UNDERGRADUATE

RESEARCH SYMPOSIUM

SPRING 2022

April 13 - 14
Colvard Student Union

MISSISSIPPI STATE UNIVERSITY™
JUDY AND BOBBY SHACKOULS
HONORS COLLEGE

Contents

To be entered into a giveaway, post a picture on Instagram with your research during the symposium with the hashtag #myMSUresearch and tag @shackoulshonors.

The winner will be announced on Instagram by Wednesday, April 20.

MISSISSIPPI STATE UNIVERSITY™
JUDY AND BOBBY SHACKOULS
HONORS COLLEGE

WELCOME

The Shackouls Honors College is pleased to host the Spring 2022 Undergraduate Research Symposium and to be a part of the first Mississippi State University Research Week. This symposium is a great way for undergraduate students to showcase their interest and dedication to research activities and for the MSU family to celebrate their engagement, curiosity, and hard work. Thank you for attending!

We believe the support of undergraduate research and creative endeavors for all students to be part of our core mission as an institution of higher learning. Participating in undergraduate research is an exciting way for students to complement their academic studies, paving the way for future intellectual work and exploration.

This event is not possible without the time, effort, and assistance of our dedicated faculty. The student work presented here represents many hours of mentoring students in their research, planning, and analysis. Many faculty have also volunteered their time and expertise to serve as judges, so thank you to all of them!

This event is an endeavor that relies on the support and sponsorship by other units, including the Office of the Provost and Executive Vice President, the Office of Research and Economic Development, the Center for Community-Engaged Learning, the Student Association, the Honor Society of Phi Kappa Phi, and the Graduate School.

Students have entered in one of four categories: Arts and Humanities, Biological Sciences and Engineering, Physical Sciences and Engineering, or Social Sciences. We are pleased to also host additional competitions in Community Engagement Research, sponsored by the Center for Community-Engaged Learning; Public Health Research, sponsored by the Department of Food Science, Nutrition and Health Promotion; 3 Minute Thesis Research sponsored by the Graduate School; and the Tomorrow Builder Award recognized by the Theta Tau Professional Engineering Fraternity.

We are delighted that you have joined us today to peruse the accomplishments of our young researchers! We hope you learn much from the diversity of fascinating research activities underway at MSU. Enjoy!

Anastasia D. Elder, Ph.D.
Associate Dean
Director of Undergraduate Research

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

We are honored to welcome you to Mississippi State University's Spring 2022 Undergraduate Research Symposium. Undergraduate students are an integral part of the multi-faceted research underway at Mississippi State.

Our faculty, staff, and students are conducting fundamental to applied research that provide innovative advancements, creative works, and new scholarship that address a range of pressing needs. As a result of this work, MSU is the leading institution in our state for research, which is a direct result of our embracing the 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 beyond the classroom. We are pleased that members of our faculty are dedicated 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.
Provost and Executive Vice President

MISSISSIPPI STATE UNIVERSITY™
OFFICE OF RESEARCH AND ECONOMIC DEVELOPMENT

Students Remain at the Core of MSU's Research Success and Impact

The Mississippi State Office of Research and Economic Development is proud to welcome you to the university's Spring 2022 Undergraduate Research Symposium. This event is a wonderful opportunity for students to showcase the exciting research they have been working on this year.

As a top-100 research university and a land-grant institution, MSU is committed to conducting groundbreaking research across many disciplines and using that knowledge to make an impact at the local, state, national, and global levels. Every day, students, faculty, and staff are making new discoveries in faculty labs, research fields, libraries, studios, and at MSU's more than 40 research centers and institutes.

One of the most exciting things about the university's diverse research portfolio is that boundless options exist for students in any major to get involved. Students can jump into ongoing projects that they find interesting and also use their creativity and passion to ask new questions and make their own world-changing discoveries.

Engaging with research is a tremendous way for students to apply what they have learned in the classroom and gain exposure to different academic and career paths. It also teaches critical skills like collaboration, drive and confidence.

All students presenting in this symposium have completed their work under the guidance of a faculty mentor. The university is proud of the way faculty connect with students to create meaningful, positive research experiences. These opportunities are important for students as they receive support from leaders in their fields, while these faculty gain fresh perspectives from the next generation of scholars.

Direct involvement of students in impactful, hands-on research, along with their preparation for exciting careers, ensures this university remains at the forefront of research and innovation in Mississippi and nationally. The tremendous impact Mississippi State has would not be possible without these dedicated students, many of whom are presenting here today.

Thanks to every one of you who has supported this terrific showcase, and we hope you enjoy the symposium.

Julie Jordan, Ph.D.
Vice President for Research and Economic Development

MISSISSIPPI STATE UNIVERSITY™
CENTER FOR COMMUNITY-ENGAGED LEARNING

In 2020, 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 359 colleges and universities to achieve this elective classification. To support students, faculty, and staff involved in community engagement and engaged scholarship, Mississippi State University created the Center for Community-Engaged Learning (CCEL), under the umbrella of the Office of Student Leadership and Community Engagement. 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.

The commitment to community engagement continues daily at Mississippi State University even during a pandemic. Our students, staff, and faculty create and sustain 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 Mississippi State University scholars are one of our university'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 contact Michelle Garraway at michelle.garraway@msstate.edu. She strives to help Mississippi State University maintain its position as a nationally recognized leader in community-engaged research, learning, and service.

Kathy S. Jones, M.S.
Director
Office of Student Leadership and Community Engagement

MISSISSIPPI STATE UNIVERSITY™
STUDENT ASSOCIATION

The MSU Student Association is proud to sponsor this year's Undergraduate Research Symposium. We fully recognize Mississippi State University's reputation and impact as a top-tier research institution. Committed to ensuring that MSU students get the most out of their time here, we are happy to help them present their undergraduate research, providing them valuable experience and growing their own impact.

MISSISSIPPI STATE UNIVERSITY™
THE GRADUATE SCHOOL

Dear Students,

Congratulations on your submissions and participation in the Mississippi State University Undergraduate Mock 3 Minute Thesis (3MT) competition. The 3MT program started fourteen years ago at the Queensland University in Australia as a means of encouraging graduate students to learn how to articulate their research in a 3-minute presentation using one slide and in a vernacular that any individual not in the field of study would walk away with a comprehension and understanding of the field of study being undertaken. This is now a global event with graduate students participating at annual regional, national, and international events.

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.

Wishing you all every success in the competition and with your future scholarly endeavors.

Best regards,
Peter

Peter Ryan, Ph.D., Professor
Executive Vice Provost for Academic Affairs
and Dean of the Graduate School
Mississippi State University

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

This year, the Undergraduate Research Symposium takes place shortly after National Public Health Week, a weeklong celebration designed to bring attention to the field of public health and the many ways that we can work to promote health and well-being within our communities and around the world. As an extension of MSU's National Public Health Week 2022 celebration, we are pleased to host the Public Health Research Competition, which recognizes excellence in undergraduate research in public health-related fields.

This year's National Public Health Week theme is "Public Health is Where You Are." Indeed, across the university, there are faculty, staff, and students engaged in important work with valuable public health implications. Topics range from food security to mental health, environmental health, health communication, violence prevention, the built environment, and more. We are pleased to recognize the students at Mississippi State University who are conducting this important research. We would also like to thank the faculty mentors who support these students, the volunteers who spend time organizing the competition and serving as judges, and the sponsor of this year's competition, the MSU Department of Food Science, Nutrition and Health Promotion.

Congratulations, researchers!

Holli Seitz, MPH, PhD
Assistant Professor
Department of Communication and the Social Science Research Center

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.

THE HONOR SOCIETY OF
PHI KAPPA PHI
Chapter 060
Mississippi State University
Mississippi State, MS 39762

17th March, 2022

RE: The Undergraduate Research Symposium – Spring 2022

Dear Undergraduate Research Symposium Participants:

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 celebrated its 70th year of membership in 2021 and consists of 770 active members at present. PKP invites only the highest achieving students from across all disciplines to join this prestigious society and induct new members each spring and fall into the Honor Society. Due to PKP's prestigious recognition and support of learning, the MSU Chapter is proud to also financially support the Spring 2022 Undergraduate Research Symposium in the Colvard Student Union at Mississippi State University. As Chapter 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!

Thank you for all you do to support undergraduate research opportunities at Mississippi State University,

Respectfully,

Peter L. Ryan, PhD, MSU PKP Chapter President

State of Mississippi Rev. 1343D10

MISSISSIPPI EVICTION NOTICE

3-Day Notice to Pay Rent or Quit

MISSISSIPPI STATE UNIVERSITY
COLVARD STUDENT UNION ART GALLERY

_____, 20___

To: _____

Rental Address:

_____

YOU ARE HEREBY NOTIFIED THAT, under the terms of: (Check one)

☐ Your tenancy (if no written lease entered)
☐ The Lease Agreement dated _____, 20___
☐ The Oral Agreement dated _____, 20___
☐ The Residential Lease Agreement dated _____, 20___
☐ Other: _____

(the "Lease") for the rent and use of the premises described above now occupied by you:

Your rent for the period from _____, 20___ to _____, 20__ is PAST DUE. Accordingly, you owe the following amounts:

Rent past due:	$_____
Late fee:	$_____
Total Amount Past Due	$_____

I demand payment in full of the total amount past due within three (3) days from the date of delivery of this notice. UNLESS PAYMENT IS MADE BY SUCH DATE, THE LEASE WILL BE TERMINATED AND YOU MUST VACATE THE PREMISES. You are further notified that unless you pay the total amount past due or vacate the premises by such date, legal action may be initiated against you.

THIS NOTICE IS PROVIDED TO YOU IN ACCORDANCE WITH THE LEASE AND MISSISSIPPI CODE § 89-7-27. NOTHING IN THIS NOTICE IS INTENDED OR SHALL BE CONSTRUED AS A WAIVER BY THE LANDLORD OF ANY RIGHTS OR REMEDIES THE LANDLORD MAY HAVE UNDER THE LEASE OR UNDER STATE OR FEDERAL LAW.

HOUSING INSECURITY IN MISSISSIPPI EXHIBITION

APR 12 - APR 25

PROJECT DIRECTORS:
Silvina Lopez Barrera and Kateryna Malaia

_____ _____
Signature Date

ARCHITECTURE STUDENTS:
Camille Bohannon, Elisa Castaneda, Reagan Douglass, Savannah Wilson, Michael Herndon, Jessica Kiger, Sam Marcus, Sarah Mixon, Caroline Prather, Lucas Elder, and Alysia Williams.

This project was made possible by a grant from the Mississippi Humanities Council, through support from the National Endowment for the Humanities. Any views, findings, conclusions, or recommendations expressed in this program do not necessarily represent those of the National Endowment for the Humanities or the Mississippi Humanities Council.

MISSISSIPPI STATE UNIVERSITY™

OFFICE OF PRESTIGIOUS EXTERNAL SCHOLARSHIPS

The Office of Prestigious External Scholarships mentors all Mississippi State University students who apply for national and international scholarships, fellowships, and awards. We work with students to find scholarships that fit their academic and professional aspirations and we help students develop competitive, compelling applications.

Since the office's inception in 2012, Mississippi State has had a Rhodes Scholar, a Gates Cambridge Scholar, three Truman Scholars, seven Fulbright scholars, two Boren scholars, seven Astronaut scholars, six PPIA JSI winners, and six Goldwater Scholars.

Undergraduate/ National Scholarships: Astronaut, Goldwater, Udall, Public Policy and International Affairs Junior Summer Institute, Truman

International Scholarships: Fulbright, Boren, Critical Language Scholarship

Graduate School Scholarships: Knight-Hennessy, Truman, Rhodes, Gates-Cambridge, Marshall, Mitchell

Are you interested in applying to an external scholarship? Schedule a meeting!

For appointments regarding specific scholarships, application processes, or editing of polished essays, please contact Dr. David Hoffman, Director of the OPES.

For appointments regarding general scholarship opportunities or preliminary editing of essays, please contact Maria Schrupp, Graduate Assistant to the OPES.

Mississippi State University's Undergraduate Research Symposium
Spring 2022 Schedule

Wednesday, April 13

Session 1: Physical Sciences and Engineering		
Time	**Event**	**Location**
9:00 a.m. - 9:30 a.m.	Project Check In Physical Sciences and Engineering	Foster Ballroom, Second Floor Colvard Student Union
9:30 a.m.	Opening Welcome Message	
9:30 a.m. - 11:30 a.m.	Physical Sciences and Engineering Poster Session	
11:30 a.m.	Poster Session Concludes with Announcement	

Session 2: Arts and Humanities (Posters) and Social Sciences		
Time	**Event**	**Location**
1:00 p.m. - 1:30 p.m.	Project Check In Arts and Humanities and Social Sciences	Foster Ballroom, Second Floor Colvard Student Union
1:30 p.m.	Opening Welcome Message Poster Session	
1:30 p.m. - 3:30 p.m.	Arts and Humanities and Social Sciences Poster Session	
3:30 p.m.	Poster Session Concludes with Announcement	

Session 2: Arts and Humanities (Oral Presentations)		
Time	**Event**	**Location**
1:30 p.m.	Opening Welcome Message Oral Presentation Session	Fowlkes Auditorium, Third Floor Colvard Student Union
*1:35 p.m. - 4:35 p.m.	Arts and Humanities Oral Presentation Session	
4:35 p.m.	Oral Presentation Session Concludes with Announcement	

Thursday, April 14

Session 3: Biological Sciences and Engineering		
Time	**Event**	**Location**
9:00 a.m. - 9:30 a.m.	Project Check In Biological Sciences and Engineering	Foster Ballroom, Second Floor Colvard Student Union
9:30 a.m.	Opening Welcome Message	
9:30 a.m. - 11:30 a.m.	Biological Sciences and Engineering Poster Session	
11:30 a.m.	Poster Session Concludes with Announcement	
*1:30 p.m. - 3:30 p.m.	Thesis Research Competition (TRC) Hosted by the Graduate School	Dawg House, First Floor Colvard Student Union

All judging, including judging for the Community Engagement Research Track, Public Health Research Competition, and the Theta Tau Tomorrow Builder Award, will take place during all category poster sessions.

Undergraduate students who place in the Symposium and other event competitions will be announced by Friday, April 22 through an official university press release and on the Honors College website (honors.msstate.edu).

*See separate event schedule

Arts and Humanities (Oral Presentations) Schedule

Wednesday, April 13 - Fowlkes Auditorium, Third Floor, Colvard Student Union

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

1:30 p.m. Welcome

1:35 p.m. Reagan Bussey (107): An Analysis of Camille Saint-Saëns' Clarinet Sonata

1:50 p.m. Tanner DeYoung (108): In Other Words, Socialized Medicine: The Journal of the American Medical Association Versus The International Labour Organization

2:05 p.m. Jonathan Franz (109): The Flaming Cross

2:20 p.m. Michael Herndon (110): Andrea Palladio's comprehensive detailing of methods of construction and ornamental details

2:35 p.m. Ana Licona Luque (111): Cuándo & Dónde

2:50 p.m. Break

3:05 p.m. Joseph Newell (112): Mohja Kahf's Amendment to the Patriarchal, Religious Interpretations of Muslim Women: An Assessment of Hajar-Inspired Personas

3:20 p.m. Jacob Pritchard (113): Novus Miles Christi: Spiritual Authority and Suffering in the Presbyterian Missionary Movement

3:35 p.m. Hailey Reeder (114): Competing Masculinities in Shakespeare's Romeo and Juliet

3:50 p.m. Maeve Rigney (115): Fragrantasia: 24 Ekphrastic Poems about Scent

4:05 p.m. Cecelia Turner (116): Handbag Design, Development, and Creation

4:20 p.m. Alysia Williams (117): Identifying the sociological impacts of ethics and empathy in architecture education on BIPOC architecture students

4:35 p.m. Closing Remarks

Three Minute Thesis Competition (3MT) Schedule

Thursday, April 14 - Dawg House, First Floor, Colvard Student Union

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

1:30 p.m. Welcome

1:35 p.m. Anna McLain (082): Evaluation of a Levels System to Address Food Refusal in Adolescences

Austin Simek (033): Wingtip Aerodynamics

Madison Brode (122): Parental favoritism in a wild bird population

3MT Schedule Continued

Joseph Newell (112): Mohja Kahf's Amendment to the Patriarchal, Religious Interpretations of Muslim Women: An Assessment of Hajar-Inspired Personas

Karly Pyles (096): Where Do You Change Your Tampon?: As Assessment of Infrastructure and Usability of Menstrual Product Disposal Devices Across Campus

Jonathan Franz (109): The Flaming Cross

2:05 p.m. Break

2:15 p.m. Sarah Dulaney (068): Investigating Differing COVID-19 Vaccine Attitudes within Families

Anne Elizabeth Harrington (070): “Being a Chi O to a Fraternity Boy is the Greatest Thing That Could Happen”: Reputation, Heterosocialization, and Status Among Sorority Women

Riley Cutler (133): Effects of Glyphosate on Recombination Plasticity in C. Elegans

Trinity Kassuhn (153): Impact of Varying Concentrations of Bovine Serum Albumin on Fowler's Toad (Anaxyrus Fowleri) Sperm Cryopreservation

Garrett Smith (101): Terrorism Tactics: Vehicular Attacks in Israel

Jacob Lee (157): Analysis of soil organic carbon and percent nitrogen in Mississippi croplands using hyperspectral remote sensing and deep learning neural networks.

2:45 p.m. Break

2:55 p.m. Satsha Burden (005): Aerodynamics of Winglets

MacKenzie Paul (092): To Sweeten or Not to Sweeten: The Unique Impact of Emotional Support and Fatalism on Sugar Consumption Among Southeastern Native Americans

Caroline Crawford (065): The impact of COVID-19 on undergraduate students’ professional experience

Davis Helton (016): Synthesis of phenoxazine, carbazole, phenazaborine and phenasiline based on polymers by Buchwald/Hartwig polyamination for conductive polymer and biosensor applications.

