellesley Dittmar
Major: Biological Engineering
Faculty Advisor, Affiliation: Cyprianna Swiderski, Department of Clinical Sciences
Project Category: Biological Sciences and Engineering
Co-Author(s): Lauren A Bright, Bindu Nanduri, Fiona M McCarthy, Nisma Mujahid, Lais RR Costa, Shane C Burgess

Modeling the Pasture-Associated Severe Equine Asthma Bronchoalveolar Lavage Fluid Proteome Identifies Molecular Events Mediating Neutrophilic Airway Inflammation

Pasture-associated severe equine asthma is a life-threatening respiratory disease that recurs annually during warm, humid months and is induced by environmental factors. Characteristics of the disease include reversible airway obstruction, airway hyper-responsiveness, and chronic neutrophilic airway inflammation. Clinical signs include episodes of wheezing, coughing, and impaired breathing. In humans with asthma, neutrophilic airway inflammation correlates with increased asthma severity, indicating the need to elucidate the mechanistic basis of this disease characteristic. Our prior investigation indicates that protein functions in normal bronchoalveolar lavage fluids (BALF) are conserved across horse, human, and mouse. Herein, we hypothesize that the activities of proteins in BALF from asthmatic horses predict changes in the functions of neutrophils that contribute to neutrophilic airway inflammation. Using shotgun proteomics, we identified 1003 unique proteins in cell free BALF from 6 horses experiencing asthma exacerbation and 6 non-diseased herdmates. 417 proteins were unique to asthmatic horses, 472 proteins were unique to control horses ($p<0.05$), and 114 proteins were found in both groups. Contributions of each protein to 10 neutrophil functions were modeled using manual biocuration, which determined each protein's net effect on the respective neutrophil functions. Proteins that increased migration, chemotaxis, cell spreading, transmigration, and infiltration of neutrophils, causing an influx of neutrophils into the airway, were increased in the BALF of affected horses relative to control horses. Proteins causing neutrophil activation, adhesion, phagocytosis, respiratory burst, and apoptosis, which shorten neutrophil lifespan, were decreased in asthmatic BALF relative to control BALF. Interaction networks created using Ingenuity Pathways Analysis (Qiagen) supported these conclusions. Congruent with our hypothesis, the collective biological functions represented in differentially expressed proteins of BALF from horses with pasture-associated severe asthma support neutrophilic airway inflammation. This study demonstrates the ability of systems modeling to characterize molecular events relevant to prominent diseases through the organization of functional genomics data.

168
Name: Cameron Douglas
Major: Educational Psychology
Faculty Advisor, Affiliation: Dr. Nicole Leach, Department of Counseling, Educational Psychology, and Foundations
Project Category: Social Sciences
Co-Author(s): Ryan McGrew

The Correlation of Social Anxiety and College Student Academic Performance

Recent studies have shown that social anxiety is an issue throughout undergraduate student bodies on college campuses everywhere. The academic effects of social anxiety on undergraduate students is unknown. The purpose of this study is to investigate how social anxiety affects undergraduate, university students' academic performance. Participants in this study included 80 undergraduate students divided evenly amongst each classification. The students were involved in this study due to their respective classes being randomly selected. The data were collected via the use of a self-report survey. Preliminary results suggest that higher levels of social anxiety are positively related with lower academic performance. Based on the preliminary results, interventions that lower social anxiety could be beneficial to undergraduate student's overall academic performance.

169
Name: Shawna Downs
Major: Animal and Dairy Sciences (Pre-Vet)
Faculty Advisor, Affiliation: Dr. Clay Cavinder, Animal & Dairy Sciences
Project Category: Social Sciences
Co-Author(s): Marina Denny
REU/Research Program: MSU Extension Undergrad Apprenticeship Program

Safety Awareness in Mississippi 4-H Horse Programs
There are few studies on the public's knowledge of and intent to implement proper safety practices. Eighty-two people from the 2018 Mississippi State 4-H Horse Show were asked about their practices, intent to practice, and level of agreement with various statements concerning horse safety. Results suggest that people were knowledgeable on the risk associated with working with horses and proper horse safety practices. Survey participants' have a positive attitude toward horse safety and indicated a potential change in horse safety behaviors such as wearing a helmet and riding in designated riding areas more frequently.

030
Name: Brady Dunaway
Major: Agricultural Science
Faculty Advisor, Affiliation: JoVonn Grady Hill, Entomology and Plant Pathology
Project Category: Biological Sciences and Engineering
Other Competition(s): Community Engagement Research Track

Comparative Analysis of Vigor and Pollinator Appeal in Black Belt Prairie Forb Seeds Versus Seeds from a Non-Local Supplier
Those who work in grasslands restoration or wildlife planting programs may find that plant materials and genotypes sourced from outside of their local ecoregion can result in plants that do not perform well in local soils and climates, do not exist on site long-term, or do not bloom at times that match the needs of local, specialist pollinators. Replacing these with even the same species but sourced from within the local ecoregion can create a healthier, more ecologically stable plant community that becomes more biodiverse with time and proper management. In cooperation with Prairie Wildlife of Clay County, Mississippi, we will run a set of field trials to compare the germination, growth, and bloom times of species from local, hand-collected seeds versus the same or similar species purchased from Roundstone Native Seed Company. Local seeds will be sown in situ, on several prepared plots of set dimensions next to their out-of-region counterparts grown on similar plots. Hypothesized results should show that while germination is less uniform or consistent in local seed sources, establishment and long-term vigor of seedlings and plant colonies may be superior to bought seeds. Locally acquired plant materials should also bloom at a time suited to the seasonal patterns of local pollinator species, whereas bought seeds may bloom and expire out of sync with what more specialized pollinators require. It may be observed that Roundstone plants bloom at an earlier age than those plants from local populations. Slight advantages, such as earlier maturation and higher germination rate, may initially reveal themselves when growing Roundstone seeds, however in a long-term trial the overall vigor and pollinator appeal should be greater in plants from local seed sources. Those working to restore native ecologies or to build habitat for local fauna should consider these qualities when sourcing their plant materials.

170
Name: Andreana Durham
Major: Psychology
Faculty Advisor, Affiliation: Mitchell Berman, Psychology Department, College of Arts and Science
Project Category: Social Sciences
Co-Author(s): Nathan Barclay, Richard Nelson, Matthew Timmins, Suzanne Amadi

How Religiosity Predicts Self-Harm in a Controlled Laboratory Environment
Self-harm frequently occurs as a form of emotion regulation in the presence of stress (Klonsky et al., 2014). Therefore, other coping mechanisms for stress, like religious activity, may buffer against self-harm behavior. Different aspects of the religious experience could be associated with self-harm behavior in different ways, so we examined the relationship between three indexes of religiosity (religious service attendance, parents' religious service attendance, and prayer outside of church) and self-harm. The SAP is a competitive reaction-time task against a fictitious opponent consisting of 40 trials (50% wins and 50% losses predetermined by the experimenter). Self-harm was defined as the number of extreme shocks (ostensibly twice as intense as a pain threshold shock determined before the trials) self-administered on losing trials. Participants were told that the "20" extreme shock was twice as intense as the "10" shock and would cause minor tissue damage. In reality, the selection of the 20 shock delivered a shock no greater than the 10 shock (the pain threshold). Self-harm was operationalized as the number of level 20 shocks selected by participants. The results of a multiple regression analysis revealed that the three predictors combined significantly predicted selfharm, $R = .218$, $p = .019$. Participant service attendance negatively predicted self-harm on the SAP ($\beta = -.256$, $p = .007$), but parent religious service attendance positively predicted self-harm ($\beta = .160$, $p = .042$). Prayer outside of organized religious activity was not a significant predictor in this model ($\beta = .028$, $p = .755$). This result may be due to religious parents possibly providing a stricter upbringing that evokes stress. The lack of significance with prayer could be explained by the fact that many may attend church for the socialization and the positive atmosphere, and prayer outside of church may not provide those same benefits.

171
Name: Isabella Durham
Major: Wildlife & Fisheries Science/Aquaculture & Fisheries Science
Faculty Advisor, Affiliation: Dr. Leslie Burger, College of Forest Resources, Department of Wildlife, Fisheries and Aquaculture
Project Category: Social Sciences
REU/Research Program: Undergraduate Research Scholarship Program
Other Competition(s): Thesis Research Competition (TRC)

Evaluating the Impacts of Undergraduate Research Programs at Mississippi State University for Developing Science Professionals
For the past five years, Mississippi State University has been offering research experiences for undergraduates through formal programs which pair high-performing students in collaborative research with faculty mentors. The purpose of these programs is to provide students with the opportunity to enhance scholarly activity, participate in the discovery of new knowledge, and become a part of the scientific community. We tested the hypotheses that undergraduate research improves student participants' educational experience (including personal and professional development), enhances retention of talented students in science careers, and leads to discovery of new information that contributes to the larger body of knowledge. Preliminary data from surveys of past program participants indicate improved discipline-specific knowledge, greater understanding of the scientific process, and enhanced interest in graduate education in STEM fields. Results also indicate undergraduate students are significant contributors to the larger body of scientific knowledge, including participating in meaningful research activities, serving as co-authors on peer-reviewed papers, and presenting research at local, state, national, and international levels. These outcomes suggest guided undergraduate research programs are an effective mechanism for increasing scientific literacy among college students and recruiting new scientists to STEM career fields.

172
Name: Stephanie Durr
Major: Sociology
Faculty Advisor, Affiliation: Dr. Lindsey Peterson, Sociology
Project Category: Social Sciences

The Effect of Race on Median Length of Stay in Foster Care
The disproportionality of Black children in foster care has long been a topic of study, meaning that there are more Black children in foster care than would be expected given their numbers in the general population. Interestingly, research on this topic has shown that states with larger than average Black populations have lower ratios of racial disproportionality among children in foster care and house fewer total children in foster care (Foster, 2012). In addition, another study revealed that foster care caseworkers were slightly more likely to rate Black children as experiencing a higher level of risk of harm than their White counterparts, which increases the probability that a case is substantiated for maltreatment and, therefore, that more Black children end up in foster care (Font et al., 2012). This same study also found that Black caseworkers tend to assess every family at a greater level of harm than White caseworkers, suggesting that the racial disproportionality in the foster care system is, at least in part, a result of institutional racism and individual racial bias. However, no previous studies have analyzed the effect that race of the child and the racial composition of the state as a whole has on the median length of stay for children in foster care. In other words, we know that Black children are more likely to end up in foster care than White children, but we do not know how their lengths of stay compare. This study addresses that gap in research by consolidating data from the Children's Bureau Child Welfare Outcomes Report Data, the U.S. Census, and other data related to state expenditures per capita and poverty rates. Expanding on the research of Foster (2012), this study will use OLS regression to determine the strength of the relationship between the variables in this study.

108
Name: Jacob Easley
Major: Mechanical Engineering
Faculty Advisor, Affiliation: Haley Doude, Center for Advanced Vehicular Systems
Project Category: Physical Sciences and Engineering

Additive Manufacturing for CubeSat Cold Gas Propulsion System
Advancements in additive manufacturing technologies have opened significant possibilities in the aerospace industry. Specifically, additive manufacturing's ability to build complex geometry and enable rapid prototyping has made it a suitable manufacturing technique for many aerospace applications where complex geometries are needed, such as in propulsion systems. Incorporating additive manufacturing into propulsion systems allows for improvement of performance and cost reduction through the implementation of components only viable through additive design. This study aims to investigate a potential advantage of using additive manufacturing in the designing and fabrication of CubeSat propulsion systems by integrating the structural components of the CubeSat with the propellant tank of a cold gas propulsion system. A design for additive manufacturing (DFAM) approach is used to mitigate some of the geometrical build limitations additive manufacturing faces. An iterative topology optimization of sorts is used to connect the CubeSat structure to the propellant tank, and a finite element model is constructed in Abaqus to analyze the stress concentrations resulting from the tank's pressure. The parameters observed from the finite element model are then hydrostatically tested to validate the stress analysis and overall design of the component.

031
Name: Lauren Ellison
Major: Animal & Dairy Sciences
Faculty Advisor, Affiliation: Dr. Derris Burnett, Animal and Dairy Science
Project Category: Biological Sciences and Engineering
Co-Author(s): Dana S. Reid

Effect of Maternal Feed Restriction During Gestation on Adipogenic Gene Expression in Fetal Perirenal Adipose Tissue
Adequate maternal nutrition is a critical factor in fetal and subsequent postnatal growth and development. When this is optimal it can maximize offspring production potential by impacting the gene expression of those involved in regulating growth, development, and composition of the offspring. Persistent drought, low quality forages, and insufficient nutrient supplementation lead to maternal nutrient restriction and impact the long-term growth trajectory of developing offspring potential in beef cattle production. These nutritional environmental factors can affect the expression of key genes involved in the growth of economically important tissues such as adipose tissue. The purpose of this study was to determine the effect of maternal nutrient restriction during mid to late gestation on mRNA expression of genes involved the formation and metabolism of perirenal adipose tissue (PR). Pregnant commercial cattle (n = 6) were equally divided into one of 2 treatments: Control (fed 100% of Nutritional Requirements) vs Restricted (fed 60% of Nutritional Requirements) from 140 to 240 days of gestation. The animals were slaughtered on day 240 of gestation. Tissues were harvested for RNA isolation and qRT-PCR was performed using TaqMan® gene assays. Results showed that there was a decrease in CEBPA ($P < 0.04$) expression in PR of restricted-fed animals. Simultaneously, the restricted-fed animals experienced an increase ($P = 0.0007$) in IGF-1R expression. Maternal feed restriction repressed expression of the early adipogenic gene CEBPA, while increasing the expression of IGF-1R which is involved in subsequent adipocyte growth. This but may indicate precocious differentiation leading to increased adiposity in later life and warrants further research.

173
Name: Mayah Emerson
Major: Educational Psychology
Faculty Advisor, Affiliation: Nicole Leach, Counseling, Educational Psychology, and Foundations
Project Category: Social Sciences
Co-Author(s): Angela Provenzano, Aleaha Fredrick

The Influence on First-Year Experience Courses on Academic Performance and Extra-Curricular Involvement
Eighty-seven percent of 4-year institutions in the United States offer freshman seminars, with potentially positive academic outcomes (U.S. Department of Education, 2016). There is little research on the topic of first year seminar courses (U.S. Department of Education, 2016). Previous research about student involvement has suggested a correlation with academic success. Results have also suggested the amount of time spent on activities outside of the classroom link with positive outcomes of college adjustment (Thanh-Thanh, Pancer,Prat,& Wintre, 2010). First year seminar courses provide an opportunity for freshman students to explore a topic they are interested, while facilitating fellowship with other students. Our current hypothesis is students who have completed a first-year experience course in the fall of their freshman year will show higher academic performance as defined through higher freshman GPA, retention, and more credit hours. Additionally, students who have completed a first-year experience program will also show significantly more hours of involvement in extracurricular activities. Researchers collected data from 80 current MSU sophomore students utilizing cluster sampling to include students from varied colleges. Preliminary results suggest first year experience classes do not significantly correlate to any aspects of academic performance nor participation in extracurricular activities. Rather, ethnicity, and family income were stronger predictors of both outcomes. Additionally, hours spent in extracurricular activities correlated with academic performance. The results suggests institutions may better benefit students by creating an academic and social program oriented toward low income, minority students specifically, in order to foster academic performance and involvement.

032
Name: Daniel A. Fajardo
Major: Animal & Dairy Sciences
Faculty Advisor, Affiliation: Jean M. Feugang, Animal and Dairy Sciences
Project Category: Biological Sciences and Engineering
Co-Author(s): Victor M. Paes, Kaylee Bundy, Jean M Feugang
Other Competition(s): Community Engagement Research Track

Magnetic sperm selection for quality enhancement

The current status of assisted reproductive technologies demands for the development of novel technical approaches to further improve productivity outcomes in farm animals. The emerging tools-based nanotechnology is offering new opportunities in biomedicine and veterinary sciences, with applications in reproductive science having potential to help overcome several limitations related to male fertility. In previous studies, we designed magnetic iron oxide nanoparticle (MNP) conjugates that harmlessly target boar spermatozoa, in a plain or a specific manner. Here, we conducted surface modifications of MNP to either scavenge free radicals or target X-bearing chromosome spermatozoa (X-spermatozoa) within boar semen samples.

033
Name: Rachael Feeney
Major: Animal and Dairy Sciences (Pre-Vet)
Faculty Advisor, Affiliation: Dr. Carrie K. Kouba (Vance), Dept. of Biochemistry, Molecular Biology, Entomology & Plant Pathology
Project Category: Biological Sciences and Engineering
Co-Author(s): Allison R. Julien, Mariana Santos-Rivera, Emmet Guy, Andrew J. Kouba
REU/Research Program: CALS URSP

Seasonal Comparisons of Behavioral and Chemical Responses of Male *Desmognathus fuscus* to Female Pheromones

The northern dusky salamander (*Desmognathus fuscus*) is found in the United States and Canada, where the Canadian Carolinian population is endangered. *D. fuscus* breeds continuously in early fall or late spring, releasing pheromones from various glands and exhibiting strong courtship behaviors in response to female pheromones. The objective of this study was to determine the presence of chemical and behavioral changes due to pheromone exposure and expression in two different seasons (fall and spring). Male *D. fuscus* (n=4) were exposed to female-cloacal-water (FCW), which was obtained by soaking females (n=4) in 12.5 ml of water for 15 hours. Male behaviors were recorded with an ethogram for one hour. Near Infrared Reflectance Spectroscopy (NIRS) spectra were collected in the regions of the tail, mental gland, and cloaca both before and after FCW exposure and then compared using chemometrics.

Statistical analysis using R Core Team (R Studio, R version 3.3.2, Vienna, Austria) showed that none of the behaviors were impacted by seasonality of the trials. Results indicate that males were attracted to the FCW significantly more ($p = 0.05$) compared to the control water in both seasons. Chemometric analysis using Unscrambler®X (v.10.5,CAMO Analytics, Oslo, Norway) revealed differences in pheromone expression from male glands in response to FWC and across seasons using Principal Component Analysis (PCA) and scores plots. In addition, chemical changes by these glands where analyzed using NIR and Linear Discriminant Analysis (LDA) where 97.2% and 94.4% of spectra were correctly classified for fall and spring, respectively. Similarly, LDA correctly identified spectral signatures indicating males' response to FCW in 94% of cases. Here, we were able to observe responses to female pheromones by male *D. fuscus* in terms of both behavioral and chemical changes. These results have the potential of being applied in new breeding programs for captive endangered plethodontid salamanders.

034
Name: Isidora Fereday
Major: Biological Sciences/Microbiology
Faculty Advisor, Affiliation: Justin Thornton, Biological Sciences
Project Category: Biological Sciences and Engineering
Co-Author(s): Keun Seok Seo, Joo Youn Park

Engineering Bacteriophage Delivery of an Antimicrobial CRISPR/Cas9 System to *Streptococcus pneumoniae*
Streptococcus pneumoniae is a gram-positive, facultative anaerobe and is the most common cause of pneumonia, meningitis, and otitis media. As antibiotic resistance becomes an increasing concern, there is demand for novel treatments for bacterial infections. One such innovative solution is phage therapy, which uses bacteriophages to treat bacterial infections. The CRISPR (clustered regularly interspaced short palindromic repeats) and CRISPR-associated Cas9 genes are used as a genome editing system in bacteria. The CRISPR/Cas9 system can be targeted to a specific sequence of DNA and will cut the DNA at that location. We hypothesize that by integrating a CRISPR/Cas9 system into the genome of a temperate pneumococcal phage, we will develop a system for specifically clearing *S. pneumoniae*. We have established a CRISPR/Cas9 system that is targeted to the pneumolysin (*ply*) gene, which is a key virulence factor of pneumococcus. Cleaving the chromosome at the *ply* locus gene will effectively neutralize the pathogen. To generate the CRISPR/Cas9 system, synthetic oligos specific to the ply gene (spacer sequence) were cloned into the *BbsI* site of pKS1 vector that contains a promoter, leader sequence, and direct repeats to create pKS2. To program the CRISPR/Cas9 system to the target gene, the pre-crRNA (promoter, leader sequence, DR, and spacer region) was amplified from pKS2 and cloned downstream of the genes for the tracr-RNA and Cas9 (originating from Streptococcus pyogenes SF370) to generate pKS4. Non-essential gene segments from *S. pneumoniae* temperate phage MM1 along with an erythromycin cassette for selection were cloned into pKS4 to flank the CRISPR/Cas9 system, thus resulting in creation of pKS5 and allowing for homologous recombination into the pneumococcal chromosome. Successful integration of this system into the genome should result in progeny phage bearing CRISPR. Engineered phage will then be used for *in vitro* and *in vivo* assays for clearance of *S. pneumoniae*.

035
Name: Ethan Fisher
Major: Biological Engineering
Faculty Advisor, Affiliation: Raj Prabhu, Agricultural and Biological Engineering; Lei Chen, Mechanical Engineering
Project Category: Biological Sciences and Engineering

Phase Field Modeling of Brain Swelling Due to Traumatic Brain Injury
Traumatic brain injuries (TBI) send 2.5 million people to the emergency room annually in the United States. 56 thousand people also die from the TBIs sustained. Thus, it is imperative to understand TBIs and how they are caused to improve clinical outcomes when treating the injuries. Multiscale modeling is the most ethical and accurate way to study the biomechanics of TBIs.
TBIs occur in response to mechanical loads applied to the head. Finite element analysis modeling can be used to obtain the stresses and strains observed in the impact of various loading schemes to brain tissue. The inflammation of the tissue seen post-injury can be further modeled using phase field method (PFM) and the inputs obtained from the finite element analysis. This method has been utilized in material processes such as solidification, solid-state phase transformation, recrystallization, and grain growth. PFM is unique in its ability to deal with time-dependent processes at a microstructural level by conveniently capturing diffuse interfaces and adjacent phases without the tedious tracking of sharp interface throughout numerical simulations used in other methods.
The proposed research will attempt to model brain swelling sustained from a TBI using the phase field method. Finite element analysis will be used to calculate deformations and stress that will serve as input for the phase-field model. The proposed model is expected to accurately predict the degree and the timing of brain swelling due to various impacts such as automobile accidents, sports collisions, and more. The information obtained can have significant clinical implications.

036
Name: Jennifer Fisher
Major: Biological Engineering
Faculty Advisor, Affiliation: Raj K. Prabhu, Center for Advanced Vehicular Systems, Department of Agricultural and Biological Engineering
Project Category: Biological Sciences and Engineering
Co-Author(s): Folly Crawford, Michael Murphy, Raj Prabhu
REU/Research Program: Dean of Engineering Research Stipend

Molecular Dynamics Modeling of the Effects of Neuronal Membrane Lipid Heterogeneity on Deformation due to Traumatic Brain Injury

Traumatic brain injury (TBI) sends 2.5 million people to the emergency room and causes 56 thousand deaths per year in the United States. Finite element analysis allows for the development of models that can give insight into the brain tissue's response to mechanical loads that cause TBI. Such models lack lower length scale information such as neuron death caused by neuron membrane mechanoporation, a significant form of damage leading to TBI. Previous work has studied mechanoporation damage in a 1-palymitoyl-2-oleoylphophatidylcholine (POPC) membrane, but the response of a membrane to deformation may be dependent on its phospholipid composition. This project provides a better understanding of the heterogeneous response of neuron membranes to mechanical loads and will lead to improved models of TBI by analyzing simplified membrane models composed of 72 dipalmitoylphosphatidylcholine (DPPC) phospholipids (sourced from the NIH Laboratory of Computation Library). The membrane models were equilibrated with added TIP3P water molecules for 10 nanoseconds using the program LAMMPS and the CHARMM36 all-atom lipid force field. Each model was tested under constant tensile velocity deformations in the x- and y-dimensions. Membranes underwent equibiaxial, 2:1 non-equibiaxial, 4:1 non-equibiaxial, strip biaxial, and uniaxial deformation. All stress states had a von Mises strain rate of $5.45 \times 10^8\ s^{-1}$, the same strain rate used for previous POPC deformations. Images from OVITO from the models went through an image analysis protocol to determined when membrane failure was (assumed to occur when water fully penetrated the bilayer). Preliminary results show that lipid chain saturation reduces the stress at which the membrane fails, i.e., DPPC fails at lower stresses than POPC due to the absence of a double bond in the lipid chains of DPPC.

037
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Major: Microbiology
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Project Category: Biological Sciences and Engineering
Co-Author(s): Michael Folse, Sunghyun Yoon, Joo Youn Park, Keun Seok Seo
Other Competition(s): Public Health Research Competition

Development of vaccine adjuvants inducing IgA response for enhancing mucosal immunity against *Staphylococcus aureus*

Staphylococcus aureus has proven to be a growing burden on global health as it is one of the most common causes of bloodstream infections. Due to a decrease in new antimicrobial agent development and an increase in antibiotic resistant *S. aureus* strains, alternative approaches to prevent *S. aureus* infections are much needed. Although vaccination has been the most effective method to prevent bacterial infections, all efforts to develop an efficacious anti-staphylococcal vaccine have not been successful. Historically, most anti-staphylococcal vaccines targeted major virulence factors of *S. aureus* including surface antigens, secreted toxins, and induced immunoglobulin G (IgG) responses for opsonization and neutralization. Given the fact that most severe *S. aureus* infections initiated from colonization at the host mucosal membranes, we hypothesize that a successful induction of IgA response, a central mechanism of mucosal immunity, will lead to the development of an efficacious anti-staphylococcal vaccine. A previous study showed that *S. aureus* infections in humans induced a strong natural IgA response to PrsA and a putative membrane protein (SAB0688) of *S. aureus*. These results suggest that immunization with PrsA or SAB0688 protein could be an ideal vaccine adjuvant to induce IgA response in humans. To test this possibility, we cloned and expressed recombinant PrsA or SAB0688 protein from *S. aureus* strain LAC. We will then immunize mice with these recombinant proteins in combination with staphylococcal cytotoxins, a group

of significant staphylococcal virulence factors, and compare serum and mucosal IgG and IgA response against staphylococcal cytotoxins, respectively. We expect that immunization with recombinant PrsA or SAB0688 protein will induce higher IgA response against staphylococcal cytotoxins. Successful completion of this study would lead to development of a universal vaccine adjuvant inducing IgA which will have significant impact on other mucosal infections by bacteria and viruses.

109
Name: Carly Foss
Major: Aerospace Engineering
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Project Category: Physical Sciences and Engineering

Evaporation Rate of a Fuel Droplet Under Different Initial Conditions
Droplet combustion is a critical physical process with a wide range of applications, especially in aviation and transportation systems. The mass and heat transfer that occurs around droplet has strong impact on the combustion behavior, which is of direct relevance to the fuel efficiency and pollutant emission of engine devices. The present research effort concerns the effects of thermal environment on fuel droplet evaporation process. Specifically, we will perform parametric study to characterize the evaporation rate of droplet under different pressure, temperature and gaseous-composition conditions. Multiple initial conditions were tested in order to compare these results and analyze how these conditions effect the droplet evaporation rates. A reduced-order analytical model was taken in order to initially reduce the computational time and complexity; however, future work adjustments will be conducted to increase the accuracy of the results and to better understand the evaporation rate effects of the droplet.

110
Name: Caleb Foster
Major: Mechanical Engineering
Faculty Advisor, Affiliation: Matthew Priddy, Mechanical Engineering
Project Category: Physical Sciences and Engineering
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Other Competition(s): Public Health Research Competition

Porous spinal implants using additive manufacturing
Spinal implants are of great importance within the biomechanical field as they must support the weight of the spine and upper body while also facilitating osseointegration between the vertebrae and implant. Most implants are constructed of either polyether ether ketone (PEEK) or Ti-6Al-4V. PEEK is often chosen due to its low stiffness and radiolucency while Ti-6Al-4V is chosen for its biocompatibility and corrosion resistance. However, both of these materials pose problems post-surgery. The elastic modulus of Ti-6Al-4V is too stiff and can result in stress shielding. Conversely, the elastic modulus of PEEK is too compliant and can result in significant implant deformation and failure. A solution to solve both of these problems is to introduce porosity into a Ti-6Al-4V implant, thereby reducing the stiffness to match the elastic modulus of cortical bone (approximately 15 GPa). This porous implant can be easily manufactured using additive manufacturing, which retains the accuracy and precision of the complex geometries. In this study, different porous structures were analyzed using finite element methods (FEM) to determine the relative amounts of porosity required to lower the effective stiffness to approximately 15 GPa. The best candidate structures were chosen based on ease of manufacturing, simplicity, and effective stiffnesses close to that of cortical bone. These were then propagated through a representative PLIF spinal implant CAD model. After performing finite element analysis (FEA) on different porosities, square extrusions proved to be the simplest and most effective structure for reducing the effective stiffness. This porous structure was input into a complex model of the spinal implant to determine the overall effectiveness. The results showed that the porous Ti-6Al-4V spinal implant's effective stiffness was reduced to 14.37 GPa which is well within the desired range.

111
Name: Zoe Fowler
Major: Electrical Engineering
Faculty Advisor, Affiliation: Jean Mohammadi-Aragh, Electrical and Computer Engineering
Project Category: Physical Sciences and Engineering
Co-Author(s): Danielle Grimes

Quantifying the Impact of a Toy Adaptation Lab Experience on ECE Students' Professional Awareness and Motivation to Persist

Service learning has been shown to increase students' persistence in engineering; however, majority of existing service learning projects span over several semesters and can be costly. This often prevents these projects from being incorporated into classrooms. The Electrical and Computer Engineering department at Mississippi State University offers a first-year classroom project where students adapt toys for children with special needs, providing an enriching experience to students. The purpose of this study is to determine in what ways the toy adaptation experience impacted students' professional awareness and motivation to pursue engineering. For our study, we focused on expectancy-value theorem. Expectancy-value theory uses an individual's expectations of success and values of a task to measure their motivation levels (Eccles, 1983). For this study, we tinkered self-efficacy developed by Mamaril et al (2016) to measure expectancy. The students who participated in this project were distributed a paper survey before and after the activity, where the pre-activity survey contained the 4 tinkering self-efficacy questions. These questions were from a previously validated instrument (Mamaril, Usher, Li, Economy, & Kennedy, 2016) and gave a better understanding of the self-efficacy levels of the participants prior to the activity. Furthermore, the questions had a 4 point Likert-like scale from Disagree to Agree. The post survey asked both quantitative and qualitative questions. The qualitative questions focused on how the project impacted them and helped to reveal other forms of motivation, while the quantitative focused on self-efficacy and expectancy-value related constructs.

112
Name: Nathan Frey
Major: Chemistry
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Project Category: Physical Sciences and Engineering
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Characterizing the Fluxional Behavior in (TMCOT)M(CO)3 (M=Cr, Mo, W, TMCOT=1,3,5,7-tetramethylcyclooctatetraene) and (COT)Cr(CO)$_3$ (COT=cyclooctatetraene) Complexes with Computational Approaches

Density functional theory computations have been applied to investigate the fluxional mechanisms of 1,3,5,7-tetramethylcyclooctatetraene chromium, molybdenum, and tungsten tricarbonyl [(TMCOT)M(CO)$_3$ (M= Cr, Mo, and W)] and cyclooctatetraene chromium tricarbonyl [(COT)Cr(CO)$_3$] complexes. All investigated geometries of (TMCOT)M(CO)$_3$ (M= Cr, Mo, and W) and (COT)Cr(CO)$_3$ were fully characterized with PBEPBE and B3LYP methods . Five transition states have been identified in the fluxional mechanism of (TMCOT)M(CO)$_3$ (M= Cr, Mo, and W), two of which are 1,2-shift transition states. The lowest energy pathway for the fluxional processes of these complexes contains a free energy of activation of 9.7, 9.7, and 10.1 kcal mol^{-1} for Cr, Mo, and W complexes, respectively. Five transition states were also characterized for the fluxional mechanism of (COT)Cr(CO)$_3$. A 1,3-shift represents the transition state of the lowest-energy pathway for the fluxional processes of (COT)Cr(CO)$_3$ with a free energy of activation of 9.1 kcal mol^{-1}. Good agreement was observed between the experimental and computed ^{1}H-NMR chemical shifts for the (TMCOT)M(CO)$_3$ (M = Cr and Mo) complexes at three different temperature regimes (the low-temperature limit, low temperature, and the high-temperature limit for each respective complex). Variable temperature ^{1}H-NMR spectra for the Cr and Mo complexes of (TMCOT)M(CO)$_3$ were also simulated in the three different temperature regions. Computed results indicate that by increasing the temperature to the high-temperature limit, a 1,3-shift, 1,2-shift-2, and 1,5-shift lead to coalescence of each of the vinyl protons and methyl peaks in the ^{1}H-NMR spectrum.

038
Name: Brandon Gerhart
Major: Wildlife & Fisheries Science/Aquaculture & Fisheries Science
Faculty Advisor, Affiliation: Peter Allen, Aquatic Sciences
Project Category: Biological Sciences and Engineering
Co-Author(s): Taylor Saucier

Effects of temperature on resting aerobic metabolic rate in adult Largemouth Bass (*Micropterus salmoides*)
Water temperature plays an important role in regulating physiological processes in aquatic organisms. In recreationally angled fishes, an understanding of the energetic costs related to water temperature is beneficial for guiding management. Because little is known in this regard about adult black bass, the life stage typically pursued by anglers, we evaluated the effects of water temperature on resting routine aerobic metabolic rate in adult Largemouth Bass (*Micropterus salmoides*). Bass were acclimated to 18, 24, and 30°C in separate tanks for ≥ 2 weeks. Aerobic metabolism (MO_2) was measured using intermittent respirometry. Bass from the 18°C treatment exhibited the lowest aerobic metabolic rate (68.9 ± 6.5 mgO_2/kg/hr), followed by the 24°C treatment (101.3 ± 7.4 mgO_2/kg/hr) and the 30°C treatment (176.8 ± 13.4 mgO_2/kg/hr)-($P<0.05$). Furthermore, Q_{10} values were calculated and showed bass exhibited a higher temperature sensitivity over the 24°C to 30°C range (Q_{10} = 2.53) compared to the 18°C to 24°C range (Q_{10} = 1.90), indicating exacerbated aerobic demands at high temperatures. Therefore, management for adult Largemouth Bass should minimize handling and induced exercise when temperatures approach 30°C or higher.