Ashutosh Shah (182): Invasive Aquatic Plant Species Identification on Nvidia Jetson Nano Using Computer Vision and Deep Learning

3:20 p.m. Closing Remarks

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

Name	Research Category	Project Number	Other Competitions
Deborah Alencar De Oliveira	Physical Sciences and Engineering	001	
Kiara Batson	Physical Sciences and Engineering	002	
Daniel Bond	Physical Sciences and Engineering	003	
Maggie Britton	Physical Sciences and Engineering	004	
Satsha Burden	Physical Sciences and Engineering	005	3MT
Elijah Caudill	Physical Sciences and Engineering	006	
Minjae Cho	Physical Sciences and Engineering	007	
Makenna Cowsert	Physical Sciences and Engineering	008	
James Duncan	Physical Sciences and Engineering	009	
Whitney Duncan	Physical Sciences and Engineering	010	
Devin Foeller	Physical Sciences and Engineering	011	
Reece Goff	Physical Sciences and Engineering	012	
Jacob Gowan	Physical Sciences and Engineering	013	CE
Brady Groce	Physical Sciences and Engineering	014	
Payne Guilliams	Physical Sciences and Engineering	015	
Davis Helton	Physical Sciences and Engineering	016	3MT
Benjamin Henkel	Physical Sciences and Engineering	017	
Jesse Hollingsworth	Physical Sciences and Engineering	018	CE
Ajay Jesuraj Vijayakumar	Physical Sciences and Engineering	019	
Claire King	Physical Sciences and Engineering	020	
Adonte Knight	Physical Sciences and Engineering	021	
Leon Koehler	Physical Sciences and Engineering	022	
Joshua Moore	Physical Sciences and Engineering	023	
David Morgan	Physical Sciences and Engineering	024	
Avri O'Daniel	Physical Sciences and Engineering	025	
David Oldenburg	Physical Sciences and Engineering	026	
Maggie Pettus	Physical Sciences and Engineering	027	
Zachary Redder	Physical Sciences and Engineering	028	
Jonathan Reeves	Physical Sciences and Engineering	029	
Titus Rogers	Physical Sciences and Engineering	030	
Jeevan Roka	Physical Sciences and Engineering	031	
Ryan Shirley	Physical Sciences and Engineering	032	
Austin Simek	Physical Sciences and Engineering	033	CE, 3MT
Kelli Skelton	Physical Sciences and Engineering	034	
Cade Sparks	Physical Sciences and Engineering	036	
Evelyn Spencer	Physical Sciences and Engineering	037	
Brady Swann	Physical Sciences and Engineering	038	
Briana Taylor	Physical Sciences and Engineering	039	
Zavian Thomas	Physical Sciences and Engineering	040	
Alayna Todd	Physical Sciences and Engineering	041	
Quyen Tran	Physical Sciences and Engineering	042	
Linah Turner-Chism	Physical Sciences and Engineering	043	

CE - Community Engagement Research Track / PH - Public Health Research Competition / 3MT - Three Minute Thesis Competition

Name	Research Category	Project Number	Other Competitions
Jefferson Van	Physical Sciences and Engineering	044	
Macey Wallace	Physical Sciences and Engineering	045	
Joshua Warnsley	Physical Sciences and Engineering	046	CE
Ethan Welford	Physical Sciences and Engineering	047	
Kylan Welford	Physical Sciences and Engineering	048	
Harrison Williams	Physical Sciences and Engineering	049	
Jackson Wilson	Physical Sciences and Engineering	050	
Katelyn Woodard	Physical Sciences and Engineering	051	CE
Timothy Wunrow	Physical Sciences and Engineering	052	
Walter Hogue	Arts and Humanities (Poster)	053	
Rachel Nobles	Arts and Humanities (Poster)	054	
Toussaint Robinson	Arts and Humanities (Poster)	055	
Alysia Williams	Arts and Humanities (Poster)	056	
Rachel Adair	Social Sciences	057	PH
Alexandra Baldwin	Social Sciences	058	CE, PH
Trinity Bancroft	Social Sciences	059	
Katherine Brune	Social Sciences	060	
Ashby Bryan	Social Sciences	061	
Callie Cain	Social Sciences	062	
Laura Chapman	Social Sciences	063	
Emilee Cooksey	Social Sciences	064	
Caroline Crawford	Social Sciences	065	3MT
Erin Dickinson	Social Sciences	066	PH
Piper Doherty	Social Sciences	067	
Sarah Dulaney	Social Sciences	068	PH, 3MT
Kristieona Epting	Social Sciences	069	
Anne Elizabeth Harrington	Social Sciences	070	3MT
Summer Hill	Social Sciences	071	
Eleanor Holt	Social Sciences	072	
Kara Hubbard	Social Sciences	073	
Ania Issac	Social Sciences	074	
Ryan Jarratt	Social Sciences	075	
Rachel Kalchbrenner	Social Sciences	076	PH
Macy Leach	Social Sciences	077	
Lauren LeBlanc	Social Sciences	078	
Haylie Lloyd	Social Sciences	079	
Ashlynn McCain, B.S.,B.A.	Social Sciences	080	
Lillian McElreath	Social Sciences	081	
Anna McLain	Social Sciences	082	CE, 3MT
Clare Meng	Social Sciences	083	
Randa Miles	Social Sciences	084	
Julie Anne M. Miller	Social Sciences	085	
Malerie Millet	Social Sciences	086	

CE - Community Engagement Research Track / PH - Public Health Research Competition / 3MT - Three Minute Thesis Competition

Name	Research Category	Project Number	Other Competitions
Mary Mitchell	Social Sciences	087	PH
Shamaria Mosley	Social Sciences	088	
Shelby Motes	Social Sciences	089	CE
Josie Nasekos	Social Sciences	090	
Camden Patterson	Social Sciences	091	PH
MacKenzie Paul	Social Sciences	092	PH, 3MT
Amy Pham	Social Sciences	093	PH
Leanna Pittman	Social Sciences	094	
Haley Power	Social Sciences	095	
Karly Pyles	Social Sciences	096	PH, 3MT
Mary Rice	Social Sciences	097	
Bailey Roux	Social Sciences	098	CE, PH
MaKailee Silliaman	Social Sciences	099	PH
Adelle Smith	Social Sciences	100	
Garrett Smith	Social Sciences	101	3MT
Makayla Smith	Social Sciences	102	
Bryce Tucker	Social Sciences	103	
Caitlin Wall	Social Sciences	104	PH
Isabella Walsh	Social Sciences	105	
Alyssa (Ally) Williams	Social Sciences	106	
Reagan Bussey	Arts and Humanities (Oral Presentation)	107	
Tanner DeYoung	Arts and Humanities (Oral Presentation)	108	PH
Jonathan Franz	Arts and Humanities (Oral Presentation)	109	3MT
Michael Herndon	Arts and Humanities (Oral Presentation)	110	
Ana Licona Luque	Arts and Humanities (Oral Presentation)	111	
Joseph Newell	Arts and Humanities (Oral Presentation)	112	3MT
Jacob Pritchard	Arts and Humanities (Oral Presentation)	113	
Hailey Reeder	Arts and Humanities (Oral Presentation)	114	
Maeve Rigney	Arts and Humanities (Oral Presentation)	115	
Cecelia Turner	Arts and Humanities (Oral Presentation)	116	
Alysia Williams	Arts and Humanities (Oral Presentation)	117	PH
Anna Bales	Biological Sciences and Engineering	118	
Abby Blakeney	Biological Sciences and Engineering	119	
Davis Bostrom	Biological Sciences and Engineering	120	
Sarah Broadaway	Biological Sciences and Engineering	121	
Madison Brode	Biological Sciences and Engineering	122	3MT
Alice Brown	Biological Sciences and Engineering	123	
Autumn Carroll	Biological Sciences and Engineering	124	
Sydni L Carter	Biological Sciences and Engineering	125	
Sunny Jo Chandler	Biological Sciences and Engineering	126	
DeShea Chasko	Biological Sciences and Engineering	127	
Kailey Clinton	Biological Sciences and Engineering	128	

CE - Community Engagement Research Track / PH - Public Health Research Competition / 3MT - Three Minute Thesis Competition

Name	Research Category	Project Number	Other Competitions
Amber Cook	Biological Sciences and Engineering	129	
Rosalynn Corzine	Biological Sciences and Engineering	130	
Olivia Cresswell	Biological Sciences and Engineering	131	
Lindsay Culpepper	Biological Sciences and Engineering	132	
Riley Cutler	Biological Sciences and Engineering	133	3MT
Amanda Daulong	Biological Sciences and Engineering	134	
Fiona Dawe	Biological Sciences and Engineering	135	
Dutton Day	Biological Sciences and Engineering	136	
Baylor Doughty	Biological Sciences and Engineering	137	
Jacob Duke	Biological Sciences and Engineering	138	
Reese Dunne	Biological Sciences and Engineering	139	
James Feduccia	Biological Sciences and Engineering	140	PH
Seth Freeny	Biological Sciences and Engineering	141	
Malley Gautreaux	Biological Sciences and Engineering	142	
Madeline Gnann	Biological Sciences and Engineering	143	
Hunter Goodson	Biological Sciences and Engineering	144	
Alexandra Gordon	Biological Sciences and Engineering	145	
Abigail Grant	Biological Sciences and Engineering	146	
Camille Green	Biological Sciences and Engineering	147	
Makeriah Hampton	Biological Sciences and Engineering	148	
Maddie Heath	Biological Sciences and Engineering	149	PH
Ainsley Jessup	Biological Sciences and Engineering	150	
Benjamin Johnson	Biological Sciences and Engineering	151	
Sophie Jones	Biological Sciences and Engineering	152	CE
Trinity Kassuhn	Biological Sciences and Engineering	153	3MT
Felicity Kleitz-Singleton	Biological Sciences and Engineering	154	
Kylie LaBelle	Biological Sciences and Engineering	155	
Robert Lawson	Biological Sciences and Engineering	156	
Jacob Lee	Biological Sciences and Engineering	157	3MT
Caitlin Luke	Biological Sciences and Engineering	158	PH
Erin Macke	Biological Sciences and Engineering	159	CE
Meredith Maynard	Biological Sciences and Engineering	160	
Abbey McCrory	Biological Sciences and Engineering	161	
Cerise Mensah	Biological Sciences and Engineering	162	CE
Hunter Mentges	Biological Sciences and Engineering	163	
Hannah Miller	Biological Sciences and Engineering	164	
Macy Moore	Biological Sciences and Engineering	165	
Brendan Morrow	Biological Sciences and Engineering	166	
Madison Newman	Biological Sciences and Engineering	167	
Grant Norman	Biological Sciences and Engineering	168	
Yvanna Paez Mendez	Biological Sciences and Engineering	169	CE
Catherine Paul	Biological Sciences and Engineering	170	
Mia Pensa	Biological Sciences and Engineering	171	PH

CE - Community Engagement Research Track / PH - Public Health Research Competition / 3MT - Three Minute Thesis Competition

Name	Research Category	Project Number	Other Competitions
Maggie Phillips	Biological Sciences and Engineering	172	PH
Stephen Phillips	Biological Sciences and Engineering	173	
Wesley Rainey	Biological Sciences and Engineering	174	
Devin Rehrig	Biological Sciences and Engineering	175	
Autumn Riggi	Biological Sciences and Engineering	176	
Jordan Rogers	Biological Sciences and Engineering	177	
Jordan Rogers	Biological Sciences and Engineering	178	
Sarah Rogers	Biological Sciences and Engineering	179	
Jessica Sandifer	Biological Sciences and Engineering	180	
Gerald Self, Jr.	Biological Sciences and Engineering	181	
Ashutosh Shah	Biological Sciences and Engineering	182	3MT
Nicholas Stinson	Biological Sciences and Engineering	183	PH
Caera Taylor	Biological Sciences and Engineering	184	
Gracie Teel	Biological Sciences and Engineering	185	
Charlotte Thompson	Biological Sciences and Engineering	186	
Jessica Tomasi	Biological Sciences and Engineering	187	CE
Emily Tucker	Biological Sciences and Engineering	188	PH
Andrea Turnbow	Biological Sciences and Engineering	189	
Emma U'Ren	Biological Sciences and Engineering	190	
Lynn Wade	Biological Sciences and Engineering	191	
Benjamin Wheeler	Biological Sciences and Engineering	192	PH
Emily White	Biological Sciences and Engineering	193	
Logan White	Biological Sciences and Engineering	194	PH
Anna Williams	Biological Sciences and Engineering	195	PH
Nathan Wright	Biological Sciences and Engineering	196	
Daniel Young	Biological Sciences and Engineering	197	

"Research is seeing what everybody else has seen and thinking what nobody else has thought."

- Albert Szent-Györgyi

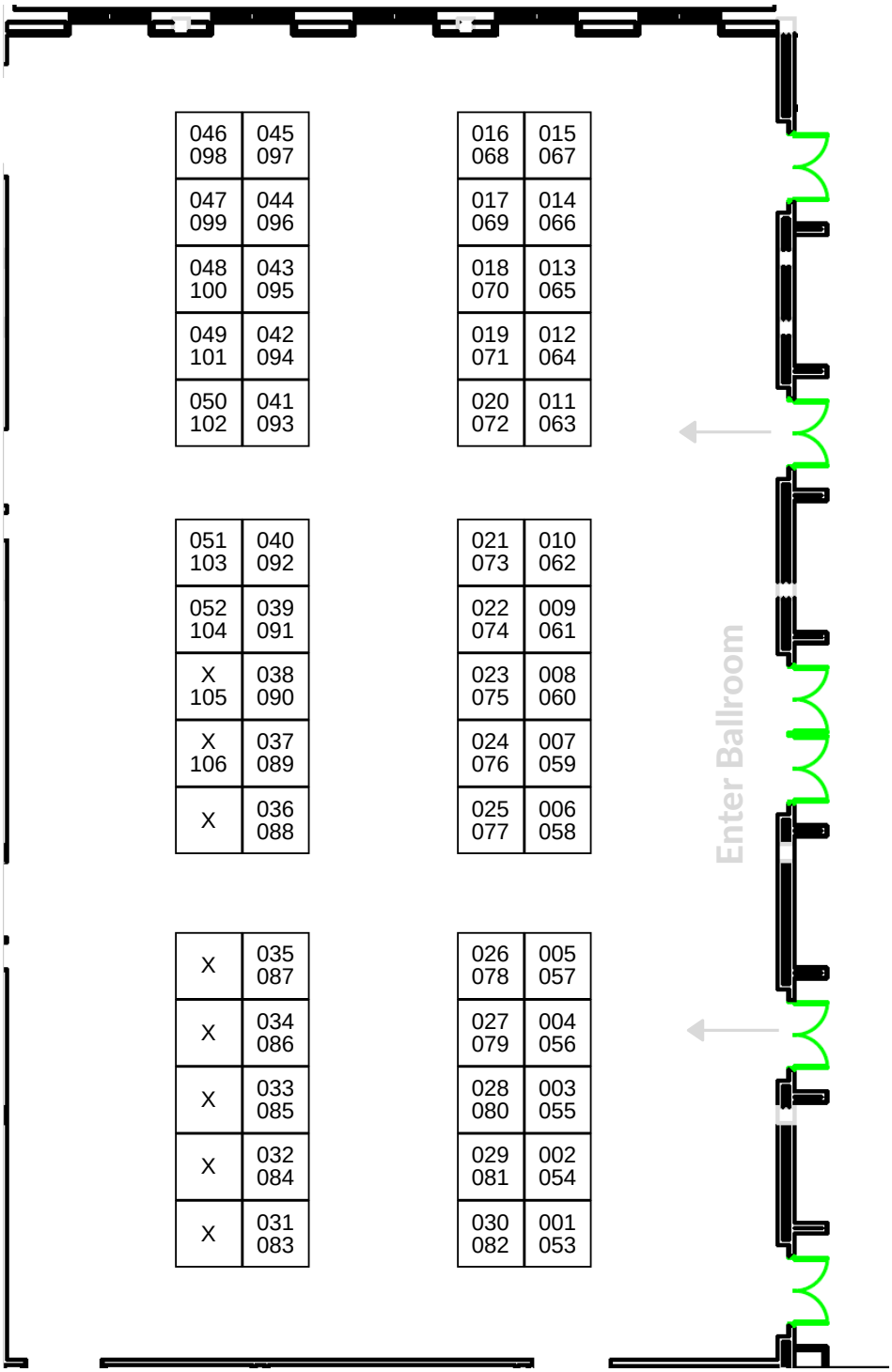
Szent-Györgyi (1893-1986) was a Hungarian pharmacologist known for his work on vitamins and oxidation. He was awarded the Nobel Prize in Physiology or Medicine in 1937.

CE - Community Engagement Research Track / PH - Public Health Research Competition / 3MT - Three Minute Thesis Competition

Sympsoium Poster Map Sessions 1 & 2

Foster Ballroom, Colvard Student Union
Mississippi State University

Physical Sciences and Engineering (001 - 052)
Arts and Humanities (053 - 056)
Social Sciences (057 - 106)

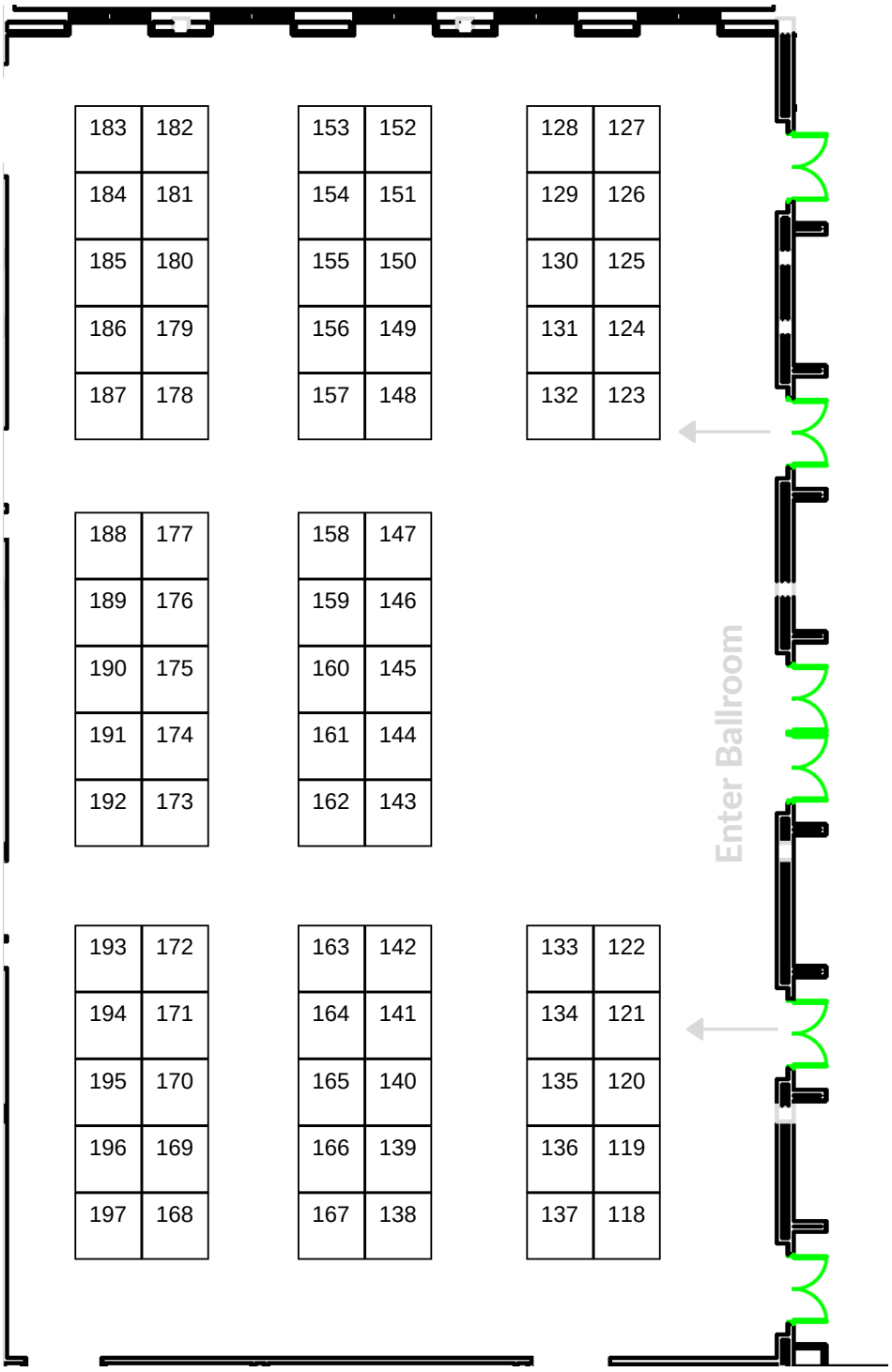


X: Extra display easels

Sympsoium Poster Map Session 3

Foster Ballroom, Colvard Student Union
Mississippi State University

Biological Sciences and Engineering (118 - 197)



ABSTRACTS

057
Name: Adair, Rachel
Major: Economics (B&I)
Faculty Advisor, Affiliation: Holli Seitz, Department of Communication and Social Science Research Center
Project Category: Social Sciences
Co-Author(s): Drew Cole
Other Competition(s): Public Health Research Competition

Adapting Diffusion of Innovation Theory Items to Measure the Uptake of HappyHealthy Recipes
Background: HappyHealthy is a social marketing campaign that aims to increase fruit and vegetable consumption among Supplemental Nutrition Assistance Program recipients. In order to increase HappyHealthy recipe adoption, there is a need to understand the attributes of a recipe that lead to greater likelihood of use. Objectives: The primary objective of this study was to adapt and validate survey items to measure Diffusion of Innovation (DOI) Theory (Rogers, 1962) attributes as they apply to HappyHealthy recipes. Methods: Existing DOI items measuring relative advantage, compatibility, complexity, observability, and trialability were collected from literature and adapted to refer to HappyHealthy recipes. Three DOI experts were recruited to assess the face validity of adapted items. Cognitive interviews were conducted with eight participants from the priority population to evaluate the comprehension of items that passed the face validity test. Online pilot surveys were administered with a sample of US (*N*=39) adults to assess internal consistency of the final scales across three recipes. Results: Following the face validity assessment of the 25 adapted items, we retained 11 items that experts agreed measured the attribute in question. Cognitive interview participants suggested shortening and simplifying the wording of items. Item wording was clarified based on feedback from cognitive interviews. The observability item was not well understood and omitted, leaving 10 items for online pilot testing. Pilot data demonstrated the following: correlation between two relative advantage items ranged from .68 and .78 across recipes, Cronbach's alpha for three compatibility items ranged from .70 to .91, and Cronbach's alpha for four complexity items ranged from .09 to .39. For complexity, Cronbach's alpha increased to .83 to .84 once a reverse-worded item was removed from the scale. Conclusion: This project led to the development of nine valid and reliable items that can be used to measure attributes of healthy recipes.