039
Name: Mary Godley
Major: Animal and Dairy Sciences (Pre-Vet)
Faculty Advisor, Affiliation: Dr. Caleb Lemley, Animal and Dairy Sciences
Project Category: Biological Sciences and Engineering
Co-Author(s): K.J. Bowers, D.D. Burnett

Investigating Placental Blood Vessel Density in Various Size Placentomes of Angus Cattle
The placenta plays a major role in regulating fetal growth and development. In cattle, the placenta is morphologically classified as cotyledonary and the efficiency of placental nutrient transport is directly related to blood vessel density. Our understanding of placental blood vessel density of various placentome size is minimal. Therefore, this study aimed at examining cotyledonary blood vessel density across various size placentomes. Three placentomes were collected from each cow (n = 6) on day 240 of gestation and categorized as large, medium, or small placentomes. Placentome weight was different ($P < 0.0001$) between large, medium, and small placentomes. Each placentome underwent measurements of macroscopic and microscopic blood vessel density. Furthermore, microscopic blood vessels were further characterized in areas of high and low vascularity as detected by macroscopic measurements. Macroscopic blood vessel density, as detected by the in vivo imaging system, was not different ($P = 0.42$) between large, medium, and small placentomes. For microscopic measurements, the number of blood vessels was not different ($P = 0.46$) between large, medium, and small placentomes. The number of blood vessels was increased ($P = 0.001$) in areas of high vascularity compared with low vascularity. The average size of blood vessels was not different ($P < 0.15$) between or within placentomes. The percent area of blood vessels was not different ($P = 0.91$) between large, medium, and small placentomes. There was no variation in blood vessel surface area between small, medium, and large placentomes but an increase ($P = 0.001$) in areas of high vascularity versus low vascularity. In conclusion, this study shows minimal variation in macroscopic blood vessel density between various sized placentomes. However, microscopic variations exist within a given placentome showing tissue heterogeneity of blood vessel density.

040
Name: Alexander Gonzalez
Major: Biological Engineering
Faculty Advisor, Affiliation: C. LaShan Simpson, Agricultural and Biological Engineering
Project Category: Biological Sciences and Engineering
Co-Author(s): Nancy Nguyen

Mechanical Properties of a Three-Dimensional Vascular Scaffold
Vascular calcification is recognized as a pathobiological process sharing many features with embryonic bone formation. Moreover, there are two types of calcification that take place in blood vessels. One is intimal calcification that occurs with the atherosclerotic plaque associated with cells and collagen. The other type is medial, and it is associated with elastin. Vascular calcification is related to vascular smooth muscle cells (VSMCs) because they tend to differentiate into osteoblast-like cells depending on the different pathological and physiological conditions. Because arteries are composed primarily of collagen, modeling calcification on a collagen scaffold is thought to be more representative for *in vitro* studies. Collagen-elastin scaffoldings were discovered to be appealing biomaterial models due to their mechanical properties and biocompatibility. That being said, there are forces that collagen and elastin can withstand to provide the appropriate biological environment. The utilization of Young's modulus was implemented into the study because it provides a measure of tension of the collagen-elastin scaffold with seeded SMCs, and non-seeded cells attached to it. Furthermore, with the use of a mechanical tester the Young's modulus was calculated and compared.

174
Name: Desiree Goodfellow
Major: Anthropology
Faculty Advisor, Affiliation: Derek Anderson, AMEC
Project Category: Social Sciences
Co-Author(s): Paul N. Eubanks

Give the Dog a Bone: Carnivore preferential gnawing as evidence of domesticated dogs at the Castalian Springs site
Middle Tennessee State University's 2017 summer field school at Castalian Springs (40SU14), a late prehistoric mound site located in north-central Tennessee, produced a varied faunal assemblage of over 6,000 specimens from six test units. The preliminary analysis summarized here identified a minimum of 19 species, although white-tailed deer would have provided most of the meat at the site. Faunal analysis shows preferential carnivore gnawing of deer bone, which we believe could indicate that processed deer scraps were given to domesticated dogs after consumption by humans.

041
Name: Demyia Graham
Major: Biological Sciences
Home Institution: Mississippi University for Women
Faculty Advisor, Affiliation: Dr. Ross Whitwam, College of Arts, Sciences, and Education, Mississippi University for Women
Project Category: Biological Sciences and Engineering
REU/Research Program: Ina E. Gordy Honors College
Other Competition(s): Thesis Research Competition (TRC)

How Cellular Metabolic State and the Chaperone Protein Hsp104 Interact to Affect the Spontaneous Formation of the Yeast Prion [URE3]
Prions are pathogenic agents that can induce abnormal folding of specific cellular proteins. If we understand the formation, propagation, and resolution of spontaneous prions in yeast, these findings could be applied to mammals. My overall aim is to determine how cellular metabolic states can influence spontaneous prion formation rates in baker's yeast (*Saccharomyces cerevisiae*) with or without the Hsp104 chaperone protein present. I predict that yeast cells at different phases in their growth cycle will show prion formation rates that are significantly different from one another.

042
Name: Christine Grant
Major: Biological Engineering
Faculty Advisor, Affiliation: Lauren B. Priddy, Agricultural and Biological Engineering
Project Category: Biological Sciences and Engineering
Co-Author(s): Leah K. Horstemeyer

Development of a Protocol to Characterize Autoclaved and Unautoclaved Poloxamer 407 as a Delivery Vehicle for Vancomycin

Poloxamer 407 (P407) is a thermoresponsive hydrogel that allows for the gel to be low-viscosity at cold temperatures (refrigerated) and high viscosity at high temperatures, such as in the body. The low-viscosity phase allows for an easy delivery of the gel into a wound while the high-viscosity phase keeps the gel in the intended area. Previously, P407 has been used successfully for the delivery of a variety of therapeutics, including the antibiotics vancomycin and amikacin. It was previously found that as the concentration of P407 increased, the release rate of antibiotic decreased. Since autoclaving removes water content, it was hypothesized that autoclaving P407 would decrease the release rate of vancomycin, leading to slower killing of bacteria? Thus, the goal of this research was to establish a protocol to characterize autoclaved and unautoclaved P407 as delivery vehicles for vancomycin *in vitro*. The *S. aureus* bacterial strain used, ATCC 6538, was fluorescent and could be quantified using an *in vivo* Imaging System (IVIS) and traditional bacterial counts. The P407 used was either autoclaved or unautoclaved and contained vancomycin. It was suspected that the P407 might be suffocating the biofilms rather than releasing vancomycin at a steady rate to kill the biofilms. Thus, P407 hydrogels (n=1) were applied to bacterial cultures in trans-wells above the cells, or in direct contact with the cells. Briefly explain how bacterial counts were done. The resulting bacterial counts were similar. In the trans-wells, the autoclaved gel had $9.4x10^7$ CFU and the unautoclaved gel had $1.04x10^8$ CFU. In the direct contact wells, the autoclaved gel had $5x10^8$ CFU and the unautoclaved gel had $2.7x10^8$ CFU. Further modifications to this protocol are needed before increasing the sample size to increase statistical power. Eventually, the goal is to quantify the amount of vancomycin released.

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043
Name: Emily Haag
Major: Animal and Dairy Sciences (Pre-Vet)
Faculty Advisor, Affiliation: Erdogan Memili, Department of Animal and Dairy Science
Project Category: Biological Sciences and Engineering
Co-Author(s): Muhammet Rasit Ugur, Mustafa Hitit
Other Competition(s): Public Health Research Competition

Correlation of Bull Fertility Phenome with Sperm Cellular and Molecular Dynamics

Fertility is the ability of the sperm to fertilize and activate the egg and support embryo development. As one of the most economically important traits, bull fertility is crucial for efficient, sustainable and profitable production of cattle because of the widespread use of artificial insemination (AI). Even though most bulls produce ample amounts of sperm with normal motility and morphology, after thousands of AI, their fertility is low. This is an important problem for cattle farming because lack of biomolecular markers to evaluate semen quality and predict bull fertility is hindering advances in

fundamental animal science and technology. The objective of this study was to test the hypothesis that low fertility is associated with damage in sperm cell membrane or nuclear chromatin. Hypoosmotic swelling test (HOST) and chromatin decondensation assay were used to ascertain integrity of cell membrane and nuclear DNA using sperm from 10 bulls with different fertility phenotype. In the HOST, 200 sperm cells were examined from each bull and the experiments were repeated three times. The results were analyzed using the T-Test and simple linear regression statistical methods. The results of the HOST experiments showed that the HOST positive cell counts were 95.1± 14.7 and 79.4± 14.1 for high or low fertility bulls, respectively. Although the results were not different, using sperm from more extreme high *vs.* low fertility could provide different results. These findings are important because they help us better understand the male gamete and its influence on fertility, and the results can be used to improve assisted reproductive technologies both for cattle and other mammals.

113
Name: Daniel Hall
Major: Aerospace Engineering
Faculty Advisor, Affiliation: Yeqing Wang, Aerospace Engineering
Project Category: Physical Sciences and Engineering
Co-Author(s): Sophia Slusasz
Other Competition(s): Community Engagement Research Track

Electrical Resistance of Stitched Carbon Fiber Epoxy Composite Laminates at Elevated Temperatures

Stitching, as an alternative joining technique for carbon fiber composite laminates, has attracted more and more interests from aerospace industry in the recent years. When compared to the conventional joining methods, such as using mechanical fasteners, rivets, and polymer adhesives, the stitching allows to reduce the weight significantly. In addition, stitching also allows to enhance the inter-laminar strength and helps to arrest the delamination and crack propagations. Recently, it was also found that the stitching lines help to arrest and mitigate the lightning strike damage. To understand the mechanisms of mitigating the lightning strike damage with stitches, in this paper, we investigated the effect of the stitching lines on the surface electrical resistance of a carbon fiber composite laminate at elevated temperatures. The electrical resistance for each set of data is measured using the four-probe method. Such a method is used to minimize the contact resistances between the electrodes and the samples. The electrical resistance of a room temperature composite has been measured across one, two, and three stitching lines (see Figure 1 below). The results have shown that electrical resistance increases as the number of stitches increase. Electrical resistance across the stitches have also been measured from room temperature to 125 °C in an oven set up. The obtained electrical resistances at elevated temperatures have also been compared with those measured for an unstitched composite sample.

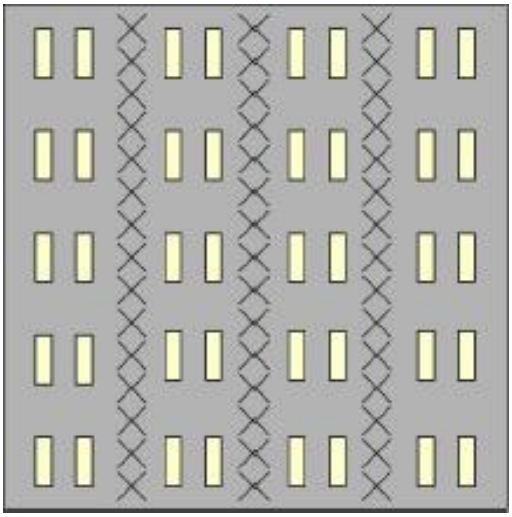

Figure. 1. A schematic diagram of the electrode attachment areas (with conductive nickel paint) for the electrical resistance of the stitched carbon fiber composite laminate panel (the columns with cross marks denote the stitch lines) using a four-probe method.

175
Name: Emily Hatcher
Major: Human Sciences/Human Dev & Family Studies
Faculty Advisor, Affiliation: Charles Freeman, School of Human Sciences; Joe Wilmoth, School of Human Sciences
Project Category: Social Sciences
Co-Author(s): Sarah Mata, Kendall Jones, Madison Ratledge, Darryl Williams

Student engagement between in-state and out-of-state students
The overall purpose of this study is to investigate the difference in student engagement between in-state and out-of-state students on Mississippi State campus. Through a Qualitrics survey we will be using the Student Engagement Scale (SES) to survey a group of in-state and out-of-state students on their levels of engagement in five areas: valuing, participation, emotional engagement, cognitive engagement, and behavioral engagement. We will then use a T test to compare data between the two groups. We hypothesize that out-of-state students will be overall more engaged in the areas defined because of the need to make a more conscious effort to get involved.

044
Name: Chelsey Hill
Major: Biochemistry (Pre-Vet)
Faculty Advisor, Affiliation: Dr. Amanda Stone, Animal and Dairy Sciences
Project Category: Biological Sciences and Engineering
Co-Author(s): Carly A. Becker
REU/Research Program: URSP

Determining the best feeding frequency for pre-weaned dairy calves
The objective of this study was to monitor the differences between overall health and growth rates of pre-weaned dairy calves associated with feeding milk replacer one, two, or three times per day. This study will be conducted at the Mississippi State University Bearden Dairy Research Center in Starkville, Mississippi from February 14 to April 28, 2019. Nine Holstein heifer calves born from a dam that did not experience severe dystocia were enrolled at birth. To ensure equal nutritional footing at study start, each calf received an amount equivalent to 15% of their birth weight of colostrum split into two feedings with an esophageal tube feeder. Calves were randomly assigned to one of three treatment groups: 1D, fed 6 L milk replacer once daily at 4:00 AM (n = 3); 2D, fed 3 L of milk replacer twice daily, at 4:00 AM and 8:00 PM (n = 3); and 3D, fed 2 L of milk replacer thrice daily, at 4:00 AM, 12:00 PM, and 8:00 PM (n = 3). Calves were housed individually in hutches with deep straw bedding and provided ad libitum water. Each calf was weighed at birth and then once a week until weaning. Weaning will occur when calves are at least 8 weeks old and eating at least 0.91 kg of grain each day for three days in row. All grain intake is measured daily. Calves are observed daily for signs of illness and all diagnoses and treatments are recorded using a calf scoring chart by the University of Wisconsin-Madison School of Veterinary Medicine. Calves in the 3D group are expected to have improved health and will grow at a faster rate than calves in the 2D and 1D groups due to possible increased availability of nutrients throughout the day caused by higher frequency of eating.

114
Name: Jennifer Hoang
Major: Civil Engineering
Faculty Advisor, Affiliation: Dr. John Ramirez-Avila, Civil and Environmental Engineering
Project Category: Physical Sciences and Engineering
Co-Author(s): Mrs. Sandra Ortega-Achury

Saving Our Water Systems and More Importantly, Our Livelihood: Determining the Concentration of Organic and Inorganic Sediments in a Degrading Stream in Mississippi
A water system and its health can affect the livelihood of organisms and the ecosystems that depend on it. Suspended sediment concentrations and loads in addition to turbidity are important water quality parameters that provide insight to

the health status of a waterbody. They are indicators of suspended particulates, organic or inorganic, in the water. Catalpa Creek in Mississippi, an identified degrading stream, is affected by different sources of sediments and nutrients that affect its water quality and health. A study was conducted to evaluate the spatial and temporal distribution of suspended materials along the upper 4-miles of the main stream of Catalpa Creek from May 2017 to November 2018. Approximately 600 filters, containing retained sediment from the determination of total suspended solids (TSS) on grabbed water samples, were burned on a furnace to eliminate sediment organic materials (VSS). The filters were then weighed and the sediment inorganic mass (FSS) was then calculated. To find the amount of FSS in each individual filter-sample, the difference between the TSS and VSS was determined. TSS concentrations ranged from 0.01 mg/l to 2705 mg/l while the VSS concentrations ranged from 0.001 mg/l to 218.8 mg/l and FSS concentration ranged from 0.01 to 2846 mg/l. Comparing VSS and FSS values to TSS, it was determined that FSS yielded the higher fraction. This means that FSS could be responsible for the accelerated consumption of dissolved oxygen and eutrophic processes in the stream. By analyzing the spatial variability of concentrations along the 9 stations of the study reach, it is easier to identify how in-stream processes (i.e. streambank erosion), channel geometry, and flow variation can increase organic material in the stream. Temporal evaluation is another alternative that can be used to identify the effect of seasonal variations on the organic material distribution as well.

115
Name: Blade Hodges
Major: Agricultural Engineering Technology & Business
Faculty Advisor, Affiliation: Mary Love Tagert, Department of Agricultural and Biological Engineering
Project Category: Physical Sciences and Engineering
Co-Author(s): J.O. Paz, D. Reginelli
Other Competition(s): Community Engagement Research Track

Evaluating In-Field Soil Moisture Variability with Sensors
There have been numerous studies on soil moisture as it pertains to irrigation in Mississippi, but more work is needed in Blackland Prairie, located in the northeastern part of Mississippi. Here, an increasing number of producers are showing an interest in irrigation. It is not economical to access groundwater over most of the region due to the depth of the aquifer, so many producers use surface water for irrigation. Sprinkler irrigation is the primary application method, to accommodate the changing topography across the landscape. Soil moisture sensors have been shown to conserve water usage while maintaining yields on irrigated fields, helping to better time irrigation applications with crop water needs. However, the ideal number of sensor sets needed over a given area and the best placement of sensors within a field needs to be determined. There are many variables that can affect soil moisture including topography, soil type, and the variability of vegetation. This study is being executed on a 15-ha soybean field under sprinkler irrigation near Brooksville, MS. A 55-m grid was placed over the field, resulting in 44 sample locations. Watermark Granular Matrix soil moisture sensors were installed at 12- and 24-inch depths at each sampling point and were connected to data loggers which recorded data hourly. Plant height and leaf area index (LAI) were measured weekly from June 29 through August 17, 2018. Soil texture was measured for each grid point, showing a relatively homogenous field with a silty clay loam as the dominant soil type. Results show spatial differences in soil moisture over time, with more variability when the soil profile is drier. At most sensor locations, plant height had a higher correlation than LAI to soil tension.

176
Name: Marsei Hogan
Major: Psychology
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Project Category: Social Sciences
Co-Author(s): Jaymes Durriseau

The effect of proactive control and fatigue on racial bias in the decision to shoot.
As the shooting of unarmed African Americans along with other minorities by police officers increases, there is growing interest in determining the underlying factors that influence an individual's decision to shoot or not to shoot. This study

examines two factors, proactive control and fatigue, in relation to how they influence racial bias in the case of an individual's decision to shoot. Studies have shown that people have a stereotype that associates African Americans with threat. Research shows that this stereotype influences biased shooting decisions. Proactive control is a cognitive process that helps an individual to reduce bias by focusing attention on the critical information in the situation (e.g., whether or not a person is armed). Fatigue has been shown to have an effect on racial bias in the decision to shoot, suggesting that when an individual is tired, it can lead to an increase in implicit racial bias in the decision to shoot. While proactive control and fatigue have been studied separately, the current study aims to investigate the interaction between these factors in relation to racially biased shooting decisions. Participants completed two different first-person shooter tasks. One task presented an even number of armed and unarmed trials for both Black and White targets. Another task presented mostly stereotype incongruent (white armed and black unarmed) trials. The mostly stereotype incongruent task was expected to induce more proactive control. Results showed that fatigue played a significant role in racially biased shooting. This fatigue effect was more pronounced in the shooter task that required more proactive control.

045
Name: Haley Holiman
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Project Category: Biological Sciences and Engineering
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REU/Research Program: Undergraduate Research Scholars Program

Using autonomous recording units to count individual marsh birds in the Gulf of Mexico
Many marsh birds are highly elusive and select wetland habitats that are difficult to navigate, as well as easily damaged by human observers. Autonomous recording units (ARUs) have been used to determine presence or absence of marsh bird species, but little is known about detection probabilities at different distances. Therefore, we arranged ARUs to record calls from common Gulf of Mexico marsh bird species (e.g., clapper rail, least bittern, seaside sparrow) broadcasted from Bluetooth speakers at fixed distances. We replicated natural calling scenarios by playing calls in different number combinations of individuals, ranging from 1 to 10 birds. To reduce interference from real bird vocalizations, we conducted our experiment in a recently burned pine savanna habitat that had similar herbaceous vegetation structure to the coastal emergent wetland habitats preferred by these marsh bird species. We used Raven Pro bioacoustics software to produce sonogram images of the broadcasted calls in order to count individuals in each recording. Detection probability of each species by distance was calculated in program R. Results showed that ARUs may be useful for counting individuals at close distances for some species (< 100m). Clapper rails had the greatest accuracy rate at farther distances (>100m) while seaside sparrows had the least (<50m), most likely due to differences in vocalization frequencies. Similar to traditional distance sampling, counting accuracy decreased for all species as the artificial birds' distance from ARU units increased. The results suggest that ARUs can be useful for surveying presence or absence of a species, but not for determining species abundance. With further study, ARUs may be able to supplement marsh bird surveys in remote areas to reduce disturbance and limit logistical issues.

116
Name: Colby Horner
Major: Aerospace Engineering
Faculty Advisor, Affiliation: Eric Collins, Center for Advanced Vehicular Systems
Project Category: Physical Sciences and Engineering

Computational Fluid Dynamics Analysis of Gurney Flap-Like Designs
Increasing the efficiency of airfoils and wings has been a major focus of research since the beginning of flight and a considerable amount of time and effort has gone into optimizing airfoils and wing shapes for specific flow regimes and desired flight performance. In this research, Computational Fluid Dynamics (CFD) simulations are utilized to examine the aerodynamic effects of modifying a symmetric airfoil with a simple yet effective device known as the Gurney flap. A Gurney flap is a small tab projecting near the trailing edge of a wing or airfoil that can increase a wing's lift to drag (L/D) ratio if

the size and placement of the flap are both within reasonable tolerances. The NACA 0012 airfoil was used as the base configuration, while numerous Gurney flap designs (varying in size, shape, and placement) were considered. Each airfoil configuration was then simulated at multiple angles of attack and the resulting lift to drag ratios were obtained. The lift to drag ratio is taken as a reasonable proxy for airfoil efficiency, and the resulting values for the various airfoil configurations are compared and ranked.

046
Name: Tianci Huang
Major: Aerospace Engineering
Faculty Advisor, Affiliation: Yu Lv, Department of Aerospace Engineering
Project Category: Biological Sciences and Engineering

Computational Fluid Dynamics Deforming and Moving Boundary Motion Library Development and Application
Computational fluid dynamics (CFD), one of the most significant design methodologies, is widely used for the engineering practice and technology development. In the aerospace industry, research that focuses in the reentry spacecraft design and modeling has been conducted for years. As the reentry vehicle holds a tremendous amount of kinetic energy as well as potential energy, the surface of the vehicle also experiences extremely high temperature while crossing the atmosphere. To prevent the vehicle to be melting, a layer of combustible material is applied to the skin that can be burned to maintain the vehicle surface temperature under the melting point.
Inspired by the fore mentioned case, this work presents a novel mesh motion library that uses the framework of OpenFOAM (an open source CFD software) to handle the deforming and dynamic mesh motion with respect to the heat flux and velocity values on each cell. Taking the advantage of OpenFOAM's existing dynamic motion library, the key points are to couple the mesh deforming algorithm with the existing library, to extract the temperature and velocity data within the cells without outputting them to file during the simulation, and to use the extracted data to adjust the amount of cell motion and deformation accordingly. After the library is compiled, it is first tested on a coarse mesh that only involves deforming boundary conditions to ensure that the algorithm works as a time-dependent function. Then, the library is tested with the deforming boundary conditions along with a prescribed boundary wave motion on the same coarse mesh to validate the robustness of the library. The library is then applied to a refined mesh to run a series of simulations with different deformation amplitudes at Mississippi State University's high-performance computing center (HPC2) to generate results.

047
Name: Mallorie Humble
Major: Animal and Dairy Sciences (Pre-Vet)
Faculty Advisor, Affiliation: Dr. Richard Baird, Biochemistry, Molecular Biology, Entomology & Plant Pathology
Project Category: Biological Sciences and Engineering
Co-Author(s): Chathuri Gamlath Mohotigge, Dr. Todd Mlsna, Dr. Richard Baird
REU/Research Program: USRP

MVOC Analysis of *Macrophomina phaseolina* in Comparison to *Rhizopus stolonifer* on Three Varieties of Infected Sweet Potato Tissues for Development of Storage Rot Detection Equipment
Macrophomina phaseolina is a fungal pathogen that affects more than 500 plant species including agronomic and horticultural crops such as sweet potatoes. Additionally, M.p. causes severe economic losses as a storage rot pathogen, therefore analytical methods that may detect the presence of M.p. or other pathogens such as *Rhizopus stolonifer* would be of extreme importance to the agricultural industry. Portable fungal detection equipment that may be used prior to storage and packaging would eliminate severe losses and prevent the potential for infected product to enter the marketplace. Microbial Volatile Organic Compounds (MVOCs) emitted by these fungi have the potential to be a part of an early warning system for contamination of stored roots. MVOC profiles of Mp and *Rhizopus* isolates of pure cultures have been identified using a headspace solid phase microextraction gas chromatography mass spectrometry (HS-SPME-GCMS) strategy. Therefore, background tissue and the pathogens are being compared on three Mississippi grown common varieties of sweet potatoes. The chemical compounds, or metabolites, in the MVOCs serve as biomarkers, and will enable

researchers to develop a portable electronic machine which will detect the presence of these pathogens in the warehouses, thus leading to less disease spread and reduced economic losses.

117
Name: Mallie Hunt
Major: Geosciences/Professional Geology
Faculty Advisor, Affiliation: Padmanava Dash, Geosciences, Remote Sensing
Project Category: Physical Sciences and Engineering
Co-Author(s): Sudeera Wickramarathna
REU/Research Program: Mississippi Based RESTORE Act Center of Excellence (MBRACE)

Whether pigments other than chlorophyll *a* and phycocyanin significantly affect remote sensing reflectance
For assessing water quality parameters such as phytoplankton, suspended sediments, or colored dissolved organic matter concentrations using remote sensing, algorithms are developed by relating remotely sensed data and co-incident field data. Simplistic empirical algorithms produce reasonable estimates in case-1 waters, however, in case-2 optically complex waters semi-empirical algorithms are developed by numerical simulations of underwater radiative transfer using inherent optical properties such as absorption (a) and backscattering coefficients (b_b). To account for the effects of phytoplankton on total remote sensing reflectance, absorption by phytoplankton (a_{ph}) is used in semi-analytical algorithms. When cyanobacteria is present, absorption by phycocyanin (a_{pc}) is used as an additional absorption term. Since a_{ph} includes a_{pc}, it is imperative to use absorption by the major pigment in phytoplankton, chlorophyll-*a*, $a_{chl\text{-}a}$ instead of a_{ph} when a_{pc} is used. Use of $a_{chl\text{-}a}$ instead of a_{ph}, necessitates the knowledge whether pigments other than chlorophyll-*a* and phycocyanin significantly affect remote sensing reflectance. To that end, a_{ph} was measured using 45 water samples collected from the western Mississippi Sound. $a_{chl\text{-}a}$ will be calculated by multiplying the chlorophyll-*a* concentrations at the 45 sites with the specific absorption coefficients computed using chlorophyll-*a* standards. Similarly, a_{pc} will be calculated by multiplying the phycocyanin concentrations at the 45 sites with the specific absorption coefficients computed using phycocyanin standards. a_{ph}, $a_{chl\text{-}a}$, and a_{pc} will be compared to test the hypothesis whether pigments other than chlorophyll-*a* and phycocyanin significantly affect remote sensing reflectance. This study is important for improving the accuracy of semi-analytical algorithms in optically complex waters.

177
Name: Laura Ingouf
Major: Anthropology
Faculty Advisor, Affiliation: Kathleen Ragsdale, Social Science Research Center
Project Category: Social Sciences
Co-Author(s): MR Read-Wahidi, K. Lower

Using the Household Hunger Scale to Explore 'Hunger Periods' among Farming Families in Rural Ghana: Results from Three Large-Scale Annual Surveys
Background: Ghana's Northern Region experiences the highest rates of food insecurity and childhood malnutrition in the country (Ghana Statistical Service, 2013; Malapit & Quisumbing, 2014). The USAID-funded Feed the Future Soybean Innovation Lab's activities in this region are focused on assisting farming families with improved household food security and sustainable agricultural productivity.
Methods: We compare results from the Household Hunger Scale (Ballard et al., 2011) administered to farmers in four Northern Region districts across three years and three different 'hunger periods': T1) May (2014; N=675): 'hunger season' begins, T2) June-July (2016; N=832) 'hunger season' peaks, T3) August-September (2017; N=983) 'hunger season' ends. The Scale categorizes household-level hunger (HLH) in the past four weeks as occasional, moderate, or severe for three hunger events (HE): HE1) No food to eat in household due to lack of resources, HE2) Household member/s went to sleep hungry, HE3) Household member/s went all day/night without food.
Results: Contrary to expectations, HLH was lower at T2 and T3 than at T1. At T1, 32.7% reported HE1, 31% reported HE2, and 24.8% reported HE3. At T2, 21.9% reported HE1, 19.7% reported HE2, and 14.4% reported HE3. At T3, 14.3% reported HE1, 9.4% reported HE2, and 6.7% reported HE3. HLH differed significantly across regional districts. At T1, HLH was highest

in Chereponi and Saboba Districts and lowest in Karaga and Tolon Districts. At T2, HLH was highest in Chereponi, increased in Tolon, and was lowest in Karaga and Saboba. At T3, HLH was highest in Chereponi and Tolon and lowest in Karaga and Saboba.
Conclusion: HLH consistently remained highest in Chereponi District and lowest in Karaga District across three years. Results suggest the need for additional research to identify drivers of chronic HLH in Chereponi in order to pinpoint leverage points for addressing this district's persistent food insecurity.

178
Name: Hannah Irwin
Major: Agricultural Economics
Faculty Advisor, Affiliation: Seong Yun, Agricultural Economics
Project Category: Social Sciences
Co-Author(s): Varun Paul

Enhancing the Efficiency of Groundwater Management between Mississippi Delta and Memphis
Mississippi Delta and Memphis share Memphis Sand Aquifer for groundwater uses. Over 0.25 million people in Memphis are dependent on the groundwater for drinking. Because of the limited water quantity and slow recharge process, however, the excessive pumping of groundwater from Memphis results in the lack of water for agricultural irrigation in the Delta during growing season. As a consequence of this long-lasting groundwater conflict, the State of Mississippi filed a bill of complaint in 2015 against the State of Tennessee, the City of Memphis, for wrongfully converting groundwater. This is an example of the tragedy of the commons well studied in the economics literature. In this standpoint, this study designs for two research objectives. The first is to analyze the groundwater quantity of the excess demands in both Memphis and the Delta. The second is to investigate how much of water bill or pumping costs will be increased to achieve socially optimal groundwater management. Using the dynamic optimization model, we show that the socially optimal solution of transboundary water resource management in the Memphis Sand Aquifer is the suppression of the excess demand by imposing extraction quantity quota to Memphis. This is the contradictory to the common belief of the effectiveness of the cost-oriented policies such as increases in water bill or pumping costs.

118
Name: Ty Irwin
Major: Mechanical Engineering
Faculty Advisor, Affiliation: Dr. Omid Askari, Mechanical Engineering Department
Project Category: Physical Sciences and Engineering
Co-Author(s): Saied Zare
Other Competition(s): Community Engagement Research Track

Influence of Plasma Discharge on Flame Stability
Advancement in methane propulsion system technology has quickly ascended into NASA's main focus, particularly due to methane's availability for reusable rocket engines allowing preservation for both resources and money. Despite the improvement in this field, the issue of flame stability and engine reliability still persist. Studies show that implementing plasma into these combustion systems serves as a path to enhance the flame stability. To study these obstacles hindering optimal performance, a Planar Laser Induced Fluorescence (PLIF) system is used alongside O_2 and CH_4 flames in a single-element coaxial injector. The PLIF system produces Nanosecond Repetitive Pulsed (NRP) plasma which discharges into flames originating from a flat flame burner. Advanced cameras and complimentary software are utilized to perform laser diagnostics to study the flame stabilization mechanisms. Before any research on the flame stability is to be taken, the PLIF system itself must be studied to ensure optimal conditions when performing the analysis. The members of the Plasma and Combustion Research Laboratory (PCRL) have dedicated the past academic year to accumulating a manual to provide detailed instruction on how to keep the system at peak performance. This manual will aid any new member added to the PCRL team with the required daily, monthly, and yearly upkeeping and maintenance required to sustain the system, troubleshooting options reparations in the case of failure, and step-by-step procedures on collecting and analyzing the

software data for a wide range of operating conditions. After the PLIF system is fully studied and understood, the PCRL team will begin its analytics on the plasma's influence in flame stability improvement.

003
Name: David Jenkins
Major: Music Education/Instrumental
Faculty Advisor, Affiliation: Jason Baker, Music
Project Category: Arts and Humanities (Performance)
Co-Author(s): Carlos Kemp, Jared Potter, Romar Sillo

The Complexities of Minimalism: Construction and Performance Practice in Steve Reich's "Drumming, Movement 1"
Steve Reich's *Drumming* is considered a masterwork and cornerstone of the 20th century minimalist style of music composition. Composed between 1970 and 1971, Reich combined techniques used in many of his previous works with inspiration from African drumming styles to create a work that is complex and engaging for performers, audience members, and scholars alike. *Drumming* is comprised of four separate movements, resulting in approximately 75 minutes of continuous music. This presentation will focus on the first movement, which is composed for four sets of tuned bongo drums. In addition to performing selections from the first movement, presenters will discuss the historical context of *Drumming*, elements of Reich's compositional techniques (including phasing and rhythmic substitution), performance techniques, and the music's legacy in the 20th century and percussion chamber music repertoire.

179
Name: Gillian Jinkins
Major: Poultry Science
Faculty Advisor, Affiliation: Dr. Thessalia Merivaki, Political Science
Project Category: Social Sciences
Other Competition(s): Thesis Research Competition (TRC)

Engaging the Voters from the Ground Up: Local Election Officials and Voter Outreach Programs
Local election officials play a very important role in how elections are run across the United States, as they are tasked with preparing for and running elections. In recent years, there has been a push towards more active engagement of election administrators with prospective voters, from visits local high schools, county fairs, to posting election information on social media. Why are some local election officials more active than others? This project takes a thorough look at states' election statutes in order to assess where voter engagement programs stem from, namely state mandates or local election officials' initiative. Given that outreach by local election officials can have a significant impact on voter participation, it is important to understand where and how the variation in engagement across the states occurs.

119
Name: Ben Jones
Major: Mechanical Engineering
Faculty Advisor, Affiliation: Dr. Omid Askari, Mechanical Engineering
Project Category: Physical Sciences and Engineering

Designing a Novel Chemical Kinetic Mechanism using Rapid Compression Expansion Machine
One of the main goals set by the Department of Energy (DOE) is to reduce petroleum consumption by 30% and GHG emissions by 14% by the year 2030. For this goal to be reached, there must be widespread and substantial utilization of improved fuels. In order to utilize promising oxygenated biofuels, such as anisole, a complete knowledge of the fundamentals of the spray and combustion parameters in addition to the chemical kinetic pathways is essential in the replacing the conventional petroleum fuels. This research focuses on using a Rapid Compression Expansion (RCEM) machine to simulate engine-like conditions to measure the spray and combustion fundamental characteristics. The RCEM is capable of performing a single stroke with pre-determined conditions where data can be gathered and interpreted for

both compression and expansion processes. Members of the Plasma and Combustion Research Laboratory (PCRL) at Mississippi State University have spent the past year refining the operation procedures of the RCEM and related systems (fuel supply, CAMAS software, etc.), troubleshooting of the total system, and building upon and editing a previously-made manual for the system's operation. Additionally, literature reviews, contact with the TESTEM company, and communication with outside researchers, was utilized to define the experimental methods for future testing: the use of the pressure rise rate to determine the ignition delay time of fuels. All of this accrued knowledge and familiarity with the system is a step toward developing a novel chemical kinetic mechanism for oxygenate biofuels and will be necessary for the machine to be utilized by future faculty and students involved with the PCRL at Mississippi State University.

048
Name: Gwyneth Jones
Major: Wildlife & Fisheries Science/Pre-Veterinary
Faculty Advisor, Affiliation: Marcus A. Lashley, Department of Wildlife, Fisheries, and Aquaculture
Project Category: Biological Sciences and Engineering
Co-Author(s): C. Baruzzi, D. Mason, C. O'Connell, M. Cove, B. Barton
REU/Research Program: Summer Research Fellowship
Other Competition(s): Community Engagement Research Track

Horizontal and vertical camera trap designs produce differing species richness in carrion food webs
Camera trapping is a valuable tool for data collection in wildlife research. This method is commonly used to observe species diversity, occupancy, abundance, and behavior. Camera traps are also a promising method for monitoring carrion food webs. However, detection bias inherent to traditional camera trap design may be of concern for studying carrion food webs. The height and orientation of the camera may determine what species at a study site will be captured. For example, horizontal camera traps may fail to detect small mammals or invertebrates on or behind carrion, resulting in an incomplete picture of scavenger diversity. Likewise, vertical camera traps necessarily sample a smaller area and may fail to detect more rare species as a result. With donated carrion, we conducted two carrion deployment experiments in 2017 and 2018 at Panther Swamp National Wildlife Refuge, MS, where we deployed paired camera traps (one horizontal and one vertical camera trap per plot) to compare species richness estimates from each design. Horizontal camera traps consistently estimated higher species richness (22 species, 13 unique) than vertical camera traps (17 species, 8 unique), but vertical cameras recorded several species including small birds, rodents, and insects not detected with horizontal methods. Thus, the addition of the vertical camera trapping method provides additional information about scavenger responses that may be valuable for understanding carrion food webs. By pairing horizontal and vertical camera trap designs, we can improve our ability to estimate species richness in carrion food web experiments.

049
Name: Kurt Junkersfeld
Major: Aerospace Engineering
Faculty Advisor, Affiliation: Mr. Calvin Walker, Aerospace Engineering; Mr. Rob Wolz, Aerospace Engineering
Project Category: Biological Sciences and Engineering

Collecting Insects In the Crop Canopy
Kurt Junkersfeld Collecting Insects In the Crop Canopy Capturing insects is something that has been studied and mastered by entomologists over the course of decades. However, collecting larger quantities of insects in a short amount of time using todays methods has proven to be an issue for larger plots of crops. The purpose of this project is to research methods for collecting large amounts of insects above a specific crop layer quickly and efficiently. The proposed method for developing a process for collecting these insect samples involves designing airborne equipment to capture large amounts of insects and testing the design for performance. Since the current methods involve a long tedious process that takes a substantial amount of time, the solutions considered for addressing this problem involved a collection system suspended under a multi-rotor UAS. Two potential methods are considered with varying weight, size, and complexity. System 1 is a differential pressure vacuum system and system 2 consists of long bristles coated with adhesive to comb through the crops. Both systems pursue different methods of collection. Since analysis indicated that System 1 failed to meet

requirements and System 2 met all the objectives and design criteria, a design based on System 2 was modeled and made for testing.

004
Name: Jane Kent
Major: Architecture
Faculty Advisor, Affiliation: Dr. Andrea Spain, English
Project Category: Arts and Humanities (Oral Presentation)

Hypocrisy and Humanity in J.M. Coetzee's *The Lives of Animals*
In the novella and accompanying articles titled *The Lives of Animals* by J. M. Coetzee, the famous novelist Elizabeth Costello is invited to give a series of lectures. Costello takes advantage of the opportunity and proceeds to speak on animal cruelty in capital industry, relating it to the devastation of the Holocaust. This comparison emits agitation in many of her listeners and absolute disgust in others, but the conviction in Costello's personal despair strikes at the heart of the matter—where does our sympathetic reasoning disappear to and what happens when it comes back? While Costello speaks on this and tiredly argues at her audience, she becomes something beyond her listeners, something nearly unattainable. That is, until the dinner after the lecture, where it comes to light that Elizabeth Costello, in all her superiority in knowledge and conviction, is still human. This is shown through a very specific piece of characterization by Coetzee. Costello wears leather shoes. She wears the dried and treated skins of the animals on whose behalf she speaks on, but she will not eat them. In this level of hypocrisy, she becomes human, something relatable for those she dines with—it also opens her up to great criticism about the validity of her lecture. This paper will argue that Costello's hypocrisy, and thereby our hypocrisy, might be the very mark of the human; perhaps it is hypocrisy that separates her from the animals with whom she tries to empathize, also thereby questioning the validity of her argument for sympathetic reasoning address the lives of animals.

050
Name: Charlotte Key
Major: Physical Education/Kinesiology
Faculty Advisor, Affiliation: Dr. Adam Knight, Kinesiology, CAVS
Project Category: Biological Sciences and Engineering
Co-Author(s): Meredith Bass, Jeffrey Simpson, Ethan Stewart, Alana Turner, David Macias
REU/Research Program: ORED Undergraduate Research Program/Grant
Other Competition(s): Community Engagement Research Track

Ankle Kinematics in Individuals With Chronic Ankle Instability During Unexpected and Expected Drop Landings
PURPOSE: Although deficits in dynamic frontal plane ankle stabilization are well-documented in chronic ankle instability (CAI) participants, anticipatory ankle kinematics during inversion perturbations are less known. This study examined the impact of anticipation on ankle kinematics during single-leg drop landings on an inverted surface. **METHODS:** Thirty participants (CAI=15, Control=15) completed unexpected and expected single-leg drop landings onto a 20° inverted surface from a height of 30 cm. Ankle inversion angle at initial contact, time to maximum inversion angle, maximum inversion angle and inversion velocity were assessed using a 2 (group) x 2 (landing condition) mixed ANOVA ($p < 0.05$). **RESULTS:** Significantly less time to maximum inversion angle ($p = 0.041$) and greater maximum ankle inversion angle ($p = 0.010$) was found in the CAI group. Regarding landing condition, significantly less ankle inversion angle at initial contact ($p = 0.003$) and greater maximum ankle inversion angle ($p < 0.001$) was observed during the unexpected landings. **CONCLUSIONS:** Altered frontal plane ankle kinematics in the CAI group suggests reductions in dynamic frontal plane ankle stabilization. However, both groups displayed similar ankle kinematics when the inversion perturbation was expected. More research is needed that examines unexpected and expected perturbations to further understand the clinical implications of these findings.

120
Name: Maleen Kidiwela
Major: Geosciences/Professional Geology
Faculty Advisor, Affiliation: Adam Skarke, Geoscience Department
Project Category: Physical Sciences and Engineering
Other Competition(s): Thesis Research Competition (TRC)

An Expanded Inventory of Methane Seeps on the US Atlantic Margin
Over the past decade, the use of multibeam echosounder water column backscatter data to identify the location of gas plumes has become more common, resulting in the detection of gas seepage on continental margins around the world. The discovery and initial cataloging of widespread gas seepage on the US Atlantic margin, presented by Skarke et al.(2014) was based on analysis of 94,000 km^2 of multibeam data acquired by the NOAA ship Okeanos *Explorer* with an EM302 (30 kHz) sonar between 2011 and 2013. The presence of gas plumes at seep locations identified in that work has subsequently been confirmed by video imagery collected on over 20 remotely operated vehicle or human occupied vehicle dives, suggesting that the employed seep detection methodology is robust. Here we present the further analysis of approximately 57,362 km^2 of previously unexamined multibeam data acquired by the vessels *Atlantis, Okeanos Explorer,* and *Sikuliaq* on the continental slope and outer-shelf of the US Atlantic margin between 2012 and 2016. Following the seep identification protocol presented by Skarke et al.(2014), we identified over 800 water column backscatter anomaly features structurally consistent with previously confirmed gas plumes and catalog the location of their associated seafloor gas seeps. Of these identified seeps, over 100 were determined to be not previously identified. These new seeps encompass a depth range from 50m to 2450m. Data set quality control was achieved through secondary independent analysis of all water column backscatter records by an experienced researcher. Additionally, consistency in seep detection between the detections made here and the individual processed the data presented in Skarke et al.(2014) was evaluated by comparing their detections on the same subset of water column backscatter data (EX 1206). Results indicated good agreement (70%) in subset seep detection between the individuals, suggesting that these respective full datasets are comparable.

180
Name: Eunbea Kim
Major: Psychology
Faculty Advisor, Affiliation: Cliff McKinney, Clinical Psychology
Project Category: Social Sciences
Co-Author(s): Erica Szkody, Ellie Steele, Cliff McKinney
Other Competition(s): Public Health Research Competition

The Impact of Custodial Grandparenting on Emerging Adult Children in Behavioral Problems and Well-Being
The number of grandparents raising their grandchildren is on the rise. It is important to investigate the impact of custodial grandparenting on children's quality of life in an aging society. The current study examined the differences in behavioral problems and quality of life between emerging adults raised by custodial grandparents and those raised by biological parents. Emerging adults were recruited from a large Southern United States University and completed online measures of household structure, behavioral problems, and quality of life. Hypotheses stated that individuals raised by custodial grandparents would have more internalizing and externalizing problems compared to individuals raised by biological parents. Similarly, hypotheses stated that individuals raised by custodial grandparents would report lower on social, psychological, physical, and environmental quality of life compared to those raised by their biological parents. Results of t-tests indicated no significant differences between groups (i.e., raised by biological parents versus raised by one or more grandparents) on behavioral outcomes (e.g., depression and anxiety). The result also showed no significant differences between the two groups in social quality of life. Emerging adult children in households with custodial grandparents reported lower physical (M = 14.51, SD = 2.71), psychological (M = 13.86, SD = 3.09), and environmental quality of life (M = 14.63, SD = 2.78) compared to those raised by their biological parents: physical (M = 15.02, SD = 2.45, $t(597) = 2.39$, p = .02), psychological quality of life (M = 14.64, SD = 2.94, $t(597) = 2.24$, p = .03), and environmental quality of life (M = 15.54, SD = 2.80, $t(596) = 2.79$, p = .01). Thus, custodial grandparenting may impact emerging adulthood grandchildren's physical,

psychological, and environmental quality of life. These findings will inform the need for more research on physical, psychological, and environmental conditions of emerging adults raised by grandparents.

051
Name: Jude Kitaif
Major: Wildlife & Fisheries Science/Wildlife Science
Faculty Advisor, Affiliation: Ray Iglay, Department of Wildlife, Fisheries, and Aquaculture
Project Category: Biological Sciences and Engineering
Co-Author(s): Haley Holiman, Auriel Fournier, Mark Woodrey
REU/Research Program: Undergraduate Student Research Program
Other Competition(s): Community Engagement Research Track

Predicting the Migratory timing of Earliest Arrival/Latest Departure dates in Rails in Jackson County, MS
Rails serve as indicator species for marsh ecosystem health. However, knowledge of the migration ecology of many rail species is limited, impeding efforts to effectively conserve rail populations. Therefore, we investigated changes in the migratory arrival/departure dates for Virginia Rails (Rallus limicola), King Rails (Rallus elegans) and Sora (*Porzana carolina*) at the West Jackson County Regional Land Treatment Facility located north of Ocean Springs, Mississippi. Using *e*Bird data collected by Mississippi Coastal Audubon Society members over the last 24 years, we inspected summarized data for patterns of primary arrival and departure windows indicated by first or last observations of each species at the lagoons, respectively. We regressed the earliest Julian day arrivals in the fall and latest Julian day departures in the spring by year but found no differences in species-specific arrivals or departures within species across years as replicated in graphs of the data. The three species of interest had similar arrival times (Virginia Rails $\bar{x}$ = 273 Julian day, $\sigma_{\bar{x}}$ = 2.7942; Sora $\bar{x}$ = 260 Julian day, $\sigma_{\bar{x}}$ = 2.5725; King Rails $\bar{x}$ = 271 Julian day, $\sigma_{\bar{x}}$ = 5.1579), but King Rails and Sora were present most years until late May (King Rails $\bar{x}$ = 120 Julian day, $\sigma_{\bar{x}}$ = 7.2990; Sora $\bar{x}$ = 129 Julian day, $\sigma_{\bar{x}}$ = 1.5871) compared to Virginia Rails which ranged from mid-April to mid-May (Virginia Rails $\bar{x}$ = 113 Julian day, $\sigma_{\bar{x}}$ = 2.5999). Virginia Rails, in 2017, were an exception as they were last observed on March 30, a much earlier departure date than previous documentation indicated. Trends for King Rails may have been skewed by their non-migratory behavior. Despite data limitations, *e*Bird is useful for gathering baseline information among diverse areas to develop research goals for investigating the interactions of rail migration ecology with climate change, habitat availability, and other potential influential factors.

181
Name: Julia Knight
Major: Human Sciences/Human Dev & Family Studies
Faculty Advisor, Affiliation: Charles Freeman, School of Human Sciences; Joe Wilmoth, School of Human Sciences
Project Category: Social Sciences
Co-Author(s): Taylor Bocage, Tyree Phillips, Taylor Wariner, CheTonya Watkins

Differences in Study Habits Among Human Sciences Students and Academic Performance
The purpose of this study is to investigate the relationship between students' GPA and their study habits. Within the School of Human Sciences, we will examine the differences using study habits as our control between Human Development and Family Science and Fashion Design and Merchandizing. Based on prior research, we expect that a higher score on study habits will have a positive direct correlation with GPA (Malik & Parveen 2016). Study habits measured include reading textbooks, taking notes in class, time management, attention, etc. (2016). We measured students' self-reporte gender, classification, major, GPA, and study habits. We are using the Palsane and Sharma Study Habit Inventory (Palsane & Sherma 1990) to measure students' study habits, and GPA was self-reported. The instrument was created and sent out to students in the School of Human Sciences, via an email and a Qualtrics link. We anticipate analyzing data with a Pearson correlation to determine, if any, the relationship between study habits and GPA. We anticipate using an ANOVA to look at the differences in different Human Sciences majors and their study habits. We predict the results to be students with higher GPAs will score higher on the scale for study habits as well as students with lower GPAs will score lower on the scale. We believe investigating this information is important to find ways to improve academic success by teaching students sufficient study habits and finding ways for students with poor study skills to improve their skills.

182
Name: Will Knotts
Major: Agribusiness
Faculty Advisor, Affiliation: Andrew W. Stevens, Agricultural Economics
Project Category: Social Sciences
REU/Research Program: CALS/MAFES undergraduate research scholars program

Estimating the Relationship Between Crop Rotations and Crop Yield
The purpose of this research is to identify the crop rotation that maximizes the yields of future harvests. Pre-existing research suggests that implementing a crop rotation will provide higher than average yields for at least one if not all crops in the rotation when compared to a mono-crop environment. This is due, in part, to the fact that certain crops can increase the presence or availability of nutrients, which are essential in the production of others. Research suggests that different rotations produce different yield effects on certain crops. This project aims to identify which rotations maximize the potential for a crop specific basis. This will allow producers to alter rotations in order to concentrate on maximizing the yield of their focus crop while producing increased quantities of the secondary crops. I utilize data from Dr. Wayne Ebelhar's Centennial rotation project that focuses on fifteen different crop rotations, on which I have data from 19 years. Dr. Ebelhar's experiment focuses on improving yields in the staple crops of the Mississippi Delta, corn, cotton, and soybeans, by finding the most beneficial rotation. I analyze my data by estimating several fixed-effects regressions to isolate the effect of crop rotations from other determinates of yield. This research contributes to the literature by studying crop rotation dynamics in the Mississippi Delta, which differs significantly from other regions, such as the Corn Belt.

121
Name: David Korba
Major: Mechanical Engineering
Faculty Advisor, Affiliation: Dr. Like Li, Mechanical Engineering
Project Category: Physical Sciences and Engineering

Modeling of Thermal and Chemical Transport between Different Materials Using the Lattice Boltzmann Method
The lattice Boltzmann Method (LBM) is a powerful computational method that can be utilized to model fluid flows and thermal and chemical transport, with intrinsic second-order accuracy. The LBM has been of great interest, particularly due to its inherent simple formulation, easy implementation, capability to handle complex geometries, and low computational cost. However, as with most computational fluid dynamics (CFD) solvers (finite-difference, finite-volume, etc.), a specific boundary condition implementation must be applied at the interface of different materials with distinct properties, e.g., different thermal conductivity and thermal/mass diffusivity. Recently, a series of numerical schemes in LBM have been proposed that attempt to properly implement the conjugate interface conditions, including the continuity of or jumps in the interfacial temperature/concentration and their fluxes. Moreover, in some models it was claimed that the local position and geometry of the interface can be ignored, while still maintaining the accuracy of the LBM. Specifically, these models were constructed with different formulations, such as the addition of a source term, using an enthalpic derivation and conservation method, and modification of the equilibrium distribution functions (EDF) in the LB model. The objective of this work is to perform a detailed accuracy analysis to compare those modified interface schemes with the second-order interface scheme we have proposed. To this end, three representative groups of the modified interface schemes were examined with a series of benchmark tests, for which analytical solutions are available. It is shown that when the local interface geometry is not considered as in those modified schemes, all three groups yield only first-order accuracy for the general situation; our previous interface scheme preserves the second-order accuracy, and the second-order accuracy can be maintained for Group 3 with modified EDF when the scheme was improved to account for local interface geometry.

005
Name: Brady Kruse
Major: Computer Science
Faculty Advisor, Affiliation: Dr. Chris Snyder, Shackouls Honors College
Project Category: Arts and Humanities (Oral Presentation)

A Tribute to England: J.R.R. Tolkien's Works as the Missing Anglo-Saxon Mythology
In 1951, J.R.R Tolkien wrote that he wished to dedicate a mythology to England, an idea that was realized with *The Lord of the Rings*. However, is it possible to artificially create a mythology, especially so for a culture that so little was known about? Using historical discoveries since Tolkien's time, I examine his works in terms of Anglo-Saxon cultural accuracy, the actual definition of mythology, and, through dictionaries and guides, particularly focus on Tolkien's use of Old English as a basis for his universe. By the end of the paper, I intend to show to what extent *The Lord of the Rings* collection is genuine Anglo-Saxon myth, and, in a larger sense, challenge the definition of myth and make an argument for artificially-created myth as a part of it.

052
Name: Danielle Kuper
Major: Biochemistry
Faculty Advisor, Affiliation: Dr. Ashli Brown Johnson, Biochemistry, Molecular Biology, Entomology and Plant Pathology
Project Category: Biological Sciences and Engineering
Co-Author(s): Colby Henderson, GRA, Darrell Sparks, PhD., Nick Mosby, Steve Demarais, PhD.
REU/Research Program: CALS-Undergraduate research

Analysis of White -Tailed Buck Responses To Doe Estrus Specific Compounds
Chronic wasting disease (CWD) is a contagious neurodegenerative prion disease affecting free ranging ruminants including the White-Tailed Deer, *Odocoileus virginianus*. This disease elicits a deterioration in the brain leading to dysfunction causing a "wasting" appearance and is always fatal. Many hunters habitually use urine-based scents to attract bucks, potentially introducing CWD and facilitating its rapid spread in uninfected populations. Synthetic based enticements are thought to be less efficient than estrus doe urine. Therefore, this study aims to elicit a sexual-behavioral response using elevated-volatile compounds found in estrus urine to assist with conservation efforts, wildlife management, and public safety. We hypothesized that elevated volatile compounds containing aromatic, aliphatic cyclic and aliphatic acyclic structures detected in estrus urine, would elicit a sexual-behavioral response from bucks when exposed during rut. To test this hypothesis, we examined buck responses to synthetic urine as a control paired with each treatment (*c*=34 observations), doe estrus urine (*e*=11 observations), treatment 1 (*t1*=10 observations), treatment 2 (*t2*=13 observations). Six stations were assembled around the deer pens each containing two wire-mesh boxes, box a and box b, two game cameras per station for observations, and treatment placements were selected and applied at random. We utilized a *t*-test to determine a significant difference between the means of two groups, and our results indicated treatment two as having statistically greater sexual-behavioral response than the control, synthetic urine. This correlation indicates bucks elicit physiological responses upon exposure to elevated compounds detected in estrus urine during rut. Potentially, these pheromones in conjunction with a synthetic formula may provide future provisions throughout the hunting community for wild life management, conservation and most importantly decreased incidences in efforts to combat the spread of chronic wasting disease.

053
Name: Taylor Ladner
Major: Biochemistry
Faculty Advisor, Affiliation: Shecoya White, Food Science, Nutrition, and Health Promotion
Project Category: Biological Sciences and Engineering
Co-Author(s): Dr. Derris Burnett, Jessa Goodeaux
REU/Research Program: CALS/MAFES URSP
Other Competition(s): Community Engagement Research Track, Public Health Research Competition

Effect of Chitosan Application on Shelf Extension of Refrigerated Catfish Stored at 4°C

Effect of Chitosan Application on Shelf Extension of Refrigerated Catfish Stored at 4°C Taylor Ladner Consumers have increased their demands for more natural preservatives used in food products. Chitosan, a complex polysaccharide found in the exoskeletons of shellfish, has been used to treat high cholesterol, obesity, and Crohn's disease. Chitosan has also been shown to possess antimicrobial properties and potential to be used as an alternate to synthetic preservatives commonly used in foods. Non-frozen, refrigerated catfish fillets were purchased from a local grocery store and aseptically cubed into 25 g samples. The cubes were the separated and subjected to different treatment applications of a patent pending chitosan solution: control (CT), chitosan steam (ST), chitosan dipping (DP), and chitosan electrostatic spray (ES). Samples were tested in triplicate intermittently on days 0, 2, 5, and 8 and were stored at 4°C. Samples were plated on APC Petrifilm, to determine total plate count, and incubated at 37°C for 24 hours. Initial microflora for all samples, including the control, had average counts of 4.87 log CFU/g. By day 2 all samples excluding the dip treated cubes had an increased microbial growth. Microbial counts for all samples increased by the final day. On day 8 both the dip treated, and electrostatic spray treated samples had lower growth compared to the control with 6.19 log CFU/g, 7.03 log CFU/g, and 8.04 log CFU/g respectively. The steam treatment was ineffective in controlling growth and was similar to the control. Both the dipping and electrostatic spray method for applying chitosan proved to be suitable mechanisms to extend the shelf life of refrigerated catfish.

122
Name: Spencer Lampkin
Major: Aerospace Engineering
Faculty Advisor, Affiliation: Dr. Yeqing Wang, Department of Aerospace Engineering
Project Category: Physical Sciences and Engineering
Co-Author(s): Joni Kluss
Other Competition(s): Community Engagement Research Track

Epoxy Resin with Carbon Nanotube Additives for Lightning Strike Damage Mitigation of Carbon Fiber Composite Laminates

Carbon fiber composites are paving the way for light weight, high strength structures in the aerospace industry. While the benefits of carbon fiber composites are undeniable, they also have their drawbacks. Crippling damage due to lightning strikes is one of them. The current solutions to reducing the damage due to lightning includes adding expensive and heavy copper mesh into the laminate. A potential solution to this problem would be to add a lightweight conductive additive to the epoxy resin instead of a copper mesh. Carbon nanotubes are chosen as the additive to create an electrically conductive resin matrix and hence increase the overall electrical conductivity of the composite. Increasing the conductivity will decrease the damage owing to a faster dissipation of lightning-strike-induced Joule heating, and more importantly increase the residual strength. In this work, we quantified the increase in conductivity through measuring the electrical resistance using the four-probe method. Results showed that the electrical resistance of the sample with carbon nanotube additives is 2 orders of magnitude lower than the one with no additives. In addition, lightning strike tests have also been carried out with both samples using an artificially generated 100 kA waveform A pulsed current. Results showed that the carbon nanotube additives significantly mitigated the visible lightning strike damage.

123
Name: Lucia Lang
Major: Aerospace Engineering
Faculty Advisor, Affiliation: Adrian Sescu, Aerospace Engineering
Project Category: Physical Sciences and Engineering
Other Competition(s): Community Engagement Research Track

Acoustic Validation of a Martian Atmosphere Rotor
In coordination with NASA Langley Research Center and Jet Propulsion Laboratory, NASA Ames has been assisting in the development of a helicopter able to fly on Mars and scout for rovers. This scout helicopter must meet unique design criteria; although the gravity on Mars is approximately 38% that of Earth and thus aircraft would weigh less, the Martian atmosphere is 99% less dense than Earth's and therefore the performance of a rotor in this environment would be impaired. The Mars Helicopter rotor was tested in the Martian Surface Wind Tunnel located in the Planetary Aeolian Laboratory (PAL) on the NASA Ames campus. The PAL is a pressure chamber that can be pumped down to very low pressure, typical to other planetary environments such as Mars. Tests of the Martian rotor were conducted in the wind tunnel at different RPMs and pressure levels and several sensors were active simultaneously during every test to measure different parameters. Acoustic data captured from the wind tunnel was intended to characterize the background noise of the motor and boundary layer as well as blade passing frequency of the rotor.
Acoustic validation studies will be performed using a mid-fidelity desktop CFD code RotCFD, which was developed by Sukra-Helitek to model the computationally intensive problem of fluid interactions with rotorcraft. The code simplifies the fluid dynamics problem to lower the burden enough to run on a desktop computer by modelling rotors as momentum sources and utilizing an unsteady Reynolds-averaged Navier Stokes flow equation solver. Data will be exported from RotCFD and will be processed for analysis using MATLAB. The purpose of this validation study is to verify the acoustic characteristics of the Martian rotor and the MARSWIT determined from the acoustic data taken, as well as to ensure RotCFD's effectiveness as a research tool.

183
Name: Elijah Layman
Major: Political Science
Faculty Advisor, Affiliation: Thessalia Merivaki, Political Science
Project Category: Social Sciences

Analyzing Online Engagement as a Predictor of Turnout in the 2018 U.S. Midterm Elections
Voter turnout in America has long been disparate when compared to other western democracies, and despite lawmakers' focus on "convenience" reforms, turnout in the United States is still abysmally low in state and local elections. Given a substantial body of literature pointing both toward and beyond solutions that incorporate the economic rational-choice model of voter participation (the framework by which these solutions seek to address low voter turnout), scholars have noted the importance of civic engagement as a vital component of citizens' inclination to vote. Online search engines, ubiquitous in our society, likely present a valid measure of such engagement, and this research focuses on the frequency of online searches relating to elections in order to take advantage of this notable tool.
Using Google Trends, which directly measures and compares the frequency of searched terms on the widely used online search engine Google, I employ a state-level analysis of election-related search queries' popularity across the United States for comparison with states' turnout rankings in the 2018 U.S. midterm election. This election saw a significant increase in turnout when compared to previous midterms, especially the immediate former, 2014, which marked a 72-year low. Incorporating phrases and topics such as, "how to register to vote," and "2018 United States Election," will give a broad overview of voters' use of Google to locate information relating to the midterm election of 2018, and indicate the strength of using this tool to understand the level of citizens' civic engagement by way of the general interest in politics leading up to the election.

124
Name: Seth Lichlyter
Major: Aerospace Engineering
Faculty Advisor, Affiliation: Rani Sullivan, Aerospace Department
Project Category: Physical Sciences and Engineering
Co-Author(s): Daniel A. Drake, Rani W. Sullivan
Other Competition(s): Community Engagement Research Track

Effects of Angle Stitching on Composite Materials

The goal of this research is to investigate the influence of angled through-the-thickness stitches on the fracture toughness of three-dimensionally reinforced sandwich composites. Fracture toughness represents the required energy to propagate a pre-existing initial delamination within a material. By analyzing the resulting change in fracture toughness based on various angles of stitching, the fracture toughness can be tailored to minimize the amount of delamination that occurs. Manufacturers may then weigh the costs of adding stitch mass and production time for a product to the benefit of increased resistance to crack growth. In this study, sandwich composites with angled (90°, 67.5°, and 45°) through-the-thickness reinforcements will undergo single-cantilever beam tests at various angles of reinforcement insertion to determine the fracture toughness during the propagation of delamination. These sandwich composites materials are comprised of outer face-sheets and an internal core structure. The face-sheets are fabricated from non-crimped carbon fabric in a laminate configuration of [(0/90)s/Core/(0/90)s]. The core used in this study is a 110 kg/m^3 polymethacrylimide (Rohacell HERO™) foam. The stitching was inserted manually by hand into the sandwich composite preform at specific stitching angles and in a chain stitching configuration. After stitching, the sandwich composite preforms were cured using a vacuum-assisted resin transfer molding process with an out-of-autoclave resin system. After fabrication, the sandwich composite will be sectioned into single-cantilever beam test coupons to determine the fracture toughness. The estimated fracture toughness of each sandwich composite configuration with uniquely stitched angles will then be obtained and discussed.

125
Name: Wenhua Lin
Major: Aerospace Engineering
Faculty Advisor, Affiliation: Rani W. Sullivan, Department of Aerospace Engineering
Project Category: Physical Sciences and Engineering

Development of a LabVIEW Interface for Optical Measurement System

Optical fibers are being increasingly used as a non-destructive testing method for the measurement of physical quantities such as strain, temperature, and pressure. They provide significant advantages over other strain or temperature sensing devices due to their small size, light weight, immunity to electromagnetic interferences, and the ability to record near continuous data. The LUNA ODiSI-B optical fiber system can record strain or temperature as a function of length and time. However, the system is not capable of recording strain or temperature as a function of applied load or displacement. An in-house bridge system is used to record the load and displacement data from an Instron 8800 series test frame. Since two separate systems are being used, different trigger times and sampling frequencies will result in different number of data entries in each of the outputs. Therefore, manual matching of the test data is required. A LabVIEW program was created to automate the process of combining the mechanical load and displacement, along with the optical measurements real time during testing at a user-defined frequency. The program was validated by testing three aluminum tensile specimens. Strain at the center of each specimen was obtained using a foil strain gauge. Two moduli of elasticity were computed for each specimen using the strain data recorded from the LUNA ODiSI-B and the strain gauges. Both moduli of elasticity were in good agreement.

184
Name: Rhodes Lipsey
Major: Psychology
Faculty Advisor, Affiliation: Danielle K. Nadorff, Psychology, Grandfamilies Lab
Project Category: Social Sciences
REU/Research Program: Grandfamilies Lab

Custodial Status to Depressive Moderate by Opposition Defiant Disorder and Conduct Disorder
Custodial Status to Depressive Moderate by Opposition Defiant Disorder and Conduct Disorder With prevalence rates ranging from 2-16%, Oppositional Defiant Disorder is one of the most common behavioral disorders seen in children (APA 2000). Furthermore, 50% of those cases will develop into Conduct Disorder. The main social risk factors for the development of Oppositional Defiant Disorder are family dysfunction, alcoholic parents, and lower socioeconomic status. Often, these factors are reported in families of grandparents raising grandchildren, implying a connection may exist between depressive custodial grandparents and the development of Oppositional Defiant Disorder. Detached, depressive caregivers will contribute to the development of behavior disorders in children, due to feelings of rejection and abandonment. This paper explores the connection between depressive custodial grandparents and the development of behavioral disorders such as Oppositional Defiant Disorder and Conduct Disorder.
Two data sets were run and analyzed with one recording 1,510 responses and the other recording 919 responses. 333 responders were grandparents raising grandchildren, 227 of them reported defiant behavior in their custodial grandchildren. 314 of the 489 children who lived either briefly or permanently with their grandparents reported high levels of depressive symptoms in their custodial grandparents. These statistics reveal a connection between depressive symptoms of guardians and oppositional behavior disorders in children.