001
Name: Alencar De Oliveira, Deborah
Major: Industrial Engineering
Faculty Advisor, Affiliation: Harun Pirim, Industrial and Systems Engineering
Project Category: Physical Sciences and Engineering

Optimization-Based Model for Allocating Available Snowplows in Regions Where Winter Maintenance Resources are Limited
Areas where snowstorms are not common may experience issues with power outages and traffic accidents that cannot be efficiently remedied due to the scarce availability of snowplows to clear their paths and allow for a timely response in case of winter storms. With these concerns in mind, I created a Mixed-Integer Linear Programming model to find the optimal distribution of available snowplows in the state of Mississippi's northwest. This was achieved by, first, cross-referencing data from the Mississippi Department of Transportation (MDOT), such as number of available plows per region and number of lane miles per county, with the distance between all counties in District 2 (as defined by MDOT). Next, a model was created to minimize the distance traveled by snowplows while maximizing the frequency of plowing. To accomplish that, I first created a binary variable to be used to select counties that will be affected by the snowstorm. Then, I decided that the model should determine the minimum number of snowplows necessary to clean the county's total lane miles in less than 3 hours, and that the number of trucks leaving each county should not exceed the number of available plows in that county. Lastly, since all counties were separated between supply and demand counties (each to act differently depending on needs), it was necessary to ensure that if a county will be affected by snow its snowplows should remain in place, and model should only calculate optimal allocation of additional plows. This model was tested by using AMPL, and the results found indicated that model works as expected. In this research I also determined a heuristic

approach to find a near optimal allocation of available snowplows that could cater for a model with larger reach, such as the whole state of Mississippi.

058
Name: Baldwin, Alexandra
Major: International Business
Faculty Advisor, Affiliation: Robert McMillen, Psychology
Project Category: Social Sciences
REU/Research Program: Tobacco Control Unit
Other Competition(s): Community Engagement Research Track, Public Health Research Competition

Risk of Addiction, E-cigarettes and Middle School Students
Background: Nicotine is an addictive chemical compound found in e-cigarettes that has the potential to harm the developing brain. The average middle school students range in age from 10-14, a time of vital brain development. Methods: The Youth Tobacco Survey (YTS) followed e-cigarette trends from 2010-2019 in Mississippi middle school students. Using a multi-stage sample design, the data were collected from students in randomly selected classrooms within participating schools. To provide further insight into high school and past middle school experiences regarding e-cigarettes, 120 high school students participated in 26 virtual focus groups during April and May of 2021. Results: Before 2014, trial use of e-cigarettes remained below 4%, but as of 2019, the percentage of middle schoolers who have tried e-cigarettes has grown to 18.8% or 21,028 Mississippi middle school students. Focus group participants reported that their first exposure to e-cigarettes occurred during their middle school years through peers and older students. They commented on the lack of anti-vape education during those years. Middle schoolers are thought to be especially susceptible to e-cigarettes due to the advertisements targeting younger individuals and through the fruit and candy flavor options. Implications: Students are often exposed to e-cigarettes in middle school. Addressing and providing earlier education on addiction, as well as other potential e-cigarette risks, helps safeguard against e-cigarette use and limits exposure to nicotine. When it comes to nicotine, longer use bring more risk of addiction and harm to brain development.

118
Name: Bales, Anna
Major: Biochemistry
Faculty Advisor, Affiliation: Dr. Florencia Meyer, Biochemistry, Molecular Biology, Entomology & Plant Pathology
Project Category: Biological Sciences and Engineering

Effects of multiplicity of infection of Bovine Herpesvirus-1 on bacterial growth during co-infection
Bovine Respiratory Disease (BRD) is a disease complex caused by the interactions of multiple common pathogens. During times of stress for the cattle, such as transport and shipping, a weakened immune system allows for infection by pathogens. A major viral contributor of BRD, Bovine Herpesvirus-1 (BoHV-1) can cause a primary infection in the animal which allows opportunistic bacteria such as *Mannheimia haemolytica* and *Pasteurella multocida* to infect. Previous studies have shown that these bacterial pathogens have an effect on viral replication during co-infection. The objective of this study was to assess the effect on bacterial replication when the dose of BoHV-1 was manipulated. Marvin Darby Bovine Kidney epithelial cells were co-infected with either *M. haemolytica* or *P. multocida* and BoHV-1 at differing multiplicity of infection (MOI) either simultaneously or with BoHV-1 4 hours prior to bacteria. The optical density was measured at 600nm every 3 hours during a 24-hour period to quantify bacterial growth. Each experiment showed typical growth curves of both *M. haemolytica* and *P. multocida*. The lowest viral dose tested, MOI 0.01, resulted in reduced bacterial growth of both *M. haemolytica* and *P. multocida* when compared to bacteria alone. Bacterial colony forming units (CFU) were quantified using the supernatant of co-infections, supporting the optical density results. Further research is necessary to determine the cause of decreased bacterial growth at the lowest viral dose.

059
Name: Bancroft, Trinity
Major: Human Sciences/Apparel Textiles & Merchandising
Faculty Advisor, Affiliation: Tommy Phillips, School of Human Sciences; JuYoung Lee, School of Human Sciences
Project Category: Social Sciences
Co-Author(s): Avery Harwell, Shelby Buitt, Chelsey Washington

The influence of social media on fashion forwardness behavior and body self-image
Modern society is obsessed with the ideology of youthfulness and beauty. It is perceived that when an individual looks their best, they feel their best. Mass media holds a significant role in setting the standard on what is considered attractive. Through extensive research, data shows the correlation between overexposure to social or fashion media and negative impact on someone's self-body image. It is a challenge to understand the complexity that is self-image. Analyzing each body part and how satisfied you are with its appearance makes up a person's body image. It is multidimensional and can change per person based on things like current fashion trends. We have witnessed fashion trends speed up tremendously, and people become more and more distressed with these faster changes. Extremely thin body types that are portrayed the most in fashion advertisements and fashion shows are what people aim to embody. Over time people have decided that this is the standard of beauty we all must fit to be pleased with our appearance. Past research examines the impact of traditional media exposure (i.e., television and magazines advertisements) on body image in females. However, little research has been published that focuses on the male population. This research study was formulated to target this research gap by focusing on the male population. The study's data was collected through a survey using measures of the body image scale, social media addiction scale, social media exposure scale, and fashion forwardness scale. Social media has evolved from a primary means of communication to a massive force that affects a wide range of sectors. Undoubtedly, social media plays a vital role in modern society, with billions of people using it regularly.

002
Name: Batson, Kiara
Major: Civil Engineering
Faculty Advisor, Affiliation: Dr. Alireza Ermagun, Rula School of Civil & Environmental Engineering
Project Category: Physical Sciences and Engineering

The Public's Acceptance and Willingness to Pay and Utilize Urban Air Mobility
This study systematically reviews 60 peer-reviewed studies to examine the public's acceptance of Urban Air Mobility (UAM). We synthesized extracted articles to understand: (1) The willingness of the public to pay and utilize Urban Air Mobility services and (2) The factors affecting the adoption of Urban Air Mobility. Our findings demonstrate that the willingness to pay for UAM services range from approximately 25%-35%, with majority of these individuals ranging from 25-30 years old, single, and/or male. Additionally, the findings present common opportunities and challenges in the adoption and implementation of UAM services. The opportunities of UAM include reduced emergency response times, an increase in accessibility, on-demand travel options, and overall increase the capacity and efficiency of urban transportation systems. Contrastingly, the challenges of UAM include safety concerns of unmanned aircraft systems, the need for more heavily regulated policies for air traffic, potential issues with nuisance and trespass law, and the integration of UAM infrastructure into city centers for seamless operations. With this, we believe that further study of Urban Air Mobility applications should be explored to ensure that the public's concerns are properly addressed.
Keywords: Urban air mobility, willingness to use, public acceptance, flying car, urban transportation

119
Name: Blakeney, Abby
Major: Physical Education/Kinesiology
Faculty Advisor, Affiliation: Stamatis Agiovlasitis, Kinesiology
Project Category: Biological Sciences and Engineering
Co-Author(s): Brantley K. Ballenger, Sydni Carter, Grant Norman
REU/Research Program: MSU ORED Undergraduate Research Grant and I'm An Athlete Foundation

Comparing Gender Differences in Perceived and Measured Physical Activity Levels
Accelerometers provide an accurate way to assess physical activity levels. Due to feasibility, it may be easier to assess physical activity levels through a survey. However, self-reported surveys may be less accurate in measuring physical activity levels. The purpose of this study was to compare participant reported physical activity levels with accelerometer measured physical activity levels. Forty adults (21 men & 19 women; age 25.7 ± 9.4 years) completed the Godin Leisure Time Exercise Questionnaire (GLTEQ). This questionnaire has participants describe their personal physical activity levels based on 3 intensity categories: light, moderate, and strenuous. The participants also wore an accelerometer on their non-dominant hip for 7 days – at least 10 hours per day. Accelerometer data were analyzed using a modified version of the Freedson cut points allowing quantification of activity levels of different intensities and sedentary behavior. Paired samples t-tests compared physical activity levels and GLTEQ scores between male and female participants. We found significant differences between males and females for percentage of time spent in sedentary (p = .004), moderate-to-vigorous (MVPA) (p < .001), and MVPA minutes per day (p < .001). For participant reported GLTEQ scores, significant differences between males and females were only found for strenuous activity (p = .003) and total score (p = .026). Males had higher percentage of MVPA and more MVPA minutes per day compared to females. Males also self-reported higher strenuous and total activity scores on the GLTEQ. The GLTEQ may be an appropriate questionnaire to measure physical activity levels when objective measurement by accelerometer is not feasible. Males and females seem to both accurately report physical activity levels.

003
Name: Bond, Daniel
Major: Mathematics
Faculty Advisor, Affiliation: Amanda Diegel, Mathematics and Statistics
Project Category: Physical Sciences and Engineering

Mathematical Modeling and Numerical Simulation of Crystalline Grain Growth
We develop a numerical method for a mathematical model called the modified phase field **c**rystal equation which models crystalline grain growth among other materials science applications. We choose the modified phase field crystal equation as the model can account for elastic and plastic deformations of the crystal lattice, dislocations, grain boundaries and more. We show that our numerical method dissipates a pseudo energy related to the modified phase field crystal equation and present images of crystalline grain growth under different assumptions illustrated by varying the a parameter multiplying the second derivative, with respect to time, of the phase field variable.

120
Name: Bostrom, Davis
Major: Animal and Dairy Sciences (Pre-Vet)
Faculty Advisor, Affiliation: Dr. Trent Smith, Animal and Dairy Sciences
Project Category: Biological Sciences and Engineering
Co-Author(s): Dr. Erdogan Memili, Dr. Muhammet Rasit Ugur
REU/Research Program: CALS URSP

Uncovering Sperm microRNAs Associated with Bull Fertility
High fertility in bulls is crucial for cattle reproduction and the implementation of cryopreservation in artificial insemination (AI). Cryopreservation in conjunction with AI allows for long term storage and expanded access and utilization of bulls with

economically desirable traits. Utilization of biomarkers as indicators for high fertility bulls can predict quality candidates for semen cryopreservation. The objective of this study is to identify microRNAs directly associated with high and low fertility in bulls due to the miRNA's interactions with spermatogenesis, conception, or embryogenesis. To obtain these objectives, bioinformatic databases were used to identify 10 miRNAs associated with high fertility and 10 associated with low fertility. Their sequences were attained through miRbase.org. The top 10 target genes were selected for each miRNA with TargetScanHuman then narrowed to a singular gene for each miRNA. Proteins transcribed from each selected target gene were then analyzed for biological and molecular function utilizing STRING: functional protein associated networks. The study revealed 10 miRNAs each for high and low fertility sperm as well as their target genes and transcribed protein sequences. Identification of these miRNAs may be utilized in further testing on cryopreserved semen samples. RNA isolation and sequencing of samples may be cross referenced with miRNAs identified in this study to determine their prevalence. Quantification of the studied miRNAs may be compared to known fertility values to establish a future baseline of miRNA biomarker quantities to test other bulls against to determine viability for fertility and semen cryopreservation.

004
Name: Britton, Maggie
Major: Chemical Engineering
Faculty Advisor, Affiliation: Santanu Kundu, Dave C. Swalm School of Chemical Engineering
Project Category: Physical Sciences and Engineering
Co-Author(s): Humayun Ahmad

Effect of varying ratios of stretchable and conjugated polymers in electrospinning process
Electrospinning is a fiber fabrication method that uses electrostatic force to convert a polymer in solution to a polymeric fiber. In this research, electrospinning is employed to produce a conjugated polymer fiber that has useful electronic properties. However, conjugated polymers cannot be directly spun into fibers because of their low molecular weight and the absence of entanglement. To overcome this, high molecular weight flexible polymer was used to assist the spinning. A coaxial electrospinning set up, which creates a core-shell structure, was utilized to produce fiber. This has been chosen because the core material, which is poly(methyl methacrylate) (PMMA), has a high molecular weight and reliably creates continuous fibers. Poly(3-hexylthiophene-2,5-diyl) (P3HT), a conjugated polymer, has been chosen as the shell material because of its useful electronic properties. Fibers of varying ratios of PMMA to P3HT were produced and investigated. The thermal, electrical, and photoluminescent properties of the resultant fibers will be presented. My research provides a critical understanding regarding the processing-structure-property relationships for conjugated polymers.

121
Name: Broadaway, Sarah
Major: Biochemistry
Faculty Advisor, Affiliation: Caleb O. Lemley, Animal and Dairy Sciences
Project Category: Biological Sciences and Engineering
Co-Author(s): Zully E. Contreras-Correa, Taylor Cochran, Kaitlyn Wood, Derris D. Burnett
REU/Research Program: Undergraduate Research Scholars Program

Examining melatonin-mediated changes in bovine fetal pancreatic insulin containing cell clusters during maternal nutrient restriction
Maternal nutrient restriction negatively affects fetal development causing decreased birth weight. Furthermore, low-birth-weight offspring have an increased risk of metabolic diseases such as diabetes in the adult life. Our previous research has shown that dietary melatonin supplementation during the summer (fall calving) mitigated fetal weight restriction in nutrient restricted dams. Therefore, we hypothesized that maternal melatonin supplementation would reverse any changes to fetal insulin containing cell clusters due to maternal undernutrition. The objective of this study was to determine the effects of melatonin supplementation and maternal nutrient restriction on the size of insulin containing cell clusters of the fetal pancreas. A total of 54 Brangus heifers (Fall, n=29; Summer, n=25) were used. At d160 of gestation, heifers were assigned to 1 of 4 groups consisting of adequately fed (ADQ-CON; 100% NRC; n=13), global nutrient restricted (RES-CON; 60% NRC; n=13), and ADQ or RES supplemented with 20 mg/d of melatonin (ADQ-MEL, n=13; RES-MEL, n=15).

At d240 of gestation, heifers underwent Cesarean sections for fetal removal and pancreas collection. Pancreas cryosections were labeled for insulin to detect islets of Langerhans which were analyzed using ImageJ software. In the fall, the percent medium clusters were decreased ($P<0.05$) in RES vs. ADQ. Percent large clusters were increased ($P<0.05$) in RES vs ADQ. The average size of cell clusters increased ($P\leq0.03$) in RES vs ADQ in the fall; however, in the summer, the average cell cluster size decreased ($P<0.01$) in MEL vs. CON. Maternal nutrient restriction in spring calving dams may shift fetal pancreatic islet size from medium to large clusters, while increasing the average size of the cell clusters. Conversely, melatonin supplementation in fall calving dams decreased the average size of the cell clusters, which may alter pancreatic function later in life.

122
Name: Brode, Madison
Major: Biological Sciences
Faculty Advisor, Affiliation: Dr. Keith Bowers, University of Memphis Department of Biological Sciences
Project Category: Biological Sciences and Engineering
Co-Author(s): Kelly Miller, Ashley J Atkins Coleman, Kelly O'Neil, LeighAnn E Poole
Other Competition(s): Three Minute Thesis Competition

Parental favoritism in a wild bird population
For altricial organisms, in which newborns are fully dependent on parental care, offspring in a variety of taxa solicit food from their parents using a combination of visual and acoustic stimuli. However, what is being communicated through these stimuli and how they shape parental responses remains unclear. Parents may be responding to a (i) signal of need, in which parents feed their young to benefit the individuals of greatest need. In other words, parents might choose to feed the runt of the brood. Alternatively, parents may be responding to a (ii) signal of quality, in which parents feed the young with the best chance of survival. In other words, parents might choose to feed the largest, healthiest-looking young as this is less likely to constitute a wasted investment. Using films and measurements gathered from nests located in nest boxes stationed around Meeman Biological Field Station in southwestern Tennessee during the 2019 breeding season, we investigated this hypothesis in a wild population of prothonotary warblers (*Protonotaria citrea*) with the prediction that parents bias food non-randomly toward certain individuals within broods depending on both nestling mass and brood size. We found that while parents with relatively more young preferentially fed nestlings that were smaller relative to their siblings, parents with relatively fewer young showed bias toward larger nestlings. These findings suggest that parents respond to begging signals according to multiple social cues with stronger siblings with greater survival prospects being favored when few copies of a parent's genes are present and runts being favored to ensure whole-brood survival when a parent has the potential to fledge more young. Future studies may shed light on the contributions of parental decision-making and memory, how nestlings learn in parent–offspring communication systems, and the adaptive significance of these behaviors.

123
Name: Brown, Alice
Major: Wildlife, Fisheries & Aqua
Faculty Advisor, Affiliation: Eric McConnell, Forest Business
Project Category: Biological Sciences and Engineering

Developing Stand Density Management Guidelines for Bottomland Hardwoods
Bottomland hardwood forests are regarded as complex systems due to a variety of factors. They are growing in interest for both their timber and non-timber benefits. When trying to determine when to implement silvicultural prescriptions and adequately time tree growth, foresters often use a stocking chart. Stocking charts depict a stand to optimum condition and are often used as a guide. There are no stocking diagrams provided for bottomland hardwood forests besides the one published by Goelz in 1995. Within his chart are some areas of fragility and two noted areas of weakness. Stand density index (SDI) is another tool used by foresters. SDI characterizes the correlation between stand density and tree size at a benchmarked value. Similar to a stocking, a chart can be created for usage. It allows for stand densities to be compared in spite of differences in site and age. Even though stand density index is incredibly effective for determining thinning and

stocking fluctuation levels, there is no available diagram for southern bottomland hardwoods. Within this research project, the goal is to create a more applicable tool to determine bottomland hardwood forest management procedures and utilize the site's resources. To do so, reduced major axis regression was applied to accurately depict the tree size-density correlation even-aged bottomland hardwood forests. A stand density diagram was also created using inventory data of stands. Upper and lower growing stock limits for optimum stocking are to be identified and discussed. These could be of availability to assist foresters in management decisions and help industries better predict costs and timber yields.

060

Name: Brune, Katherine
Major: Human Sciences/Human Dev & Family Studies
Faculty Advisor, Affiliation: Dr. Marina Denny, School of Human Sciences; Dr. Alisha Hardman, School of Human Sciences
Project Category: Social Sciences
REU/Research Program: MSU Extension Undergraduate Apprenticeship Program

Development of Competencies for Family and Consumer Science Extension Personnel in Mississippi

Family and Consumer Science (FCS) Extension agents are required to hold knowledge in a wide variety of disciplines. Our project used a framework developed by the University of Tennessee to assess core competencies for FCS Extension professionals to create a list of competencies to clarify what FCS Extension personnel need to know. The framework is comprised of four knowledge areas, but this abstract focuses only on human development. Within each knowledge area, similar competencies were placed in groups known as concepts. Surveys were distributed via Qualtrics to six Mississippi State University Extension faculty to develop a definition of the concepts and provide feedback on the relevance of the competencies in the state of Mississippi. The following year, focus groups were conducted to gain consensus on the definitions synthesized from the survey responses, finalize the competencies included, and create a knowledge area definition. After these focus groups, drafts of the competencies were sent out for final review and approval. Initially, 22 competencies were present on the draft sheet, but after the survey, focus group, and final edits, 37 competencies were present on the list. A total of 15 competencies were added, and 14 edits were made. The knowledge area of human development was defined as, "Evolution of an individual's development (physical, cognitive, social, and emotional within physical, social, familial, and cultural contexts/environments across the lifespan." This reveals that competencies for FCS Extension professionals are highly context-specific and should be based on the unique needs and programming **i**n the state. Extension personnel should be involved in the development and modifications of frameworks to ensure that the priorities of the state are being met. Further research is planned to create assessments to assess agents' competency, which will be used to shape future training for FCS agents.

061

Name: Bryan, Ashby
Major: Human Sciences/Apparel Textiles & Merchandising
Faculty Advisor, Affiliation: Dr. Lee, School of Human Science
Project Category: Social Sciences
Co-Author(s): Jayta Cook, Gretchen Kellen, Emma Wilson

The Effects of Smartphone Use on Sleep Quality in Young Adults

Throughout the past decade, smartphone usage has increased and led to poor sleep quality in many individuals. Sleep quality is determined by how many hours one is asleep without waking up and how well-rested the individual feels after sleep. By implementing both the SQS (Sleep Quality Scale) and Smartphone Addiction Scale, we were able to determine the correlation between sleep quality and smartphone usage. Due to smartphones being addictive for many reasons, sleep quality is affected in many ways for a lot of people. The research survey also contains a demographic questionnaire that distinguishes the effects between different genders which led to finding that although smartphone owners have access to similar applications, males and females normally use their phones differently.

By using Qualtrics, a survey was created to record electronic responses from across the nation using an online mechanical Turk. The research study will be used for individuals to better understand the importance of using their smartphones less

often to obtain better quality sleep. It is also important to note that good quality sleep determines one's success throughout their daily performance.

005
Name: Burden, Satsha
Major: Aerospace Engineering
Faculty Advisor, Affiliation: Shreyas Narsipur, Aerospace Engineering
Project Category: Physical Sciences and Engineering
Co-Author(s): Joshua Figures, Sarah Studer, Justin Randle
Other Competition(s): Three Minute Thesis Competition

Aerodynamics of Winglets
Winglets are vertical airfoils that are installed at an airplane's wingtip to reduce drag by inhibiting turbulence into the tip vortices. Studying the aerodynamics of winglets involves many different aspects such as estimating drag coefficient, lift coefficient, and lift to drag ratio. This project aims to test winglet designs and compare results derived using three different methods. The methods in question include analytical, computational, and experimental methods. These methods are used to study and evaluate the aerodynamics of a NACA 2411 wing with and without winglets. This will be accomplished at an average speed of 130 mph which is in the subsonic regime. Analytical data is gathered using low order math while computational data is collected via CFD (Computational Fluid Dynamics) conducted in ANSYS Fluent. Lastly, wind tunnel experiments will be conducted on a 3D printed model. The results will then be compared and discussed.

107
Name: Bussey, Reagan
Major: Music Education/Instrumental
Faculty Advisor, Affiliation: James Sobaskie, Department of Music
Project Category: Arts and Humanities (Oral Presentation)

An Analysis of Camille Saint-Saëns' Clarinet Sonata
French Romantic composer Camille Saint-Saëns (1835-1921) composed his clarinet sonata only months before his death. Despite being stylistically conservative for 1921, this sonata pushes the aptitude for clarinet players. This theory will be proven with a live demonstration of the technical challenges faced by a performer. An analysis of this work will demonstrate the advanced technical demands placed on the performer as most of the clarinet range is explored in rapid succession. The dominant theme is often repeated rhythmically but melodically altered. This composition is attainable only to advanced students and professionals due to the extensive variation in the presentation of the main theme and the technical demands of the work. A large range of dynamics are used which provides the sonata with an extra layer of musicality, proving more challenges for the player. Progressive elements do exist within this 20th-century work, despite conservative elements in the composition. Saint-Saëns did not conceive this piece to showcase harmonic complexities, but rather to evolve the technical abilities of performers. The composer's purpose for writing this piece was to provide a greater variety of clarinet literature for 20th-century clarinet players and beyond. During Saint-Saëns' lifetime, a limited number of clarinet sonatas existed, and the composer wanted to leave this work as part of his legacy.

062
Name: Cain, Callie
Major: Psychology
Faculty Advisor, Affiliation: Cliff McKinney, Psychology
Project Category: Social Sciences
Co-Author(s): Madison Bibbs

The impact of financial stress in relation to anxiety among white and minority college students

Current research has shown direct links between increased financial stress and psychological problems (i.e., anxiety) in college students. Few studies have examined the relation between parental education and minority status as it relates to financial stress and anxiety. The current study examined these links in relation to students' racial/ethnic minoritized status (White, Minoritized) as well as parental education level (parent received college education, parent did not receive college education). The study consisted of 269 emerging adults from a large Southern United States university. Participants were asked to answer questions about perceived anxiety problems (using the Adult Self Report, *e.g., I worry a lot*; Achenbach & Rescorla, 2003) and financial stress (using the Response to Stress Questionnaire – Financial Problems, e.g., *I could not pay all of my bills*; Wadsworth & Compas, 2002) over the past 6 months. Results indicated significant links between White students with a college-educated parent (n = 168) and anxiety related to financial stress, β = .31, p < .001, but not for other groups including White students without a college-educated parent (n = 37), β = .25, p = .14; Minoritized students with a college-educated parent (n = 43), β = .01, p = .93; or Minoritized students without a college- educated parent (n = 21), β = .16, p = .50. Overall, the relation between financial stress and anxiety was stronger for White students, for whom the effect was significant when they reported having a college-educated parent and trending when they did not. Conversely for Minoritized students, this effect was not significant nor trending for those without a college- educated parent and near-zero for those with a college-educated parent. Future research should include a larger sample size with a more inclusive population to further explore the effects found in this study.

124
Name: Carroll, Autumn
Major: Wildlife & Fisheries Science/Pre-Veterinary
Faculty Advisor, Affiliation: Sandra Correa, College of Forest Resources
Project Category: Biological Sciences and Engineering
Co-Author(s): Grant Peterson

Larval and Juvenile Fishes within Floodplain Forests of the Pascagoula River

Seasonally flooded forests are an often-understudied ecosystem that provide services such as water purification, flood control, and habitat for many species. As deforestation and human-altered hydrology threaten river-floodplain forests, it is important to understand the role of these ecosystems in the lives of aquatic organisms. While research has shown that flooded forests represent key habitat for adult fish, little is known about fish in early life stages. Our goal was to determine the species composition of larval and juvenile fish communities in the Pascagoula River, one of the only major rivers in the USA with unaltered hydrology. We hypothesized that species presence would be the same for young and adult stage fishes. Monthly, we returned to the Pascagoula River to sample larval and juvenile fish using quatrefoil light traps and fyke nets. We sampled randomly selected flooded forest sites on the lower and upper river reaches, rotating monthly. At each site, we deployed our traps at least 100 meters apart and left them overnight. The next day, traps were pulled and contents, including fishes and invertebrates, were collected in jars. Water depth was recorded, and water quality measurements, such as chlorophyll (a proxy for phytoplankton production), pH, conductivity, ammonium, and temperature, were also taken using a HydroLab sound. The traps were re-set in the water for another night. On the third day, traps were checked, samples were collected, water quality measurements were taken, and the traps were pulled from the river. The fish samples were divided by morphotype in the lab. Fish from each morphotype will be identified by comparing a sample of their mitochondrial DNA against a DNA library from GeneBank compiled using a database of fish known to inhabit the Pascagoula River. Sampling will continue until October 2022 for a full annual cycle. This study's results are still pending.

125
Name: Carter, Sydni L
Major: Physical Education/Kinesiology
Faculty Advisor, Affiliation: Stamatis Agiovlasitis, Kinesiology
Project Category: Biological Sciences and Engineering
Co-Author(s): Brantley K. Ballenger, Grant Norman, Abby Blakeney
REU/Research Program: MSU ORED Undergraduate Research Grant and I'm An Athlete Foundation

Relationship Between Pulse Wave Velocity, Body Composition, and Physical Activity Levels

Cardiovascular disease is one of the leading causes of death among adults in the United States. Carotid-femoral pulse wave velocity (CF-PWV) is the gold standard measurement of arterial stiffness which is a risk factor for cardiovascular disease. Investigating the relationships between pulse wave velocity, body composition, and physical activity levels can offer insight into which factor may have the greatest impact on arterial stiffness. The purpose of this study was to determine relationships that exist between arterial stiffness, body composition, and percentage of time spent at different physical activity levels. Forty adults (21 men & 19 women; age 25.7 ± 9.4 years) had arterial stiffness measured by CF-PWV, and body composition by bioelectrical impedance. The participants then wore an accelerometer on their nondominant hip for 7 days – at least 10 hours per day. Accelerometer data were analyzed using a modified version of the Freedson vector magnitude cut points which included a category for sedentary behavior. Pearson's correlations indicated that CF-PWV was significantly associated with all body composition variables: waist circumference (r = .48; p = .002), hip circumference (r = .52; p < .001), weight (r = .38; p = .017), BMI (r = .41; p = .009), and body fat percentage (r = .44; p = .005). For physical activity levels, CFPWV was significantly correlated with percentage of time spent in sedentary behaviors (r = .33; p = .039), but not moderate-to-vigorous physical activity (r = -.29; p = .07). CF-PWV may be influenced more by body composition than physical activity levels. However, limiting sedentary behavior may be an important factor for decreasing arterial stiffness and improving cardiovascular health.

006
Name: Caudill, Elijah
Major: Aerospace Engineering
Faculty Advisor, Affiliation: Zhenhua Tian, Aerospace Engineering
Project Category: Physical Sciences and Engineering
Co-Author(s): James Tripp, Walter Gonzalez, Joel Sheffield
REU/Research Program: Mississippi Space Grant Consortium

Acoustic Manipulation of Boundary Layer Flow

The purpose of this experiment is to study and analyze the effects of acoustic excitation on the air flow field near an airfoil. In flight, boundary layer flow separation greatly influences the aerodynamic characteristics of the airfoil. Acoustic excitation could delay or prevent boundary layer flow separation and improve aerodynamic performance. Smoke-wind tunnel experimentation was performed with transducers and an airfoil present to observe the varying effects of acoustics on the boundary layer. An Arduino circuit board powered the array of acoustic transducers such that each ultrasonic transducer produced a frequency of 40 kHz. The ultrasonic transducers were configured to create a standing wave acoustic field. That is, the transducers were placed facing one another. This arrangement creates a strong acoustic field and, in turn, a strong pressure field. In such a pressure field, regions of higher and lower relative pressure exist. Equilibrium demands that airflow should naturally pass through the lower-pressure regions. Several configurations of transducer arrays were created and tested in the smoke-wind tunnel. However, the acoustic field created by the 40 kHz transducers did not produce the necessary pressure field to affect the air flow immediately around the airfoil in the manner desired. Therefore, further experimentation was focused on simulating and predicting viable acoustic fields. A transducer array configuration was simulated in MATLAB, reproduced with laboratory equipment, and then recorded with microphone CNC measurements to verify predicted field characteristics. Finally, the field was again tested in the wind tunnel and the simulation files and microphone measurements were confirmed by smoke tunnel testing. Thus, it would be possible to create a setup in which the boundary layer on an airfoil is manipulated in like fashion.

126
Name: Chandler, Sunny Jo
Major: Physical Education/Kinesiology
Faculty Advisor, Affiliation: Harish Chander, Neuromechanics Laboratory, Department of Kinesiology
Project Category: Biological Sciences and Engineering
Co-Author(s): Daniel Young, Sydni Carter, Abbey McCrory, Seth Freeny, Reuben Burch, Charles Freeman, Adam Knight

Limits of stability in postural control are not impacted by compression socks in healthy adults
The ability to maintain one's center of gravity (COG) within the base of support (BOS) is defined as postural stability and crucial when performing activities of daily living (ADLs) that require leaning or weight-shifts. The limits of stability (LOS) test assess spatial and temporal measures of postural control which includes intentional movements of leaning and weight-shifts in various directions, maximizing excursions without losing balance and falling. The fear of falling, limits ADLs due to constraints in LOS. The purpose of the study was to assess the impact of two types of compression socks [sub-clinical (SC): <20mmHg and clinical (CL): 20-40mmHg] compared against barefoot (BF) on LOS. Twenty male and female young adults [age: 21.5 ± 2 years; height: 169.6 ± 9.2cm; weight: 72.1 ± 16.5kg] completed the LOS test on a BTrackS™ balance platform that involved standing and leaning/performing weight shifts in four directions [front left (FL), back left (BL), back right (BR), and front right (FR)], in BF, SC, and CL, in a counter-balanced order. The center of pressure (COP) area (cm2) was used as an outcome measure of LOS, with greater area indicating better LOS and postural control. A 3 (BF, SC, CL) × 4 (EO, EC, EOF, ECF) repeated measures ANOVA was used to assess COP area at an alpha level of 0.05 using JASP open-source statistical program. Results revealed significant differences between LOS directions, with FL and FR being significantly greater compared to BL and BR, supporting the inverted pendulum model for LOS. However, no significant differences were evident between compression socks among LOS directions but presented with greater LOS collectively in SC and CL compared to BF, suggesting that even though SC and CL did not significantly change LOS, benefits of improving LOS exist with both SC and CL compression socks.

063
Name: Chapman, Laura
Major: Psychology
Faculty Advisor, Affiliation: Dr. Danielle K. Nadorff, Psychology
Project Category: Social Sciences
Co-Author(s): Acacia R. Lopez, M.S.
REU/Research Program: ORED Undergraduate Research Program

"Knowledge of Safety Practices, Attachment, and Childhood Injuries in Grandfamilies"
The Center for Disease Control (2020) cites unintentional injuries as the leading cause of death among adolescents and children with approximately 12,000 deaths due to unintentional accidents each year. Caregivers' lack of safety knowledge procedures and their level of attachment may impact the occurrence of children's injuries. Children raised by their grandparents ("custodial grandchildren") are a population on the rise and may be at risk of disrupted attachment due to being separated from their biological caregivers. This study aimed to understand the role of attachment on the relation between knowledge of safety practices and total number of injuries in custodial grandchildren. Custodial grandparents completed surveys via Qualtrics (N= 322; 86.3% female, *M* age = 55.66). Moderation analyses indicated the overall model was significant and accounted for 23% of the variance (R^2 =.23, p < .001). Knowledge of child safety behaviors had a significant direct effect on childhood injuries (*b* = -0.94, t(77) = -2.82, p < .001). Attachment also had a significant direct effect on childhood injuries (*b* = -7.29 t(77) = -2.63, *p* = .01). The interaction between knowledge of child safety behaviors and attachment was significant (*b* = 0.05, t(77) = 2.38, *p* = .02). Results show that both knowledge of child safety and attachment have a significant relation with childhood injuries, and moreover, that there is an interaction effect of knowledge of safety behaviors and attachment. This suggests that high knowledge of safety behaviors and secure attachment may moderate the number of unintentional injuries in children who reside with their grandparents. Therefore, targeted interventions to educate grandparents on safety procedures as well as strengthen the attachment within this caregiving dyad may help the lower number of unintentional injuries in children who were separated from their original primary caregiver.

127
Name: Chasko, DeShea
Major: Biological Engineering
Faculty Advisor, Affiliation: Raheleh Miralami, Center for Advanced Vehicular Systems
Project Category: Biological Sciences and Engineering

Anti-Bactericidal Effects of Nanopillar Array on Titanium Surface Based on Naturally Occurring Topographies
Medical implants are not only prone to bacterial infections at the tissue-implant interface but are challenging to treat due to an increase in bacterial resistance. Adhesion of bacteria on the implant surface is the first and most important action required for infection to ensue. Recent studies have looked at the topography of naturally occurring surfaces due to their high bactericidal properties to determine the mechanism that causes bacterial activity. Here, we looked at the adhesion of gram-negative and positive bacteria on different topological surfaces, strictly looking at the physical interactions between the bacteria and structure. We focused our research on nanopillars, where the height and diameter of the pillars were of particular interest. We conducted a comprehensive literature review to gain perspective on different surface characteristics that have been previously assessed. Exclusion variables, such as studies that used chemical doping, radiation, light treatment, random orientation, or nanopores instead of pillars, were selected to narrow our findings. The dimensions from the remaining studies were uploaded to an SPSS software to calculate the mean and standard deviation for the height and diameter of the pillars. Normal distributions and boxplots indicated outliers, which were then removed to normalize the data. Based on our calculations, pillars with a height of 305 (304.39) µm and a diameter of 120 (123.09) µm are most effective against gram-negative and positive bacteria. We use the additive manufacturing technique (laser printing) to create the pillars on a titanium surface with the previously stated dimensions. Different surface studies are conducted to evaluate the created nanopillars, including Scanning Electron Microscopy (SEM), contact angle measurement, and wettability tests. Last, the modified surfaces are tested for their anti-bactericidal properties against *Staphylococcus aureus* and *Escherichia coli*. Our findings indicate the effectiveness of nanopillars in reducing the risk of post-operative infection on orthopedic implants.

007
Name: Cho, Minjae
Major: Mechanical Engineering
Faculty Advisor, Affiliation: Joonsik Hwang, Mechanical Engineering
Project Category: Physical Sciences and Engineering
Co-Author(s): Dr. Sungkwang Mun

Development of Generative Adversarial Network (GAN) Model for Multi-Phase Flow Prediction
In recent years, Machine Learning and Artificial Intelligence (ML/AI) approaches have been transforming many scientific and engineering fields in a way that extracts novel insights from data or predicts untested properties. This remarkable success of ML/AI is due to the use of deep learning, especially in the form of artificial neural networks.
We developed a deep learning framework to predict the complex spray and air-fuel mixing in gasoline direct-injection (GDI) engines, which has been a great challenge due to the lack of understanding of the complicated two-phase flow dynamics. The developed deep learning framework is based on conditional Generative Adversarial Network (cGAN) which is widely used in an image classification. For the training database, nine different fuels (iso-octane, di-isobutylene, Olefinic, etc.) are sprayed through multi-hole injectors 100 times per fuel and projected inside a combustion chamber. Furthermore, the projected images are acquired at three different camera angles for later 3D reconstruction as post-processing. These massive image data are then converted to pixel intensity data according to physically quantitative projected liquid volume (PLV) and separated into a training and validation set before training by the cGAN algorithm implemented in MATLAB. After many hours of training on a GPU, the model predicts the morphology of fuels that are not included in the training data. Throughout this research, we found optimal parameters and network architecture that improves prediction inaccuracy from 7~8% to 1~2% and is achieved in 30% of a previous time. We expect the model will accelerate the development of a new type of fuel, such as an optimal blend with biofuel, by predicting the properties of interest. Furthermore, it can be extended to predict the spray images based on its ambient conditions: temperature, pressure, and the fuel property.

128
Name: Clinton, Kailey
Major: Biological Engineering
Faculty Advisor, Affiliation: Dr. Lauren B Priddy, Agricultural and Biological Engineering; Dr. Wenmeng Tian, Industrial and Systems Engineering
Project Category: Biological Sciences and Engineering
Co-Author(s): Mahathir Bappy, Emma Van Epps

Evaluation of the printability of additively manufactured poly(lactic-co-glycolic acid) and nano-hydroxyapatite composite bone scaffolds

Large bone defects often require reconstructive procedures and are most commonly caused by trauma, congenital disorders, or tissue resection due to cancer. Current treatments for bone injuries are limited due to a finite supply of donor bone for bone grafting procedures. Additively manufactured, or 3D printed, bone scaffolds have the potential to alleviate this problem and allow for patient specificity in scaffold geometry and material composition. A bone scaffold made of poly(lactic-co-glycolic acid) (PLGA) polymer and nanohydroxyapatite (nHA) ceramic would have the advantages of being biodegradable, readily available, and mechanically strong enough for application in load-bearing bone. A current challenge in 3D printing bone scaffolds is the development of protocols that ensure repeatability in the size and shape of the scaffolds. In this experiment, scaffolds were 3D printed using a CELLINK BIOX2 printer which controls temperature, pressure, and speed of printing. To examine the accuracy of the printed scaffolds to their as-designed geometry, an analysis of images collected via three imaging modalities was performed. Layer-by-layer images were collected during printing via a camera attachment on the printer. Additionally, micro-CT scanning and surface profilometry were used to capture 3D volumes and surface topology, respectively. These images were compared to the as designed scaffold, to offer insight into the accuracy of the print and to inform selection of printing parameters. The next steps in this research will be to analyze images for various printing parameters. Due to the complex process of printing with the bioprinter used in these experiments, we are also exploring the use of a fused deposition modeling (FDM) printer. FDM would have fewer printing parameters to optimize and may produce more reliable prints and consistent, high-quality bone scaffolds. This work is important in alleviating the current limitations in bone defect repair and would be an advancement towards personalized medicine.

129
Name: Cook, Amber
Major: Biological Engineering
Faculty Advisor, Affiliation: Andrew Lawton, Biological Sciences
Project Category: Biological Sciences and Engineering
Co-Author(s): Kayla Powe

The Conservation of Brain Folding Mechanics

The human brain is intricately and beautifully folded. While proper brain folding is critical for function, little is known about the conservation of the tissue mechanics and their underlying cellular regulation that contribute to the final shaping of this complex morphology. The cerebellum, the highly conserved hindbrain element, provides an excellent model to investigate brain folding as it is folded in several laboratory friendly species and demonstrates a simplified folding pattern when compared to the cerebral cortex. Previously, we showed that in the murine cerebellum, folding initiates through the onset of a differential-expansion of the rapidly growing External Granule Layer (EGL) and the inner core of the cerebellum. Additionally, we demonstrated that the outer layer behaves like a fluid, which is required to achieving the folding shapes seen during development. To investigate which, if any, of these tissue-level factors are more broadly conserved, and therefore likely to be fundamental in brain folding, we collected chicken cerebella from incubation day 8 – 15. While the gross shape and folding pattern of the cerebella of chicken and mice are dramatically different, they have similar cytoarchitecture, including EGL. Here we report that, like in the mouse, the chicken cerebella undergo a differential-expansion. This expansion period precisely correlates with onset of tissue folding. As the thickness variation of the outer layer of the cerebellum is predicted to indicate the mechanical properties, namely whether the layer is behaving as a fluid or a plastic solid, we have started measuring the thickness variation of the EGL. Our preliminary data points to a uniform thickness profile – unlike the mouse system – suggesting the outer layer may be behaving more as a

solid or that we have caught a critical transition phase, as predicted in the murine model. Our results provide evidence that the predicted driver of folding, differential-expansion, is conserved. This work will shed light on both the mechanics of brain folding and their conservation through evolutionary time.