185
Name: Rebekah Lowe
Major: Psychology
Faculty Advisor, Affiliation: Deborah K. Eakin, Psychology
Project Category: Social Sciences
Co-Author(s): Dustin Finch

“There’s Rosemary; That’s for Remembrance.” Was Shakespeare Right About Context Effects on Memory?
Memory is better when information is tested in the same context in which it was learned. For example, subjects who studied a list of words either on land or under water did best when they were tested in the same location, although taking a test under water might not seem ideal (Godden & Baddeley, 1975). Will similar results occur when the context of odor is manipulated? The hypothesis was that memory would be better when the odor present during a test matched the odor present during study as compared to when the odors did not match. Participants studied a list of 100 word (10 words from each of 10 categories). Either lemon or rosemary essential oils were diffused into the room using an electric water diffuser, creating two study/test match conditions (lemon/lemon, rosemary/rosemary) and two study/test mismatch conditions (lemon/rosemary, rosemary/lemon). Several control study/test conditions were also included: no odor/no odor, lemon/no odor, rosemary/no odor. After an interval, participants were moved to a different room where either the same odor or the opposite odor was being diffused. They took a final memory test which required them to type all of words they remembered studying. For the lemon conditions, memory varied in unpredicted ways over and above match manipulation. Therefore, memory results are reported for the rosemary conditions only. Memory was better when rosemary oil was diffused during study and test than when rosemary oil was diffused during study and lemon oil was diffused during test. The implication of these results for real-world studying will be discussed, as well as the theoretical implications for research on context-dependent memory.

054
Name: Tyler Lowe
Major: Biological Sciences
Faculty Advisor, Affiliation: Glenn B. Crisler II, Chemistry
Project Category: Biological Sciences and Engineering
Co-Author(s): Glenn B. Crisler II, Cintly Guzman Hernandez, Andre Orr, Roger Davis, Tyler Lowe, Jessie Moore, James Smith, Deb Mlsna, Jac Varco
Other Competition(s): Community Engagement Research Track

Biochar Soil's Laboratory
The purpose of this laboratory is to understand how different Mississippi soil types retain nutrients (phosphate), and how this can be improved. Mississippi is a huge agricultural state, so it is important for students to understand how soil chemistry relates to crop yields and the consequences of irresponsible farming (largely the health of the watershed). Students will conduct a series of soil tests in order to classify their soil with respect to permeability, flow-through, pH, texture, organic matter content, and phosphate retention. Students will use this knowledge to understand how agriculture plays a role in ocean and watershed health, and how soil testing, soil amendments, and responsible farming practices can minimize agriculture's footprint. Students also suggest potential remediation depending on their soil test results.
Soil science is a branch of chemistry that studies soil physical and chemical properties. Soil characteristics have profound consequences with respect to the fate of plant nutrients (Example phosphorus) which affects the soil's ability to support plant life. This relationship between soil properties and successful plant growth has been noted for centuries. In the 5th century, Romans implemented a crop rotation system that helped keep certain nutrients in the soil so successful crop yields could be obtained consistently. Modernly, soil testing has been standardized where soils are tested for a variety of properties including nutrient content, CEC, texture, and pH. A report is sent to the person requesting the test along with suggested fertilizer application rates. Mississippi has a diverse profile of soils, which include Southern Mississippi Valley Alluvium/Delta, Southern Mississippi Valley Uplands/ Brown Loam Hills/ Thin Loess, Coastal Plain, Blackland Prairie, Gulf Coast Marsh, and Eastern Gulf Coast Flatwoods.
In this laboratory experiment, students will pick a soil and characterize it according to its phosphate retaining characteristics: soil texture, pH, organic matter content, and permeability.

055
Name: Andrew Lowery
Major: Forestry/Environmental Conservation
Faculty Advisor, Affiliation: Dr. Courtney Siegert, Department of Forestry
Project Category: Biological Sciences and Engineering
Co-Author(s): Dr. Heidi Renninger, Dr. Randall Rousseau
REU/Research Program: Undergraduate Research Scholars Program

Hydrological Impacts of a Short Rotation Woody Crop Plantation
Around the world, short rotation woody crops (SRWCs) such as eastern cottonwood (*Populus deltoides*) and a variety of different hybrid poplar taxa are growing in popularity due to their rapid production of biomass and their viability to produce renewable bioproducts such as carbon fiber and polymers. This swift accumulation of biomass, however, can stress the water budget through increased canopy interception, leading to decreased canopy throughfall. Much research has been conducted on various aspects of SRWCs, however little information is available concerning the interactions between canopy throughfall and biomass production, especially with regards to the water budget of the surrounding ecosystem and landscape. This study sought to analyze net throughfall to determine the effects that short rotation woody crop plantations have on water partitioning and soil moisture availability. Preliminary data shows that mean net throughfall was at 62.4% in the first year of growth. Seasonally, net throughfall was at 61.0% and 75.7% in the first growing season and in the first dormant season, respectively. It is predicted that net throughfall will decrease as the plantation grows in age. Because of the accelerated growth of SRWCs and the stresses on the hydrologic cycle that they place, this study quantifies their effects on the water budget that can be beneficial to both fellow researchers and landowners.

056
Name: Eric Lucas
Major: Biological Engineering
Faculty Advisor, Affiliation: Dr. LaShan Simpson, ABE
Project Category: Biological Sciences and Engineering
Other Competition(s): Community Engagement Research Track

High Phosphate Level in African-American Diets Lead to Vascular Calcification
One of the biggest health disparities affecting families across the United States, primarily African-Americans, is cardiovascular diseases and complications. The leading factor causing this phenomenon is the calcification of the vascular system. Studies have shown that phosphate found in everyday foods begins the downward cascade of cardiovascular health. Socioeconomic lines and health disparities are often two pathways that cross. Food Deserts (FD) are a common issue that effect low socioeconomic communities across the United States, more so African-American communities. FD's limit the access for people in the community to attain fresh food which often results to only fast food options. These processed foods from fast foods and grocery outlets are found to have high concentrations of inorganic phosphates. Phosphates are highly absorbed in digestion and lead to upregulation of biomarkers of vascular calcification (VC) and other cardiovascular issues. The aim of this study is to establish how to effectively lower phosphate levels and intake. By successfully lowering phosphate levels/intake, this will decrease or even prevent VC. Positive outcomes such as lowering VC would have a huge impact on the cardiac health of millions.

126
Name: Ryan Lurk
Major: Forestry/Forest Products
Faculty Advisor, Affiliation: Dr. Hyungsuk Lim, Sustainable Bioproducts
Project Category: Physical Sciences and Engineering
Co-Author(s): Sachin Tripathi, Bojan Cosovic

Effects of Preservative Treatments on the mechanical properties of Southern Pine cross-laminated timber
This project aims to investigate the effects that preservative systems on the properties of Cross Laminated Timber (CLT). CLT is a mass timber product that consists of dimensional lumber layers glued orthogonal to each other, which yields a stronger and more dimensionally stable product. All CLT test specimens were constructed using Southern Yellow Pine lumber. Untreated CLT specimens were compared to the ones treated with Micronized Copper Azole Type C (MCA-C) at a retention level of UC4A for ground contact applications. The laminations of the treated CLT specimens were pressure-treated prior to adhesion with Polyurethane (PUR) resin. Delamination, block-shear, and short-span bending tests were conducted following the ANSI/APA PRG 320 standard. No significant difference was found between two groups in terms of delamination and block-shear tests, which indicate that PUR can be used for manufacturing MCA-C treated CLT.

186
Name: Michayla Mack
Major: Psychology
Faculty Advisor, Affiliation: Dr. H. Colleen Sinclair, Psychology, Social Science Research Center
Project Category: Social Sciences
Co-Author(s): Chelsea Ellithorpe, Jessica Weiss Utley

Love in Iran
Understanding and measuring passionate love has been debated among relationship researchers (e.g., Hatfield, Bensman, & Rapson, 2011). Few studies exist on passionate love outside of Western cultures, which introduces the debate of whether the concept of love is universal or culturally-specific. Furthermore, the available literature regarding passionate love does not provide comprehensive evidence on the relationships, attitudes, and experiences of young people in Eastern countries, such as Turkey (Yildirim, Hablemitoglu, & Barnett, 2014). The current study examines the cultural influence on relationship indices within an Eastern culture and the validity and reliability of standardized Western measures of love

(Hatfield & Sprecher, 1986; Braiker & Kelley, 1979), commitment (Lund, 1985) and trust (Rempel et al., 1985), when translated and presented to a community sample of Iranian adults. Participants (n=620) were involved in romantic relationships, with an average age of 25.9 and an average relationship duration of 19.9 months, with the majority being married (32%). All scales had acceptable reliability. Scales were correlated, indicating construct validity. When relationship quality indices were used in a linear regression predicting likelihood to stay in the relationship, love and trust were found to be positive predictors, and distrust was found to be a negative predictor. In comparison to Western cultures, the Turkish participants' perception of love was found to be essentially the same, indicating that love may be a universal concept. However, further investigation of trust should be examined in future studies in Iran, as this construct was found to be different than in Western cultures. Due to the religious legal system related to dating and marriage within Iran, it may be important to consider religiosity in future studies of love and trust in Persian culture, which could provide insight into how religion affects their differing views on trust.

057
Name: Luci Makamson
Major: Biological Sciences
Faculty Advisor, Affiliation: Dr. JoVonn Hill, Department of Biochemistry, Molecular Biology, Entomology and Plant Pathology
Project Category: Biological Sciences and Engineering

Study of Genus *Paroxya*
Paroxya is a genus of grasshoppers found in eastern North America that inhabit wet areas such as ponds, swamps, and coastal salt marshes (Capinera, Scherer, Squitier, 2001). *Paroxya* is described as a medium sized species with a moderately large head and large eyes (Blatchley, 1920). The males of the genus have antennae that are least half the length of the body, but can be longer; a mostly flat disk of pronotum cut by the last transverse sulcus, prozona that is one-half to one-third as long as the metazona; tegmina and wings that vary in size but are always longer than the pronotum; hind femora that are of average stoutness and either as long or longer than the abdomen; a subgenital plate that is of equal width throughout; and strongly exerted ovipositor valves with irregular upper edges and the smooth lower edges (Blatchley, 1920). This genus shows many similarities with genus *Melanoplus* but can be distinguished by the length the of the antennae (Capinera et al., 2001). To date, there are seven described species of *Paroxya*, but there has been no formal taxonomic revision of the genus. For this study, three species of the genus Paroxya were dissected and imaged to determine the variability of the genitalia between distinct species. The species focused on are *Paroxya atlantica*, *Paroxya clavuliger*, and *Paroxya hoosieri*. For *P. atlantica*, grasshoppers from Mississippi, Texas, and Florida were dissected and imaged to determine variability among a single species. The images are of the phallic complex of male grasshoppers with close attention to the species-specific valves of the endophallus.

187
Name: Sara Butler Makamson
Major: Educational Psychology
Faculty Advisor, Affiliation: Dr. Nicole Leach, Department of Counseling, Educational Psychology and Foundations
Project Category: Social Sciences
Co-Author(s): Anna Fennell, Taylor Dalrymple

Media Multitasking and its effects on Academic Performance
Media multitasking is a new and recent phenomenon that includes using two or more media devices at one time that is capturing the attention and minds of young adults across college campuses. The purpose of this study is to investigate whether media multitasking has an effect on a student's academic performance. The research question is: does attention moderate the relationship between media multitasking and academic performance? We have collected data through observation. The estimated sample size is 90 undergraduate students. We are conducting this research across two class periods. The preliminary findings indicated that the students performed better on using their preferred note taking style. We also found that when the students used their non-preferred way of taking notes, the scores were not as high from the first day. The preliminary results suggested that students performed better on the quiz using their preferred style of note

taking. These results indicated that students perform better using their preferred note taking style. The data showed that because students learn better using their preferred style of note taking, teachers should encourage students to figure out what style of note taking benefits them the most.

188
Name: Randeep Reddy Marri
Major: Psychology
Faculty Advisor, Affiliation: Arazais Oliveros, Psychology
Project Category: Social Sciences

Characteristics of a public mass shooter: review of a taxonomy and treatment recommendations
Characteristics of a public mass shooter: review of a taxonomy and treatment recommendations According to Congressional Research Service (CRS) the definition of mass shooting is an incident occurring in relatively public places, involving four or more deaths, which is distinguished from familicide (limited to your family members), and killing that happens during the process of some other crime, like a robbery. According to FBI records and criminology research, the actual number of public mass shooting deaths (547) and casualties (1023) between the years 1983 and 2013 were a small proportion of the total number of deaths. While these distinctions are made in the legal sector, do they serve to provide a taxonomy to understand aggression that results in multiple deaths?
According to the Clinical Psychologist Peter Langman, school shooters typically fall into three categories, which he labels psychopathic, psychotic and traumatized. A person labeled as psychopathic could be described as lacking empathy for others. Being psychotic would include experiencing hallucinations and delusion (e.g., paranoid beliefs) and disorganized thinking and behavior that interferes with functioning (e.g., social skills). A person described a traumatized may have experienced abuse and domestic violence. The current study involves reviewing recent empirical research on these categories to determine if these three profiles represent the full range of public targeted aggression (mass shootings) and to summarize empirically supported intervention programs that can play a role in helping these individuals so they don't pose a danger to society.

011
Name: Madison Martin
Major: Art/Fine Arts
Faculty Advisor, Affiliation: Dominic Lippillo, Photography
Project Category: Arts and Humanities (Poster)

Convergence
The concept of my thesis body of work, titled Convergence, is to reveal the effect nature has on us and how it can affect our mental state. My thesis is exhibited through a series of photographs, which have been thought out, explored, and captured throughout the semester. My personal investment in this project is fueled by my own clarity of how energy within nature can affect my mental state and how there is a harsh reality behind this fact. In addition to furthering my research of artists bound to mental disorders, art history, psychology, and biology, I have referenced the book "The Aesthetics of Disengagement: Contemporary Art and Depression." It has guided me through the bonded ties of depression and art. This book, among other books, films, and articles have helped clarify my understanding of the relationships between these topics. It has allowed me to personally illustrate these topics through my body of work. While mental disorders such as depression, anxiety, and panic disorder are "treatable" illnesses, they are trivial and bound to numerous factors including aspects of nature. Mental illnesses communicate through energies which create a prevalent danger. They conjunctively seep through our society like a parasite. This is relevant for the viewer, because it evokes an awareness or understanding for this danger or truth. It is my utmost desire to radically and passionately expose this numbing, disturbing reality through art.

127
Name: Vivian Mayora
Major: Chemical Engineering
Faculty Advisor, Affiliation: Dong Meng, Chemical Engineering
Project Category: Physical Sciences and Engineering

Telechelic polymers
Telechelic polymers are macromolecules that carry hydrogen bonding sites at each of the two chain ends. Each polymer molecule functions as a building block. In solutions these building blocks can connect to each other through forming Hydrogen bonds. This association process is in dynamic equilibrium, producing a plethora of assembled products that varies in the number of building blocks being connected– i.e. effective molecular weight, as well as in the manner building blocks being arranged – i.e. architectures. Difference in the distribution of the assembled products will be eventually manifested by the different physical properties (such as viscosity) exhibited by the polymer solution. In this study, using Monte Carlo simulations, we want to illustrate how we can exert control on this assembly process, through varying the building block molecular weight, polymer concentration, and hydrogen bonding strength. Knowledge obtained from this study will be useful in using telechelic polymers for creating fluids whose viscosity can be finetuned.

189
Name: Emily McCabe
Major: Biological Engineering
Faculty Advisor, Affiliation: Alta Knizley, Mechanical Engineering
Project Category: Social Sciences

Making a Mentor: Cultivating Outreach Culture and Soft Skill Development in Engineering
Engineering education and outreach has been a topic of interest for both K-12 programs and universities across the country. There's a high demand for STEM positions, and companies are trying to recruit not only capable candidates, but diverse and engaged employees. It is important to not only create effective K-12 programs, but also to engage college students as they approach the job market. While many K-12 programs exist in varying forms, there has been an ongoing conversation about their short-term and long-term impacts. There is evidence that supports the necessity for well-trained, enthusiastic mentors to run these K-12 outreach programs. The need to engage and develop college students and the need for engaging mentors for K-12 students work in an interdependent cycle, where strengthening mentors also strengthens the K-12 student experience. The purpose of this study is to examine best practices for engineering mentor development in order to improve efficacy of outreach programs while simultaneously improving the skillsets of engineering students. Focuses will include the impacts of training mentors from a personal development view, as well as assessing their success as mentors during a K-12 outreach program in place at Mississippi State. There will also be an assessment to determine whether these diverse, trained mentors impact the efficacy of the program and how they impact the participants. Surveys will be conducted throughout this process to evaluate attitudes and skill sets of a core team leading the event and of faculty, student mentors, and K-12 participants. Observations will also be noted from training sessions and outreach sessions to help assess improvement from past years of outreach events. Initial survey results from faculty and student volunteers indicate that soft skill development for engineering students is needed, and observations from core team suggest that mentorship can be improved through training.

058
Name: Victoria McCaffrey
Major: Chemical Engineering
Faculty Advisor, Affiliation: Dr. R. Mark Bricka, Dave C. Swalm School of Chemical Engineering
Project Category: Biological Sciences and Engineering
Other Competition(s): Thesis Research Competition (TRC)

Evaluation of Various Extractants for Removing CCA from Out-of-Service Pressure Treated Wood
Copper-Chromium-Arsenate (CCA) treatment is used as a wood preservative to prevent wood decay and insect infestation. While banned for residential use, it remains a method for wood preservation for utility poles and railroad cross-ties. Prior to 2005, it was the most used method for wood preservation, and it is predicted that the peak of out of service CCA treated wood will be reached by 2020. Our research focuses on removing the CCA from the wood. In this study, four different chemicals – Sodium Hypochlorite (NaOCl), Hydrogen Peroxide (H2O2), Monopotassium Phosphate (KH2PO4), and Water (H2O) – were evaluated at four different concentrations in liquid solution strength per % volume:

- 0.08 %
- 1.70 %
- 6.70 %
- 16.70 %

Each concentration was tested with three different ratios:

- 1 gram of chemical in 60 ml
- 3 grams of chemical in 60 ml
- 5 grams of chemical in 60 ml

It was previously determined that these chemicals at a concentrations higher than 16.70 % saw no impact on CCA removal. The chemical that extracts the largest amount of copper, chromium, and arsenic was determined. The results of the study show NaOCl and H2O2 removed the largest mass percentage of arsenic from the wood, but both chemicals also degraded the wood. To efficiently extract the CCA chemicals with minimum wood loss, this study found that a solution of NaOCl at 16.70 % and 3 grams in 60 ml provided optimum CCA removal with minimum wood loss.

128
Name: Martin McCandless
Major: Aerospace Engineering
Faculty Advisor, Affiliation: Keith Koenig, Department of Aerospace Engineering; NOAA Advisors: Tim Fuller-Rowell, Rodney Viereck, Naomi Maruyama - NOAA/SWPC, CIRES-CU Boulder
Project Category: Physical Sciences and Engineering
Co-Author(s): Mariangel Fedrizzi, Zhuxiao Li, Tzu-Wei Fang, Joseph Schoonover, George Millward, Rodney Viereck
Other Competition(s): Community Engagement Research Track, Public Health Research Competition

Modeling the Variability in the Thermospheric Mass Density
Recent accelerometer observations onboard Low Earth Orbit (LEO) spacecraft have revealed a considerable amount of variability in thermospheric neutral mass density on various temporal and spatial scales not only during periods of elevated geomagnetic activity but also during quiet times. Accurately predicting the upper atmosphere density is crucial for estimating the trajectory of LEO spacecraft since satellite drag introduces errors in orbit determination solutions for the rapidly increasing number of man-made objects. The purpose of this study is to quantify the degree of variability in the neutral mass density in the thermosphere and identify the possible causes by utilizing the coupled Whole Atmosphere Model and Ionosphere-Plasmasphere-Electrodynamics (WAM-IPE) that is running in real-time development mode in preparation for operations at NOAA/SWPC. In this presentation, the mass density variations for various geophysical conditions are compared between the WAM-IPE model, accelerometer satellite observations from GOCE, and the Coupled Thermosphere, Ionosphere, Plasmasphere, and electrodynamics (CTIPe) model that has been well established by continuous validation efforts for over a decade. The results comparing WAM-IPE with GOCE and CTIPe suggest that the WAM-IPE model can capture the normal diurnal/latitude neutral density structure as well as the response and recovery to geomagnetic storms. With appropriate parameters in place, the results yield reasonable agreement across the neutral mass density and temperature comparisons. Furthermore, the neutral composition and energy drivers are validated to

improve the storm-time and recovery responses. Sensitivity analysis is carried out to quantify the neutral mass density variability toward improved predictions of satellite orbits.

059
Name: Emili McClure
Major: Animal and Dairy Sciences (Pre-Vet)
Faculty Advisor, Affiliation: Clay A. Cavinder, Animal and Dairy Sciences
Project Category: Biological Sciences and Engineering
Co-Author(s): C. P. Heaton, D. Sajeev, C. O. Lemley, T. T. N. Dinh
REU/Research Program: Undergraduate Research Scholars Program
Other Competition(s): Community Engagement Research Track

Effect of short-chain fructoogliosaccharides on total antioxidant capacity and thiobarbiturate acid reactive substances in mature and senior stock-type horses
Oxidative stress (OS) causes many health complications through the destruction of cellular components as individuals age or are exercised. Reactive oxygen species can be used to measure OS through trolox equivalent antioxidant capacity (TEAC) and thiobarbiturate acid reactive substances (TBARS). Prebiotics have been used to reduce plasma OS markers in numerous species, however, the effect of short-chain fructooligosaccharides (scFOS) on OS have not been studied in equines. Ten healthy stock-type horses were blocked by age into 2 groups: mature (MA; n = 5; 7.0 ± 0.87 yr) and senior (SR; n = 5; 22.6 ± 1.1 yr) to analyze effects of scFOS on TEAC and TBARS. Horses were randomly assigned to 1 of 3 diets for 25 d before transition to another diet. Diets were bermudagrass offered at 1.5% BW/d hay as-fed, or hay with either a ration balancer (CON) or ration balancer with scFOS added at a rate of 2.5 g/kg (PRE). On d 21, horses were fasted overnight for 12 h with blood samples taken immediately prior to feeding (0), 30, and 60 min postprandial. Oxidative stress markers were analyzed for the 2 ration balancer diets. Statistical analysis was performed with SAS using the MIXED procedure with horse within diet as a random effect and significance at $P \leq 0.05$. Trolox equivalent antioxidant capacity was unaffected by diet ($P = 0.827$) or age ($P = 0.347$). Time ($P = 0.006$) was significant for TBARS which increased postprandially regardless of treatment or age. Consistent with other species, higher levels of OS as indicated by TBARS was found in SR compared to MA regardless of time or diet ($P = 0.037$; 4.491 µM vs. 3.412 µM, respectively). These results indicate that scFOS do not seem to be effective in reducing OS in SR and MA horses.

129
Name: Sam McDevitt
Major: Computer Engineering
Faculty Advisor, Affiliation: Ron Unz, Institute for Clean Energy Technology
Project Category: Physical Sciences and Engineering
Co-Author(s): Jay McCown, Jake Hartzburg, Adam Randal, Devin Neal
Other Competition(s): Community Engagement Research Track

The Use of Rapid Prototyping for the Development of Autonomous Surveying Systems Controls.
Autonomous survey systems are needed to accelerate, reduce cost, and improve safety of the remediation process of depleted uranium impacting U.S. Army facilities. These systems provide a safer alternative to traditional walkover surveys by decreasing human exposure to ionizing radiation and unexploded ordinance The autonomous systems are composed of global positioning systems, light detection and ranging sensors, inorganic scintillators, wireless telemetry systems and custom hardware for power and controls.
Hardware for power and control systems went through rapid prototyping for installation on the surveying systems. Printed circuit boards (PCB) were designed in EAGLE, a PCB design software by Autodesk. PCB designs were milled using the PnC circuit board router in the robotics prototyping laboratory at the Institute for Clean Energy Technology. Finally, the circuit boards were then completed by adding the necessary components for any needed functional part. Design changes could be made, and new PCBs could be quickly manufactured in a few hours.
The autonomous platforms needed a remote emergency stop system in the event the systems begin to behave erratically. The emergency stop controls system being developed uses a Microchip PIC32MX250F128B for system processing and a

LINX-HUM-900 Pro for RF communication. The receiver has a series of relays to shut off power to the motor controller on the autonomous systems in case of emergency. The receiver also utilizes a Universal Asynchronous Receiver/Transmitter (UART) to RS232 chip to send instructions to the motor controller. The controls system has one transmitter that can be set to control an individual platform using a joystick. This emergency stop controls system allows for safer testing of platforms as we prepare to design a three-meter-wide platform.

060
Name: Liam McDougal
Major: Mechanical Engineering
Faculty Advisor, Affiliation: Lauren Priddy, Agricultural and Biological Engineering
Project Category: Biological Sciences and Engineering
Co-Author(s): Luke Nichols, Weitong Chen

Investigating Effects of Scaffold Offset on Mechanical Properties of 3D printed Polylactic Acid Scaffold
Presently, the 'gold standard' treatment of a large bone defect is autografting, which harvests bone from a non-load-bearing site in the patient. However, due to limited tissue availability and the complication of the secondary operations, an alternative treatment is desirable. The overall purpose of this research is to use additive manufacturing (AM) to print a biodegradable polymer scaffold to be implanted in the defect site of a patient's bone. Ideally, this scaffold will have similar mechanical properties to those of the bone tissue. Since the porous structure strongly influences the mechanical properties, three different offset values (0%, 50%, or 100%, the distance between struts on top of each other) for the porous structure were investigated through compression test. The purpose of this research experiment is to determine which offset value results in the best mechanical properties. We hypothesize that the 0% offset group will result in the highest Young's modulus and being similar to the cancellous bone.

006
Name: Colleen McInnis
Major: Art/Fine Arts
Faculty Advisor, Affiliation: Dominic Lippillo, Art-Photography
Project Category: Arts and Humanities (Oral Presentation)
Other Competition(s): Thesis Research Competition (TRC)

Modern Studio Techniques Matched with Alternative Processes in the Pursuit of Identity Portraiture
In the photographic community, the idea of identity portraiture is a well-known style of artistic representation. Studio portraiture has become a standard in modern life when it comes to sitting and smiling for a school portrait, or looking at tabloids and the social media of celebrities. However, the concept of identity portraiture is a process that historically has been debated for its subjective nature. This research shows the connection between modern studio portraiture and the alternative processing of the images to show the "True Identity" of the subject. In Roland Barthes "Camera Lucida," Barthes uses his knowledge of symbols and linguistics to find a photograph of his late mother that showed her identity, during this journey he explains the idea of the punctum and how it effects how we see photographs. The punctum is a complex set of aesthetic elements that differs subjectively between each viewer of an artistic piece. Using this idea of the punctum you can begin to analyze a photographs connection to the viewer and the interpretation they find in it. On the other hand, Barthes also includes the idea of the Studium, as the literal interpretation of a piece, bringing together these two opposing ideas an artist can analyze and interpret imagery on both physical or observable aspects of a piece and the uncontrolled connection to the piece. Using this idea of the stadium and the punctum this research began to find how they can relate to the alternative processes of identity portraiture, learning about what makes a portrait aesthetically pleasing, what impact it has on the viewer, and then being able to control that impact through alternative processes ranging from emulsion transfers to historical processes.

061
Name: Thomas Miles
Major: Wildlife & Fisheries Science/Aquaculture & Fisheries Science
Faculty Advisor, Affiliation: Graham Rosser, CVM Basic Sciences
Project Category: Biological Sciences and Engineering
Co-Author(s): Justin M. Stilwell, Ethan T. Woodyard, Alvin C. Camus, Matt J. Griffin
REU/Research Program: MSU CVM Basic Sciences Undergraduate Research

Morphological, histopathological and molecular identification of an Echinochasmus sp. metacercaria in farm-raised catfish production systems in northeast Mississippi

Farm-raised catfish remain the most commonly cultured freshwater food fish in the United States, with most of their production concentrated in the southeastern states. These earthen ponds are static systems open to the external influences and are ideal environments for the propagation of trematode parasite life cycles. Recently routine case submissions of channel catfish Ictalurus punctatus to the MSU CVM Aquatic Research and Diagnostic Laboratory have revealed an uncharacterized echinostomatid metacercaria surrounding and within the cartilage filaments of the primary gill lamellae. These metacercariae were morphologically consistent with the genus Echinochasmus, a seldom encountered parasite in farm-raised catfish. To further investigate these accounts, catfish and forage fish species were sampled from two production ponds on a farm identified as harboring fish with metacercaria. Microscopic examination of gill wet mounts revealed 100% infection prevalence in channel catfish, western mosquitofish Gambusia affinis, inland silversides Menidia beryllina, and blue gill Lepomis macrochirus. Gill tissue from channel catfish and whole forage fish were fixed in formalin for histopathological examination. Ethanol preserved metacercaria from each fish host were used to molecularly identify the Echinochasmus sp. by sequencing ribosomal and mitochondrial gene regions useful in determining species identity and linking other developmental stages of the parasite when they are encountered. Freshwater snails were collected and examined for the release of cercariae in an effort to identify the intermediate snail host for the Echinochasmus sp. However, the snail species Planorbella trivolvis, Biomphalaria havanensis, Physa gyrina, and Cincinnatia integra, were not found to be shedding an Echinochasmus sp. cercaria at the time of collection. Future work will focus on elucidation of the life cycle by comparing sequence data generated from metacercariae with adult Echinochasmus found in piscivorous birds and evaluating experimental infections in channel and hybrid catfish.

190
Name: Ragan Mims
Major: Psychology
Faculty Advisor, Affiliation: H. Colleen Sinclair, Psychology Department, Social Science Research Center
Project Category: Social Sciences
Co-Author(s): Jessica Weiss Utley, Chelsea Ellithorpe
REU/Research Program: Psychology Department and Social Science Research Center

Culture of Honor: Not just for boys anymore

The theory of culture of honor has been used to explain different rates of aggression and violent crime, including gun violence, between northern and southern states in the United States (Nisbett & Cohen, 1996). In fact, culture of honor states have been shown to have twice as many school shootings as non-culture of honor states (Brown, Osterman, & Barnes, 2009). Southerners traditionally endorse honor ideologies that encourage the use of violence to defend one's honor, particularly among men. In the present study, 414 high school students (54.3% female) in the southern United States reported their use of aggression toward classmates, their choice to retaliate against aggression by others, and their endorsement of honor ideology. Although previous studies have not focused on gender, the present study used a female-inclusive sample to examine the intersectionality of gender, honor ideology, and aggression. We hypothesized that those higher in honor ideology should be higher in aggressive behavior, particularly retaliatory aggression, and that male students would display more aggressive behavior than female students. Findings indicated that attitudes sanctioning honor ideology better predict perpetration differences than gender did, particularly when examining physical aggression. Endorsement of honor ideology also predicted who retaliated when victimized by others. Although usually cast as an ideology for manhood, young women endorsing these norms were also more aggressive. The only instance where endorsement of honor ideology was not predictive was when the student had been a victim of cyber aggression.

062
Name: Makayla Minton
Major: Animal and Dairy Sciences (Pre-Vet)
Faculty Advisor, Affiliation: Wei Zhai, Poultry Science
Project Category: Biological Sciences and Engineering
Co-Author(s): Sabin Poudel

Effects of riboflavin and Bacillus subtilis on internal organ development in Ross 708 male broilers with or without coccidial challenge

Probiotics may inhibit pathogenic bacteria growth by improving beneficial bacteria growth in broilers' intestines. However, beneficial bacteria produce bile salt hydrolase which breaks bile salts, subsequently decreasing lipid metabolism and impairing production. The hypothesis of this study was that addition of the probiotic, *Bacillus subtilis*, and the bile salt hydrolase inhibitor, riboflavin, to broilers' diets could improve production by decreasing the immune response and internal organ weights. 13 birds were placed in 96 pens with 8 replication blocks. 12 treatments were in a 3×2×2 factorial arrangement, including 3 riboflavin dosages (0.75 ppm, 6.6 ppm, 20 ppm), with or without *Bacillus subtilis*, and whether or not the birds were cocci challenged. To induce coccidiosis, birds were gavaged with 20× dose of cocci vaccine on day 14. One bird per pen was randomly selected for sampling on days 27 and 36. The relative organ weights to body weights were calculated. On day 27, 20ppm riboflavin and *Bacillus subtilis* supplementation lowered the relative gizzard weight. Cocci challenge increased relative weights of the proventriculus (stomach; $P = 0.001$), spleen (immune organ; $P = 0.001$), duodenum, jejunum, and ileum (small intestine; $P < 0.0001$) weights. However, on day 36, the effects of cocci challenge on spleen, duodenum, and jejunum were lost and the ileum weight was decreased ($P = 0.0003$) by cocci challenge. In addition, 20ppm riboflavin supplementation also lowered ($P = 0.023$) relative ileum weight. Among all the 12 treatments, cocci challenged birds fed 0.75 ppm riboflavin and *Bacillus subtilis* exhibited the heaviest duodenum weight on day 36 ($P = 0.032$). The results show that *Bacillus subtilis* may affect the organs under different gut health conditions and cocci challenge may affect the organs differently depending on age, which may be due to the progress of the coccidiosis condition in the gut.

063
Name: Blaklie Mitchell
Major: Biological Sciences
Faculty Advisor, Affiliation: Mark Welch, Biological Sciences
Project Category: Biological Sciences and Engineering
Co-Author(s): Jeanette (Jen) Moss

Forensic Analysis of *Iguana iguana* in Cayman Islands Provides Warning of Invasion on Little Cayman

Iguana iguana, the Green Iguana, was originally native to Central and South America; however, due to trafficking, this species has been introduced to multiple islands within the Caribbean and Pacific as well as certain regions of North America. In much of this range, they have proven to be extremely invasive, and their invasion on some islands may pose a threat to other native iguana species, including the Grand Cayman Blue Iguana, *Cyclura lewisi*. The impact of the invasive Green Iguana on this native has yet to be quantified. There are concerns that the species will compete for resources and that hybridization between the two species could further threaten *C. lewisi*. Hybridization can lead to a form of gradual extinction whereby a native population is replaced by an invasive population; hence, *C. lewisi* could be lost even after other anthropogenic disturbances are remedied.

My goal is to assess whether an invasive green iguana colony has been established on the island of Little Cayman, which hosts a sister species of *C. lewisi*, *Cyclura nubila caymanensis*. Using molecular markers including nuclear microsatellites and mtDNA sequence data, the sibship and parentage of 14 green iguana hatchlings and 6 hybrid hatchlings were evaluated. My analyses also included 45 green iguana samples from Cayman Brac and Little Cayman as a genetic reference. Results thus far have been largely inconclusive due to a lack of genetic variation in the molecular markers investigated. However, results from microsatellite genotyping suggest that a single individual did not dam both the Green Iguana and hybrid hatchlings that were recently found on Little Cayman. This finding demonstrates that green iguanas may have successfully colonized Little Cayman Island. Further characterization of this ongoing invasion will require the development of additional molecular markers given the lack of variability among those tools currently available.

064
Name: Jayla Mondy
Major: Biochemistry
Faculty Advisor, Affiliation: Janice Chambers, Department of Basic Sciences, Center for Environmental Health Sciences
Project Category: Biological Sciences and Engineering

Investigating Stability of Novel Oxime Antidotes for Combatting Nerve Agents Used in Chemical Warfare
With an increased threat of chemical warfare throughout the world, there is an immediate need to develop a drug that effectively combats their toxicity. Organophosphates, such as the nerve agents sarin and VX, are extremely toxic chemicals used in warfare or in terrorism that inhibit the enzyme acetylcholinesterase (AChE) of the nervous system. The currently approved pyridinium oxime drug, 2-PAM, reverses this inhibitory effect of the organophosphates; however, due to 2-PAM's positively charged pyridinium ring, it is unable to permeate the blood-brain barrier and reestablish enzyme activity in the brain. This inability leads to the accumulation of acetylcholine in the brain, stimulating seizures which lead to brain damage. The novel substituted phenoxyalkyl pyridinium oximes, created and patented at Mississippi State University, offer innovative reactivation of AChE enzyme activity in the brain. Due to the higher lipophilicity of these novel oximes compared to 2-PAM, these oximes can permeate the blood-brain barrier and reactivate AChE in the brain, thus dampening the neurotoxicity. If these novel oximes have the potential to become FDA-approved drugs, they must have adequate stability and shelf-life to be practical. In this study, the oximes, either as dry chemicals or in solution, were exposed to a variety of storage conditions, such as prolonged storage and different temperatures. The reactivation ability of the lead oxime was evaluated to assess any deterioration of efficacy. As a dry chemical the lead oxime remained stable for at least one month at room temperature. In solution the lead oxime showed only slight deterioration at one month at room temperature, thus showing appreciable stability. This work ultimately contributes to the development of these patented oximes as drugs which, coupled with 2-PAM, could more efficiently combat nerve agent toxicity and provide protection to the brains of organophosphate-poisoned victims.
(Supported by NIH U01 NS083430).

130
Name: Jessie Moore
Major: Biological Sciences
Faculty Advisor, Affiliation: Todd Mlsna, Department of Chemistry
Project Category: Physical Sciences and Engineering

Slag VS. Biochar: The Final Showdown
Slag and modified Al/ Mg biochar were compared for their phosphate adsorbing abilities. Batch sorption experiments were performed to compare the adsorption of both sorbents in aqueous media. Several characterization analyses were performed including FT-IR, elemental analysis, SEM, EDX, and BET. It was found that Al/ Mg biochar's adsorption capacity was 3.82 % higher than slag. Slag's capacity was found to be 18.25 mg $PO_4^{3-/}$ g while Al/ Mg biochar's adsorption capacity is 69.75 mg $PO_4^{3-/}$ g. It was also found that biochar reached equilibrium 32 x faster than slag. Biochar took 30 minutes to reach equilibrium while slag took a total of 8 hours. Additionally, the surface area of slag was measured to be 4.05 m^2/g while biochar's surface area was found to be 364.12 m^2/g.

065
Name: Andrew Moran
Major: Biological Engineering
Faculty Advisor, Affiliation: Dr. Lauren Priddy, Department of Agriculture and Biological Engineering
Project Category: Biological Sciences and Engineering
Co-Author(s): K. M. Sebastian, D. Moran, L. B. Priddy, R. Prabhu

Cyclic Compression Testing to Determine the Viscoelastic Characteristics of Porcine Brain Tissue
This research views the effects of cyclic compression on viscoelastic, porcine brain tissue as a means of better understanding head trauma. The high strain levels applied in this study replicate the effects of traumatic brain injuries

(TBI) which are generally diagnosed as a concussion of some severity. Many studies are currently underway researching concussive injuries, but little data exists for in vitro tests on the tissue. The goal of this study is to quantify and analyze both the mechanical and cellular response of the tissue. The focus for the cellular response revolves around the grey matter because that tissue is most susceptible to impact being that it coats the outer surface of the brain. The cellular distributions of neuronal and glial cells are noted by their area fraction for all different sample settings ranging in strain rate, number of cycles and strain level.

131
Name: Buckston Morgan
Major: Chemical Engineering
Faculty Advisor, Affiliation: Dr. Santanu Kundu, Dave C. Swalm School of Chemical Engineering
Project Category: Physical Sciences and Engineering
Co-Author(s): Dr. Rangana Wijayapala, Satish Mishra

Double Network Hydrogel from Acrylic Acid
Hydrogels attract great attention due to their soft and wet nature, similar to that of biomaterials. Recent innovations in several tough hydrogels show their potential as structural biomaterials, such as cartilage. In order for tough hydrogels to be used in biomedical applications, their required mechanical properties such stiffness, strength, toughness, damping, fatigue resistance and self-healing, along with biocompatibility are considered for every application. In this study, physical and chemical crosslinked tough hydrogels were synthesized via one-pot bulk copolymerization of acrylic acid (AAc), methacrylamide (MAAm) and polypropylene glycol diacrylate (PPO-DA). The gel formations were characterized by FTIR spectroscopy and TEM to determine structural properties and bonding. The mechanical properties were examined using rheology, tensile testing, and high speed camera capture retraction.

132
Name: Obinna Muoh
Major: Chemical Engineering
Faculty Advisor, Affiliation: Neeraj Rai, Chemical Engineering
Project Category: Physical Sciences and Engineering
Co-Author(s): Sabuj Md. Abdus

Structure-property Relationship of High-spin State Donor-acceptor Polymer: A Computational Study
There have been a lot of efforts to design new types of organic materials having high-spin state that can be a replacement of traditional silicon-based materials used in semiconductor, light-emitting-diodes, photovoltaics, and solar cells. Polymeric materials having alternating donor-acceptor (DA) units are under intensive study due to its solution processability, backbone flexibility, lightweight and low processing cost than silicon-based materials. For years, high-spin state DA polymers have been illusive to scientific community. Recently, our group contributed to analyze the electronic properties of a high-spin (S=1) state DA polymer, which is neutral in its ground state. Here, we have designed new types of DA configurations to investigate electronic properties with density functional theory (DFT), changing the molecular structures. To vary the donor and acceptor strength, different substituents have been used in the polymer backbone and electronic properties were investigated. This work shows direct evidence of tuning molecular and electronic properties of high-spin state DA polymers.

133
Name: Olivia Murtagh
Major: Chemistry
Faculty Advisor, Affiliation: Dr. Joesph Emerson, Chemistry
Project Category: Physical Sciences and Engineering
Co-Author(s): Kayla D. McConnell

A thermostability study of the diiron metalloenzyme, AurF, using differential scanning calorimetry
AurF is non-heme, iron(II)-dependent monooxygenase that catalyzes the oxidation of arylamines to their respective nitro functional groups as the terminal step in the biosynthesis of aureothin a potent antibiotic. AurF is known to have diiron active site that is the epicenter for O2 activation. There have been computational and experimental studies interrogating the mechanism of this enzyme. However, this enzyme has also been shown to maintain its reactivity when substituted with manganese(II). The differing metal centers in AurF have also been spectroscopically characterized, but there are still many questions regarding how the change of the metal ions effect the protein's overall stability. To further characterize AurF and study its thermostability, a series of differential scanning calorimetry (DSC) experiments will be performed. In a DSC experiment, we will thermally denature the metalloenzyme and measure the changes in heat capacity (ΔC_p) and melting temperature (T_m) of both the iron and manganese forms of AurF. Using this data, conformational changes can be determined and compared for the two metals ions forms of AurF, giving insight into their effect on globular protein stability. AurF's bimetallic center makes it an interesting molecule for study, and this research hopes to give a more detailed look into the stability and characterization of AurF, and shed more light on its potential use in biosynthesis.

134
Name: Shanika Musser
Major: Civil Engineering
Faculty Advisor, Affiliation: John J. Ramirez-Avila, Civil and Environmental Engineering
Project Category: Physical Sciences and Engineering
Co-Author(s): Sandra Ortega-Achury, Civil and Environmental Engineering

Seasonal Variation of Nutrients along a Catalpa Creek tributary at the Mississippi State University campus
Excessive levels of nutrients such as nitrogen and phosphorus in surface waters result in eutrophication, which can induce algal blooms that deplete oxygen that fish and other aquatic life need to survive. This is of particular concern in the Gulf Coast, where toxic algal blooms are detrimental to the fishing and tourism industries. The most effective method to address algal blooms is to prevent nutrients from ever entering the water. A study was conducted from August 2017 to August 2018 to monitor the concentrations of total nitrogen (TN), nitrates/nitrites (NO_2-NO_3), total phosphorus (TP) and total suspended solids (TSS) along a tributary of Catalpa Creek on the Mississippi State University campus. The headwaters of the tributary are located under a forested riparian zone, the stream's natural condition. Downstream, the natural forested riparian zone has been replaced by a grassed riparian zone due to anthropogenic influences. Considering that the amount of nutrients that enter the stream can be impacted by the type of riparian vegetation, nutrient concentrations were evaluated for seasonal variations. Preliminary results suggest that the highest concentrations of TP take place during the summer and the lowest concentrations during the winter, with average values of 1.73 mg/L and 0.35 mg/L, respectively. For nitrogen, both TN and NO_2-NO_3 showed the highest values during winter with average values of 2.0 mg/L and 0.65 mg/L, respectively; and lowest values during spring and fall. On the other hand, values of TSS varied from 4.5 mg/L to 18.4 mg/L for fall and winter, respectively. TSS, TN, and NO_2-NO_3 values followed a similar seasonal trend, suggesting that nitrogen may attach to the sediment, which is more abundant in the rainy winter season due to erosion.

191
Name: Allyson Nash
Major: Educational Psychology
Faculty Advisor, Affiliation: Nicole Leach, Counseling, Educational Psychology, & Foundations
Project Category: Social Sciences
Co-Author(s): Abbey Rankin, Mary Gardner

Comparing the Quality of Notes and Test Scores in Handwritten vs Electronic Note Taking Methods
Throughout universities, laptops are becoming more apparent in the college classroom as a tool for taking notes. However, recent evidence suggests that the use of handwritten notes in the college classroom is considered a more beneficial note taking method. The purpose of this experiment was to determine the correlation between handwritten or typed notes and test scores. Our research question asks, does handwritten or electronic note taking relate to quality of notes and test scores? The experiment consisted of randomly selecting upper level Educational Psychology classes. Participants in these classes were asked to watch and take either handwritten or typed notes on two videos, turn in the notes by hand or email, and then take a short recall test during the next class period. Prior to watching the videos, participants filled out a basic information questionnaire and a note taking preference questionnaire. We hypothesize that, if students take detailed handwritten notes, they will perform better on a test than those who take electronic notes, although taking notes on a laptop may be faster. Preliminary results suggest students who took typed notes performed better on the test. Implications of the experiment could be that students who took handwritten notes may have had a lower quality of notes than those who typed their notes. Students who typed their notes may have been able to type at a faster pace than those who took handwritten notes.

066
Name: Rachel Nation
Major: Forestry/Wildlife Management
Faculty Advisor, Affiliation: Heather D. Alexander, Forestry
Project Category: Biological Sciences and Engineering
Co-Author(s): Geoff Denny, Jennifer K. McDaniel, Alison K. Paulson
REU/Research Program: College of Forest Resources Undergraduate Research Scholars Program

Impacts of Increasing Fuel Loads on Acorn Germination and Early Oak Seedling Establishment
Prescribed fire is increasingly implemented as a management tool to restore upland oak forests in the eastern U.S., but little is known about impacts of fall burns on recently fallen acorns. Here, we explored the effects of increasing fine fuel loads (i.e., leaf litter) on acorn germination and early oak seedling establishment. In December 2018, following acorn drop, we implemented small-scale experimental burns in upland oak stands in northern Mississippi. We tested four fuel load treatments: unburned, unmanipulated fuels, doubled fuels, and tripled fuels. Before burning, we placed 30 acorns each of white oak (*Quercus alba*) and Shumard oak (*Quercus shumardii*) ~1 cm below the litter surface in five plots of each treatment. Soon after treatment, we planted the acorns in a greenhouse, and height and basal diameter were measured weekly for eight weeks. Acorns burned in unmanipulated fuel plots experienced a 54% and 42% decline in germination rates compared to unburned plots for white and Shumard oak acorns, respectively, but burned acorns that germinated displayed growth patterns similar to unburned acorns. In doubled and tripled fuel load treatments, most acorns did not germinate. The higher germination rates of Shumard oak acorns compared to white oaks may be due to their thicker outer coating, which may better protect the embryo and cotyledons from fire damage. Further, Shumard oak acorns require an overwintering period before germination, whereas white oaks germinate immediately after seedfall. These results suggest that acorns are more likely to survive burns with lower fuel loads compared to burns with higher fuel loads, and that survival rates are better for Shumard oak acorns than white oak acorns. Although acorns were able to survive fires with lower fuel loads, managing for oak regeneration may require use of prescribed fire prior to acorn drop due to a decrease in germination rates.

192
Name: Meagan Nusz
Major: Human Sciences/Apparel Textiles & Merchandising
Faculty Advisor, Affiliation: Charles Freeman, School of Human Sciences; Joe Wilmoth, School of Human Sciences
Project Category: Social Sciences
Co-Author(s): Claire Beckham, Catherine Ford, Alex Ann Greer, Allison Robbins

Influence of make-up usage on self-esteem among college-age women
The purpose of this study is to investigate the relationship between makeup use and self-esteem amongst university women. Prior research indicates that the more makeup typically worn by the subject the greater the self-esteem of body image. Based on this information, we hypothesize a positive outcome of high self-esteem with makeup usage. The following variables were measured using a Rosenberg self-esteem scale and The Beauty Industry on Women's survey. Electronic surveys were administered to college women. Data will be analyzed through a scale that measures the knowledge, industry investment, and usage of cosmetic products. Survey links were distributed to 200-300 college women through emails and variety of social media channels. We will analyze data using a bi variant correlation. We anticipate finding a positive correlation between makeup usage and self-esteem. With society's pressure on outer appearance and peoples struggles for beauty perfection, does makeup make you feel better about yourself.

193
Name: Allison O'Leary
Major: Educational Psychology
Faculty Advisor, Affiliation: Dr. Nicole Leach, Counseling, Educational Psychology, & Foundations
Project Category: Social Sciences
Co-Author(s): Bailey Cozart

How does class start time affect student attention level in undergraduate courses?
Transitioning from high school to college often brings many changes to students' lives. One significant change is the varying options for class start times. Most students have personal preferences towards what courses to enroll in based off of start time. Our research question is how class start time influences levels of attention amongst class students. The method of research consisted of collecting surveys regarding attention levels from approximately 300 undergraduate Calculus 1 courses at a large, public university beginning at 8am, 11am, and 1pm, and comparing the resulting data. This course was selected due to the diversity of majors which required Calculus 1 and the varying points throughout the college career it should be taken, meaning there will be a variety of freshman to seniors in the class making the data more generalizable. Data is currently being collected and will be analyzed upon collection. Once data has been analyzed, we are hopeful that it can be used to help students best tailor their course start times to best suit their academic needs.

135
Name: Erin O'Quinn
Major: Mechanical Engineering
Faculty Advisor, Affiliation: Matthew Priddy, Mechanical Engineering
Project Category: Physical Sciences and Engineering

Spherical Indentation of Tungsten
The determination of local mechanical properties within heterogeneous materials can help to elucidate spatially-dependent deformation phenomena. Spherical nanoindentation has grown in popularity in recent years because of the ability to extract elastic and plastic mechanical properties of individual phases within multi-phase materials. However, the processing of experimental datasets leaves some room for interpretation, leading to a range of acceptable values. To minimize the acceptable range, analytical solutions or computational models (such as the finite element method) can be used to help guide the analysis of the experimental datasets.
This research employs ABAQUS, a finite element software, to perform nanoindentation simulations to compare the elastic response with results obtained from an analytical solution. These simulations explore the elastic properties of irradiated

tungsten and compare the computational results with experimental data to learn more about the localized response within the material. This work focuses on irradiated tungsten because exposure to radiation effects the surface of the component, causing the formation of voids and dislocation loops that impact different material properties such as hardness and ductility. In addition, the radiation causes the formation of different layers in the tungsten, which experience varying levels of radiation damage. Therefore, these simulations will also be performed to different depths in an effort to understand the role of radiation on the mechanical response.

067
Name: Mmesoma Okafor
Major: Biochemistry
Faculty Advisor, Affiliation: Dr. Jonas King, Department of Biochemistry and Molecular biology
Project Category: Biological Sciences and Engineering
Co-Author(s): Aumbriel Schwirian, Aline Bronzato-Badial, Will Jones
REU/Research Program: CALS URSP
Other Competition(s): Public Health Research Competition

Effects of Swainsonine on Liver Cell Surface Glycoconjugates as it Relates to Malaria Biology.
Plasmodium spp., the causative agent of malaria, infects hundreds of millions and kills hundreds of thousands of people annually, causing 30% of the childhood deaths in Africa. Along with other factors, the lack of an efficacious long-lasting vaccine, hinders disease eradication efforts. Even though it is a primary source of potential vaccine targets, the mechanisms of host cell invasion is still poorly understood in some cases. It is well-understood that during cellular invasion the circumsporozoite protein covering *Plasmodium* sporozoites binds to host cell surface heparin sulfate proteoglycan (HSPG) molecules. However, the involvement of other glycoconjugates, such as complex N-glycans, remains unknown. Swainsonine is an indolizidine alkaloid that inhibits glycoprotein processing, specifically α-mannosidase, which catalyzes the commitment step in complex N-glycan production. The objective of this study is to test the effect of different swainsonine concentrations on human HepG2 hepatocarcinoma cells with a final goal of investigating if inhibiting α-mannosidase will affect *Plasmodium berghei* sporozoite invasion. HepG2 cells were grown to confluency under standard conditions prior to exposure to different swainsonine concentrations (1µg/ml, 10µg/ml and 100µg/ml) in order to investigate its effect on cell survival and potential pleiotropy in the molecular response. After 72 hours of incubation, RNA from both treated and control samples was isolated and standard protocol for cDNA synthesis was conducted. We then used a panel of qPCR assays targeting genes involved in hepatocyte glycocalyx formation as well as genes reported to be involved in *Plasmodium* invasion. Fluorescent live/dead cell staining assays and fluorescent histochemistry with a panel of lectins were also performed at this point. Results showed that HepG2 cells remain viable at much higher concentrations of swainsonine that were recently reported in a widely-cited paper, with several older studies confirming this observation. Transcriptomic results suggest pleiotropic effects on glycocalyx formation after the inhibition of α-mannosidase.

068
Name: Kate Parkes
Major: Biochemistry
Faculty Advisor, Affiliation: Ms. Clarissa J. Balbalian, Disease and Nematode Diagnostics, Plant and Soil Sciences
Project Category: Biological Sciences and Engineering
Co-Author(s): Dr. Eric Reasor
REU/Research Program: CALS URSP

Implementing Growing Degree-Day Based Application Frequencies on Ultradwarf Bermudagrass Putting Greens
Plant growth regulator (PGR) programs are currently utilized worldwide in the golf course industry to provide consistent playability among putting greens. Current PGR treatments are based on routine application with a disregard for climate and environmental factors, resulting in an overaccumulation of PGR product within the turfgrass that contributes to decreased traffic tolerance, increased disease presence and severity, and increased weed accrual. To combat this problem, the concept of integrating a growing degree day (GDD) approach (that determines reapplication by using heat accumulation to estimate the amount of PGR remaining in the turfgrass) to predict optimal PGR reapplications was

researched at Mississippi State University, the University of Tennessee, and North Carolina State University on ultradwarf bermudagrass (common to the Southeastern U.S.). Three PGR programs were implemented on the ultradwarf bermudagrass from May to November 2018 to test the GDD model against the current weekly administered programs. The PGR programs consisted of trinexapac-ethyl (Primo MAXX, Syngenta) applications at 4 fl oz per acre every week, 2 fl oz per acre twice weekly, 4 fl oz per acre every 220 GDD_{10C}, and included a non-treated control. Visual turfgrass quality on a scale of one to nine was acquired weekly, and ball roll distance was measured three times per day twice a week using a USGA stimpmeter. Results of the weekly versus GDD treatments yielded a trend of the GDD model having greater visual quality. The GDD approach significantly increased ball roll distance compared to the other treatments in early summer, but significantly decreased ball roll distance in the latter part of the season. Thus, implementing a GDD approach could benefit golf course managers by reducing PGR applications while still maintaining desired ball roll distance and high visual quality.

194
Name: Mary Grace Payne
Major: Psychology
Faculty Advisor, Affiliation: Dr. H. Colleen Sinclair, Psychology, Social Science Research Center
Project Category: Social Sciences
Co-Author(s): Chelsea Ellithorpe, Jessica Weiss Utley

Dear Diary: A daily diary study of experiences with bullying in high school
The prevalence of school violence and bullying has been of increasing concern to families in recent years (Robers et. al., 2014). To examine whether bullying leads to aggressive vs. prosocial behaviors, students were given take-home daily diaries to complete over two weeks. The study was conducted twice over a two-year time period. The variables included aggression type (verbal, relational, physical, and cyber), emotional and cognitive responses, and behavioral responses (antisocial, prosocial, or asocial behavior). Of the 88 students who completed entries, 43 reported having aggression experiences for a total of 135 incidents in the first year. Regarding aggression experiences, 50% experienced verbal aggression, 24% experienced physical aggression, 20% experienced relational aggression, and 6% experienced cyber aggression. The results yielded that 50% of the students' responses to aggression were neutral (did nothing), 20% were prosocial (sought help), 18% were antisocial (sought revenge), and 13% were asocial (kept to themselves). For the second year, the results yielded that 6% experienced physical aggression, 33% experienced verbal aggression, 15% experienced social aggression, and 4% experienced cyber aggression. In the second study, there was inclusion of multiple kinds of aggression within one experience. The results concluded that 4% experienced physical-verbal aggression, .50% experienced physical-social, 16% experienced verbal-social aggression, 4% experienced verbal-cyber, 3% experienced social-cyber, 2% experienced physical-verbal-social, 6% verbal-social-cyber aggression, and 2% experienced all four types of aggression within one incident. Of the responses to the encounters with aggression within the second year, 46% of the students' responses were prosocial (getting help), 19% of the responses were antisocial (seeking revenge), 29% of the responses were asocial (kept to themselves), and 6% of the responses were anti-self (harming themselves).

012
Name: Sara Peppers
Major: Landscape Architecture
Faculty Advisor, Affiliation: Peter Summerlin, Department of Landscape Architecture
Project Category: Arts and Humanities (Poster)
Co-Author(s): Zack McWilliams
Other Competition(s): Community Engagement Research Track

Return to Nature - Locating Wolf River Nature Camps
As major cities around the country continue to grow, there are increased efforts to establish and expand outdoor recreation camps within these metropolitan areas. Engagement with nature at an early age promotes a healthier cognitive development and can serve as a foundation for environmental literacy for future generations. At the same time, the protection and preservation of forested habitats for our cities is crucial as urbanization puts pressure on the remaining

wilderness. It is with this in mind that this project seeks to target potential sites for new outdoor recreation camps within the Wolf River Watershed in Memphis, Tennessee and serve as a model process for future nature camps in metropolitan areas.
Initial stages of the project documented similar camp types outside of the Memphis region to serve as precedent for the proposed camp identities. The camps observed take advantage of nature museums, botanic gardens, arboretums, and the like and used them as bases for overnight camping, canoe trips, outdoor survival, and other topics. From these and other ideas, the design team established a range of camp types to distribute across the watershed.
To locate these camps, the design team developed a methodology to target 3 unique types of camps within the watershed: urban, adventure, and science-driven camps. The methodology looked at 5 pieces of data for the 3 camps; roads, streams, landcover, natural areas, and schools. Each piece of data was reclassified in relation to each camp in order to prioritize certain elements of the data. The design team used this weighted data along with manual overlays, again, dependent on the specific camp typology, to help find the optimal site for the 3 unique nature camps. Related infrastructure like medical care was also taken into account when determining the most optimal site among the results.

195
Name: Abbigail Petersen
Major: Agricultural Information Science
Faculty Advisor, Affiliation: Dr. Carla Jagger, School of Human Sciences
Project Category: Social Sciences
Co-Author(s): Christien Russell
REU/Research Program: Undergraduate Research Scholars Program

Culturally Responsive Teaching: Experiences of underrepresented students
Classrooms are becoming increasingly more diverse, including postsecondary education. Teachers are faced with the challenge of meeting needs for all students enrolled in their coursework. Culturally responsive teaching techniques can help students feel included in the learning environment without being alienated. The purpose of this study was to identify and describe the experiences of minority postsecondary students related to culturally responsive teaching and examine the aspects that make students feel included and excluded in learning environments across Mississippi State University. The framework for this research was Culturally Responsive Teaching (CRT), which engages learners while still respecting cultural integrity. Focus group methodology was chosen due to the ability to gain common experiences from underrepresented groups on campus. A total of three focus groups were held during Spring 2018 and twelve students from various degrees across campus agreed to participate. Based on the questions asked participant responses were themed under three general areas*: feelings of inclusion or exclusion on campus, classroom experiences, and lastly indicators of culturally responsive teaching*. Participants associate the following attributes to CRT, diversity in the classroom population, when teachers try to know their learners and use appropriate examples for learning, and when effective communication is established. When CRT is not present they notice more hesitation from others in the course, they feel a different energy in the classroom, and at times feel unwelcome or secluded. Overall the knowledge of these results can benefit all educators as we continue to see more diverse classroom audiences. By incorporating simple gestures like using varying examples from multiple cultural perspectives or building rapport with all our learners we can make strides to a more inclusive environment. When culturally responsive teaching is not utilized by educators, our learners tend to disengage and keep to themselves, which does not build an effective learning experience.

007
Name: Hannah Phillips
Major: English
Faculty Advisor, Affiliation: Bonnie O'Neill, English
Project Category: Arts and Humanities (Oral Presentation)

Power in Poise: Mesmerism and Feminine Empowerment in *The House of the Seven Gables*
Nathaniel Hawthorne's novel, *The House of the Seven Gables*, exposes the historical conflict between the Maule family and the Pyncheon family, and thus sets up a power dynamic that is illustrated through the symbol of mesmerism in the

text and is influenced by class and gender. The fabled mesmerism of Alice Pyncheon by Matthew Maule in the novel, through descriptive language, symbolizes sexual violence and further exemplifies the gendered power dynamic of the male and female character. While Matthew Maule essentially enslaves Alice Pyncheon, his descendent, Holgrave-Maule, attempts to mesmerize Phoebe Pyncheon, but decides against exerting his power upon Phoebe. In fact, the novel uses language that suggests that Phoebe herself has a mystical, spiritual power. This paper provides evidence for Phoebe's empowerment, but questions where her power lies and thus refers to the larger critical conversation about Nathaniel Hawthorne's status as a feminist writer. Analyzing mesmerism as a symbol for a gendered hierarchy in the home, I argue that, not only is Phoebe the metaphorical mesmerist of Holgrave, but Sophia Peabody, Nathaniel Hawthorne's wife, is also the metaphorical mesmerist of Hawthorne. T. Walter Herbert in his article "Different from Himself: Hawthorne and the Masks of Masculinity," suggests that Hawthorne had anxieties about the rift between the inner self and the outer self and provides evidence that Hawthorne felt that his wife provided a reflection of his inner self which ultimately gives her a metaphorical, mesmeric power that compares Sophia to Phoebe and Hawthorne to Holgrave. The gendered power dynamic of mesmerism is thus flipped in both relationships. While the novel shows that the spiritual domination of man over woman is implicitly violent, I argue that the spiritual domination of woman over man is positively revealing.

196
Name: Janiece Pigg
Major: Agricultural Information Science
Faculty Advisor, Affiliation: Dr. Laura Greenhaw, School of Human Sciences
Project Category: Social Sciences
Co-Author(s): Dr. Tobin Redwine
Other Competition(s): Community Engagement Research Track

Investigating Wisely: Using Q methodology to decipher what employers really think about study abroad
In recent years, universities have implemented high-impact educational practices to ensure employability and career competitiveness of graduates. One such practice is study abroad. A plethora of literature documents benefits of study abroad for students and faculty. Principally, students who study abroad develop desirable skills including acceptance of self and others, overall maturity, acceptance of responsibility, and independence (McKiernan, 1980 as cited in Wilson, 1992). Further, the Institute of International Education reported in 2017 that study abroad positively impacted long-term career progression and promotion. While these indicators suggest that employers should value study abroad experience in potential candidates, little empirical evidence exists demonstrating that employers seek or favor candidates who have studied abroad. Given the strained financial resources of higher education institutions as well as students, it is prudent to fully understand the value employers place on study abroad experience.
Therefore, the purpose of this research is to investigate agricultural employers' perceptions and preferences of study abroad experience in potential employees. This study will employ Q methodology to analyze the viewpoints of agricultural employers about the value of study abroad experience. In short, a Q sort is an adapted factor analysis combining quantitative and qualitative methodologies where participant experiences can be deeply analyzed without sacrificing the power of statistical analysis. We will invite employers representing the agriculture and natural resources (ANR) industries to participate in the research. This study is a collaborative exploration with Dr. Tobin Redwine, Instructional Assistant Professor at Texas A&M University, who serves as the methodology expert. Our findings will provide foundational knowledge regarding agricultural employers' preferences and perceptions regarding potential employees' study abroad experience. A clearer understanding of the value potential employers place on these experiences will assist universities and students making informed investments in educational experiences.

197
Name: Baleigh Pinder
Major: Psychology
Faculty Advisor, Affiliation: Dr. H. Colleen Sinclair, Psychology, Social Science Research Center
Project Category: Social Sciences
Co-Author(s): Chelsea Ellithorpe, Jessica Weiss Utley
Other Competition(s): Community Engagement Research Track

Feeling Alienated: Consequences of Bullying

In 2010, Reijntes and colleagues coined the term "the outcast-lash-out effect" to capture how those who score high on feelings of social alienation (Jessor & Jessor, 1977) are more likely than others to respond to rejection from others with aggression. The "outcast-lash-out effect" poses problems to the safety and well-being of the school, as well as the students who are alienated themselves. Social alienation can be defined as a reaction to a stressor that is a result of emotional distress or life-altering situations involving peer rejection or self-isolation (Ketterer et al., 2011). In the current study, we attempted to replicate the finding that those who chronically feel socially alienated are more likely than their peers to retaliate when experiencing bullying. We surveyed students from a rural high school in the southern United States (n= 447) on their experiences with physical (i.e., hitting or pushing), verbal (i.e., calling someone names), relational (i.e., social ostracism), and cyber (i.e., harassment over an online platform) bullying. Of the students who reported being victimized, over 88% reported feeling alienated. Youth experiencing cyber and relational bullying reported significantly higher rates of social alienation than those experiencing other kinds of bullying. Victimized youth suffered more when feeling alienated, reporting lower self-esteem, lack of alternative relationships, and more emotional and physical pain. Social alienation acted as a moderator between rejection and behavioral response (i.e., prosocial, antisocial towards self or others, and withdrawal). Alienated youth did, in fact, lash out when experiencing verbal or relational bullying, whereas alienated youth withdrew when experiencing physical or cyber bullying. These results show that the type of bullying experienced is an important factor to consider when examining the factors that lead alienated youth to lash out.

136
Name: Rupesh Pokharel
Major: Electrical Engineering
Faculty Advisor, Affiliation: Dr. Chaomin Luo, Department of Electrical and Computer Engineering
Project Category: Physical Sciences and Engineering

An Efficient ACO Approach to Vehicle Navigation

A heading direction methodology is proposed in this project in conjunction with a colony optimization algorithm (ACO) during the motion planning in the vicinity of obstacles to plan safer trajectories for real-time navigation and map building of an unmanned ground vehicle (UGV). In real world applications, a UGV is required to plan a shortest and reasonable collision-free trajectory that, in this project, is capable of being implemented by a novel heading-enabled ant colony optimization model. A LIDAR-based local navigation algorithm is implemented to carry out obstacle avoidance missions. As the robot plans its trajectory toward the target, unreasonable path will be inevitably planned. A heading-enabled navigation paradigm is developed for guidance of the UGV locally so as to plan more reasonable and safer trajectories. In addition, grid-based map representations are implemented for real-time UGV navigation. In this project, simulation results successfully demonstrate robustness and effectiveness of the proposed real-time heading-enabled ACO approach of a UGV.