064
Name: Cooksey, Emilee
Major: Human Sciences/Apparel Textiles & Merchandising
Faculty Advisor, Affiliation: Tommy Phillips, School of Human Sciences
Project Category: Social Sciences
Co-Author(s): Anna Rose Harris, Gracy Barber, Riley Baker

The Effect of Social Media on College Age Women's Maturity and Mental Health
The rise of social media through the years has had a great impact on every aspect of our modern lives– how we dress, our interests, hobbies, extracurricular activities, how we perceive ourselves and how we view the world around us– the list goes on. To what extent has social media impacted these aspects, and what portion of these effects are positive and which negative? What has the generation most heavily impacted by the rapid growth of social media over the past decade noticed about the way social media has influenced their maturity, positively or negatively? With social media taking up such a large part of our lives, it is not surprising the impact it has on our lives especially in young women. This study shows the mental health and maturity in women impacted positively or negatively by social media. We are looking to understand the depth of how media impacts college age women from not just Mississippi State, but as far and wide across the country so as to see from further perspectives. As a team, we chose our demographic to be college age women due to undergraduate school and the transition from adolescence to young adulthood being such a vulnerable time– especially for women. Through the process of our research we have found official scales to help us answer this by providing a survey through MSU Qualtrics. Both scales are based on a Likert scale, with answers varying from Strongly Disagree to Strongly Agree.

130
Name: Corzine, Rosalynn
Major: Biological Sciences/Medical Technology
Faculty Advisor, Affiliation: Andrew Lawton, Biological Sciences
Project Category: Biological Sciences and Engineering
Co-Author(s): Peyton York

Finalizing Folding Through a Return to Balanced Growth
In human development, the cerebral cortex and the cerebellum expand and fold into intricate and beautiful patterns. These folds increase the synaptic volume and compartmentalize the underlying circuitry. Folding perturbations present in a variety of human pathologies. Yet little is known about how the amount or pattern of brain folds are formed or regulated during development. Previously we demonstrated that murine cerebellar folding is initiated through a differential-expansion of the rapidly growing External Granule Layer (EGL) and the slower growing inner volume. The difference in growth rates of the connected layers creates the driving force for the tissue deformation needed to initiate folding. But nothing is known about how folding is completed or how the timing of folding termination may influence the final folding amount. In mouse, folding is considered complete at around postnatal day seven (P7), though the cerebellum continues to increase in size beyond this time. We hypothesized that to continue growing without adding new folds, the differential-expansion must be reduced, and the growth of the layers become balanced. To test if there is a decrease in differential-expansion we collected a developmental series of cerebella from postnatal stages 7-28 (P7-P28). We measured the cross-sectional area of the cerebella, the length of the EGL, and the positive curvature of the EGL. Our preliminary data indicates that the differential-expansion is reduced. Further research will investigate whether proliferation rate of the outer layer has decreased, or if the myelination has increased the expansion of the inner volume to reduce the difference between the inner and outer growth rates. This work will shed light on how the final folding amount is achieved and provide new hypotheses to investigate concerning folding perturbations seen in human patients.

008
Name: Cowsert, Makenna
Major: Civil Engineering
Faculty Advisor, Affiliation: Alireza Ermagun, Richard A. Rula School of Civil & Environmental Engineering
Project Category: Physical Sciences and Engineering

Bicycles Aren't Made for Women: The History of Gender Inequality in Bike Design
This research systematically reviews the history of gender inequality in bike design since its most preliminary invention in 1418 and consolidates relevant information discussing how false medical claims and religious constraints discouraged women from biking. Retrieved information are categorized into three major components: (1) history of bicycle design, designers, and well-known female riders, (2) research of medical claims tied to bicycle design and potential medical biases, and (3) practices and habits of other cultures when riding bicycles and how it can be tied into the gender inequality. Qualitative analyses are performed to (1) create two timelines showing both the history of design and designers as well as the history of female riders to visually conceptualize the inconsistencies, (2) compare current medical studies regarding bicycle design to studies performed in the past to determine the accuracy of the medical claims, and (3) explore cultural and religious factors discouraging women from biking. Three observations are discerned. First, early women bike riders changed a regular piece of transport equipment into so much more, and that is why bicycles were so controversial in its origin. Many women bike riders knew that riding was seemed "inappropriate," but continued to ride for the sake of independence. Second, medical studies throughout the 1900s claimed biking caused infertility and sexual pleasure. Bike design changed to accommodate women, but even after these claims were proven wrong the gap between men and women riders increased. Third, the gap became smaller in America but women in other countries are discriminated against riding due to religious and cultural barriers. For example, some predominately Muslim countries outlaw bicycling for women because of their beliefs. To increase women riders, communities can create supportive environments, make policies, and provide incentives all to promote riding while keeping gender equalities a priority.

065
Name: Crawford, Caroline
Major: Wildlife & Fisheries Science/Wildlife Science
Faculty Advisor, Affiliation: Leslie Burger, College of Forest Resources
Project Category: Social Sciences
Other Competition(s): Three Minute Thesis Competition

The impact of COVID-19 on undergraduate students' professional experience
Careers in wildlife, fisheries, and aquaculture sciences are typically hands-on, and professional experience during the undergraduate years is critical for students to successfully acquire jobs after graduation. We explored how the COVID-19 pandemic affected undergraduate students' ability to obtain the summer professional experience necessary for future employment. Four years (2018-2021) of survey data collected from Mississippi State University students majoring in Wildlife, Fisheries and Aquaculture (WFA) were analyzed to understand how COVID-19 changed students' summer opportunities. In 2020 and 2021, students reported that COVID-19 had impacted their ability to gain professional experience during the summer. Not only were WFA students unable to find opportunities related to their field, they were also unable to obtain professional experience due to COVID-19-related family health concerns and financial difficulties. The lack of summer professional experience opportunities may need to be compensated for in the undergraduate curriculum in the next few years in order for students to be prepared for a career or graduate school. Further, it is important for hiring managers to recognize that the upcoming classes of undergraduates may not have the same amount of professional experience as previous groups of students.

131
Name: Cresswell, Olivia
Major: Animal and Dairy Sciences (Pre-Vet) Major
Faculty Advisor, Affiliation: Barbara Kaplan, Department of Comparative Biomedical Sciences
Project Category: Biological Sciences and Engineering

Cannabinoids Render Peptide-stimulated Immune Cells Sensitive to Inhibition in Response to Subsequent Stimulation
In studying cannabinoid effects on leukocytes, a constant and reliable source of cell stimulation is essential. One such source is myelin oligodendrocyte glycoprotein (MOG) peptide, which induces experimental autoimmune encephalomyelitis (EAE), a disease state similar to multiple sclerosis. Previous studies using this model in vivo demonstrate that marijuana compounds such as 9-tetrahydrocannabinol (THC) or cannabidiol (CBD) suppress clinical disease. On a cellular level, we conducted in vitro studies on mouse splenocytes to observe cytokines and T cells under MOG treatment. Cells were stimulated with MOG twice over 7 days, and results showed increased cytokine production and T cell populations. This suggests MOG can stimulate T cells in vitro. Further investigations found that T cells from lymph nodes are also responsive to MOG peptide stimulation; both CD4 and CD8 T cells were observed in the 7-day cultures treated with MOG. Our next experiments introduced cannabinoids. After initial stimulation of splenocytes for 4 days with MOG peptide, CBD and THC inhibited cytokine production (IFN-γ, TNF-α, and GM-CSF) during an additional 3- day stimulation with more MOG peptide. Our final experiment introduced phorbol ester plus calcium ionophore (PMA/Io) which is known to further stimulate T cells. After initial stimulation of splenocytes with MOG peptide, PMA/Io was used as a short-term treatment, and we observed that CBD and THC still inhibited cytokine production (IFN-γ). In all of these studies, stimulation of T cell populations with MOG peptide provides an antigen-specific model of immunity allowing us to study cannabinoid effects on T cell activation and differentiation as well as cytokine production. Future studies include looking at cannabinoid effects on calcium signaling when stimulated by MOG and short-term PMA/Io.

132
Name: Culpepper, Lindsay
Major: Wildlife & Fisheries Science/Wildlife Science
Faculty Advisor, Affiliation: Dr. Carrie K. Vance, Biochemistry
Project Category: Biological Sciences and Engineering
Co-Author(s): Devin Chen, Isabella Burger, Li-Dunn Chen, Andy J. Kouba
REU/Research Program: URSP

Influence of salinity on hatch rate of Fowler's toad (Anaxyrus fowleri) embryos
Many endangered amphibian species rely on captive breeding programs to bolster their populations and could benefit from better developmental success following natural breeding or *in-vitro* fertilization (IVF). Although fertilized amphibian eggs may experience high cleavage rates, the number of eggs that reach neurulation and hatching is often much lower, resulting in markedly fewer tadpoles than expected. One possible contribution to this problem is the liquid medium in which eggs are raised. IVFs performed in sterile lab settings may not sufficiently duplicate environmental conditions present in natural breeding ponds. This experiment sought to identify whether increasing salt content and osmolality of solutions used to flood each IVF dish, following mixing of eggs and sperm, would influence the hatching rates of Fowler's toad (*Anaxyrus fowleri*) tadpoles. Three treatments were evaluated: 10% Holtfreter's solution; 10% Simplified Amphibian Ringer's solution (SAR); and aged, dechlorinated tap water. The first two treatments are mixtures of differing amounts of sodium chloride, calcium chloride, potassium chloride, and sodium bicarbonate, with SAR having a higher salt content than Holtfreter's. We predicted that 10% Holtfreter's solution would result in the highest hatch rate due to its moderate salinity and osmolality. Multiple IVFs were conducted resulting in four genetically unique toad pairings. After a 5 minute fertilization period, each dish of eggs was flooded with one of the three solutions being evaluated. Cleavage, neurulation, and hatching rates were recorded. Results indicated no significant differences ($p>0.05$) in mean hatch rates between the three treatments: control water (85.5±1.6%), Holtfreter's (83.5±1.1%) or SAR (75.1±1.7%). However, it was found that SAR yielded lower hatch rates on average when compared to control water and Holtfreter's solution. Further research is needed to determine the optimal medium for sustaining *A. fowleri* embryos, though these preliminary results can be applied to at-risk amphibian species to aid in their conservation.

133
Name: Cutler, Riley
Major: Biological Sciences
Faculty Advisor, Affiliation: Amy Dapper, Biological Sciences
Project Category: Biological Sciences and Engineering
Other Competition(s): Three Minute Thesis Competition

Effects of Glyphosate on Recombination Plasticity in *C. Elegans*
During meiosis, homologous chromosomes pair and exchange DNA, forming crossovers. These recombination events create novel allelic combinations. From an evolutionary perspective, this process is particularly important as it generates genetic diversity and can produce favorable genotype combinations in successive generations. Although meiosis is highly conserved and regulated, recombination can be influenced by both extrinsic and intrinsic modifiers. Extrinsic factors, generally consisting of stressful stimuli, have been observed to modulate meiotic crossover rate. The cellular mechanism and genes responsible for meiotic recombination plasticity is largely unknown. However, DNA methylation status, chromatin modifications, and RNA splicing have all been suggested candidates for the mechanism underpinning modulation of recombination rate. While there has been extensive focus on the impact of temperature on recombination rate, less is known about the effects of herbicide. Experimental testing on plants, while limited has shown a significant decrease in crossover rate. Herbicide injury has been found to induce DNA methylation modulation and cause significant oxidative stress. I predict that recombination rates will decrease in *Caenorhabditis elegans* when exposed to glyphosate. I have selected *C. elegans* as a study system due to its availability, short generation time, and cost effectiveness. I will phenotypically measure recombination rates via fluorescent markers on *C. elegans*. Studying *C. elegans* will provide insight on the impacts of herbicide in the surrounding agricultural ecosystem. The planned experiment will determine if recombination plasticity exists in *C. elegans*. Follow up experiments can investigate whether the "plasticity" is an adaptive response or a direct biproduct of cellular stress.

134
Name: Daulong, Amanda
Major: Wildlife & Fisheries Science/Aquaculture & Fisheries Science
Faculty Advisor, Affiliation: Dr. Peter Allen, FWRC- Wildlife, Fisheries, and Aquaculture
Project Category: Biological Sciences and Engineering
Co-Author(s): Abby Vaughn, WFA; Dr. Thu Dinh, Animal and Dairy Science; Dr. Fernando Yamamoto, WFA
REU/Research Program: Undergraduate Research Scholars Program

Effects of Low Temperatures on Liver and Muscle Energy Storage and Condition in Catfish
During the latter portion of the growing season, temperate fishes have adapted to store accumulated energy to aid in survival during periods of food scarcity during winter months. Despite the economic importance of commercial catfish, little is known about energy storage during cold conditions. Therefore, this study focused on the function of liver and muscle tissue for storing energy in cooler environments. Six treatment combinations were evaluated, including testing effects of temperature (10 and 20°C) on channel (*Ictalurus punctatus*), blue (*Ictalurus furcatus*), and hybrid (*I. punctatus × I. furcatus*) catfish over a 17-week period. Eighteen tanks were sampled with three tanks per treatment combination. Sampling included three fish per tank in which liver tissue, muscle tissue, and whole blood were collected. Fatty acid profiles, and lipid and glycogen content were also compared Larger mean liver weights were observed in channel catfish in both temperature treatments. Additionally, there were stark differences in hepatosomatic index (HSI) at 10°C with channel catfish having a significantly higher percentage than blue and hybrid catfish. In contrast, HSI percentage between each catfish type in the 20°C treatment was relatively consistent. Results will be discussed in the context of temperate fish species and aquaculture.

135
Name: Dawe, Fiona
Major: Civil Engineering
Faculty Advisor, Affiliation: John Ramirez-Avila, Rula School of Civil & Environmental Engineering
Project Category: Biological Sciences and Engineering

The Use of Macroinvertebrates to Identify Water Quality
Streams are vital components of ecosystems and when they are polluted, everything that relies on the stream, including humans, are affected. Macroinvertebrates that reside within the streams are very susceptible to pollution. They need a good stream ecosystem to establish the proper balance between these creatures and their prey. It is important for the ecosystem as they keep the prey populations under control and breakdown decaying plants and animals to release their nutrients. Macroinvertebrate and water samples were collected from a reach adjacent to the MSU's Joey Bearden Dairy Research Center. Water samples were processed and analyzed for determination of sediment, nutrient, and pathogen concentration at the Environmental Lab of the Richard A. Rula School of Civil and Environmental Engineering. Macroinvertebrates were cleaned, counted, and identified to be used as indicators of the stream health and water quality status of the study reach. Preliminary results indicate water quality and stream health can be affected during the summer season, while increasing flows and cooler climate conditions improve the targeted environmental assessments.

136
Name: Day, Dutton
Major: Biochemistry
Faculty Advisor, Affiliation: Dr. John J Riggins, Forest Entomology
Project Category: Biological Sciences and Engineering
Co-Author(s): Kristy McAndrew, John Thomason, Natalie Clay, Richard Hofstetter, Julia Tang, Courtney Siegert, Oscar Leveron, Natalie Dearing
REU/Research Program: CALS/MAFES Undergraduate Research Scholarship Program

Effects of Ophiostomatoid Fungi on Invertebrate Mediated Decomposition of Pine Trees
An interesting relationship exists between the subterranean termites (*Coptotermes* and *Reticulitermes* spp.), bark beetles (Coleoptera: Curculionidae), and bark beetles' fungal associates (Ascomycota: Ophiostomatales). Bark beetles, present in most forest ecosystems, contribute to terrestrial carbon stocks by attacking and killing pine trees and creating massive amounts of deadwood. Bark beetles have associated fungi called ophiostomatoid fungi that are inoculated into trees when the beetles attack. Termites, when present, are decomposers of deadwood such as that generated during bark beetle epidemics. It was previously discovered that subterranean termites in the southeastern USA were drawn to (~4X) and preferentially fed on (>2X) wood containing the ophiostomatoid fungal associates of bark beetles. Despite a large body of knowledge being developed about fungus-mediated interactions between the southern pine beetle and their host trees, almost nothing is known about how ophiostomatoid fungi influence the succession of invertebrate decomposer communities during the subsequent decomposition process. The goal of this study was to investigate how the presence of ophiostomatoid fungi effects the biodiversity of invertebrate decomposers within southern pine beetle infested trees in Arizona, Mississippi, and Honduras. In some cases, treatment and location influenced biodiversity. These results will quantify decomposition of wood from bark beetle-killed trees. Additionally, these findings might shed light on the rate of decomposition of bark beetle killed trees, and how bark beetle epidemics impact the terrestrial carbon cycle of pine forests, one of the largest terrestrial carbon sinks globally.

108
Name: DeYoung, Tanner
Major: Biochemistry
Faculty Advisor, Affiliation: Matthew Peaple, Shackouls Honors College
Project Category: Arts and Humanities (Oral Presentation)
Other Competition(s): Public Health Research Competition

In Other Words, Socialized Medicine: The Journal of the American Medical Association Versus the International Labour Organization

In the summer of 1952, the International Labour Organization—an agency of the United Nations—adopted the Social Security (Minimum Standards) Convention. It detailed and defined the minimum acceptable standards for social security in nine different areas, including medical care, in the nations which ratified the convention. However, in order to ratify the convention, nations need only prove compliance with four of the nine areas, possibly eliminating medical care reform entirely. This provision did not prevent the American Medical Association, through its published journal, from attacking the recommendations related to healthcare as "socialized medicine." Through these attacks, the AMA continued its pattern of opposition to centralized medical care or national health insurance. The goal of this study is to use these attacks as a case study to examine rhetoric and strategy behind opposition to expanded health coverage in the United States. Using excerpts from the *Journal of the American Medical Association*, this paper will analyze the tonal arc of the writings concerning the Social Security (Minimum Standards) Convention and dissect the AMA's approach to oppositional persuasion and policy. This study will also examine the AMA's opposition to "socialized medicine" through a novel lens separate from their hostility toward the Harry Truman's Fair Deal or Lyndon Johnson's War on Poverty. This will provide added insight into potential attacks to expect during future attempts to reform health insurance.

066
Name: Dickinson, Erin
Major: Human Sciences/Food Nutrition & Dietetics
Faculty Advisor, Affiliation: Dr. Terezie Tolar-Peterson, Food Science, Nutrition, and Health Promotion
Project Category: Social Sciences
Co-Author(s): Nicole Reeder
Other Competition(s): Public Health Research Competition

Alcohol Consumption and Sleep Quality Among College Students at Mississippi State University

Background: Excessive alcohol consumption among college students remains highly prevalent. College students also commonly experience poor sleep quality due to irregular schedules and academic and social demands. Objective: The purpose of this study was to examine whether there is a correlation between alcohol consumption and sleep quality among college students at Mississippi State University. Methods: Students enrolled at Mississippi State University completed two validated surveys, the Alcohol Use Disorders Identification Test (AUDIT) and the Pittsburg Sleep Quality Index (PSQI). Participants with a PSQI score >5 were considered to experience significant sleep disturbance. Independent samples t-tests were used to compare AUDIT scores between students with and without significant sleep disturbance. Results: This study consisted of 107 students (88.8% female, mean age 20.3 ± 2.5 years). The majority of students had a PSQI score >5 indicating poor quality sleep (n=71, 66.4%). Students with a PSQI score >5 more often reported not being able to stop drinking once they had started ($p=0.001$, 1.3 ± 0.68 vs 1.0 ± 0.0), and that they or someone else had been injured as a result of their drinking ($p=0.006$, 1.2 ± 0.54 vs 1.0 ± 0.0) compared to students with higher sleep quality scores. Conclusion: This study suggests that students who report experiencing consequences of excessive alcohol intake also commonly experience poor sleep quality. Both of these factors can affect the health and academic performance of college students. Interventions that address binge drinking and sleep hygiene should be encouraged on college campuses.

067
Name: Doherty, Piper
Major: Educational Psychology
Faculty Advisor, Affiliation: Kasia Gallo, Counseling, Educational Psychology, and Foundations; Jianling Xie, Counseling, Educational Psychology, and Foundations
Project Category: Social Sciences
Co-Author(s): Lucy Brake, Malerie Millett
REU/Research Program: MSU ORED Undergraduate Research Program

Validating the New Scientific Writing/Thinking Self-efficacy Scale

Self-efficacy, or a belief in one's ability to succeed at a specific task, is influenced by perceptions of one's past performance, observing the performance of others, feedback received, and one's physiological response to the task. People with high self-efficacy are more likely to pursue a task "for the love of it," stick with a challenging task longer, and are less disappointed by setbacks than their low self-efficacy peers. Various measures exist for assessing writing self-efficacy in college students and focus on a range of factors, including writing apprehension, writing motivation, and perceptions of one's writing performance. However, no scale exists for measuring writers' self-efficacy in APA Style writing. We report on our effort to provide evidence towards the validity of a newly developed Scientific Writing/Thinking Self-efficacy scale (SW/TSES) focusing specifically on APA Style formatted writing, as a part of a larger project to develop and validate this scale. The 42-item measure is based on the previously identified characteristics of undergraduate psychology student's writing, and its structure has been established by a previously conducted exploratory factor analysis.