137
Name: Lauren Pounds
Major: Geosciences/Broadcast Meteorology/Climatology
Faculty Advisor, Affiliation: Andrew Mercer, Geosciences
Project Category: Physical Sciences and Engineering
REU/Research Program: Blue Waters Student Internship Program

Analyzing the Importance of Model Physics in Simulating Environments Associated with Tornadogenesis Within Tropical Cyclones

Tornadogenesis within tropical cyclones remains a poorly understood process due to the difficulty in isolating the tornado environment with the larger tropical cyclone environment. These difficulties are exacerbated by the variety of modeling configurations that could be used to characterize tornado-prone regions within tropical cyclone environments. Using the Weather Research and Forecasting model, five landfalling hurricanes simulations were done over a 48 hour period surrounding the cyclone's landfall using 24 combinations of model physics (2 cumulus schemes, 3 boundary layer schemes, and 4 microphysics schemes). Tornado reports from the Storm Prediction Center's report database were used to define the 6 hour time period within the 48 hour total simulation where the greatest number of tornado reports occurred, which was predominantly during peak daytime heating. A kernel density estimation of the tornado reports from this peak intensity period was used to construct a tornado-prone environment within each simulation, and common severe weather diagnostics were computed within this region to determine their sensitivity to model physics configuration. Significant differences were noted in the two cumulus parametrizations in all the differing combinations.

008
Name: Rebecca Poynor
Major: English
Faculty Advisor, Affiliation: Andrea Spain, English
Project Category: Arts and Humanities (Oral Presentation)

Jane and Bertha: The Madwoman Within

Charlotte Brontë's *Jane Eyre* is wrought with elements of madness. These elements are shown not only through the madwoman in the attic, Bertha Mason, but through the eponymous Jane Eyre as well as she often worries that she, too, will one day be considered mad. This paper addresses those ideas of madness through the lens of Hélène Cixous's landmark essay, "The Laugh of the Medusa." Cixous writes that a phallocentric society associates women's voices and writing with madness so severely that, while regarding this mindset, women internalize this viewpoint themselves. Jane exhibits this internalization as she strives to tamp down her own feminine voice due to the phallocentric society that she is immersed in. My research concerns literary criticism on the relationship between madness, society and the women of *Jane Eyre*. This paper will look at how Jane Eyre and Bertha Mason contrast one another in their struggle with the feminine roles forced upon them, and how they each give voice to an aspect of the feminine traits that Cixous speaks of. Bertha embraces her feminine voice and is punished for it, and Jane attempts to hide from her own feminine voice as she eventually falls into the trap of the conventional feminine life that the phallocentric society set up for her, despite her claims of protestation. Bertha finds an independence, even in her prison, defying expectations through her mere survival.

198
Name: Dixie Priest
Major: Agricultural Information Science
Faculty Advisor, Affiliation: Laura L Greenhaw, School of Human Sciences
Project Category: Social Sciences
Co-Author(s): Dr. Julie Parker
REU/Research Program: CALS undergraduate research scholar
Other Competition(s): Community Engagement Research Track

Analyzing Effects of Two Silent Laps at Onset of Therapeutic Riding Sessions for Riders with Autism Spectrum Disorder
Use of therapeutic horseback riding to emphasize control, focus, sensory management, and communication skills, while providing a multisensory experience is a research field still requiring much qualitative and quantitative evidence. Positive effects of therapeutic horseback riding on children with autism spectrum disorder (ASD) continues to surface; however, discerning which specific components of therapeutic riding are most effective in this population lacks exploration.
The purpose of this research was to discover whether implementation of completing two silent laps at the onset of the riders' therapy session impacts rider outcomes. Research Objectives were: (1) describe participant behaviors before and after 10-week therapeutic riding intervention without two silent laps, (2) describe participant behaviors before and after 10-week therapeutic riding intervention with two silent laps (3) determine any differences in participant behavior before and after a 10-week therapeutic riding intervention.
This case study consisted of a consensus of seven participants. All riders exhibited manifestations consistent with ASD. Participants' parents completed sensory profile instruments and riding instructors completed Naples Equestrian Evaluations for all participants. Both instruments were completed prior to and at the completion of 10-week sessions. A matched pair T-test determined any statistical differences. In addition, the researcher recorded anecdotal observations. All participants completed all therapeutic riding sessions, six participants completed pre and post assessments.
The first 10-week riding session without the silent lap protocol was completed during Fall 2019. The second 10-week session implementing the silent lap protocol is in progress. Preliminary data analysis indicates no significant difference in sensory profiles before and after the 10-week session. Anecdotal evidence indicates improvements noted by care-givers immediately following riding sessions. However, those improvements seem to regress before the next session. The silent lap protocol will be assessed at the conclusion of the 10-week spring session, with ongoing analysis of sensory profiles and Naples Equestrian Evaluations.

069
Name: Katelyn Provine
Major: Microbiology
Faculty Advisor, Affiliation: Mark Welch, Biological Sciences
Project Category: Biological Sciences and Engineering
Co-Author(s): Anna Jackson, Mallory McKinney
Other Competition(s): Community Engagement Research Track

Nasty Neighbors: DNA Barcoding Mosquito Blood Meals to Determine the Epidemiological Threat of the Invasive Green Iguana (*Iguana iguana*) to Two Endemic Iguana Species in the Cayman Islands
The Cayman Islands host three iguana species: the endangered Grand Cayman Blue Iguana, *Cyclura lewisi*, the endangered Sister Isles Rock Iguana, *Cyclura nubila* caymanensis, and the invasive Green Iguana, *Iguana*. Invasive species pose clear threats to their endangered relatives. These threats include competition, as well as hybridization that can ultimately lead to the replacement of native species via genetic swamping. However, the epidemiological threat of invasive species often remains overlooked. DNA analysis of arthropod blood meals to identify vertebrate hosts may provide insight to vector-host relationships. Our working hypotheses are: (1) Cayman Islands mosquitos feed non-discriminately on all iguanas present on the islands. (2) The ratios of species-specific iguana DNA present within blood meals will reflect known population proportions of iguanas across the islands. To test our hypothesis, DNA fragment analysis following standard polymerase chain reaction (PCR) of the NADH-ubiquinone oxidoreductase chain 4 (ND4) gene and restriction enzyme digestion was tested for accuracy on known blood samples of the three iguana species in question, with increasing sample dilution to simulate low yield DNA extractions from blood meals. The refined protocol was successfully utilized to

demonstrate that the maternal haplotype of putative *Cyclura lewisi* hybrids from a Florida pet owner were derived from *C. nubila*. This protocol will be used on mosquito blood meals provided by the Mosquito Research and Control Unit (MRCU) of Grand Cayman. The study will aid in assessing the epidemiological threat that the Green Iguana poses to its endangered relatives.

199
Name: Raegan Ramage
Major: Agricultural Information Science
Faculty Advisor, Affiliation: Carla Jagger, Agriculture Education, Leadership, and Communication
Project Category: Social Sciences
Other Competition(s): Thesis Research Competition (TRC)

Agriculture Industry Employer Satisfaction of Agriculture Degree Graduates
The purpose of this study was to determine agricultural industry employer perceptions of qualities and skills acquired by employees who earn an agricultural related degree(s) versus those employees with non-agricultural degree(s). This study was guided by the following research questions when comparing employees with an agricultural degree versus employees with nonagricultural degrees, what are employer preferences towards graduates when hiring, what workplace skills do employers report as inadequate, and is employer satisfaction regarding employees different. The research was a descriptive, quantitative study focused on perceptions of agricultural industry employers in the southern region of the United States. Data was collected using a Qualtrics internet-based survey instrument. The sample size consisted of 18 agricultural employers holding positions with hiring responsibilities. The majority of these hiring employers indicated they prefer an employee who completed an agricultural degree (n = 16). Three workplace habit skills were identified as inadequate for agricultural degree employees; including communication skills (M = 2.71), organization (M = 2.76), and creativity (M = 2.82). Whereas, ten workplace habit skills were identified as inadequate for non-agricultural degree employees. The lowest four skills were entry level knowledge (M = 2.25), communication skills (M = 2.56), and both common sense and self-motivation with means of 2.63. Five workplace habit skills were identified sufficient for agricultural degree employees including work ethic (M = 3.76), reliability (M = 3.53), as well as integrity, common sense, and trustworthiness all with a mean of 3.47. None of the non-agricultural degree workplace habit skills reached a mean level of sufficiency which we marked as 3.45. According to these results, it appears we are sufficiently preparing our agricultural degree students to enter the agricultural industry workforce when compared to those individuals not seeking an agricultural degree.

138
Name: Brennan Reeder
Major: Aerospace Engineering
Faculty Advisor, Affiliation: David Thompson, Aerospace Engineering
Project Category: Physical Sciences and Engineering

FlowPsi Turbulence Model Investigation of Cavity Bay Flow
The goal of this effort is to investigate the differences in flow resolution from different turbulence models on a cavity flow. This problem is of interest because of the wide range of fluid dynamics phenomena: (1) the boundary layer leading up to the cavity, (2) the shear layer over the cavity, (3) the vortices in the cavity, (4) the pressure waves coming out of the rear of the cavity, and (5) the expansion fan just after the cavity. The supersonic flow in and around a rectangular cavity was analyzed using the flow solver Flowpsi, which was developed at Mississippi State.
The configuration considered is described in the AIAA article “Oscillatory Characteristics of Shallow Open Cavities in Supersonic Flow”, written by V. Sridhar, S. L. Gai, and H. Kleine. A flat plate before the leading edge of the cavity was 184 mm, the depth of the cavity was 4 mm and the length of the cavity was varied to obtain length to depth ratios of 5 and 8 with lengths of 20 mm and 32 mm respectively. The Mach number was 2 and the Reynolds number was 4.6 X 10^6. The initial turbulence model used was the Baseline model, which uses a k-omega model in the wall region and switches to a k-epsilon model away from the wall. Additional turbulence models to be tested if time permits are the Hybrid RANS/LES and the Wilcox k-omega.

The results from Sridhar et al. that will be used for comparisons with the results obtained here will include the momentum thickness, visualizations of the flow velocity fields, skin friction coefficients, and normalized pressure distributions

070
Name: Reilly Reeves
Major: Biological Engineering
Faculty Advisor, Affiliation: Adam Knight, Kinesiology
Project Category: Biological Sciences and Engineering
Other Competition(s): Community Engagement Research Track

Using 3D Printing to Fabricate an Adjustable Hyperextension Orthotic Knee Brace for Patients with Hypotonia
This project studies the effects of a mutation of the BCL11A gene and how it leads to hypotonia and joint laxity in a seven-year-old male patient. The patient's joint laxity and low muscle tone cause him to hyperextend his knees, and as the patient grows this will become a greater problem as added stress is placed on the knee joint. The patient currently wears ankle foot orthoses (AFOs) to assist with his gait, however they do not address the hyperextension of the patient's knees. The goal of this project was to 3D print an adjustable hyperextension orthotic knee brace that will connect to the patient's current AFOs. The brace was drawn in Autodesk Inventor and then was 3D printed using MatterHackers PRO Polylactic Acid Filament. The brace was designed to be adjustable in girth and length in order to be adjustable as the patient grows. The brace was tested using both qualitative and quantitative assessments. Surveys were administered to parents, therapists, and teachers to monitor the effectiveness of the brace. Force plate technology and MaxTRAQ software was used to quantitatively measure the success of the brace by determining the force placed on the patient's lower extremities and the angles of the knee. The design of the brace is to be cost effective, time efficient, and easily available. It is the hope of this project that it will not only improve the quality of life of those like our patient, but one day could be marketable to help others who suffer from hypotonia or joint laxity.

071
Name: Matthew Register
Major: Biological Engineering
Faculty Advisor, Affiliation: Dr. Raj Prabhu, Agricultural and Biological Engineering
Project Category: Biological Sciences and Engineering
Co-Author(s): Kali Sebastian
Other Competition(s): Community Engagement Research Track

Mechanical Response of Porcine Brain Tissue to Cyclic Loading
A traumatic brain injury, or TBI, is a disruption in the normal function of the brain that is caused by an external force or impact to the head. This is commonly seen in people who suffer from a concussion which occurs regularly in sports, namely football, as well as car accidents. Over the last few decades, researchers have attempted to study the effects of forces applied to the brain in various ways. Some of the most promising research has been conducted through computer modeling that simulates blunt force trauma to the brain which is inclusive of various shear and compressive deformation characteristics. Computer modeling works well by allowing the user to change variables or parameters as well as run many iterations for different impact scenarios. However, the major problem with these models is that they require parameters that can only be obtained from in vitro testing on brain tissue. The research conducted provides greater insight for these shortcomings by quantifying stress—strain characteristics using porcine brain tissue. The mechanical behavior of the viscoelastic brain tissue was acquired through cyclic compression testing at low strain rate and high strain levels.

139
Name: Claudia Reid
Major: Biochemistry
Faculty Advisor, Affiliation: Dr. Todd Mlsna, Department of Chemistry
Project Category: Physical Sciences and Engineering
Co-Author(s): Amali Herath

Using potassium hydroxide activated biochar to remove cadmium from aqueous systems
The use and popularity of biochar has steadily increased due to its positive characteristics such as its ability to absorb and preserve nutrients in soil, its potential to increase soil fertility in dry environments, its large surface area, and its low production cost. The value of the use biochar has also been displayed in its ability to improve environmental quality and decrease the number of environmental pollutants. Potassium hydroxide was used to activate DFBC, or Douglas fir biochar through fast pyrolysis. This was done by dissolving KOH in distilled water at room temperature and placing and soaking the DFBC in it. Then, the prepared biochar solution went through thermal treatment by being placed in the muffle furnace set to 700°C with nitrogen flow. The produced biochar treated with KOH was characterized with scanning electron microscopy, transmission electron microscopy, energy dispersive X-ray spectroscopy and point zero charge measurements. It was concluded that the BET surface area for the KOH treated biochar was greater than that of untreated DFBC. This was calculated through N2 adsorption isotherms. The KOH treated DFBC surface area was found to be 1049 m^2/g, and untreated DFBC surface area was found to be 535 m^2/g. Batch sorption studies for the KOH treated DFBC were calculated. These tests were completed using variable pH values from 2 to 8. The treated biochar absorption of cadmium was tested by calculating the equilibrium concentration of cadmium in the filtrate through atomic absorption spectroscopy. Finally, the kinetics of the KOH treated DFBC were studied. The kinetic studied were completed at 25, 35 and 45 °C. The models used to calculate the maximum adsorption capacity of cadmium on KDFBC were: Langmuir, Freundlich, Sips, Redlich- Peterson, and Toth. It was concluded that, KOH treated biochar displayed a greater absorption capacity to lead than normal biochar.

009
Name: Jasmine Riddle
Major: Art/Fine Arts
Faculty Advisor, Affiliation: Dominic Lippillo, Photography
Project Category: Arts and Humanities (Oral Presentation)
Other Competition(s): Thesis Research Competition (TRC)

I am Nobody. Nobody knows me.
Expressing the different stages people go through while having anxiety is something I plan to express throughout my series of photographs. Anxiety is something I've always chosen to not speak about. Creating my body of work will be informative as well as a form of healing for myself. I want the viewers to feel the irritation that comes with dealing with anxiety while viewing my images. I have dealt with anxiety for years. Showing the effect it has had on my life is what will be expressed within my work. After researching, I found that I suffer from selective mutism. Being unable to publicly speak has kept me from a lot of great opportunities and sometimes lead to depression.
In addition to making images, I will produce videos as well. The visual motion will hit the viewer harder because of the continuous imagery. Speaking in front of crowds is something several people get nervous about. With the use of zoom I will be able to showcase the fear and anxiety of public speaking. Along with the video I plan to attach sound and selective words. Having a clip of me just sitting in a room with nothing surrounding me will be used in order to express the emptiness I feel inside after thinking of myself as a complete failure. By the use of multiple exposures, I plan to express the stage of losing my mind from overthinking about certain situations and events.

140
Name: Ross Robertson
Major: Aerospace Engineering
Faculty Advisor, Affiliation: Yeqing Wang, Aerospace Engineering
Project Category: Physical Sciences and Engineering
Co-Author(s): Spencer Lampkin
REU/Research Program: Dean of Engineering Undergraduate Research Stipend

Residual Strength of Wind Turbine Blades After Lightning Strike
Wind farms are becoming more common as wind energy becomes a popular source of electricity; however, wind farms are often compromised when wind turbine blades are damaged by lightning strikes. Lightning strike damage to wind turbine blades is growing concern as material developments allow these blades to become longer which leads to them becoming more susceptible to lightning strikes. My research aims to examine the residual strength of wind turbine blades after they have been damaged by 50, 100, and 150 kiloamp lightning strikes. The test pieces being struck are manufactured using a fiberglass woven prepreg following a standard wind turbine tip layup of [+45/-45/0_6/+45/-45/02]. The residual strength is examined by subjecting each test piece to a four-point bending test and comparing the resulting stress-strain curves to a control test piece that has not been damaged by lighting strike. Results of experimentation aim to understand the extent of damage that wind turbine blades face when subjected to a variety of lighting strike incidents so that damage can be mitigated in the future.

141
Name: Jacob Rogers
Major: Aerospace Engineering
Faculty Advisor, Affiliation: Donghoon Kim, Aerospace Engineering
Project Category: Physical Sciences and Engineering

Accurate and Cost-Efficient Indoor Positioning System Improvement Through Filtering Implementation
An indoor positioning system (IPS) is an effective way of localizing an object indoors since the Global Positioning System (GPS) is often inaccurate or unusable. This project is a continuation on the development of a low cost and accurate sensing system for autonomous platforms that operate indoors or in locations impenetrable by GPS signals. The ranging sensors chosen for the project are justified. The IPS constructed uses ultra-wide band (UWB) ranging sensors to provide the distance measurements needed for trilaterating the position of a tagged object. This presentation displays the progress made with the UWB IPS in dynamic scenarios through simulation and experimentation. Modified versions of the Kalman filtering (KF) were implemented into the localization algorithms to increase the accuracy of the position estimation since the standard deviation of the UWB ranging sensors increases for dynamic scenarios. To further validate the algorithms, a study was conducted to determine the KF estimation performance under random disturbance conditions, such as a human crossing a sensor pair's line of sight. This progress is crucial to the development of a reliable and affordable IPS.

072
Name: Anna Rourke
Major: Biological Engineering
Faculty Advisor, Affiliation: Dr. Lauren B. Priddy, Agricultural and Biological Engineering
Project Category: Biological Sciences and Engineering

Hydroxyapatite Coatings of Biodegradable Magnesium Implants
Due to the biocompatibility and mechanical properties of magnesium, it holds much promise in the future of biomedical implants and devices. Nonetheless, magnesium has a few drawbacks such as a rapid degradation rate which can lead to insufficient mechanical support. One way to combat this is to coat the material with hydroxyapatite (HA), which is a fundamental mineral component of bone. Along with decreasing the degradation rate, HA coatings may also increase the osseointegration of the implant. The most widely used method for coating hydroxyapatite on magnesium is solution deposition. In this study, pH, treatment time, and solute concentration will be varied to achieve a coating that is stable,

homogeneous, and conducive to cell attachment. The morphological changes will be monitored using Scanning Electron Microscopy and Talysurf CLI 2000 surface profilometry. The first variable tested was treatment time, which was either 8 hours, 16 hours, or 24 hours. Preliminary results showed a consistent coating was formed and the surface roughness may increase with increasing time in solution. The second variable tested will be pH, which will be either 7.4, 8.9, or 11.3. The last variable tested will be the solute concentration, which will be either 0.05 M or 0.25 M. From these parameters, a matrix of 8 total conditions can be created. Each condition will be treated at 363 K, which is below the lowest extrusion temperature for magnesium.

073
Name: Erin Rowcliff
Major: Chemical Engineering
Faculty Advisor, Affiliation: Dr. R Mark Bricka, Dave C. Swalm School of Chemical Engineering
Project Category: Biological Sciences and Engineering
Other Competition(s): Thesis Research Competition (TRC)

Investigation of Ion Specific Electrodes and Conductivity Probes as a Reliable Method for Detecting Na+ and Cl- ions in Effluent Generated from the Electrokinetic Remediation of Soils
Electrokinetic (EK) remediation is an electrical process where electrodes are placed into a contaminated soil and low voltage direct current is placed across the soil to facilitate contaminant removal. We are currently working alongside a group conducting research on chloride-contaminated soil using EK. The purpose of our research is to identify and adapt a reliable and cost-effective method for detecting the concentration of sodium (Na^+) and chloride (Cl^-) ions extracted from the soil using EK. We have identified that one method to detect Na and Cl is to use specific ion electrodes (SIE). To gain a better understanding how the electrodes work we initiated a detailed study to examine their usefulness for our application. This work initiated with identifying the best SIE for our use. After these SIE were acquired, ACS grade sodium chloride was purchased, and a stock solution of 5000 ppm Na was prepared. Using serial dilution standards concentrations of 1000, 500, 200, 100, 75, 50, 25, 10, 1, 0.5, 0.1 ppm Na were prepared. These solutions were used to calibrate a sodium and chloride SIE as well as a conductivity probe. Unfortunately, problems were encountered when calibrating the electrodes. Initial results indicate that the SIE and conductivity probe reading are very unstable. Currently we are the possibility of using Ionic Strength Adjuster (ISA) to assist in stabilizing the electrode readings. Other method of addressing stability issues will also be detailed. Our systematic approach and final solutions to address ISA and conductivity stability issues will be the focus of this presentation.

074
Name: Timothy Rozek
Major: Chemical Engineering
Faculty Advisor, Affiliation: R. Mark Bricka, Dave C. Swalm School of Chemical Engineering
Project Category: Biological Sciences and Engineering
Co-Author(s): William Boot
Other Competition(s): Community Engagement Research Track

Investigation and Determining the Root Cause of Corrosion Occurring in a Wood Drying Kiln
The purpose of this study is to help a local company address various corrosion issues. The company is currently plagued by many forms of corrosion in a kiln used to dry wood. The kiln being studied has been in service for around five years and is severely deteriorated due to corrosion. Several pieces in the kiln have been replaced within the five years of service at a high cost. A inspection of the kiln was conducted and it was observed that, a large amount of ash build up was found caked onto the kiln's internals (i.e. support beams, baffles, fire suppression piping etc.) Multiple samples of ash and condensate have been taken to be studied. A piece of pipe that was removed from the kiln was cut into small sections. The sections of pipe will be subjected to corrosion testing. The sections of pipe will be subjected to seven different solutions, which include the following: deionized water, ash mixed with deionized water, hydrochloric acid, ash mixed with hydrochloric acid, ash mixed with hydrochloric acid tested at elevated temperature, condensate, and ash mixed with condensate. This presentation will discuss the results of this corrosion testing and offer possible a plan of action to slow

the rate of corrosion occurring in the kiln. This research is part of the directed individual study that is currently ongoing thus, data continues to be developed and all data available at the time of the presentation will be discussed.

075
Name: Erin Rushing
Major: Biochemistry
Faculty Advisor, Affiliation: Barbara Kaplan, Basic Sciences CVM
Project Category: Biological Sciences and Engineering
Co-Author(s): Evangel Kummari

Optimization of JC-1 Apoptosis Assay to Evaluate the Effects of the Environmental Contaminant TCDD
Previous results from our laboratory showed that TCDD can suppress the autoimmune disease experimental autoimmune encephalomyelitis (EAE). Specifically, TCDD suppressed T cell immune function in the spleen, which correlated with decreased neuroinflammation and clinical scores. The goal of this project is to determine if TCDD-treated B cells contribute to decreased T cell function. Our hypothesis is that TCDD will induce regulatory B cells in the EAE model. Toward that end, we showed that TCDD increased expression of Fas ligand (FasL) in B cells from spleen and spinal cord. FasL induces apoptosis in Fas-expressing T cells. Based on these data, we have begun to investigate if this is the mechanism by which the regulatory B cells are operating. It then became necessary to develop an apoptosis assay. One such assay is JC-1, which uses mitochondrial membrane potential to determine the cells' viability status. We first began the optimization process by varying the levels of the cationic JC-1 dye to determine the most effective concentration. We then altered the amount of FCCP, the positive control. As expected the FCCP positive control reduced membrane potential at various concentrations of JC-1, but further optimization is needed before we assess the effects of TCDD. Establishment of this assay will allow us to assess whether TCDD-treated B cells are capable of inducing apoptosis in T cells. Project funded by NIH R15 027650

142
Name: Gabriel Sanders
Major: Aerospace Engineering
Faculty Advisor, Affiliation: Dr. R. Sullivan, Aerospace Engineering Department
Project Category: Physical Sciences and Engineering
Co-Author(s): Daniel Drake, Dr. R. Sullivan
Other Competition(s): Community Engagement Research Track

Influence of Ply Orientation on the Fracture Toughness of Stitched Sandwich Laminates
In this study, the effect of ply orientation on the calculated fracture energy of stitched and unstitched sandwich composites is investigated. Fracture energy is defined as the required energy to produce a crack or delamination within a composite laminate. A sandwich composite is a composite structure that consists of facesheets on both sides of a thick, rigid core. The core used in this study is a 110 kg/m3 perforated (Rohacell HERO^{TM}) foam core. Sandwiched composites are often used in primary and secondary composite load structures due to their high flexural stiffness and strength. However, sandwich composites are susceptible to core-to-facesheet separation due to low interfacial strength between the facesheets and the core. As a result, fracture tests are needed to characterize the fracture energy during core-to-facesheet separation. Furthermore, the fracture energy can develop significant variations through crack propagation due to Poisson's effect. Sandwich composite preforms of [±45°/∓45°/Core/±45°/∓45°] and [0°/90°/90°/0°/Core/0°/90°/90°/0°] laminate configurations were stitched using an industrial sewing machine. Stitching is performed on these laminates to decrease the rate at which delamination will occur along the length of the specimen. Once the sandwich composite preforms are stitched, each laminate was cured using a vacuum-assisted resin transfer molding process, using an out-of-autoclave resin system. Single cantilever beam tests will be performed to determine the fracture energy. From these measurements, the Mode 1 interlaminar fracture energy of the composite can be calculated using modified beam theory. The final paper will discuss the influence of ply orientation on the fracture toughness, with and without stitching, and how these results can impact the aerospace industry.

076
Name: Hannah Scheaffer
Major: Biochemistry
Faculty Advisor, Affiliation: Matthew Ross, College of Veterinary Medicine, Department of Basic Sciences
Project Category: Biological Sciences and Engineering
Co-Author(s): Abdolsamad Borazjani, Brittany Szafran

Inactivation of Prostaglandin D2 Glyceryl Ester Hydrolysis Using Carboxylesterase 1 Inhibitors Augments Its Anti-Inflammatory Effects in Human THP1 Monocytic/Macrophage Cells

Human monocytic cells in blood have important roles in host defense and express the enzyme carboxylesterase 1 (CES1). This metabolic serine hydrolase plays a critical role in the metabolism of many molecules, including lipid mediators called prostaglandin glycerol esters (PG-Gs), which are formed during cyclooxygenase-mediated oxygenation of the endocannabinoid 2arachidonoylglycerol. Some PG-Gs have been shown to exhibit anti-inflammatory effects. However, they are unstable compounds and their hydrolytic breakdown generates pro-inflammatory prostaglandins. We hypothesized that by blocking the ability of CES1 in monocytes/macrophages to hydrolyze PG-Gs, the beneficial effects of anti-inflammatory PGD2-G could be augmented. The goal of this study was to determine whether PGD2-G is catabolized by CES1, then to evaluate the degree to which this metabolism is blocked by small-molecule inhibitors. A human monocytic cell line (THP1 cells) was pretreated with increasing concentrations of small-molecule inhibitors that block CES1 activity [chlorpyrifos oxon (CPO), WWL229, or WWL113], followed by incubation with PGD2-G (10 μM). Organic solvent extracts of the treated cells were prepared and analyzed by LC-MS/MS to assess levels of the hydrolysis product PGD2. Further, THP1 monocytes with normal CES1 expression (control cells) and knocked down CES1 expression (CES1KD cells) were employed to confirm CES1's role in PGD2-G catabolism. We found that CES1 has a prominent role in PGD2-G hydrolysis in this cell line, accounting for about 50% of its hydrolytic metabolism, and that PGD2-G could be stabilized by the inclusion of CES1 inhibitors. The inhibitor potency followed the rank order: CPO>WWL113>WWL229. THP1 macrophages co-treated with WWL113 and PGD2-G prior to stimulation with lipopolysaccharide exhibited a more pronounced attenuation of proinflammatory cytokine levels (IL-6) than by PGD2-G treatment alone. These results suggest that the anti-inflammatory effects induced by PGD2-G can be further augmented by inactivating CES1 activity with specific small-molecule inhibitors.

077
Name: Jaylan Sears
Major: Biological Sciences
Faculty Advisor, Affiliation: Dr. Barbara Kaplan, CVM Department of Basic Sciences
Project Category: Biological Sciences and Engineering
Co-Author(s): Clare Brown, Dr. Todd Archer

In vitro Assessment of Cannabinoids on Immune Responses in Canine PBMCs

The aim of this project was to examine the effects of the plant-derived cannabinoids, cannabidiol (CBD) and tetrahydrocannabinol (THC), on canine peripheral blood mononuclear cells (PBMCs) in vitro. Studies such as these are important not only to understand effects of cannabinoids on immune function to assess their potential to treat canine autoimmune disease, but because, similar to human self-treatment for a variety of ailments, pet owners are increasingly using cannabinoid compounds to treat their pet's ailments. PBMCs were isolated from canine blood and treated with CBD or THC, followed by stimulation with Concanavalin-A (ConA) or PMA/ionomycin (PI). RNA was isolated to determine gene expression of cytokines interleukin-2 (*IL2*) and interferon gamma (*IFNG*) via qPCR. The PBMCs were also allowed to undergo an overnight recovery period following isolation and before stimulation to determine if this affected endpoints. Results from qPCR indicated that CBD and THC could affect cytokine production, but that it was dog-specific; some dogs exhibited no or negligible effects, some dogs exhibited modest suppression of *IL2* and *IFNG* expression by CBD and THC, while one dog exhibited modest enhancement of *IL2* and *IFNG* expression by CBD and THC. *IFNG* consistently exhibited a higher magnitude of stimulation than *IL2*, but the stimulation magnitude also varied from dog to dog. Although these evaluations appear to show that cannabinoid effects on gene expression are dog-specific, these findings provide important preliminary insight into the potential of these compounds for canine autoimmune diseases. They will also contribute to our understanding of immune effects in the event of accidental exposures or purposeful administration of cannabinoid compounds in domestic species.

143
Name: Chirantan Sen Mukherjee
Major: Electrical Engineering
Faculty Advisor, Affiliation: Dr. Shan Yang, Physics, Atmospheric Sciences & Geoscience, Jackson State University
Project Category: Physical Sciences and Engineering
REU/Research Program: MSINBRE

Dual Excitation Raman Spectroscopic Analysis On Water Levels In Biological Tissues
Raman spectroscopic analysis was performed on dry and wet chicken and pork skin samples ex vivo. The goal was to determine the componential influences from protein and fat on the skin hydration. Dual excitation Raman spectroscopy was pertinent for this study in order to achieve a greater range in wavelength, hence revealing the region where water could be detected in the enamel via -OH bonding. Fluorescence emitted from proteins is a common issue when probing biological tissues, however, the NIR illumination of Raman spectroscopy greatly reduces the auto-fluorescence of biological samples such as chicken and pork skin. Additionally, dual excitation will allow the detection of protein structure change from wet to dry skin. The patterns in the results reveal that a higher right shoulder in the C-H region of the skin is associated with a greater OH- intensity, meaning a larger content of unbound water. Furthermore, comparison between Raman spectra and FTIR spectra indicate Raman spectra is superior than FTIR in studying the componential and structural difference of skin at high wavenumber regions.
Acknowledgement: This work was supported by the National Institute of General Medical Sciences (NIGMS) and National Institute of Dental and Craniofacial Research (NIDCR) of the National Institutes of Health (NIH) under award number SC2DE027240, and the Mississippi INBRE, funded by an Institutional Development Award (IDeA) from the NIGMS of the NIH under grant number P20GM103476. The equipment was partially supported by the National Science Foundation (NSF) under award number 1332444.

078
Name: Katie Shearer
Major: Biochemistry
Faculty Advisor, Affiliation: Dr. Florencia Meyer, Biochemistry
Project Category: Biological Sciences and Engineering

Cobalt Chloride inhibits the growth of *Mannheimia haemolytica*
Mannheimia haemolytica is an opportunistic pathogen that proliferates in the nasal pharynx of cattle. It is gram negative, non-motile, and the cause of bovine pneumonic pasteurellosis, also known as shipping fever. When the animal is under stress and its immune system is compromised, the bacteria is able to invade the lower respiratory tract and cause pneumonia (Lo, Sathiamoorthy, & Shewen 2006). This bacteria is a known contributor to bovine respiratory disease, which costs the cattle industry up to one billion dollars annually (Oppermann, Busse, & Czermak 2017). Cobalt has been shown to improve the immune system and is also a metal that is known to inhibit bacterial growth. A study done by Paterson & MacPherson (1990) showed that cattle on a depleted Co diet had a lowered immune response and more severe bacterial infection than Co supplemented cattle. However, when too much cobalt is taken into the body, it can cause harmful effects. The goal of this experiment is to find the optimal concentration of CoCl2 to use to inhibit the growth of *Mannheimia haemolytica*.
Our results show that the effect of cobalt chloride on *Mannheimia haemolytica* growth is concentration-dependent and cell-density dependent.

200
Name: Jihyun Shin
Major: Sociology
Faculty Advisor, Affiliation: Kenya Cistrunk, Department of Sociology
Project Category: Social Sciences
Co-Author(s): Dr. Branden Leap, Dr. Keisha Johnson, Sarah Caylor, Emily Tingle
REU/Research Program: Northeast Mississippi Daily Journal (NEMDJ) Undergraduate Research Award Program
Other Competition(s): Community Engagement Research Track, Thesis Research Competition (TRC)

Effects of Gender, Age, Race, and Rurality on Food Insecurity

The purpose of my research is to investigate Food Insecurity in a rural setting (Vardaman MS). Food insecurity means that people cannot pursue high-quality foods that are healthy, fresh, and affordable. The percentage of of poverty in Mississippi at 22% and at food insecurity 22% is higher than the national poverty average of 15.5% and food insecurity average of 13% . This study has two hypotheses that aim to measure the level of food insecurity for people who live in the rural community of Vardaman. My first hypothesis suggests that there is no link between residents' food preferences and actual "buying" practices based on whether residents favor fresh local and organic foods. Even though people in Vardaman realize the importance of nutritional food, their ideas are not linked to their real purchasing and eating habits. Secondly, there is a relationship between self-reported health and the frequency of utilizing unhealthy cooking styles, such as convenience foods and fast food restaurants. On average, residents use "ready meals (instant)" or cook "ready-made meals." Interestingly, recipients who answered only having "ready meals" are one-third of the participants. Through the research, it is possible to investigate the co-relationships between rurality and food insecurity. As a result, data which are used for three hypotheses prove the significance of rurality and high food insecurity level. People in Vardaman need patterns in foodways and food governmentality for their health and initiative lives. In the basis on the characteristics of rural community has; communal and interactive among neighborhoods, collective food secure programs should be introduced.

201
Name: Cory Shumate
Major: Psychology
Faculty Advisor, Affiliation: Dr. H. Colleen Sinclair, Psychology, Social Science Research Center
Project Category: Social Sciences
Co-Author(s): Chelsea Ellithorpe, Jessica Weiss Utley, Megan Stubbs-Richardson, Sierra Nelson

Lunchtable Legacies: Consequences of Identity-Based Bullying in High School

Bullying is increasingly being understood as a form of intergroup conflict (e.g., Gaertner et al., 2008). The aim of the present study is to chronicle the frequency of bullying based on social identities, such as gender, race/ethnicity, and sexual orientation. Further, we examined the psychosocial and behavioral consequences of bullying based on these identities, as compared to general aggression. We employed Intergroup Emotions Theory (IET) to test our hypotheses. IET states others will see an individual, and that individual's actions, in terms of their implications for that ingroup, rather than for the individual personally. Three hypotheses were included in this experiment. First, we hypothesized that identity-based school aggression was linked to more severe negative behavioral outcomes than general aggression. Secondly, we hypothesized that identity-based school aggression was linked to more severe negative psychological outcomes than general aggression. Lastly, we hypothesized that, in accordance with IET, fear responses will result in asocial and self-harm responding, while anger will trigger antisocial responding to school aggression. Five hundred and seventy-eight students in a rural southeastern U.S. high school agreed to participate in an online survey regarding how often they experienced or engaged in physical, verbal, relational, and cyber bullying over the last three months. In our sample, 52% reported experiencing identity-based aggression. Findings suggest identity-based aggression leads to more severe psychological consequences than general aggression (i.e., negative affect, lowered self-esteem, and perceived costs). Identity-based verbal aggression resulted in asocial and self-harm responses, while identity-based cyberbullying resulted in higher rates of self-harm and aggression.

202
Name: Sam Shurden
Major: Psychology
Faculty Advisor, Affiliation: Hilary DeShong, Psychology
Project Category: Social Sciences
Co-Author(s): Karen Kelley
Other Competition(s): Public Health Research Competition

Potential mediating effects between neuroticism, substance use, and stressful life events in predicting risk for suicide
Suicide continues to be a public health concern, as it is the second leading cause of death among adolescents and the fourth leading cause of death among individuals ages 35-54 (Centers for Disease Control and Prevention, 2016). Finding ways to mitigate suicide continues to be of upmost importance and one avenue of investigation is to better understand the various upstream and downstream mechanisms that may increase or decrease suicide risk. For instance, neuroticism is a personality trait that has been positively linked to suicidal behavior (Walker, Chang, & Hirsch, 2017) and ideation (DeShong et al., 2015). Previous research also suggests that those who have experienced stressful life events have increased neuroticism, and that neuroticism predicts engagement in substance use (Riese et al., 2014; Papachristou et al., 2016). Because neuroticism has been linked to these constructs, there may be specific pathways through these underlying and environmental factors that lead to increased suicide risk. The current study investigated the role of stressful life events and substance use as mediating factors between neuroticism and suicide risk. It is expected that elevated neuroticism will lead to increased stressful life events, which will lead to increased substance use. This combination of underlying traits, environmental factors, and coping behaviors will increase suicide risk. The current sample consisted of undergraduate students (n=294) who completed *the International Personality Item Pool 120-item version* (IPIP-NEO-120) and the *Personality Assessment Inventory* (PAI) for an online study. Two chain mediation models were conducted using Hayes Process Model 6. The study highlights the need for early intervention coping strategies for those that experience stressful life events, especially for those individuals with high levels of neuroticism.

079
Name: Safaa Siddiqui
Major: Anthropology
Faculty Advisor, Affiliation: Britney Kyle, Department of Anthropology, University of Northern Colorado
Project Category: Biological Sciences and Engineering
Co-Author(s): Stefano Vassallo, Laurie J. Reitsema
REU/Research Program: NSF REU Site - Immersive Research in the Bioarchaeology of Greek Colonization, Sicily, Italy
Other Competition(s): Community Engagement Research Track, Public Health Research Competition, Thesis Research Competition (TRC)

Himera (Sicily): Estimating allostatic load and age-at-death using stress indices
In humans, “stress” and “health” have a complex relationship. In living individuals, physiological strain is tracked using allostatic load, which is difficult to estimate within skeletal remains. The Skeletal Frailty Index (SFI), based on 13 skeletal biomarkers, measures allostatic load in skeletal remains. Applying a modified SFI, 9 skeletal biomarkers and age-at-death were used to estimate stress in individuals from the Greek colony Himera (n=428, 6th-5th c. BCE), located on Sicily, Italy. We expected a higher frequency and variety of early life pathological biomarkers correlating with earlier age-at-death, following the hypothesis that colonization causes stress during the life-course and that early life stress leads to earlier age-at-death. We created a pathological index by dividing pathological conditions present by pathological conditions observable per individual. Logistic regression analysis comparing age-at-death and pathological indices of three or more observable biomarkers revealed a significant relationship between stress and age-at-death ($p=5.792e-06$; $p<0.05$). There was a negative relationship between the childhood pathological index and age-at-death ($p=.10$), there was a positive relationship between a lifetime cumulative pathological index and age-at-death ($p=0.002281$). Skeletal pathologies that can develop at any age increased with age-at-death, while skeletal pathologies that only develop during childhood tended to decrease with age, possibly suggesting a relationship between childhood stress and early mortality in Greek colonies.

This project provides support for the use of biomarker-based indices for estimating stress in past populations and may facilitate understanding in similar modern situations of stress and demographic transition.
This research was funded by National Science Foundation Research Experience for Undergraduates award numbers 1560227 and 1560158, as well as the University of Georgia and the University of Northern Colorado.

203
Name: David Sides
Major: International Business
Faculty Advisor, Affiliation: Ginger Pizer, English
Project Category: Social Sciences
Other Competition(s): Community Engagement Research Track, Thesis Research Competition (TRC)

Language Endangerment in an Urbanizing Tanzania
This paper explores the relationship between socioeconomic factors and the maintenance of regional languages within Tanzania. Specifically, this paper highlights the role of the intranational movement of people on the strengthening of a regional lingua franca, Swahili. Due to the increased interactions between people of different ethnic heritages in urban areas, the number of speakers of the ethnic regional languages is quickly declining, as predicted in Krauss (1992). In order to collect data on this trend, the researcher interviewed a group of 30 Catholic monks living in the Rukwa region of Tanzania concerning their demographic and linguistic backgrounds. Preliminary results show a clear trend towards Swahili as the first language, particularly for individuals from urban areas. This trend goes against data from the last 25 years which shows Swahili predominantly as an L2 as opposed to an L1. This data should serve as a catalyst for documentation and revitalization efforts in the country in order to collect data before the number of speakers of the over 100 distinct regional languages begins to seriously decline.
Keywords: urbanization, linguistic suicide, Swahili, Tanzania, language maintenance

080
Name: Katherine Slack
Major: Wildlife & Fisheries Science/Aquaculture & Fisheries Science
Faculty Advisor, Affiliation: Scott Rush, Wildlife, Fisheries, and Aquaculture
Project Category: Biological Sciences and Engineering
Co-Author(s): Thomas G. Rosser, Scott A. Rush
REU/Research Program: Undergraduate Research Scholars Program

Morphological and molecular survey of avian haemosporidians of Passerine hosts banded in Oktibbeha County, Mississippi
Haemosporidians are a cosmopolitan group of vector-borne protozoan endoparasites of blood cells of avian, reptilian, and mammalian hosts. The literature is teeming with accounts of haemosporidians in wild birds, novel locality and host records, and supplemental molecular data useful in identifying their cryptic diversity. *Haemoproteus* spp. are intraerythrocytic parasites of numerous avian species. Among birds, passerines make up more than half of all species. To investigate the diversity of haemosporidians in Starkville, Mississippi, 114 individuals representing 14 species from seven families of passerines were captured using mist nets from January 2018 to March 2019, and blood samples were collected in the field for morphological and molecular parasite assessment. Air dried smears were Giemsa stained and read at 1,000× magnification for a minimum of 20 min for the detection of haemosporidians. Polymerase chain reaction amplification of partial cytochrome b (cytb) gene was amplified using a nested PCR assay and sequenced bidirectionally to molecularly identify parasite lineages identified by microscopy. Haemoproteus was the only haemosporidian detected by microscopy from 12.3% of the total birds sampled. Other haematozoans sporadically observed include a *Trypanosoma* sp. and nematode microfilariae. These molecular data coupled with the banding numbers allows future investigation into phylogenic relationship between species and movement of these parasites and their bird hosts.

081
Name: Jacob Smith
Major: Agricultural Science
Faculty Advisor, Affiliation: John Riggins, Department of Biochemistry, Molecular Biology, Entomology and Plant Pathology
Project Category: Biological Sciences and Engineering
Co-Author(s): John Thomason, Todd Matthews
Other Competition(s): Community Engagement Research Track

Geocaching: A New Tool for Don't Move Firewood Outreach
Unwelcome non-native forest insect pests are threatening U.S. forests. Species such as the emerald ash borer are causing significant economic loss. Firewood is believed to be the main mode of transportation for these pests. Long distance movement of firewood can introduce forest insect pests to new communities. In this outreach program, “Don’t Move Firewood” themed geocaches will be placed near campgrounds or other outdoor recreation areas across Mississippi in an effort to inform the public of the dangers of moving firewood.

082
Name: Samantha Sockwell
Major: Human Sciences/Food Nutrition & Dietetics
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Project Category: Biological Sciences and Engineering
Co-Author(s): Allie Cowles, Nicole Reeder, Ahmed Saddam, Terezie Mosby
REU/Research Program: SRI
Other Competition(s): Public Health Research Competition

The Relationship Between Nut Consumption and Body Fat Percent in Female College Students
College students have different barriers for not being able to have a steady and healthy diet. One of the contributing factors is snaking habits when studying or with a busy schedule. Nuts are an easy grab and go snack that are full of health benefits. They are a good source of unsaturated fats, fiber, and Omega 3 fatty acids, which all have been shown to decrease risk of heart disease and other health problems common in individuals with excessive body fat.
The purpose of this study was to investigate the correlation between nut consumption and body fat percentage among female college students. Female college students enrolled at Mississippi State University (n=456, mean age 20.05±2.42 years) completed the NIH Diet History Questionnaire II and had their body fat percentage measured via a Bioelectric Impedance Analysis (Tanita) scale.
There was a significant inverse correlation (p= 0.029) between body fat percentage and nut consumption. There was also a significant difference in nut consumption between Caucasian females (n=346) and African American females (n=98), with the Caucasian group consuming more nuts than the African American group (1.07±1.70 servings/day vs 0.35±0.71 servings/day).
The findings of the study provide further information on the dietary habits of young, female adults which may be used to tailor obesity interventions in this population.

204
Name: Je'Kylynn Steen
Major: Human Sciences/Human Dev & Family Studies
Faculty Advisor, Affiliation: David R. Buys, PhD, MSPH, CPH, Food Science, Nutrition, and Health Promotion
Project Category: Social Sciences
Co-Author(s): Reagan Moak, Ann Sansing, Jasmine Harris-Speight
Other Competition(s): Public Health Research Competition

Junior Master Wellness Volunteer: A Community-based Health Education Program
Mississippi State University Extension Service's Junior Master Wellness Volunteer (JMWV) program is designed for teens ranging from 14-18 years of age that are interested in delivering community-based health and wellness outreach. The program promotes community partnerships, positive youth development, and intentional learning experiences. JMWVs are trained in community health assessment, chronic disease prevention, oral health, mental health and other topics as well as social media outreach as well as five new modules which include: asthma, bullying, healthy homes, heat and sun safety, and opioid prevention and misuse. These modules were chosen because they were reflective of current events, community need, and interests of the volunteers. The modules have been implemented during the 2018-2019 school year and are on-going. Each module includes definitions, explanations, activities, pre-set health messages for social media, and take-home challenges for everyday implementation. By increasing the number of modules and range of topics, we are able to teach a more inclusive curriculum to impact a diverse audience and build a foundation for increased health literacy. Since the addendum modules have been piloted, 462 students have been trained, 7,531 contacts, and 5,849 community service hours have been completed. This report is based on the Extension Program Planning Model and describes the process of planning, developing and implementing five new modules of the JMWV program.
Keywords: positive youth development, 4-H, cooperative extension, community-based health education

205
Name: Ashley Stephens
Major: Human Sciences/Apparel Textiles & Merchandising
Faculty Advisor, Affiliation: Charles Freeman, School of Human Sciences; Joe Wilmoth, School of Human Sciences
Project Category: Social Sciences
Co-Author(s): Sammie Davis, Farrod Green, Cammie Gunn, Francheska Washington

Do likes lead to liking oneself? An investigation into the relationships between Instagram, self-esteem, and life satisfaction
The purpose of this research project is to investigate the relationship between self-esteem, life satisfaction, and Instagram usage by Mississippi State University students. To measure self-esteem, we will use Rosenberg's [Self-Esteem Scale, 1965], and to measure life satisfaction we will use [Satisfaction with Life Scale, 1985]. To measure Instagram usage, we will use the Social Media Addiction Scale. Our hypothesis is that higher Instagram usage will be negatively correlated with life satisfaction and self-esteem. We will use an online Qualtrics instrument to survey college students at Mississippi State University to evaluate their reliance on Instagram and the relationship of their usage to self-esteem and life satisfaction. We will be able to see how this social media platform is related to the overall life satisfaction and self-esteem. We also will be using regression to see if life satisfaction n and self-esteem predict Instagram usage. We predict that higher levels of self-esteem and life satisfaction will predict higher usage of Instagram.

206
Name: Logan Strock
Major: Agricultural Education, Leadership & Communications
Faculty Advisor, Affiliation: Dr. Carla B. Jagger, Human Sciences, Agricultural Education, Leadership, and Communication
Project Category: Social Sciences

Judging the Value: Impact on Academic and Professional Success from Collegiate Livestock Judging.
The purpose of this study was to evaluate students' academic and professional value of participation on collegiate livestock judging teams, to help explain potential benefits for agricultural education. Sixty-six student members of collegiate livestock judging teams at agricultural universities became the sample for this study. Participants were recruited to complete an online survey to identify their background and experiences while on judging teams. Participants were asked their GPA before joining the team, and their GPA at the time of this survey. Their average current GPA was a 3.36, with an average decrease of -0.05 of a point from their previous GPA. Participants, on a 7-point Likert-type scale (1= Strongly Agree, 7= Strongly Disagree), were asked to rank the following skills based on how strongly they believed livestock judging contributed to the development of their academic related skills: Oral Communication (M= 1.23), Commitment (M= 1.34), Time Management (M= 1.52), Organization (M= 1.70) Critical Thinking (M= 1.29), Responsibility (M= 1.41), and Self-Motivation (M= 1.32). Participants responded that they strongly agreed all seven skills gained from judging livestock contributed to their academic success. In addition, participants were asked, on the same 7-point Likert-type scale, to rank the following skills that are often gained from judging livestock, based on how strongly they believed they contributed to their professional success: Active Listening (M= 1.42), Integrity (M= 1.40), Adaptability (M= 1.35), Teamwork (M= 1.58), Strategic Thinking (M= 1.25), Goal Setting(M=1.25), Data-backed Decision Making (M=1.42), and Creativity (M=1.46). Again, the strong majority of participants responded, saying they strongly agreed that all eight of the aforementioned skills contributed to their professional success. Through the evaluation of student's responses, agriculture educators can see tangible results of the benefits that livestock evaluation can provide students, particularly when paired with participation on a collegiate livestock judging team.

144
Name: Skylar Taggart
Major: Aerospace Engineering
Faculty Advisor, Affiliation: Keith Koenig, Aerospace Engineering Department
Project Category: Physical Sciences and Engineering
Co-Author(s): David Thompson

Analysis of Supersonic Nosecone
Three different nosecone shapes were compared to determine which has the best aerodynamic properties at supersonic speeds. The three designs are Von Karman, Sears-Haack, and ¾ Power Series. Von Karman and Sears-Haack were both selected due to their equations being mathematically derived for minimum drag. The ¾ Power series was chosen due to it being constructed from geometric figures and to compare how a geometric design may differ from a mathematically derived shape. These three designs also have their own three different sizes by changing the fineness ratio to 3.5, 5, and 7. Simulations were ran using Computational Fluid Dynamics of each nosecone and completed in computational fluid dynamics to further understand how the designs behave. Using the force applied to the nosecone the drag coefficient was found for each nosecone. This data was used to determine the best nosecone to use at supersonic speeds.

145
Name: Pronnoy Tarafdar
Major: Mechanical Engineering
Faculty Advisor, Affiliation: Dr. Junfeng Ma, Industrial and Systems Engineering; Dr. Tian Wenmeng, Industrial and Systems Engineering
Project Category: Physical Sciences and Engineering
Co-Author(s): Sayali Joshi
Other Competition(s): Community Engagement Research Track

Early Career Training for Precast/Prestressed Concrete Industry Employees in a Virtual Reality Environment
One of the major challenges in precast/prestressed concrete industry (PPCI) is the significant staff turnover at the early career stage during new employee training. A more attractive and effective early career training strategy will encourage more new employees to stay in the industry, accelerate new employees' learning pace, and thus shorten their transition from fresh employees to skilled workers. This study focuses on new employee safety training, involving stressing process safety, heavy object lifting, silica dust control, and other personal protective equipment necessity.
The advancement of Virtual Reality (VR) technology provides new opportunities to simulate the operational conditions in a virtual environment to prepare the trainees with necessary awareness and skills for their daily operations. The new employees in PPCI are suffering lack of sufficient safety awareness, which makes it easy to get injured. One of the possible ways to strengthen the safety of consciousness is to show the trainees all tangible and physical scenes. However, most of those scenes are intractable and more importantly too risky to be exposed to new employees. The VR technology can fill the gap in the safety training by its enhanced visualization and interaction.
This study is being conducted through the collaboration between ISE dept. and Tindall Corp, Moss Point. My major point of focus in this project is to help develop a realistic environment using SolidWorks and Maya.

083
Name: Hudson Thames
Major: Animal and Dairy Sciences (Pre-Vet)
Faculty Advisor, Affiliation: Dr. Thu Dinh, Department of Animal & Dairy Sciences
Project Category: Biological Sciences and Engineering
Co-Author(s): Dishnu Sajeev, Harper C. Cobb, Anuraj T. Sukumaran, Alex J. Holtcamp
Other Competition(s): Community Engagement Research Track, Thesis Research Competition (TRC)

Effects of electrostatic spray and natural antioxidants on chemical quality of grass-finished beef strips steaks
This study was aimed to determine how electrostatic spray of natural antioxidants impacts chemical quality of grass-finished beef strip steaks.
Twenty certified grass-finished beef loins from ten animals were purchased from a certified grass-fed beef purveyor. Two loins of the same animals were cut into 16 2.5-cm thick steaks (8 steaks per loin) without the *gluteus medius* muscle and the steaks were randomly assigned to a negative control (no spraying; NEG) and 1000-ppm of electrostatic spray of cherry extract rich in ascorbic acid (ES-ACE), electrostatic spray of rosemary and green tea extract rich in polyphenols (ES-RGT), and pressurized spray of ACE (PS-ACE) and 2 retail time points (0 and 5 d). Five loins were randomly selected for the analyses of total polyphenols (Folin-Ciocalteu methos; FC), thiobarbituric acid reactive substances (TBARS), trolox equivalent antioxidant capacity (TEAC). Data were analyzed by SAS v9.4 and actual probability was reported.
On d 0, NEG steaks had less FC values than all treatment steaks ($P < 0.001$), of which the ES_ACE steaks had 14 and 100% more than PS_ACE and ES_RGT steaks, respectively ($P \leq 0.005$). Only ES_ACE steaks had greater FC value than NEG steaks on d 5 ($P < 0.001$). As a result, TEAC value of ES_ACE steaks was 17 and 75% more than that of PS_ACE and ES_RGT steaks ($P \leq 0.005$) and remained greater than that of NEG steaks on d 5 ($P = 0.064$). Greater antioxidant capacity in ES_ACE and PS_ACE steaks decreased lipid oxidation by 56% (0.9 μg MDA/kg less in ES_ACE and PS_ACE on d 5) as compared with NEG steaks in ES_ACE steaks in contrast to the other treatments ($P < 0.001$).
Electrostatic spray of cherry extract rich in ascorbic acid was the most effective antioxidant application to prevent lipid oxidation in grass-finished beef strips steaks.

084
Name: Kensey Thomas
Major: Biochemistry (Pre-Vet)
Faculty Advisor, Affiliation: Cyprianna Swiderski, Clinical Sciences
Project Category: Biological Sciences and Engineering
Co-Author(s): Frodella CM, Thomas KA, Bowser JE, Mochal CA, Eddy AL, Claude A, Swiderski CE

The Lung Transcriptome of Horses with Pasture-Associated Severe Equine Asthma Identifies A TH17-High TH2-Low Phenotype.

Severe equine asthma (SEA) is characterized by reversible airway obstruction, non-specific airway hyper-responsiveness and chronic neutrophilic airway inflammation. Two forms of SEA have been described. One is elicited by barn dust in association with indoor housing in continental climates. The second form is associated with grazing pastures during conditions of high heat and humidity. Airway inflammation is predominantly neutrophilic in SEA, presenting a conundrum because TH2 cytokine responses identified in both conditions are predicted to precipitate eosinophilic inflammation. Increased IL-17 has been identified in horses with barn dust SEA, leading us to hypothesize that TH17 and TH2 phenotypes co-exist in pasture-associated equine asthma. To test this hypothesis and identify relevant upstream regulators, we contrasted the lung transcriptomes of horses with pasture-associated SEA (N=6) in serial lung biopsies collected during disease exacerbation and remission. Reads were aligned to EquCab3.0 with differential expression analysis and modeling using CLC Genomics Workbench and Ingenuity Pathways Analysis, respectively (Qiagen). IL-17 signaling (p=7.6x10E-11) was the top canonical pathway, supporting predominance of TH17 responses in pasture-associated SEA. TH2 signaling was also significantly increased (p=3.2x10E-4). HMGB-1 signaling, documented to support both TH17 and TH2 differentiation, was significantly increased. HMGB-1 is increased via TLR4 signaling and identified in serum and sputum of severe asthmatics where TH17 high and TH2 low phenotypes are described. We conclude that horses with pasture-associated SEA are similarly characterized by a TH17 high/TH2 low phenotype and that environmentally induced HMGB-1 signaling mediates a shift toward TH17 signaling during seasonally induced exacerbations of pasture-associated SEA.

This project was supported by the Agriculture and Food Research Initiative (AFRI) Animal Health Program competitive grant no. 2015-67016-23172 from the USDA - National Institute of Food and Agriculture.

146
Name: Victoria Thompson
Major: Building Construction Science
Faculty Advisor, Affiliation: Saeed Rokooei, Building Construction Science
Project Category: Physical Sciences and Engineering
Co-Author(s): Jalyn Wallin

Improving Gender Disparity in Engineering and Construction (EC) Higher Education by Investigating Background Factors Motivating Female Students into EC

Gender disparity in engineering and construction is not a recent matter. For decades, the number of women in EC has shown great disproportion to the number of male counterparts. According to Isaacs, the paucity of women in the construction industry are related to the skewed image of the engineering profession and lack of understanding about the profession (Isaacs, 2001). Isaacs found that women enrolled in engineering retained approximately at the same rate as their male classmates. In the past ten years, however, studies have shown an increase in the ratio of women in engineering and construction industries.

In 2014, 19.9 percent of engineering bachelor's degrees were to women, according to Profiles of Engineering and Engineering Technology Colleges (Yoder, 2014), which is a notable increase for the sixth consecutive year rising 17.8 percent since 2009. Despite the rise in EC women, in comparison to other fields such as education and health services (74.6 percent), financial activities (53 percent), or information technology (39.1 percent) (Yoder, 2014).

This study looks at the factors impacting the perception of female students in engineering and construction programs at Mississippi State University. This research aims to provide better understanding of the factors that impact female students when choosing majors in EC. Furthermore, the study intents to provide data to better understand influences, initiatives, and barriers for females in the traditionally made dominated professions. Women in the College of Engineering make up

19% of undergraduate students and only 4% of graduate students, and MSU's Building Construction Science Program has only 6% female students.

085
Name: Bibek Timalsina
Major: Biochemistry
Faculty Advisor, Affiliation: Henry Paz, Animal and Dairy sciences
Project Category: Biological Sciences and Engineering

Comparison of rumen fermentation parameters between the Holstein and Jersey breeds
The objective of this study was to compare the diurnal changes of ruminal pH and volatile fatty acids (VFA) profile between Holstein and Jersey cows. Five multiparous Holstein (days in milk = 210 ± 13, body weight = 650 ± 9 kg) and five multiparous Jersey (days in milk = 243 ± 28, body weight = 508 ± 39 kg) cows were selected and kept under the same dietary and management regimes. Cows were fed twice daily using the Calan gate system to obtain individual intake and were trained to eat behind the door three weeks before the start of the experiment. Cows were fed *ad libitum* and had constant access to water for four weeks (experimental period). Rumen samples (200 mL) were collected via esophageal tubing on 0 (pre-feeding), 14, and 28 d and within d, samples were collected at 0 (pre-feeding), 6, 12, 18, and 24 h. The pH was measured immediately after collection and VFA were determined using gas chromatography. Data were analyzed using the PROC MIXED procedure of SAS with breed, day, time, and interactions as fixed effects and cow as random effect. Rumen pH was similar between Holstein and Jersey cows (6.63 vs. 6.52 ± 0.07, P = 0.30), but vary across collection times (P = 0.004). Total VFA concentration (mM) was higher in Holstein than Jersey cows (86.7 vs. 77.9 ± 2.59, P = 0.02). For specific VFA, isobutyrate, butyrate, isovalerate, valerate, hexanoate, and heptanoate were similar (P > 0.16) between breeds and acetate was higher (P = 0.06) in Jersey and propionate was higher (P = 0.004) in Holstein cows. Results showed differences in the fermentation profile between Holstein and Jersey cows which might influence the rumen microbiome structure and production responses. Future studies to elucidate these associations are warranted.

207
Name: Emily Tingle
Major: Sociology
Faculty Advisor, Affiliation: Kenya Cistrunk, Department of Sociology
Project Category: Social Sciences
Other Competition(s): Community Engagement Research Track, Public Health Research Competition

Race and Food Insecurity in Rural Mississippi
This project mainly draws on sociological literature regarding the racial wealth gap and how that gap applies to food security. Due to race playing a large part in the stratification of the United States economic system, minorities are put at a disadvantage in regards to income leading to their higher likelihood of being food insecure. This issue becomes intersectional in rural communities where resources are significantly more scarce causing the likelihood of food insecurity to increase for minorities. This project also includes ethnographical research through both observations and interviews on the products available at local grocery stores and WIC centers to draw more realistic conclusions on how much help regarding food security is actually available versus what is available on paper. The conclusions of this project provide information as to the demographics of those most food insecure and what options they currently have in regards to both their communities and government assistance. These findings conclude that there needs to be a larger call to action to improve the conditions of food availability in rural communities as food insecurity can be considered a public health crisis and causes major health risks.

086
Name: Kezia To
Major: Food Science & Technology
Faculty Advisor, Affiliation: M. Wes Schilling, Food Science, Nutrition and Health Promotion
Project Category: Biological Sciences and Engineering
Co-Author(s): Xue Zhang, Yan L. Campbell, Wenjie Shao, Michael D. Bayron, Jasmine Hendrix, Thomas W. Phillips, Thu Dinh
REU/Research Program: USDA Methyl Bromide Transitions, ORED Undergraduate Research Support
Other Competition(s): Community Engagement Research Track

Determining the Combined Effect of Environment Relative Humidity and Dry-Cured Ham Water Activity on Mite Infestation

Methyl bromide fumigation is commonly used to control Tyrophagus putrescentiae (ham mite) infestations in the U.S. dry cured pork industry but is being phased out of use due to its ozone-depleting nature. Without the availability of methyl bromide, this niche product cannot be aged for longer than 6 months without mite infestations. Food-grade ingredient infused nets have been used to control mites on dry-cured ham cubes (water activity (a_w) =0.85-0.92) under laboratory conditions at 55-85% relative humidity (RH) and 24-32°C. Five replications of a 5 × 4 factorial arrangement within a completely randomized design was used to evaluate the effect of a_w (0.65, 0.70, 0.75, 0.80, and 0.85) and 4 combinations of RH (65% and 75%) and temperature (24°C and 28°C) on mite reproduction on ham cubes in both treated (infused with propylene glycol, propylene glycol alginate, carrageenan, and water) and control nets. For control nets, ham cubes harbored a greater number of mites ($P<0.05$) at 28°C × 65% RH than 24°C × 75% RH, but no other differences existed ($P>0.05$) when averaged over a_w. When averaged over temperature, ham cubes with the a_w of 0.65 had fewer mites ($P<0.05$) than other a_w treatments except for 0.70. The ham cubes of aw 0.65 at 28°C × 65% RH, 24°C × 75% RH and 28°C × 75% RH were the only control net treatments that contained fewer mites than the initial inoculum level of 20. For the treated nets, ham cubes averaged less than 2 mites in comparison to the initial inoculum level of 20. For untreated nets, decreasing aw of the ham led to better control of ham mites at all storage conditions. When the treated nets were used, mite growth was controlled; environmental conditions and water activity of the ham had minimal impact on mite growth.

087
Name: Auriana Tucker
Major: Biochemistry (Pre-Vet)
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Faculty Advisor Email: tt1024@msstate.edu
Project Category: Biological Sciences and Engineering
Co-Author(s): Brooklyn Schumaker, Swati Shresthra, Shandrea Stallworth, Nilda Burgos
REU/Research Program: USRP
Other Competition(s): Thesis Research Competition (TRC)

Root system architecture associated with allelopathy in weedy rice

The unique hardiness of weedy rice (WR) species allows them to thrive in dynamic and stressful environments. Weedy rice thrives because it retained traits that harness the potential to grow taller, produce more tillers, and consume more nutrients. This suggests that WR is an untapped source of novel genes for competitive traits that can be integrated in rice breeding programs, since they are the same species. Our focus trait is allelopathy, which occurs when a species releases secondary metabolites to suppress growth and development of neighboring species. Our preliminary study using 10 WR accessions identified 2 accessions with ability to suppress barnyardgrass weed seedlings by causing significant height reduction (50%-75%). Weed management is a leading factor limiting rice productivity, with barnyardgrass reducing rice grain yield the most (70%). Therefore, it is critical to identify specific allelopathic WR accessions to determine the genetic pathways and mechanisms associated with allelopathy.

The goal is to identify root system architectural changes associated with allelopathic phenotypes; and use genome-wide association study to map root system architectural traits associated with allelopathy in WR. As wild relative is often explored by plant breeders for crop improvement programs, 54 WR accessions were evaluated for their interference or weed suppressive potential against two major weeds: barnyardgrass and amazon sprangletop.

Notable WR accessions include B2 and B81, both of which had higher interference, and inhibition of growth (50%) with barnyardgrass (61%) and sprangletop (52%), respectively. Nei's genetic diversity among WR (0.45) was found to be higher than cultivated rice (0.24) but lower than allelopathic rice (0.56). B2, which had high weed suppressive potential was genetically distinct than other WR accessions. This knowledge will be helpful for marker assisted breeding, and further understanding the physiological mechanisms associated with allelopathy in WR for rice/crop improvement.