We recruited 90 undergraduate and graduate students (80 women) who previously wrote papers in APA Style for this survey study. Participants completed our measure as well as another previously validated measure assessing aspects of academic writing self-efficacy and self-regulation. Participants also reported their composite ACT scores, current GPA, and a grade on their most recent APA Style paper. Significant strong score correlation (r = .52, p < .001) between our measure and the pre-existing academic writing scale provides evidence towards criterion (concurrent) validity. As self-efficacy should be in line with performance, a significant moderate correlation (r = .33, p = .003) with composite ACT and a significant weak correlation (r = .22, p = .037) with APA Style paper grades support convergent construct validity.

137
Name: Doughty, Baylor
Major: Forestry/Wildlife Management
Faculty Advisor, Affiliation: Adam Polinko, Forestry
Project Category: Biological Sciences and Engineering

Improving the Establishment of Longleaf Pine Through Silviculture

Longleaf pine (*Pinus palustris*) is an important economic and ecological species in the Southeast. However, it is often overlooked for replanting because of the slow growth associated with the physiological adaptation known as the "grass stage". During this stage, longleaf pine does not put on any height growth but instead allocates resources to establish a healthy root system. Longleaf pine is fire adapted with thick bark, the ability to resprout its crown following fire, and rapid growth after emerging from the grass stage. The removal of fire from Southern forests and preference for faster growing loblolly pine (*Pinus tadeda*) has resulted in a major decrease of the range of longleaf pine. This study investigates different fertilization methods to reduce the time in the grass stage and initiate earlier height and diameter growth in longleaf pine. The site is located near Quitman, Mississippi near the northern edge of longleaf pine's native range. Soils on the site consist of a mix of silt loams, fine sands, and sandy clays. A total of three treatments were applied in a randomized complete block design to a recently clear-cut stand. Treatments included control, broadcast fertilizer (NPK 32-14-5) applied at a rate of at 35lbs/ac. and RTI (Silva Pak Worm Blend) controlled release fertilizer bags (NPS 19-8-3) applied adjacent to each planted seedling. One year following establishment, we measured root collar diameter (RCD), survival, and vigor of the seedlings. First year results will be presented and discussed. Reducing the time of the grass stage in longleaf pine will result in the reestablishment of longleaf to its native range and an increase in ecological diversity across the Southeast.

138
Name: Duke, Jacob
Major: Forestry/Environmental Conservation
Faculty Advisor, Affiliation: Dr. Krishna Poudel, FWRC- Forestry
Project Category: Biological Sciences and Engineering

Spacing effects on Eastern cottonwood (*Populus deltoides*) component biomass
Eastern cottonwood is a fast-growing hardwood species native to river bottoms throughout the southeastern United States that is often grown as a short rotation woody crop because of its potential to provide high biomass yield in short periods of time. This study examined the effects of initial planting spacing in biomass portioning of Eastern cottonwood trees in the Lower Mississippi Alluvial Valley. The experimental design used was a randomized complete block design with three replicate blocks. Plantation spacing levels were 0.9x0.9 m (3x3 ft.), 2.1x0.9 m (7x2.5 ft.), 2.7x1.8 m (9x6 ft.), and 3.7x3.7 m (12x12 ft.) with planting densities of 10,131, 6150, 1994, and 746 trees per hectare, respectively. Tree diameter at breast height (dbh), total tree height, tree taper, as well as biomass data were acquired by destructively sampling 36 trees in the summer of 2021. Preliminary results showed differences in tree dbh, total tree height, taper, and biomass partitioning among different planting densities. Mean dbh ranged from 8.0 cm in 2.1x0.8 m spacing to 11.9 cm in the 3.7x3.7 m spacing. Mean heights ranged from 10.8 m in 0.9x0.9 m and 2.1x0.8 m spacing to 12.8 m in the 3.7x3.7 m spacing. Component biomass in 3.7x3.7m spacing was significantly different from 0.9x0.9m and 2.1x0.9m spacing but not from the 2.7x1.8m spacing. Results of this study will provide insights into the biomass production potential and help make better management decisions for sustainable bioenergy production from short rotation woody crops in the Lower Mississippi Alluvial Valley.

068
Name: Dulaney, Sarah
Major: Microbiology
Faculty Advisor, Affiliation: Holli Seitz, Department of Communication and Social Science Research Center
Project Category: Social Sciences
REU/Research Program: Shackouls Honors College Research Fellowship
Other Competition(s): Public Health Research Competition, Three Minute Thesis Competition

Investigating Differing COVID-19 Vaccine Attitudes within Families
Introduction: Although young adults can legally make their own vaccine decisions, parental influence can be a major factor in their decision making (Patel, Zochowski, Peterman et. al 2012). Objective: The aim of this study is to investigate the sociological phenomena behind the differing attitudes between family members on the topic of COVID-19 vaccination. Methods: A Qualtrics survey was used to collect demographic and screening data; the survey screened for young adults aged 18-25 who have a different opinion on the COVID-19 vaccine than their family member(s). Out of the 73 survey respondents, 14 fit the selection criteria (N=14). Those who fit the criteria and agreed to be interviewed were invited to participate in a virtual WebEx interview (N=4). Interviews were analyzed thematically (Braun & Clarke, 2006) using NVivo. Results: Four main themes were identified: 1) Personal choice, 2) Job Influence/Pressure, 3) Politics, and 4) Novelty of the COVID-19 vaccine. Negative vaccine attitudes were assessed using the screening survey and during the interview. The main themes, and subthemes, were typically found within interview answers including negative vaccine attitudes from either the parent or the participant. Personal choice had two subthemes (religion, belief in natural immunity) and novelty of the COVID-19 vaccine had one (fear of vaccine side effects). There were few reports of severe arguments between the parent and the participant; most discussions were reported to be civil and respectful. Conclusions: In this study, when vaccine attitudes varied within families, young adult children tended to be understanding of their parents' vaccine opinions and attitudes, and vice versa. Both parties expressed a strong belief in personal choice, and those who accepted the COVID-19 vaccine understood the hesitancy over its novelty. Future research could address whether or not these respectful and understanding discussions between close individuals (such as a parent and child) could help promote vaccine acceptance.

009
Name: Duncan, James
Major: Aerospace Engineering
Faculty Advisor, Affiliation: Shreyas Narsipur, Aerospace Engineering
Project Category: Physical Sciences and Engineering
Co-Author(s): Lee Soorikian

Wing Aerodynamics Testing Mount for a Subsonic Wind Tunnel
The current configuration of the low-speed subsonic wind tunnel in the ASE department uses a mounting system that produces upstream effects and requires set screws to attach the test model. Small changes to the air flow occur because of these, which reduces the accuracy of the tests performed. To reduce the upstream effects of the mount system, a flush fit mounting system is being developed, which will hide the mount below the testing section and inside of the model. The mounting system will be integrated with a 6-axis force/torque sensor. Angle of attack control will be switched to a simple rotation of the mounting plate instead of the current double beam system. A new mounting plate and undercarriage is being developed to facilitate these changes. A CFD analysis of the wind tunnel system is also being performed to study the boundary layer present in the wind tunnel to best position the new mounting system.

010
Name: Duncan, Whitney
Major: Civil Engineering
Faculty Advisor, Affiliation: Saeed Rokooei, Building Construction Science
Project Category: Physical Sciences and Engineering

Construction Professionals' Perception of COVID-19 Impacts on the Construction Industry over Time
COVID-19 has altered routines and processes in the world since the beginning of 2020. Many industries changed their norms because of mandatory or recommended quarantine or limitations, including the construction industry. Being aware and knowledgeable of the impacts COVID-19 has had on the construction industry can help construction professionals and managers to be vigilant in the future and handle the situation wisely. This study was performed to understand construction professionals' perceptions of COVID-19 on the industry over time. The similarities and differences of these perceptions at different periods of time were examined as well. Professionals from a developed country (U.S.) and a developing country (Iran) were asked to participate in three rounds of surveys at six-month intervals. 567 responses were collected from the two countries combined. Statistical tests were conducted to assess the recurrence and strength level of the impact of COVID-19 and the similarities and differences between each set of surveys. Overall, the two groups perceived the influence of COVID-19 as a strong factor in their professional careers, reducing over time. The results also revealed that as the scope of the commodity increased, similarities decreased, and differences grew. These findings highlighted the need for improvement when it comes to the preparedness to handle concerns with efficiency in the construction industry. Collecting the perceptions of construction professionals can help improve vigilance for future and even ongoing projects.

139
Name: Dunne, Reese
Major: Mechanical Engineering
Faculty Advisor, Affiliation: Garry Gold, Department of Radiology, Stanford University, Stanford, CA, USA
Project Category: Biological Sciences and Engineering
Co-Author(s): Valentina Mazzoli
REU/Research Program: Stanford Radiological Sciences Laboratory REU

A Diffusion Tensor Imaging approach to investigate the effects of exercise on quadricep muscle fiber lengths
Muscles are a highly plastic tissue that can adapt due to exercise intervention and resistance training, but changes in the microstructure of the muscles after exercise are generally unclear. In order to improve muscle adaptation in training regimens and monitor the effects of treatment and rehabilitation over time, it is crucial to understand how the microstructure of the muscles, specifically muscle fibers, change due to exercise. The goal of this research is to utilize

Diffusion Tensor Imaging (DTI) and deterministic fiber tractography to investigate the effects of resistance training on fiber lengths in the quadricep muscles. Five healthy human subjects participated in a resistance training regimen for three months. DTI scans of each subject were generated at five total time points throughout the training regimen, and a deterministic fiber tractography algorithm used these scans to track and reconstruct the muscle fibers in the quadricep muscles of all five subjects. Fiber lengths in the Vastus Lateralis, Vastus Medialis, and Rectus Femoris muscle groups were averaged together with a minimum threshold of 30 mm. Differences in average muscle fiber lengths were compared for all subjects using the Single Factor ANOVA statistical analysis with a significance level of 0.05. After the three-month resistance training regimen, no statistically significant differences in fiber length were observed. However, DTI and muscle tractography calculated quadricep fiber lengths that agree with values found in literature. Taken together, these results suggest that, with further optimization, DTI fiber tractography could be a useful tool to monitor changes in quadricep muscle fiber length due to exercise.

069

Name: Epting, Kristieona
Major: Educational Psychology
Faculty Advisor, Affiliation: Kasia Z. Gallo, Counseling Educational Psychology & Foundation; Jialing Xie, Counseling Educational Psychology & Foundation
Project Category: Social Sciences
Co-Author(s): Piper Doherty, Malerie Millet, Carmen L. Carter
REU/Research Program: Communicating Science Research Lab, Mississippi State

Undergraduate Faculty Impressions of Pivot Teaching During the COVID-19 Pandemic: A Literature Review

Because of the COVID-19 pandemic, universities transitioned to online instruction around March 2020. In the present literature review, we highlight faculty experiences during this time. We have located 15 peer-reviewed empirical reports published in 2020 and 2021. We used the following search terms: COVID-19 pandemic AND pivot teaching AND higher education or college or university or post-secondary or postsecondary AND undergraduate to identify articles in three databases: Academic Search Complete, PsychINFO, APA PsycArticles, and ERIC, and in Google Scholar. The following themes emerged from our analysis: a) motivation deficits, b) willingness to move online, c) assessment difficulties, d) extensive prep time, e) technology-related difficulties, f) shifts in relationships, g) communication issues, h) teaching/learning environment challenges. Faculty motivation was diminished due to a global pandemic and by perceived lack of student motivation. Additionally, traditional-delivery faculty were overwhelmed by pivoting to online teaching. Many educators were unfamiliar with the online teaching resources at their institutions and faced a steep learning curve. Many struggled to quickly learn effective online teaching and assessment methods. Faculty accustomed to pen and paper tests worried about students cheating and lack of clarity regarding student readiness for tests. Relatedly, students reported confusion regarding the online test format and how to best prepare. Some faculty moved from no (or minimal) online presence to an online-only presence which led to extensive class prep times. Additionally, all-online teaching exposed issues with technology: inadequate internet connections, and problems with videoconferencing platforms. Lacking in-person contact affected student-teacher relationships and communication. Some felt strained by being available to students 24/7, others reported the shared difficulties increased connection. Home environments sometimes disrupted online teaching, though some faculty reported fewer distractions and higher effectiveness than when on campus. Relatedly, home environments presented obstacles for some students lacking laptops/cameras or reliable internet connection.

140
Name: Feduccia, James
Major: Biochemistry
Faculty Advisor, Affiliation: Xueyan Shan, Biochemistry, Molecular Biology, Entomology, and Plant Pathology
Project Category: Biological Sciences and Engineering
Co-Author(s): W. Paul Williams
Other Competition(s): Public Health Research Competition

Antimicrobial Peptide Encoding Gene Polymorphisms
Antimicrobial peptides (AMPs) are a promising group of compounds that contribute to the natural resistance against *Aspergillus flavus* found in corn. The corn inbred lines selected for this study include MP313E which has less agronomically favored qualities such as taller stems and longer maturity times, as opposed to the susceptible Va35 which has a faster maturity time and shorter stalk. *Aspergillus flavus* is a grain targeting fungus that produces carcinogenic aflatoxin and is one of the main causes of loss of corn crop and other grain producing crops resulting from infection. Polymorphism analysis using molecular biology techniques of five groups of antimicrobial genes in Mp313E and Va35 resulted in several candidate AMP genes that indicated contribution to genetic resistance. Candidate AMP genes were selected for molecular cloning for further analysis of the peptides and their interactions with *A. flavus*. Identifying the full trait for *A. flavus* resistance can lead to the integration of that trait into the agronomically favored susceptible corn varieties for higher yield in corn produce per year.

011
Name: Foeller, Devin
Major: Aerospace Engineering
Faculty Advisor, Affiliation: Rob Wolz, Aerospace Engineering
Project Category: Physical Sciences and Engineering
Co-Author(s): Cooper Baughn, Marshall Gaines

NMEA Communicator Integration for Flight Simulator Training
Navigational advancements in the aviation industry have allowed pilots the ability to utilize the Global Positioning System throughout the flight profile. From taxiing to navigation, GPS-capable devices provide an additional point of view that assist pilots throughout the flight. While GPS utilization is very useful in real world application, its benefits are negated when training in a stationary flight simulator. The stationary aspect of flight simulators leads to a disconnect in the simulated state and active location on separate GPS-capable devices. As the goal of simulator training is to accurately reflect the real-world environment, updates to flight simulators are needed to allow for pairing GPS-capable devices, such as Apple tablets, using mapping applications like Garmin Pilot. The objective of the project was to use a Bluetooth NMEA-BT communicator developed by AMAN Enterprises to receive locational data which can be used to overwrite location services on Apple devices. The locational data that reflects the state of the simulation is first gathered and organized using Python into GGA and RMC sentences at baud rate matching the RS-232 serial port specifications. Two primary sections were completed to demonstrate the requirements and capabilities of using an NMEA-BT communicator. The proof of concept served to identify NMEA sentence variables that were necessary for location simulation. By altering individual variables using simplified location data in a series of functionality tests, variables requiring continuous recalculations were identified as well as variables capable of remaining constant. With all variable types identified, the Python script was reconfigured to read data in a .csv file that was collected from a recorded flight simulator session. The results supported the claim that Bluetooth NMEA communicators can be integrated in a flight simulator allowing for a simulated location on Apple devices.

109
Name: Franz, Jonathan
Major: History
Faculty Advisor, Affiliation: James Giesen, History
Project Category: Arts and Humanities (Oral Presentation)
Other Competition(s): Three Minute Thesis Competition

The Flaming Cross
Despite the prominence of moderate white leadership in the Methodist Church, the church in Mississippi never took a stand against segregation. On the surface the era between the 1956 and 1964 General Conferences changed nothing to end the Methodist Church's segregated structure. The churches stance on segregation and integration remained on a purely voluntary level, however Carolyn Renee Dupont noted Methodist Church, "Passed the civil rights years in chronic, debilitating turmoil."[1] This turmoil stemmed from a power struggle between institutional moderate leadership, segregationists, and progressives who fought for control of the church. At the heart of this struggle was the effort to abolish the Central Jurisdiction and have General Conference enforce mandatory segregation. In this struggle white supremacist within the church used the formal church structure to keep the church segregated while progressive clergy in the African American church and Civil Rights movement drew attention to the dichotomy between the Methodist Churches stated policy and reality. In the face of this pressure the moderate leadership tried to maintain "respectability" and institutional unity in Mississippi. It was a fight the moderate institutionalists would win, but because of their loyalty to the unity of the Church they often served as enablers for segregationists to exercise control. In the moderate's best attempt to save the church they loved, they failed to look past the interest of institutional church they knew and created a power vacuum that white supremacist exploited to keep the church segregated.

141
Name: Freeny, Seth
Major: Physical Education/Kinesiology
Faculty Advisor, Affiliation: Harish Chander, Neuromechanics Laboratory, Department of Kinesiology
Project Category: Biological Sciences and Engineering
Co-Author(s): Abbey McCrory, Sunny Jo Chandler, Daniel Young, Sydni Carter, Savannah-Kate Trigg, Reuben Burch, Adam Knight

Quick on your feet: Revamping the star excursion balance test with a response time task
The Star Excursion Balance Test (SEBT) is a common balance assessment used across clinical and research settings to test dynamic balance. The primary outcome measure of this test is maximal reaching distance performed by the non-stance limb. Response time (RT) is a critical cognitive component of dynamic balance control and the faster the RT, the better the postural control and recovery from a postural perturbation. However, the measure of RT has never been done in conjunction with SEBT, especially with musculoskeletal fatigue. The purpose of this study is to examine RT during a SEBT, with a secondary goal to examine the effects of muscular fatigue on RT during SEBT. Sixteen healthy young male and female adults [age: 20 ± 1 years; height: 169.48 ± 8.2 cm; weight: 67.93 ± 12.7 kg] performed the SEBT in five directions for three trials, after which the same was repeated with a response time task using Blazepod™ with random stimulus. Participants then performed a low intensity musculoskeletal fatigue task and completed the above measures again. A 2 × 2 × 3 repeated measures ANOVA was performed to test for differences in mean response time across trials, fatigue states, and leg reach as within-subjects factors. All statistical analysis was conducted in JASP at alpha level of 0.05. RT significantly decreased over the course of testing regardless of reach leg or fatigue state ($p=0.023$). Trial 3 demonstrated significantly lower RT compared to Trial 1 ($p=0.019$, mean difference (MD)=44.984 ms). No significant differences were found between fatigue states or leg reach. These results indicate that response time during an SEBT with RT is a learned skill that can change over time and future research should include an extended familiarization period to remove learning effects, while greater fatigue may be required to demonstrate differences in RT and SEBT.

142
Name: Gautreaux, Malley
Major: Biological Engineering
Faculty Advisor, Affiliation: Lauren Priddy, Agricultural and Biological Engineering
Project Category: Biological Sciences and Engineering
Co-Author(s): Luke J. Tucker, Xavier J. Person

Haptoglobin as a Measure of Infection Progression in a Rat Model of Implant-Based Osteomyelitis

Orthopedic disease or trauma causes a complex immunological response, contributing to changes in circulating immune cells and proteins in the blood which can be used to longitudinally track infection and/or inflammation. One disease that has been modeled for study of disease progression and treatment efficacy is osteomyelitis, a bone infection commonly caused by staphylococcal strains. Current treatment includes long-term, systemic antibiotics, but low penetration of antimicrobials in bone can result in chronic infections, warranting surgical debridement or even amputation. We have previously established an implant-based femoral osteomyelitis model in the rat, which we have characterized using representative radiographic/fluorescent imaging and terminal bacterial quantification; however, no quantitative, longitudinal measures have been made. We are evaluating chitosan, the deacetylated derivative of chitin, which has innate antimicrobial properties, in hydrogel form for local treatment of osteomyelitis. We have previously shown that fosfomycin-loaded chitosan hydrogel displayed significant killing of *Staphylococcus aureus* (*S. aureus*) *in vitro*. It was hypothesized that wrapping a porous electrospun polycaprolactone (PCL) membrane around fosfomycin-loaded chitosan hydrogel would increase antibiotic retention at the infection site in our rat model. One week after infection was established, the screw was removed and treatment was applied: chitosan hydrogel, chitosan hydrogel with fosfomycin, or chitosan hydrogel with fosfomycin and the PCL scaffold. Blood samples were collected throughout the study and analyzed for haptoglobin concentrations. Increased haptoglobin levels were seen as early as day 3, with all groups elevated at day 10. Additionally, all groups had returned to baseline levels by day 21. Future study will include exploration of additional markers for a more in-depth understanding of the immunological response to osteomyelitis and antimicrobial treatments.

143
Name: Gnann, Madeline
Major: Forestry/Forest Products
Faculty Advisor, Affiliation: Xuefeng Zhang, Sustainable Bioproducts
Project Category: Biological Sciences and Engineering

Hydrophobic Paper Prepared by Metal-Ion-Modification for Packaging

Paper is a recyclable, biodegradable, and renewable material manufactured mainly from cellulose. However, paper suffers low wet strength and poor water resistance because of its hydrophilic nature, limiting its widespread applicability.

This study suggests a simple, environmentally friendly approach to modifying traditional hydrophilic paper into hydrophobic paper through a metal-ion-modification process using Fe^{3+} and Zr^{4+} ions. The effects of modification time and metal ion concentration on the water contact angle (WCA) of modified papers were investigated. Different types of paper have been successfully modified thus far, including paper towels, A4 paper, packaging papers, newspaper, etc.; high WCAs up to 140° have been attained. These modified papers have maintained high WCAs and shown high stability even after solvent washing (e.g., ethanol, methanol, water, etc.). Results from infrared spectroscopy, X-ray photoelectron spectroscopy, and scanning electron microscopy suggest that the hydrophilic to hydrophobic transition is presumably due to coordination interactions between multivalent ions and the major components of paper, i.e., cellulose and hemicellulose. Therefore, conventional hydrophilic paper modified by metal ions could be a viable method to produce hydrophobic, water-resistant packaging paper for the conventional world.

Keywords: Metal-ion-modification, hydrophobic paper, coordination, water contact angle

012
Name: Goff, Reece
Major: Chemical Engineering
Faculty Advisor, Affiliation: Maryam Mirabolghasemi, Swalm School of Chemical Engineering
Project Category: Physical Sciences and Engineering

Analysis of Drilling, Mud Log, and Lithology Data for Volve Field Wells
A key piece to the hydrocarbon production puzzle is data collection. Without the proper data collection and utilization, any hopeful production of tangible, reliable energy is bound to be inefficient and costly. During a typical drilling operation, different types of data are collected for preliminary formation evaluation. These data include drilling data such as rate of penetration, measurement/logging while drilling, and mud logging. Drilling data has been shown to be correlated to formation properties such as the lithology. However, it is not clear if mud log data is correlated with drilling and lithology data. In this study we use the data from Volve field to investigate the correlation between drilling data (D-exponent, rate of penetration), lithology, and mud log data. We found that a power law correlation exists between the D-exponent and the rate of penetration for each well. Once a correlation is found between drilling parameters, lithology, and mud log data, it will be applied to data from a field other than Volve to check the general applicability of the correlation. If successful, the established correlation may serve as a real-time estimation of lithology and help drilling, reservoir and production operations alike with the on-site rock cutting analysis serving as a delayed confirmation of the estimation.

144
Name: Goodson, Hunter
Major: Animal & Dairy Sciences
Faculty Advisor, Affiliation: Thu Dinh, Animal and Dairy Sciences
Project Category: Biological Sciences and Engineering
Co-Author(s): Chelsie Dahlgren, Shangshang Wang , Michael Colle, Wes Schilling
REU/Research Program: CALS Undergraduate Research Scholar Program

Effects of Electrical Stimulation on Total Peptides and Free Amino Acids in Beef
This study examined the effects of electrical stimulation of beef carcasses on total peptide and free amino acid concentrations in beef. Beef steers (N = 4) were stimulated for 20 s at 20 V. Top round cap muscle (*gracilis*) was sampled immediately before (PRE), immediately after (POST), and 24 h after stimulation (H24). Sample was trimmed of fat and connective tissues, snap-frozen in liquid nitrogen, and stored at -80 °C. Water-soluble flavor compounds were extracted in solvent mixture of perchloric acid, water, and acetonitrile and filtered through a 3kDa membrane. Total peptides were analyzed using a Pierce™ Quantitative Colorimetric Peptide Assay kit (#23275, Thermo Scientific™, Waltham, MA). Free amino acids were derivatized by propyl chloroformate and determined by gas chromatography - mass spectrometry. Data were analyzed in a generalized linear mixed model with sampling time as a fixed effect and animal as random effect. The first-order autoregressive covariance structure was used for the repeated measurement in the GLIMMIX procedure of SAS. The total peptide content range from 1.69 to 1.99 mg/g and did not differ among time points ($P = 0.074$). Among all free amino acids, GLN, ALA, HIS, VAL, GLY, and β-ALA were the most predominant with content ranging from 0.57 to 2.2 mmol/kg; whereas SAR, ASP, PHE, ASN, and MET were the least predominant, ranging from 0.04 to 0.07 mmol/kg. Among timepoints, PRE samples had more ($P \leq 0.032$) ALA, β-ALA, LEU, ILE, HYP, PHE, LYS, TYR, and TRP than both POST and H24 samples. However, ASP and GLU were less ($P \leq 0.022$) in PRE compared to the other timepoint. Free amino acids are important flavor precursors; therefore, electrical stimulation influences postmortem development of beef flavor.

145
Name: Gordon, Alexandra
Major: Animal and Dairy Sciences (Pre-Vet) Major
Faculty Advisor, Affiliation: Dr. Jean M. Feugang, Animal and Dairy Science
Project Category: Biological Sciences and Engineering
Co-Author(s): Notsile H. Dlamini
REU/Research Program: CALS URSP

Gum Arabic supplementation to boar semen extender benefits low-motility spermatozoa

Gum Arabic (GA) is an organic compound derived from *Acacia seval* and *Acacia Senegal* trees found in several African countries. GA is beneficial in the pharmaceutical, food, and cosmetic industry due to its high solubility and antioxidant effects. GA has shown satisfactory results preserving ram and stallion spermatozoa. Therefore, the study aims to determine the impact of GA on improving sperm characteristics of boar spermatozoa. GA stocks were prepared in water and frozen for experiments. Aliquots of GA were frozen-thawed at room temperature for each replicate. We obtained freshly extended boar semen of high and low motility from Prestage Farms (West Point, MS). A volume of GA stock was added to semen aliquots to reach final concentrations of 0, 25, or 100 µg/ml on the collection day (Day 0). All mixtures were stored at 18 ^{0}C for up to 10 days post collection. On days 1, 3, 5, 7, and 10 post-collections, mixtures were incubated at 37 ^{o}C for 10 minutes, followed by sperm motility and morphology analyses (CASA; Computer Assisted-Sperm Analyzer). Experiments were replicated three times, and data were analyzed using Microsoft Excel statistical software. The presence of GA in semen extender revealed consistent improvements of total and progressive sperm motility, using either low (50 µg/ml) or high (25 µg/ml) motile spermatozoa. These beneficial effects were observed throughout the sperm storage with consistently higher effects than control samples. However, higher concentrations of GA were needed to maintain lower proportions of bent-tailed spermatozoa in low (100 µg/ml) and high (50 µg/ml) sperm motility groups. We conclude that Gum Arabic is beneficial for boar sperm preservation, regardless of their motility. Investigations are ongoing to evaluate its effects on boar sperm freezability and viability of boar spermatozoa.

013
Name: Gowan, Jacob
Major: Computer Science
Faculty Advisor, Affiliation: Daniel Carruth, Center for Advanced Vehicular Systems
Project Category: Physical Sciences and Engineering
Co-Author(s): Dr. Julie Baca, US Army Engineer Research and Development Center
Other Competition(s): Community Engagement Research Track

ERDC Outreach Program

Mobile augmented reality (MAR) has shown significant potential for increasing user engagement across a range of application areas with unique benefits demonstrated in the realm of educational activities. CAVS researchers in collaboration with the ERDC DAAC recently investigated the integration of this technology with an interface design metaphor based on the notion of storytelling, an emerging research area in the field of human-computer interaction. This previous work showed potential tangible improvements in learner engagement with the integration of this design approach with MAR. However, MAR presents particular design challenges beyond those of traditional interfaces. Best practices in this area are rapidly evolving. Effective educational applications must balance guidelines such as simplifying visual input to avoid overloading users and keeping interactions as simple as possible against the complexities of the 3D visual and tactile nature of AR technology which leads to increased learner engagement. In working with previously developed mobile applications involving scientific and mathematical foundations, we are working to develop better applications for the use of outreach by the ERDC DAAC. These applications will be based upon research being performed by the researchers at the ERDC DAAC and will serve to introduce students to ideas currently being researched in engineering to help create more future engineers. Improvements will be made primarily in usability and user interaction with a focus on ease-of-access for students.

146
Name: Grant, Abigail
Major: Biological Engineering
Faculty Advisor, Affiliation: LaShan Simpson, Agricultural and Biological Engineering
Project Category: Biological Sciences and Engineering
REU/Research Program: Shackouls Honors College Research Fellowship

Alternative Inhibitors of Cannonical Wnt Signaling Pathway for Vascular Calfication
Cardiovascular diseases are one of the top causes of death in the United States, responsible for over 29% of deaths worldwide. Myocardial infarctions (MI), angina, and strokes take over 16 million lives every year, with the underlying mechanisms being currently investigated. One of the main underlying pathological inflammatory vascular diseases is atherosclerosis which accounts for most MIs and stroke. Vascular calcification, which is the deposit of hydroxyapatite in the arterial wall causes increases of disease such as heart disease, stroke, and atherosclerotic plaque rupture. Vascular calcification involves vascular smooth muscle cells undergoing a cellular mediated phenotypic switch into cells that resemble bone, characterized by an upregulation of osteogenic markers and a loss of smooth muscle markers. Runx2, one of the osteochondrogenic markers, is a transcription factor that contributes to osteoblast differentiation for calcifying the smooth muscle cells and could be the cause of this differentiation. This transcription factor is also a Wnt signaling factor that regulates direct bone turnover and remodeling. Because these two things play a factor in calcification and have been investigated for its effects, looking into other factors that may play a part in calcification and could inhibit certain parts of this process could prove beneficial to regulation of this disease. The canonical Wnt signaling pathway is not completely understood but some elements are currently being investigated. Further research is being conducted to investigate inhibitors of the canonical Wnt signaling pathway to combat atherosclerosis and if they are novel treatments for vascular calcification.

147
Name: Green, Camille
Major: Wildlife & Fisheries Science/Wildlife Science
Faculty Advisor, Affiliation: Eric McConnell, Forestry
Project Category: Biological Sciences and Engineering
Co-Author(s): Adam Polinko, A. Brady Self

The Value of Words in Mississippi Timberland Sales
Our goal was to identify keywords and phrases that most commonly appeared in timberland sales prospectuses in order to 1) assist land agents, financial lenders, and foresters with finding the ideal combination of descriptors to capture a tract's characteristics when planning a sale and 2) find the most common values related to the outdoors that may add value to the property when these characteristics are management objectives. We evaluated the top 20 most recent Timberland Sales on the Lands of America website for each of the 5 regions of Mississippi: Delta, Capital Region, Pines, Coastal, and Hills. The stipulation was the land could not have any building that was capable of being lived in (hunting cabins/ trailers), with the exception of shooting houses. The sales totaled 18,100 acres and $40.9 million in total value. The entire broker listing and all of the commodities that it advertised were recorded. After removing filler words (e.g., a, an, the, etc.), we reviewed over 2,000 descriptors. These were analyzed to document frequency in a pivot table and then classified them into one of 3 categories: Timber, Wildlife, or the Parcel. The top 5 frequencies for each category were documented. Overall, the top 3 words were: "Property" used 251 times, "Hunting" used 222 times, and "Timber" used 143 times. Other popular terms include Pine, Hardwood, Hunting, Turkey, Fishing, Deer, Food Plots, Heavily Treed, Thinned, County, and Creek. Across all regions the top word frequencies were related to the Parcel, followed by Wildlife, and then Timber. The hypothesis that timberland brokers who describe properties by physical characteristics and their natural resource commodities can increase the selling potential of the tract was supported. Further research will be conducted utilizing a hedonic model to estimate how the tract characteristics affect final sales values.

014
Name: Groce, Brady
Major: Aerospace Engineering
Faculty Advisor, Affiliation: Rob Wolz, Aerospace Engineering
Project Category: Physical Sciences and Engineering
Co-Author(s): Jacob Williams

Optimization of Plasma Propulsion
Plasma propulsion is the forefront of spacecraft propulsion and is the future of deep space travel as the high efficiency of the engine reduces the need for large amounts of fuel. There are, however, two glaring problems with this archetype of rocket engine moving forward: thrust and power supply. Extensive research was conducted on the basic workings of the thrust systems to fully understand potential changes that could be made to improve performance. After the extensive research, learning of the fundamental makeup of plasma propulsion systems and gaining an understanding of the physical principles that govern the mechanics of these engines, potential modifications were hypothesized that could increase thrust and power efficiency: utilizing different materials for the power systems and mixing elements in fuels to increase ionization. These potential improvements were derived from These are, however, hypotheses based on research and related studies and cannot definitively be proven from only computational data since the physics behind plasma propulsion systems is not easily predicted. Therefore, experiments must be conducted related to these hypotheses to determine whether they improve performance or not.

015
Name: Guilliams, Payne
Major: Mechanical Engineering
Faculty Advisor, Affiliation: Ben Xu, Mechanical Engineering
Project Category: Physical Sciences and Engineering
REU/Research Program: Undergraduate Research Scholar

New Method for Additive Manufacturing using EDB Droplet Levitation
A new method of additive manufacturing involves the use of an electrodynamic balance (EDB). An EDB is based on the principle of superposition of DC and AC electric fields applied to a charged particle. This research focuses on the for additive manufacturing is the quadrupole EDB. A quadrupole EDB consists of four metallic rods oriented with equal spacing around a central axis. The voltage is applied to the rods such that rods directly opposite of each other contain the same charge. When a positively charged particle is created outside of the electric field of the EDB, a negatively charged plate is used to attract the particle into the rods of the EDB. As the particle enters the EDB, the DC voltage balances the particle between the rods, and the AC voltage stabilizes the motion of the particle. Since there is no physical contact present with the particle inside the EDB, a liquid droplet can maintain a perfectly spherical shape. An EDB is beneficial for additive manufacturing because no physical contact with the particle is required to control its position. To test the concept of a quadrupole EDB, a design was created using Solidworks, and a prototype of the EDB was built. The full EDB system setup in the lab consists of the EDB prototype, a syringe pump, multiple DC power supplies, a function generator, an oscilloscope, and a power amplifier. Initial testing of the EDB was done with water to simplify testing. The goal of the prototype is to test droplets of various sizes to characterize the AC and DC voltages required to levitate the particles. Changes in voltage between the feed nozzle and aluminum plate, AC frequency, nozzle size and spacing, and droplet pumping speeds have also been examined to understand how the changes affect droplet formation.

148
Name: Hampton, Makeriah
Major: Natural Resource and Environmental Conservation
Faculty Advisor, Affiliation: Courtney Siegert, Department of Forest Resources
Project Category: Biological Sciences and Engineering
Co-Author(s): Amie Triplett, Anna Ilek, Courtney Siegert

Changes in bark hydrologic properties along the stem height of four common southeastern tree species
A significant amount of moisture can be absorbed by tree bark during periods of rainfall, thereby contributing to the hydrologic cycle of the forest. Rather than being diverted to the forest floor for soil moisture and plant root availability, water is diverted into bark storage. Various species of trees can store different amounts of water based on their bark surface and inner structural characteristics such as density, thickness, and hygroscopicity. Additionally, these properties vary along the stem, but there are further variables to consider, particularly as they relate to other forest hydrologic cycle components. For the purpose of exploring this variability, bark samples from four common Southeastern tree species were collected: loblolly pine, sweetgum, shagbark hickory, and cherry-bark oak. Furthermore, in the laboratory, we conducted a series of experiments to measure bark volume, density, and hygroscopicity (i.e., the amount of saturated water vapor absorbed directly from the atmosphere). Bark bulk density was lowest in loblolly pine (0.33 ± 0.01 g/cm^3) followed by sweetgum (0.39 ± 0.01 g/cm^3), shagbark hickory (0.54 ± 0.01 g/cm^3), and cherry-bark oak (0.59 ± 0.01 g/cm^3). For cherry bark oak, sweetgum, and loblolly pine bark bulk density was greater at intermediate tree heights along the stem, lower at the base, and higher up the tree stem while shagbark displayed the opposite trend. Hygroscopicity showed the opposite trend with shagbark hickory and cherry bark oak having higher hygroscopicity (0.91 ± 0.06 mm and 0.81 ± 0.06 H_2O per cm bark thickness, respectively) and loblolly pine and sweetgum with lower hygroscopicity (0.75 ± 0.06 and 0.66 ± 0.06 H_2O per cm bark thickness, respectively). Shagbark hickory displayed the most pronounced trend in hygroscopicity along tree stem height with higher hygroscopicity closer to the base of the tree and lower hygroscopicity at higher stem heights. Results demonstrate that structural characteristics of bark are variable across species and along tree stems. Hydrologic models that are dependent on bark water storage parameters could be improved by considering this variability.

070
Name: Harrington, Anne Elizabeth
Major: Sociology
Faculty Advisor, Affiliation: Rachel Allison, Sociology
Project Category: Social Sciences
REU/Research Program: ORED Undergraduate Research Program
Other Competition(s): Three Minute Thesis Competition

"Being a Chi O to a Fraternity Boy is the Greatest Thing That Could Happen": Reputation, Heterosocialization, and Status Among Sorority Women
Since their establishment in the mid- to late-19th century, National Panhellenic Conference sororities have existed to preserve definitions of affluent, white, heterosexual womanhood in an age of the diversification of higher education. A central aspect of this traditional womanhood was marriage, so sororities have focused heavily on appealing to and socializing with elite men, termed heterosocialization. However, appealing to elite men has been rebranded as a new type of femininity – the smart, driven, and physically attractive "good girl"- and this is evident in the reputations of the top sororities that are perpetuated by and for these men. Drawing on in-depth interviews with 19 women affiliated with 8 National Panhellenic Conference sororities at Mississippi State University, I examine how a woman's reputation – and thus her status - in the Greek system is still dependent on her appeal to fraternity men. There is a clear and consistent, but informal, hierarchy that establishes some chapters as "top-tier" and others as the "bottom-tier." I find that these rankings are based upon the chapter's reputation, which originates with fraternity men. A reputation that appeals to elite men – being "womanly" – earns the chapter a spot in the "top-tier." Heterosocialization remains a major focus of sororities, and women in the top-tier sororities have exclusive access to a network of elite fraternity men because of the status and reputation that elite fraternity men have given them. Thus, the Greek system illustrates a microcosm where a woman's place in the social system is not only determined by how well she appeals to elite men, but also determines her access to the most valuable resource in the system – elite men.

149
Name: Heath, Maddie
Major: Biological Sciences/Biological Sciences
Faculty Advisor, Affiliation: Cooper Brookshire, Dept of Clinical Sciences, College of Veterinary Medicine
Project Category: Biological Sciences and Engineering
Co-Author(s): Dr. Keun Seok Seo
REU/Research Program: ORED Undergraduate Research Program
Other Competition(s): Public Health Research Competition

Susceptibility of Clinical Veterinary Staphylococcal Isolates to Chlorhexidine

Chlorhexidine is very commonly used in veterinary settings as a hospital disinfectant, topical medication for bacterial skin infections, surgical patient skin disinfectant, and surgeon hand disinfectant. Chlorhexidine susceptibility is not routinely monitored for in veterinary diagnostic labs, and very little data are published describing susceptibility surveillance of veterinary pathogens. Despite chlorhexidine's status as first-line therapy for bacterial skin infections in dogs and emerging concerns about antimicrobial resistance, clinical chlorhexidine breakpoints have not been established for veterinary associated staphylococcal species. However, epidemiologic cut-off values have been suggested for related staphylococcal species. Chlorhexidine susceptibility testing of 100 clinical *Staphylococcus (pseud)intermedius* and *S. schleiferi* isolates obtained between 2020 and 2022 from veterinary diagnostic labs in Starkville, MS and Pearl, MS between was performed. A variety of staphylococcal phenotypes were included in the study, including both methicillin susceptible and methicillin resistant strains. Manual micro-broth dilution testing was conducted using standard microbiologic techniques in 96-well plates with chlorhexidine concentrations around the estimated epidemiologic cut off value of 8 µg/mL (0.125-64 µg/mL with both positive and negative control wells for each isolate). The minimal inhibitory concentration was below the estimated epidemiologic cut-off of 8 µg/mL for all 100 isolates (95% CI; 0.96-1), which suggests a low probability of chlorhexidine resistance among clinical staphylococcal isolates recently submitted to veterinary diagnostic labs in Mississippi. However, reports of emerging chlorhexidine resistance have been published, so ongoing monitoring should be continued.