088
Name: Natalene Vonkchalee
Major: Microbiology
Faculty Advisor, Affiliation: Dr. Justin A. Thornton, Department of Biological Sciences
Project Category: Biological Sciences and Engineering

Expresion of Pneumococcal Surface Proteins in a Staphylococcal Expression System for Host Cell Receptor Identification by Far-Western Blot.
Streptococcus pneumoniae is the leading cause of community-acquired pneumonia and acute otitis media in young children and elderly adults. Diseases due to *S. pneumoniae* results in a large economic burden resulting in more than 1 million deaths per year, primarily in developing countries. Due to the limitations of current pneumococcal vaccines, it is imperative that we identify novel ways to reduce the ability for pneumococcus to colonize and bind to host tissue. **We *hypothesize* expression of pneumococcal surface proteins in a staphylococcal expression system is a more relevant and efficient method of producing recombinant for identifying eukaryotic ligands by Far-western blot and mass spectrometry analysis.** pOS1 staphylococcal expression vector was used to express pneumococcal surface proteins in the *S.aureus* protein expression system for secretion into the growth medium BHI. Supernatant was sterile-filtered, and proteins were purified by affinity chromatography. Protein expression was verified by coomassie blue-stained SDS-PAGE. The total proteins of human pharynx cell (Detroit 562) was extracted and transferred onto PVDF membrane by standard techniques. PVDF membranes were probed with biotinylated pneumococcal proteins and reactive bands were detected by chemiluminescent detection following probing for 1 hr with HRP-conjugated streptavidin. PsaA (SP_1650) purified from *S. aureus* expression system was found by Farwestern blot to interact with one of Detroit cell protein (Annexin A2). To characterize the interaction of PsaA with Annexin A2, we created a clean deletion mutant of PsaA using the pMBSacB plasmid system. We will use this PsaA mutant and Annexin A2 blocking antibodies in adhesion assays to human nasopharyngeal epithelial cells in vitro. Identifying a host cell receptor that can interact with pneumococcal surface proteins can lead to creating a vaccine specifically designed to target such factors, thus limiting *S. pneumoniae*'s ability to colonize and cause invasive disease.

208
Name: Mariah Warner
Major: Criminology
Faculty Advisor, Affiliation: Ashley Perry, Sociology
Project Category: Social Sciences
Other Competition(s): Thesis Research Competition (TRC)

Trust in the Police: How Bad is it, and What Can We do to Fix it?
Trust in the police is not a new issue; however, the proliferation of the media has made it recently more publicly salient than ever. Trust in the police has been declining in the United States for many years, particularly among black individuals whose levels of trust are already lower than other groups. Trust in the legitimacy of law enforcement is necessary for effective policing. The police depend on members of the community to report crimes and to cooperate during investigations, and this cooperation is only possible of the police are believed to be trusted. If we wish for the rule of law to be maintained in the United States, changes to increase citizens' levels of trust and confidence in the police are necessary. All literature finds that white individuals express more trust in the police than blacks, as well as conservatives more than liberals. Scholarship varies in regard to age and gender, though the general consensus is that older males are the most trusting group. Literature focuses in on three other broad areas in its discussion of trust in the police: general feelings of social trust toward one's community, belief in the absence or presence of procedural justice, and perceptions

of police effectiveness in the neighborhood in terms of disorder and incivilities. In this project, I use data from the World Values Survey collected in 2011 in the United States to examine these correlates of trust in the police by way of logistic regression models. I find that, in accordance with recent scholarship, individuals' perceptions of procedural justice have the greatest impact on one's trust in the police. These findings should impart legislators to give substantial weight to potential policies such as the "Law Enforcement Trust and integrity Act of 2018" if the US wishes to improve its policing.

089
Name: Lauren Waters
Major: Horticulture
Faculty Advisor, Affiliation: Dr. Guihong Bi, Plant and Soil Sciences
Project Category: Biological Sciences and Engineering

Extending Blueberry Production Season with Early Fruiting Cultivars and High Tunnel System
Blueberries have become an increasingly important crop in recent years, with consumption increased dramatically due to the increasing awareness of its health benefits. Nationwide, the per capita consumption increased from 0.26 pounds in 2000 to nearly 1.6 pounds in 2015. Blueberries ranked as the second most important commercial berry crop in the U.S., with more than 588 million pounds in production in 2016 and a total crop value over $720 million. Of that, around 53% of harvested blueberries were sold as fresh berries. Since majority of blueberries in the U.S. are peak harvested in the late spring through summer, the U.S. also imports a significant amount of fresh blueberries every year to meet the demand of the fresh markets in the fall, winter and early spring. This offers U.S. growers an opportunity to produce off-season blueberries using suitable cultivars in combination with season-extension technologies, to meet part of the market demand during the traditional off-season. The objective of this study is to investigate the potential of producing early season blueberries in high tunnels in Mississippi and evaluate different southern highbush blueberry cultivars for early fruiting in high tunnels. Ten southern highbush cultivars ('Emerald', 'Farthing', 'Georgia Dawn', 'Gupton', 'Jewel', 'Meadowlark', 'Pearl', 'Rebel', 'Star', and 'Sweetcrisp') were used in this study. The plants were grown in 15-gal plastic containers under a high tunnel. Preliminary results showed that there is great potential to produce early season blueberries in high tunnels using early fruiting southern highbush cultivars. However, there is still risk of frost damage on blooms and berries in early spring even with high tunnel protection.

209
Name: Megan Watson
Major: Educational Psychology
Faculty Advisor, Affiliation: Kasia Gallo, Department of Counseling, Educational Psychology, and Foundations
Project Category: Social Sciences

The Effects of ADHD and ADHD Medication on Creative Ability
Many researchers have hypothesized that people with ADHD are more creative than people without ADHD. However, it is unknown how ADHD stimulant medication affects creativity in people with and without ADHD. The current literature combines 15 empirical research articles to determine if people with ADHD are more creative than people without ADHD, and to determine if the use of stimulant medication (Adderall, Methylphenidate) influences creativity in people with and without ADHD. Participants' ages ranged from 7-39 among all the studies. There was an equal amount of female and male participants, excluding one study of 1,419 people where most participants were female. The main components measured were ADHD, IQ, creative output (verbal and nonverbal), and creative thinking. The Torrance Tests of Creative Thinking was the most commonly used creativity test. Other measures included the Alternate Unusual Test (AUT), Test of Divergent Thinking (TDT), Remote Associates Test (RAT), and a series of psychosocial functioning questionnaires that measured self-esteem, self-efficacy, temperament, & character. Overall, the results depended on which measure was used. Results indicated that people with ADHD were no more creative than people without ADHD. However, people with ADHD showed more non-verbal creativity; whereas, people without ADHD showed more verbal creativity. In conclusion, people with ADHD are not more creative than people without ADHD; however, they do display different creative strengths/weaknesses than those without ADHD. Overall, stimulant medication is shown to reduce certain aspects of creativity in those with ADHD, and creativity in people without ADHD on medication depends on creativity scores before medication.

210
Name: Rebecca Weatherford
Major: Political Science
Home Institution: Samford University
Faculty Advisor, Affiliation: Dr. Serena Simoni, Department of Political Science, International Relations Program, Samford University
Project Category: Social Sciences
Other Competition(s): Thesis Research Competition (TRC)

Restorative Justice as a Means of Post-Civil War Reconciliation: The Cases of Rwanda and Argentina
Restorative justice is widely believed to be an ineffective tool in restoring peace after a conflict. My analysis challenges this conventional wisdom, arguing that restorative justice practices can reconcile warring parties following a civil war. This qualitative analysis discusses the use of restorative justice practices as an alternative to traditional systems, outlines the process in which restorative justice was used in Rwanda and Argentina, elaborates on the effect the practices had on legislative policies, and discusses the conditions in which restorative justice practices were used to reconcile social sufferings caused by civil wars. The overall aim is to articulate the ways in which restorative justice can be used as a mechanism to unify a country following a violent intrastate conflict. In this thesis, I explored a variety of sources in relation to restorative justice, civil war theory, gacaca courts in Rwanda, and CONADEP truth commissions in Argentina to understand the process between restorative justice practices in restoring peace through legislation. The least-likely case studies done on the uses of restorative justice practices in both Rwanda and Argentina provide strong evidence for my argument that restorative justice practices successfully restore peace after a civil war. Therefore, I conclude that restorative justice is an effective alternative to traditional legal court systems because it give victims a more active role in crafting a justice narrative, whereas the traditional courts typically only focus on the wrongdoing done by the perpetrator and does not reconcile the two groups.

211
Name: Jimmie Webb
Major: Business Economics
Faculty Advisor, Affiliation: Dr. Alan Barefield, Economics
Project Category: Social Sciences
Co-Author(s): Dr. Kalyn Coatney
Other Competition(s): Community Engagement Research Track

Comparison of Water System Demand Estimation Techniques to Accurately Predict Revenue
Public water systems strive to provide a safe source of drinking water at an affordable price to its customers. Governing officials of public water systems face major challenges when developing an appropriate rate structure that generates adequate revenue to cover the system's future short-term treatment and distribution costs, as well as contributes to long-term infrastructure improvements. The challenges are (1) identification of the factors which comprise expected system total costs, and (2) unbiased estimation of future water demand. Unless these challenges are overcome, the rate structure imposed is likely to result in either revenue shortfalls or excesses.
The most common method for estimating demand to determine water rates is based on the assumption that monthly customer demand is a simple average of aggregate customer demand over the previous 12 months divided by the number of annual customers. However, this method implicitly assumes that customer usages are normally distributed and ignores changing annual weather patterns that highly influence expectations of future water demand.
The goal of this research is to improve upon the common method used by public water systems to estimate demand. This research first tests the assumption of normally distributed usages and identifies the appropriate distribution if normality is rejected. The results indicate that the distribution of individual customer usage is more likely lognormal in nature. Second, the research compares the accuracy of the expected revenues generated between using the simple annual average versus the true distributions of consumer demands across multiple years. The results indicate that, given any consistent rate structure, the simple average can either overestimate or underestimate the expected returns as compared to the true distributions over time. Therefore, the simple average approach is an inadequate method to meet system goals.

212
Name: Clemmie Weddle
Major: Agricultural Information Science
Faculty Advisor, Affiliation: Tommy Phillips, Human Sciences
Project Category: Social Sciences
REU/Research Program: CALS/MAFES Undergraduate Research Scholars Program

Mississippi Farm Families and Youth Study
As of 2012, there were 2.1 million farms in the United States, 97% of which were family-owned and family-operated (U.S. Department of Agriculture, 2015). During the same year, an estimated 955,000 youth under the age of 20 resided on farms (Centers for Disease Control, 2014). Most prior research on children and youth in farm families has addressed topics such as child labor and child health (physical) and safety. Despite the fact that most American farms are, in fact, family farms that are home to almost a million youth, comparatively little research has explored how living on a farm and growing up in a farm family affects youth's psychosocial development, well-being, and outcomes. An exception has been the Iowa Youth and Families Project (Elder & Conger, 2000). Based on information from the Iowa Youth and Families Project, as well as observational and anecdotal evidence, it is proposed that farm families are characterized by the following: (1) strong, positive family relations, (2) intergenerational bonds and interaction, (3) positive, prosocial values (including a strong work ethic), (4) less chaos and more predictability and stability in family life and daily routines, (5) stable, long-lasting ties to place, (6) productive roles for everyone in the family, including children and youth, (7) faith, (8) connections to community life and institutions, (9) greater social support/capital, (10) routines, rituals, and traditions, (11) collective endeavors and non-materialistic goals, and (12) long-term perspective. As part of a larger, multi-year study of farm families and youth living in such families, parents completed an online survey assessing this model. Data collection is on-going.

090
Name: Branson Wetzstein
Major: Forestry/Forest Management
Faculty Advisor, Affiliation: Dr. John L. Willis, College of Forest Resources
Project Category: Biological Sciences and Engineering
Co-Author(s): Justin Yow

Selective Seed Depredation of Tree Species in Longleaf Pine Savannas
Removing midstory hardwoods is a common management technique in restoring fire suppressed savannas. However, recent evidence demonstrating hardwood facilitation on longleaf pine (*Pinus palustris*) regeneration has brought this practice into question on xeric sites. The presence of midstory hardwoods may improve longleaf pine seedling establishment by concealing longleaf pine seeds on the forest floor in hardwood litter, or by providing an alternative seed source to satiate seed predators. To test these hypotheses, we established a randomized complete block design containing a total of 104 plots in in the Sandhills ecoregion of North Carolina. Petri dishes containing 10 seeds each of longleaf pine, loblolly pine (*P. taeda*), red maple (*Acer rubrum*), sweetgum (*Liquidambar styraciflua*), and water oak (*Quercus nigra*) were placed in a 2x2 factorial fully crossing hardwood retention or removal with vertebrate seed predator access or exclusion. Each treatment was replicated 78 times. Seed depredation varied significantly by species ($P < 0.0001$), with depredation rates being inversely related to seed size: (40%) sweetgum, longleaf pine (20%), loblolly pine (17%), red maple (7%), and water oak (4%). Neither midstory retention nor seed predator exclusion significantly influenced depredation rates. Our findings demonstrate that invertebrates are the primary seed predator at our site, and that retaining midstory hardwoods does not influence foraging patterns. Moreover, the preference of invertebrates for smaller seeds suggests that maintaining smaller seeded species could alleviate seed depredation pressure on longleaf pine.

091
Name: Heather White
Major: Biological Engineering
Faculty Advisor, Affiliation: Olga Pechanova, Institute for Genomics, Biocomputing & Biotechnology
Project Category: Biological Sciences and Engineering
Co-Author(s): Dr. Olga Pechanova, Mark A. Arick II, Dr. Tibor Pechan, Dr. Daniel G. Peterson

Proteogenomic Mapping of *Gossypium mustelinum* Leaf

Cotton, having a production value of $7.2 billion in 2017, is one of the most valuable crops in the United States. While not a fiber-producing species, the wild Brazilian tetraploid *Gossypium mustelinum* may produce a hybrid with exceptionally long fibers if crossed with G. hirsutum, one of the most commonly cultivated species. For the first time, presented here is the global proteome profile of the *G. mustelinum* leaf which may be used as a reference in future studies. Proteins were extracted from three individual *G. mustelinum* plants. To maximize protein coverage, two sample preparation techniques were utilized: size-based fractionation by SageELF instrument and complex protein mixture. A total of 3005 proteins were identified by nano-liquid chromatography-tandem mass spectrometry and database search, of which 1550 were unique to SageELF, 472 were unique to complex mixtures, and 983 were common to both techniques. Functional classification by Gene Ontology (GO) Annotation was performed on the identified proteins. For cellular component categorization, 245 were found in protein-containing complexes and 112 were located in organelles such as plastids and Golgi apparatus. The molecular function GO aspect included 306 oxidoreductases, 80 transferases, 71 hydrolases, and 810 proteins involved in binding. Of the proteins involved in biological processes, 241 pertain to transport, 278 belong to biosynthetic processes, and 121 relate to photosynthesis. A total of 16 GO terms such as extracellular region, nucleoplasm, and vacuoles were assigned to proteins identified in the fractionated samples but not in the complex mixture samples. Additionally, GO terms that were found in both types of samples were more plentiful in the fractionated samples than the complex mixture samples. These findings validate the use of two different sample preparation techniques to obtain a more comprehensive proteome coverage.

092
Name: Lucas Whittenton
Major: Agribusiness
Faculty Advisor, Affiliation: Dr. Amelia A.A. Fox, Plant and Soil Sciences
Project Category: Biological Sciences and Engineering
Co-Author(s): Dr. J.J. Varco
Other Competition(s): Community Engagement Research Track

Advancing canopy reflectance based variable rate fertilizer N application in cotton by employing UAS-RedEdge Camera Technology

Current N fertilization practices involve applying a constant N rate across spatially variable fields to best match a field average goal. Inevitably, when dealing with highly spatially variable fields constant N rate fertilization can result in areas of both deficiencies and excesses. When N availability is less than plant demand, obvious reductions in cotton yield can occur. Excessive available N can delay harvest due to induced vegetative growth; thus, compromising reproductive growth period and ultimately preventing optimum lint yield (Gerik, 1998). Although aerial imaging technology supports real-time, variable-rate N (VRN) fertilizer modeling, limited evidence exists to validate the effects of spatial redistribution of fertilizer N inputs on yield and N use efficiency. Without calibrated VRN models, producers may inefficiently utilize fertilizer N and reduce application effectiveness. The study purpose was to determine if an off-the-shelf UAS imaging sensor could assist cotton producers in developing early VRN fertilizer prescriptions that increase N use efficiency (NUE) without deleteriously affecting yield or profit.

A field in continuous-cotton in Arkansas containing three different mapped soil units served as the study site. PhytoGen 312 (Dow AgroSciences LLC, Indianapolis, IN) cotton seed was planted on May 5th, 2018 in 38-inch rows. Canopy reflectance at early bloom cotton was acquired using an unmanned aerial system (UAS) carrying a MicaSense RedEdge Sensor (MicaSense, Seattle, WA) on June 15th. On June 25th, a canopy reflectance based VRN prescription and fixed N rate (110 lb N ac^{-1}) treatments were applied across three replications within a 26.7 acre field. In comparison based on lint yield, there was compelling evidence to indicate that spatial redistribution of fertilizer N enhanced NUE. The results of this study

suggest producers can benefit both economically and ecologically through spatially adjusted fertilizer N rates based on canopy reflectance across varying soil types.

213
Name: Sydney Wicks
Major: Psychology
Faculty Advisor, Affiliation: Dr. Cliff McKinney, Psychology
Project Category: Social Sciences
Co-Author(s): Mary Moussa Rogers

Overprotective Parenting and Parental Warmth: Implications for Child Anxiety and Peer Bonding
Helicopter parenting is characterized by low amounts of granted autonomy with high amounts of both control and support. Both helicopter parenting, similar to overprotective parenting, alongside parental warmth, indicated by affirmation and praise, are linked with the socialization process of emerging adults. Warmth may serve as a buffer to diminish the effect of overprotective parenting on child anxiety. The shifting social expectations of emerging adulthood may place unique strains on emerging adults who have less developed social skills. Previous studies have already indicated that overprotection and warmth may be associated with child anxiety. Additionally, children of parents utilizing overprotective parenting are more likely to have higher anxiety problems, which are in turn linked to higher peer bonding, indicated by higher levels of perceived trust and communication with peers, and lower levels of perceived alienation from peers. Participants included 438 emerging adults (176 males and 262 females) ranging in age from 18 to 25 years (M = 19.02) who were attending a large Southern United States university. Participants completed questionnaires presented in random order using an online survey. Path analyses indicated that anxiety mediated the relationship between paternal warmth (b = .014, p < .05) and overprotection (b = -.022, p < .05) and daughters' peer bonding. Additionally, paternal overprotection and warmth significantly interacted to predict daughters' anxiety, such that daughters' anxiety is lowest when paternal warmth is higher and paternal overprotection is lower. Child anxiety mediated the relationship between parental warmth and sons' peer bonding. Regarding sons, it was indicated that mothers' or fathers' warmth play a significant role on peer bonding. In hopes of increasing peer bonding in emerging adults, parents must be aware of the amount of overprotection and warmth they provide. Warmth may play more of a role in the presence of higher anxiety than overprotection.

147
Name: Dustin Widmer
Major: Aerospace Engineering
Faculty Advisor, Affiliation: Rob Wolz, Aerospace Engineering
Project Category: Physical Sciences and Engineering
Other Competition(s): Community Engagement Research Track

Structural Testing of a Fiberglass Fuselage on a Failed Catapult Launch
In this experiment, a drop test was used to simulate a failed pneumatic catapult launch. This drop test was used to identify which fuselage would be optimal for an unmanned aerial vehicle. The objective was to test three fiberglass fuselages varying in one, two, and three layers, keep track of weight, resources used, and to test until failure. The fiberglass fuselages were manufactured using a wet layup process. Each fuselage was subjected to 27 pounds of weight, distributed to replicate an unmanned aerial vehicle before a mission, and dropped from an altitude of four feet. The fiberglass fuselages were all found to be strong enough to withstand the drop with only minor cracks that could be easily repaired. The results from the drop test were unexpected but showed some other features that would make a lighter and thinner fuselage impractical for an unmanned aerial vehicle. The pliability of the fuselages showed that only the thicker fuselage would hold the necessary parts in place without pressing them together.

093
Name: Olivia Williams
Major: Chemical Engineering
Faculty Advisor, Affiliation: Nicholas Fitzkee, Department of Chemistry
Project Category: Biological Sciences and Engineering
Co-Author(s): Kayla McConnell

Understanding the thermodynamics of protein-surface interactions using 15 nm gold nanoparticles

The surface characteristics of a substrate will affect the adsorption of protein onto that surface. Gold nanoparticles may be used for targeted drug delivery, but the introduction of nanoparticles into the bloodstream will introduce the surface to many proteins, any of which may interfere with the intended function of the nanoparticle. The proteins, too, when binding to the surface may not be able to perform their intended function. In this work, we explore the binding of several proteins to gold nanoparticles of 15 nm sizes. For each protein, fifteen samples consisting of increasing concentrations of protein in constant concentrations of nanoparticle-buffer solution were prepared. The proteins tested were: BCA (Bovine carbonic anhydrase), BSA (Bovine serum albumin), Glutathione, wild type GB3, as well as the GB3 mutant, K19C. UV-Vis spectroscopy was utilized to record the absorbance measurements for the protein-coated particles. It was shown that the spectra exhibited a horizontal shift when compared to the spectra for bare nanoparticles; this peak shift can then be used to calculate the disassociation constant of the protein-nanoparticle system. The disassociation constant may be determined using two methods. The first method assumes that most of the protein is unbound. The second method requires no such assumption; with knowledge of the fixed concentration of nanoparticles in solution, the number of identical, independent binding sites, the ligand concentration, and the degree of binding, KD is easily calculated. The two methods resulted in significantly different values for the disassociation constant, which led to the conclusion that the second method is superior.

094
Name: Victoria Williams
Major: Poultry Science
Faculty Advisor, Affiliation: Pratima Adhikari, Ph.D., Poultry Science
Project Category: Biological Sciences and Engineering
Co-Author(s): Milan Sharma, Danya Brown
REU/Research Program: CALS MAFES USRP

Effect of House Type and Strain on Egg Production, Cracked, and Dirty Shells in Commercial Laying Hens

Hy-Line W-36 and Hy-Line Brown (HB) commercial layers are two of the most common hen strains used in the United States. The objective of the current study was to compare housing types conventional cage (CC), enriched colony (EC), and cage-free (CF) and strain interaction (W-36 and HB) on egg production and shell characteristics. This study was a completely randomized design with a two by three factorial arrangement to give a total of six treatments (two hen strains and three house types) and six replicates of each treatment. This study was conducted in hens from 48 to 62 weeks of age, and eighteen groups thirty-two HB and eighteen groups thirty-two W-36 hens were randomly assigned to six replicate pens of each housing type. Hens were provided ad libitum a commercial laying hen ration and water and were housed in 16 h light/dark. Throughout the experiment, daily production, cracked, and dirty eggs were recorded; hen-day egg production (HDEP), percent cracked, and percent dirty were calculated weekly. There was a three-way interaction between house, strain and week on percent cracked ($P > 0.0427$) and percent dirty ($P > 0.0058$) eggs. There was a substantially higher percentage of cracked eggs in the EC for both W-36 and HB throughout every week. Furthermore, both strains of CC and CF had consistently higher HDEP than EC ($P > 0.0001$); however, the brown strain had a higher HDEP than W-36 beyond week 49 ($P > 0.0003$). Overall, CC and CF had higher production and fewer cracks and dirty shells in comparison to EC. Further understanding of different housing types and their effect on individual hen strain type is important before a complete shift towards an alternative housing system.

095
Name: Bayley Wilmoth
Major: Wildlife & Fisheries Science/Aquaculture & Fisheries Science
Faculty Advisor, Affiliation: Michael E. Colvin, Wildlife, Fisheries, and Aquaculture
Project Category: Biological Sciences and Engineering
Co-Author(s): David A. Schumann, Bradley M. Richardson, Caleb A. Aldridge, and Michael E. Colvin
REU/Research Program: College of Forest Resources Undergraduate Research Scholars Program

Ontogeny of Southern Brook Lamprey, Ichthyomyzon *gagei*, with emphasis on abundance, distribution, and morphology in a small watershed

The ecology of many non-game fish species is understudied. Little is known about the life-history and population structure of the diverse species, the spatial structure, or the abundances of Southern Brook Lamprey (*Ichthyomyzon gagei*) populations. Even less is known about their early life-history and ontogeny. This species lives for up to seven years and experiences an ammocoete, metamorphosis, and adult life stage. We estimated lamprey abundance at nine stream reaches in Panther Creek to define population structure and identify factors that affect the metamorphosis from ammocoetes to adult. We electro-fished one hundred meter reaches along the creek beginning March 2018. Captured individuals were measured for total length, photographed for morphological analyses in the ImageJ software, and assigned to one of the three life stages based on the development of gill slits, caudal fins, and photopic vision. Southern Brook Lamprey were not present in four of the stream-reaches, and 107 individuals were captured across the sites where lamprey were present. There was a 26.2% chance of an individual being metamorphic or an adult if it is at least 120 mm long and approximately a 59% chance at 150mm. Because of these results and because even at lengths larger than 150mm ammocoetes have been documented, it is possible there is another influence on metamorphosis which has yet to be determined. Additional sampling of Panther Creek will provide clarity about the population structure and distribution of lamprey in this watershed and potentially identify mechanisms that regulate transitions between life stages. Identifying potential metamorphosis triggers would allow for new management efforts to keep Southern Brook Lamprey from being added to the endangered species list unlike the Northern Brook Lamprey (*Ichthyomyzon fossor*).

214
Name: Dianna Wilson
Major: Food Science & Technology
Faculty Advisor, Affiliation: Dr. Antonio Gardner, Department of Food Science, Nutrition, and Health Promotion
Project Category: Social Sciences
REU/Research Program: Undergraduate Research Scholars Program

Using Barbershops to Educate Heterosexual African-American Men about HIV Risk Reduction: A Literature Review

Background: Young heterosexual African American men are affected immensely by the HIV epidemic. The barbershop, also known as The Black Man's Country Club is seen as a safe haven for conversations in the African American community. To help combat the HIV epidemic, barbershop based HIV risk-reduction programs were created. The purpose of this study was to evaluate the advantages, disadvantages, and effectiveness of previous barbershop-based HIV risk-reduction programs on the education of heterosexual African American men.

Methods: The following key words were used to search the EBSCO Discovery Service database for articles: African American, Barbershop, Black, Community-based Participatory Research, Community Intervention, HIV. The time frame of the articles ranged from 2012 until 2017. Five articles met the inclusion criteria for this literature review.

Results: Analysis of the articles revealed that the strong bond between barbers and their clients increased the effectiveness of barbershop based HIV intervention programs. Keeping the community's needs in mind through community advisory boards, and communication with barbers and clients also increased the acceptability of receiving such information.

Conclusion: Piloting a barbershop based HIV risk-reduction program can be effective. With proper marketing and persuasion tactics, young heterosexual African American men could benefit from educational modules to lower the risk of unsafe sexual behaviors, which could lead to the acquisition of HIV.

148
Name: Tori Wilson
Major: Chemical Engineering
Faculty Advisor, Affiliation: Dr. R. Mark Bricka, Chemical Engineering
Project Category: Physical Sciences and Engineering

Investigation into the Sorbatetive Capacity of Three Sorbates for NaCl
Abstract Investigation into the Sorbative Capacity of Three Sorbates for NaCl Presented by Ms. Tori Wilson Mentor: Dr. R. Mark Bricka Dave C. Swalm School of Chemical Engineering Mississippi State University Submitted to the Mississippi State University Spring 2019 Undergraduate Research Symposium Research Category: Biological Sciences and Engineering Energy as a part of everyday life. The oil and gas industry is one of the major energy producers needed to meet our demands. As part of oil production, oil is removed from deep within the ground and generates a by-product brine material (commonly called "producer water"). This material is unwanted and historically was stored near the oil drilling site in large unlined ponds. As a result of this storage, salt and other contaminants (from the brine) have impacted the soil. The objective of this research is to investigate the sorption and extraction of the contaminants on various soils. In this study, three different sorbates soil types were used consisting of a Mississippi native soil, gumbo clay, and granulated activated carbon (GAC). The GAC was chosen for comparison due to its known superior sorption properties. Batch isotherms were generated to investigate the sorption properties. The first set of tests were conducted to determine the optimal time to reach sorption equilibrium. After this was determined, the liquid phase concentration vs. sorbate was investigated. This study resulted in producing over 200 samples. The conductivity, pH, Na+ and Cl- were measured for sample. After the sorbates are saturated at their maximum, the desorption of the ions will be investigated using deionized water as the extractant. The result of this investigation will be provided as part of in this presentation.

215
Name: Emma Winterhalter
Major: Wildlife & Fisheries Science/Aquaculture & Fisheries Science
Faculty Advisor, Affiliation: Dr. Carley Morrison, Agriculture Education, Leadership and Communication
Project Category: Social Sciences
Co-Author(s): Jesse I. Morrison

The rookie: Describing a researcher's first semester teaching in a university classroom
Research faculty often find themselves teaching classes with little knowledge of effective teaching methods. The purpose of this phenomenological study was to describe the teaching experience for a faculty member with a research appointment and no formal teacher training. During this experiment, the instructor and students kept weekly journals reflecting on their teaching and learning experiences. After analyzing the instructor's journal individually, we met as a team and agreed on four themes. Those themes were compared with the students' journals (N = 35) to provide a well-rounded view of the class experience. The themes identified included confidence in teaching ability and knowledge of topic, dedication to providing a quality learning experience, planning and time commitment, and building rapport with students. Regarding themes one and four, the instructor experienced frustration with teaching methods and student engagement. In addition, the amount of time it took to prepare for class each week made the instructor feel like they were neglecting their other responsibilities as a researcher (theme three), resulting in short-changing the students who enrolled in the course (theme two). The students' frustrations mirrored the instructor's; however, on several occasions positive student remarks about the instructor's personable approach to teaching contradicted the instructor's own self-criticism. As faculty in the agricultural education discipline, we are uniquely positioned to provide teaching support to faculty members in this position. It is recommended that researchers continue investigating the university teaching and learning experience from a novice instructor's point-of-view to best meet their professional development needs.

096
Name: Justin Yow
Major: Forestry/Wildlife Management
Faculty Advisor, Affiliation: Heidi Renninger, College of Forest Resources
Project Category: Biological Sciences and Engineering

Comparing Photosynthesis, Water Use, and Leaf Nitrogen Across Poplar Varietals at Upland and Alluvial Sites
Short rotation woody crops are selectively bred to add large amounts of aboveground mass in the shortest amount of time possible. Understanding photosynthetic capacity, water- and nitrogen- use efficiency may help scientists better select the most sustainable biomass species and varietals to plant. The most efficient species will have the highest rates of photosynthesis while maintaining low rates of water and nitrogen use. In this study, six biomass varietals were tested. Three varietals were hybrid poplars, one Populus trichocarpa x Populus deltoides (5077) and two Populus deltoides x Populus maximowiczii (6329, 8019), and three were eastern cottonwood varietals (Populus deltoides; 110412, S7C8, ST66). The experiment was conducted on two different sites, one upland and one alluvial located in Mississippi. Measurements taken include monthly photosynthetic rates, stomatal conductance, transpiration rates, leaf nitrogen content (N), carbon content (C), leaf nitrogen to carbon ratio (CN) water use efficiencies (iWUE and WUE) and photosynthetic nitrogen use efficiency (PNUE).
Across all varietals on both sites, there were no significant differences in photosynthesis rates. We found that in hybrid poplar varietal 5077, there was a significantly higher CN ratio and significantly lower nitrogen content ($p < 0.05$) than varietal 6329 and all eastern cottonwood varietals. Across all varietals and sites there was a significantly positive correlation between photosynthesis and water use parameters including stomatal conductance ($r2= 0.2881$) and transpiration ($r2=0.2033$). However, photosynthesis was not correlated with any leaf nitrogen parameters. Across all varietals, trees at the alluvial site had higher photosynthetic nitrogen use efficiencies but used more water while trees on the upland site had higher water use efficiencies but used more nitrogen. My findings suggest that varietal 5077 may be the most sustainable in terms of nitrogen use and is a viable option, particularly on alluvial sites that are more nitrogen limited than upland sites.

097
Name: Tony Zbysinski
Major: Biochemistry
Faculty Advisor, Affiliation: Dr. Jonas King, Biochemistry, Molecular Biology, Entomology and Plant Pathology
Project Category: Biological Sciences and Engineerin
Co-Author(s): Dr. Aline Bronzato-Badial
Other Competition(s): Public Health Research Competition

Evolution of RHS Proteins in Blood-Feeding Arthropods with an Emphasis on *Cimex*
Members of the RHS protein family have been found in the saliva of mosquitoes and appear to be present in the genomes of several other disparate groups of arthropods. Recent studies from bacteria have suggested the likely function of RHS proteins as contact dependent growth inhibitors. Therefore, based on our data we hypothesize that RHS proteins act to influence the insect microbiome in certain insect tissues or act as immunomodulators of the vertebrate skin during blood-feeding. This research focuses on the RHS proteins of Aedes albopictus, *Cimex lectularius*, and Wolbachia. First we conducted phylogenetic and codon-bias analyses of the genomics-supported arthropod RHS proteins. We then determined the presence of an rhs gene in the *Cimex* genome, and not in its obligate Wolbachia symbiont, using long-PCR and tissue-specific qPCR analysis before and after antibiotic treatment. We will present data from ongoing studies investigating changes in *Cimex* RHS expression after infection and in the absence of Wolbachia in antibiotic treated *Cimex lectularius*. There are also 24 hour, 5 day and 10 day survival experiments being conducted to study the effects of simulating traumatic insemination and the role the RHS proteins may play in protecting the bacteriocyte. We are also currently exploring the effects on the life history and response of *Cimex lectularius* to infection after silencing RHS. Preliminary data regarding this final aim will be presented.

SUMMER 2019

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