016
Name: Helton, Davis
Major: Biochemistry
Faculty Advisor, Affiliation: Mohammed Almtiri, Chemistry
Project Category: Physical Sciences and Engineering
Co-Author(s): Dr. Colleen Scott
Other Competition(s): Three Minute Thesis Competition

Synthesis of phenoxazine, carbazole, phenazaborine and phenasiline based on polymers by Buchwald/Hartwig polyamination for conductive polymer and biosensor applications.

Phenoxazine, a fused heterocyclic compound, is a naturally found antibiotic, anti-cancer agent, and dye. It has excellent photophysical electrochemical properties. Therefore, it is ideal for biosensing applications. A key characteristic of biosensors is the ability to transmit chemical signals through either optical or electrical processes. Our group has worked to develop biosensors for analytes like hydrogen peroxide. Hydrogen peroxide have important roles to play in the body such as the redox signaling pathway. When hydrogen peroxide is found in excess, this can be a very important indication of stress at the cellular level. This presentation will address the efforts made to develop a biosensor that is capable of detecting the concentration of hydrogen peroxide. The phenoxazine-based polymer was synthesized via a step growth polymerization with *p*-phenylenediamine as the co-monomer during a Buchwald/Hartwig reaction. The diamine co-monomers were varied in order to allow for the proper fine tuning of the polymer's optoelectrical properties and stability. The synthetic approach, characterization of the small molecules and polymer, and optical properties of the polymer will be discussed in detail.

017
Name: Henkel, Benjamin
Major: Geosciences/Broadcast Meteorology/Climatology
Faculty Advisor, Affiliation: Johna Rudzin, Geosciences
Project Category: Physical Sciences and Engineering
Co-Author(s): Elizabeth R. Sanabia, Steven R. Jayne, Casey R. Densmore, Jonathan Zawislak, Joshua Wadler, Jun Zhang, Joseph Cione

A collocated atmospheric-oceanic dataset to improve understanding, sampling, and forecasting of tropical cyclone air-sea interaction

Numerous observational and numerical studies have highlighted the importance of air-sea interaction in tropical cyclone (TC) intensity change. Yet obtaining targeted, in-storm collocated atmospheric and oceanic boundary layer observations has still remained a coordinated challenge. While sea surface temperature (SST) is a crucial boundary condition to air-sea transfer in TCs, this variable is modified by its underlying subsurface ocean structure. Likewise, collocated atmospheric boundary layer measurements are crucial to understand the impact of the air-sea response on atmospheric boundary layer thermodynamics and kinematics. Thus, both atmospheric and oceanic boundary layer observations in TCs are necessary to understand air-sea relationships for various TC conditions. We present the beginning steps to a collocated atmospheric-oceanic dataset that utilizes atmospheric dropwindsondes from the Tropical Cyclone Dropsonde Research and Operations Product Suite (TC-DROPS, Zawislak et al. 2018) and aircraft expendable bathythermographs (AXBTs) from the Training and Research in Oceanic and Atmospheric Processes in Tropical Cyclones (TROPIC) database (Sanabia, 2020). The TROPIC and TC-DROPS databases include approximately 1,700 ocean temperature profiles and 19,000 dropsondes, respectively, which are used to find collocated pairs of observations. The TC-DROPS dataset includes metadata such as 200-850 hPa shear magnitude and direction from the Statistical Hurricane Intensity Prediction Scheme (SHIPS) database (DeMaria and Kaplan 1994), TC intensity at profile time, and daily SST from the 0.25° global level 4 Group for High Resolution Sea Surface Temperature database (Reynolds et al. 2007). Utilizing TC-DROPS metadata and estimated ocean metrics from AXBT profiles, this new composite dataset will help identify conditions within the atmospheric and oceanic boundary layers and air-sea interface that lead to TC intensity change and provide guidance for air-sea sampling.

110
Name: Herndon, Michael
Major: Architecture
Faculty Advisor, Affiliation: Aaron White, Architecture
Project Category: Arts and Humanities (Oral Presentation)

Andrea Palladio's comprehensive detailing of methods of construction and ornamental details

Andrea Palladio, an architect of the 16th century, is an architect of pragmatic design and inspiration. In his *I Quattro Libri dell'Architectura* (1570), the Italian architect Andrea Palladio detailed methods of construction as well as ornamental details in the same book using his own works to explain and illustrate the process. This is unique, as he is the first in history to use his own works as subjects of analysis. Palladio compiles his information and analyses simply in order of how a typical architectural project would be organized; the study that has been crafted operates no differently, analyzing his subject from the simple yet detailed information about structure and site to the refined elements such as walls and ornaments. What Palladio makes evident in his pursuit of diagramming the practice of architecture is his interests in simple considerations of construction in sourcing materials and design followed by his more complex considerations in construction of detail elements regarding proportions, placements, and volumes of items necessary to make a building "beautiful." Through this analysis, Palladio comes to divulge a common divide in the practice of architecture which will be studied in this paper: those who practice theory and those who practice building. Through his expertise in building, Palladio cleverly integrates intellectual theory into the simplified ideas of building, making comprehensive descriptions and drawings of building that a theorizing architect can admire for its considerations in beauty and considerations of "perfect" forms. Through these bases comes a refined method of building construction in the Italian Renaissance era, becoming one of the few antique descriptions of precise building practice during his time that levels the art of architecture with the professionals that interact with and build great works.

071
Name: Hill, Summer
Major: Human Sciences/Apparel Textiles & Merchandising
Faculty Advisor, Affiliation: JuYoung Lee, Fashion Design & Merchandising
Project Category: Social Sciences
Co-Author(s): Marla McCaskill, Lydia Rajaoberison, Taylor Verdell

Analysis of the effect of inconsistent apparel sizing on women's body image

This research study is focused on measuring the mental response of women in relation to inconsistent sizing and measurements with the apparel industry, and how it affects perceptions such as body image. For this research in particular, the main focus is on inconsistencies with apparel fit. Whether it be within a brand itself, or throughout the entire industry, this is a problem many women face whether it be online or in-person shopping. If a woman is a size 4, and has not gained any weight, but tries on size 4 denim jeans, and it does not fit, this can negatively affect the woman's body image, as she could be inclined to think she has gained weight. The "weight gain" or lack thereof is simply just an inconsistent measurement. The woman could be a size 4 with American Eagle, but a size 6 in Zara. Many women encounter this issue daily, and it certainly has a noticeable effect on body image. This study aims to survey women between the ages of 19 to 59 about their experiences and attitudes towards shopping and apparel fit. It is hypothesized that when experiencing inconsistent sizing measurements in apparel, women are more likely to experience negative feelings about their body image. Through the process of online surveying, it is hoped that there will be a more in depth understanding of how inconsistent sizing in clothing apparel affects women's satisfaction with their own body image.

053
Name: Hogue, Walter
Major: Landscape Architecture
Faculty Advisor, Affiliation: Dr. SaMin Han, Landscape Architecture
Project Category: Arts and Humanities (Poster)
Co-Author(s): Rachel Nobles

Resilient Marine Systems in Biscayne Bay

Globally, sea-level rise and the ever-increasing frequency and intensity of coastal storm-surge have increased the infrastructural, geological, and ecological vulnerability of many coastal cities. Miami, FLis recognized as the foremost of these target communities (Han & Mozumder, 2022; Tompkins & Deconcini, 2014). This study seeks to analyze the infrastructural and ecological vulnerabilities of Miami-Dade County's marine systems. Through the literature review on ecological report cards for the Miami Bay region and analyses of the county's shoreline and bathymetric changes, this study targets two vulnerability factors: 1) the marine and coastline systems of Miami and 2) the dredging of Miami Bay and urban runoff, Both have facilitated the removal of ecological shoreline protections, which serve as natural systems of storm-surge attenuation, tidal flood absorption, and shoreline stabilization (Miami Dade County, 2020; Banks et al., 2007; Scyphers et al., 2011). We also conducted a vulnerability analysis of Miami-Dade County. This research includes overlaying a bank of endangered species maps, storm-water infrastructural density maps, FEMA evacuation routes, storm surge vulnerability maps, and elevation data, and creating the overall vulnerability index map which spatially quantified vulnerability from 1 to 15. The results of the GIS vulnerability index display a higher density of combined vulnerability within the North Bay area of Miami, especially along the Biscayne Bay peninsula. In response to the literary and GIS analysis, we propose an adaptive framework to achieve ecological and infrastructural resilience in the North Biscayne Bay. A three-pronged living-shoreline design strategy, composed of an ecotone of salt-water marshes, sea-grass communities, and oyster reef borders, not only makes a heathier marine habitat, but also builds a more resilient structure for the coastal communities. This design strategy hopes to provide a tailorable toolset for addressing Miami's varying vulnerabilities.

018
Name: Hollingsworth, Jesse
Major: Electrical Engineering
Faculty Advisor, Affiliation: Vuk Marojevic, Electrical and Computer Engineering
Project Category: Physical Sciences and Engineering
REU/Research Program: AERPAW
Other Competition(s): Community Engagement Research Track

AERPAW (Aerial Experimentation and Research Platform for Advanced Wireless)
The AERPAW project is creating a new type of aerial platform that will help speed up the integration of drones into the national airspace. The platform will also enable new, advanced wireless features for drones, such as flying base stations for hot spot wireless connectivity. As part of this effort, AERPAW is developing a software-defined, reproducible, and open-access advanced wireless platform with experimentation features spanning 5G technologies and beyond. The AERPAW platform is a system that uses both drones and 5G technology to help improve communication and connectivity. Drones are used to provide increased coverage and connectivity for 5G, while 5G provides improved signals and location data for drones. This system can be especially helpful in emergency situations, like after a natural disaster, when traditional cellular networks may be damaged. This gives both first responders and the victims ways to communicate or use important tools. Some other use cases are mobile nodes for traditional vehicles, like cars and buses, to communicate during autonomous driving and even reduce accidents. With the speed capabilities of 5G and the portability of drones and ground vehicles, the AERPAW platform is unlocking a new chapter in wireless communications.

072
Name: Holt, Eleanor
Major: Psychology
Faculty Advisor, Affiliation: Dr. Cliff McKinney, Psychology
Project Category: Social Sciences

Parenting and Emerging Adult Sexual Health: The Impact of Parental Religiosity and Relationship Quality on Risky Sexual Behavior
In the Southern United States, where religiosity is higher than other parts of the country, many researchers have questioned if the religiosity of parents plays a role in emerging adults' risky sexual behavior (RSB). Specifically, research suggests that certain aspects of religiosity (i.e., conservatism) are especially detrimental when examining RSB. In the current study, college students (N = 585, 65.5% women, 69.2% White, 25.0% Black) completed self-report measures on parental religiosity (Stearns-McKinney Assessment of Religious Traits – Short Form; Stearns & McKinney, 2018), parent-child relationship quality (Parental Environment Questionnaire; Elkins et al., 1997), and RSB (Student Sexual Risks Scale; DeHart & Birkimer, 1997). It was hypothesized that 1) parent-child relationship quality would associate negatively with RSB, 2) that maternal effects would be stronger than paternal effects, and 3) parental conservative religiosity would associate positively with RSB, whereas other aspects of parental religiosity (i.e., private, coping, social, conviction) would associate negatively with RSB. Results of path analysis (reported statistics have $p < .05$) indicated that maternal relationship quality had a significant negative association with RSB in emerging adult women, β = -.27, and men, β = -.20; paternal relationship quality also associated negatively with RSB in women, β = -.12, and men, β = -.20. Of all the parental religiosity variables, only maternal conservatism had a significant effect, where it demonstrated a positive association with RSB in women, β = .34, and men, β = -.20. These results suggest that parent-child relationship quality and maternal conservative religiosity influence emerging adult RSB. This study presents novel insight into the specific aspects of parental religiosity that, at least in the current study, are found to influence RSB.

073
Name: Hubbard, Kara
Major: Biological Sciences/Biological Sciences
Faculty Advisor, Affiliation: Danielle Nadorff, Psychology
Project Category: Social Sciences
Co-Author(s): Acacia Lopez
REU/Research Program: Grandfamilies Lab

Adverse Childhood Experiences and BMI in Custodial Grandchildren

The Adverse Childhood Experiences Survey (ACEs) screens for ten emotionally distressing events that occur in childhood that have been shown to have lasting impacts on the child's health and life opportunities. Literature suggests that a safe and stable relationship with an adult moderates the relation between ACEs and negative outcomes. Grandchildren raised by their grandparents ("custodial grandchildren") are at an increased risk for adverse life events, as they are frequently removed from the home of their biological parent due to traumatic circumstances such as death, or incarceration of their biological parent. Presently, there is scant research on the impacts of ACEs on physical health in custodial grandchildren. This study aimed to investigate the role of family relationship quality as a moderator on the relation between ACEs and custodial grandchildren's body mass index. This study utilized the publicly accessible 2019-2020 National Survey of Children's Health (NSCH) dataset which surveyed 771 grandparent-headed households nationwide. Grandparents completed self-report measures on themselves as well as their grandchildren (*M* age = 9.69, SD = 4.87, 53.1% male, 55.2% White), including the ACEs; height and weight of child; and questions on communication within the family, which were used as a proxy to assess secure and stable relationships. Moderation analyses were run using SPSS Process Macro v3.5. The results did not support moderation, but subsequent exploratory independent t-tests revealed that compared to their same-aged peers, custodial grandchildren had significantly higher numbers of ACES, $t(1581.98) = -30.04$, $p < .001$, as well BMI, $t(1093.20) = -8.22$, $p < .001$. Additionally, grandparent-headed households reported significantly lower resiliency, $t(2177) = 5.59$, $p < .001$. Future research should utilize measures with valid psychometric properties to assess resiliency, including measures that may assess attachment or relationship quality between child and caregiver to better understand these variables in this population.

074
Name: Issac, Ania
Major: Psychology
Faculty Advisor, Affiliation: Kathleen Ragsdale, Social Science Research Center; Mary Read-Wahidi, Social Science Research Center
Project Category: Social Sciences
REU/Research Program: Division of Access, Diversity, and Inclusion; Office of Research and Economic Development; Social Science Research Center (Gender Impacts Lab)

Fish Consumption & Nutrition Among Women & Young Children in Zambia & Adjacent Countries: A FishFirst! Zambia Literature Review

Funded by USAID and Feed the Future Fish Innovation Lab, FishFirst! Zambia's goal is to better understand how gender and related disparities within the smallscale fishery value chain impacts men and women differently in order to help transition rural households towards better food security, nutrition, and economic development. To help achieve this goal, we conducted a systematic literature review focused on Zambia and adjacent countries to explore three research questions: 1) What fish types are consumed by pregnant and lactating woman (PLW) and infants and young children (IYC) ages 6-23 months in Zambia and adjacent countries?, 2) How is fish linked to nutrition among these two populations?, and 3) What form of fish is typically consumed by these two populations? Online databases such as PubMed and HINARI were used to find supporting articles published between 2008-2021. Key search terms such as "fish in diets" and "pregnant" were used to narrow the search. A national study found that 35% of children in Zambia under 5 years are stunted, 12% are underweight, and 4% are wasted, which is cause for concern. However, another study found evidence that IYC who consumed fish were within the normal range of height-for-age z-scores [HAZ] (i.e., were non-stunted). In a study among IYC and PLW in Lusaka, Zambia, 90.5% of PLW had consume fish and 33.1% of IYC had consumed an animal source food (ASF) in the past 24 hours. In fact, fish was the most consumed ASF for IYC in Zambia (25.9%) and Malawi (22.7%) and PLW

in Ghana consumed fish at 5-7 meals a week. Fresh and dried fish were the most frequently consumed, as compared to smoked or salted fish. These data highlight the importance of fish on the nutritional status of IYC and PLW in Zambia and adjacent countries.

075
Name: Jarratt, Ryan
Major: Political Science/Philosophy
Faculty Advisor, Affiliation: Dr. Benjamin Tkach, Political Science and Public Administration
Project Category: Social Sciences

Extinguish the Spark: Mass Protests as a Determinant of Journalist Killings, 1992-2020
Previous research indicates that civilian mass mobilizations in protest of the government can have profound negative effects on a state's ability to govern. The most prevalent news sources in most localities are still traditional journalistic television and print publications. Citizens rely upon journalists to track state abuse, misdeeds, and corruption, which affects when citizens mobilize against the state. The occurrence of protests, especially those involving protestor violence and lethal government responses, can seriously threaten a political regime and border on a civilian uprising. I contend that more frequent mass mobilizations in a state motivate the government to adopt a more preventative stance towards future protests. I argue that governments aiming to prevent a population from being driven to mobilize may deploy lethal measures against journalists in order to decrease information flow and prevent informed citizen mass mobilizations. I assert that states which experience more civilian mass mobilizations are more likely to engage in the extra-judicial killing of journalists as a means of attempting to limit future anti-state protests. Comparing motive-confirmed journalist killings between 1992 and 2020 with data detailing civilian mass mobilization events over the same time period, I show that when mass mobilizations occur in which protestors are killed by government authorities, the state is more likely to kill journalists in the immediate future. This adds to a growing literature detailing factors that forecast violence against journalists and sheds light on the methods by which governments take action to suppress information from the populace.

150
Name: Jessup, Ainsley
Major: Food Science & Technology
Faculty Advisor, Affiliation: Dr. Shecoya White, Food Science, Nutrition, and Health Promotion; Dr. Juan Silva, Food Science, Nutrition, and Health Promotion
Project Category: Biological Sciences and Engineering
Co-Author(s): Jailyn Smith
REU/Research Program: Undergraduate Research Scholars Program

Efficacy of Natural Coatings on Salmonella Spp. Persistence on Reusable Plastic Containers
Fresh berries are one of the most susceptible food products on the market to pathogen contamination due to lack of a kill step and being consumed raw. During the post-harvest process the berries go directly into reusable plastic containers (RPCs), however, without proper sanitation between each RPC usage, produce is susceptible to cross-contamination and transfer of microorganisms from batch to batch. In this study, RPC coupons were coated with a chitosan-, essential oil-, or chitosan/essential oil-based coating to determine *Salmonella spp*. persistence. The treatments were sterile water (control), 1% chitosan only, 1% carvacrol only, and 1% chitosan + 0.5% carvacrol. They were then inoculated with a *Salmonella spp*. cocktail (3 log CFU/RPC) and stored at ambient temperature. At 0, 4-, 8-, 12-, and 24- hours RPCs were placed in sterile bags with buffer to release any microorganisms present. Serial dilutions were performed and plated on XLD, *Salmonella* selective media. The results showed that after 12 hours, all treatments proved to be bactericidal, preventing Salmonella persistence or biofilm formation on the RPCs. This was further confirmed with *Salmonella* enrichment broth Rappaport Vassiliadis broth (R.V.). This study demonstrated that *Salmonella* could persist on untreated RPC surfaces and can potentially transfer to berries. These coatings could potentially be used as an antimicrobial coating for reusable plastic containers in the food industry to address pathogenic transfer via cross-contamination from containers to berries.

019
Name: Jesuraj Vijayakumar, Ajay
Major: Aerospace Engineering
Faculty Advisor, Affiliation: Dr. Shreyas Narsipur, Aerospace Engineering
Project Category: Physical Sciences and Engineering
Co-Author(s): Rob Wolz, Megan Dalton, Sneh Patel, Bibek Sapkota
REU/Research Program: Aerospace Engineering

Deriving Drag from the Deficit of Momentum
The goal of the project is to be able to calculate the drag created by a structure placed in the Aerospace Department's wind tunnel. This can be accomplished by finding the difference in momentum of airflow in front of and behind the structure. To facilitate this process, the team needs to establish an operational 3-D Traverse System. The Traverse System includes a Wake Rake, containing multiple pressure sensors, allowing experimenters to collect pressure data. From the pressure data, momentum is calculated. The loss in momentum of the airflow will provide a drag profile for the body. A LabVIEW code was also developed to assist with the motion of the Traverse System. Having determined the functionality of the complete system, it would help experimenters to be able to make full use of the wind tunnel.

151
Name: Johnson, Benjamin
Major: Biological Engineering
Faculty Advisor, Affiliation: S.D. Filip To, Agricultural and Biological Engineering
Project Category: Biological Sciences and Engineering
Co-Author(s): Anna Marie Clay

Using behavior analysis to evaluate an appropriate impact threshold for a mild traumatic brain injury on a rat model.
Mild traumatic brain injury (mTBI) is a generic form of head injury seen in patients across the United States. These injuries cause complications with both physiological and psychological health, however of the estimated 1.4 – 3.8 million Americans who suffer from an mTBI, only roughly 25% of patients seek medical treatment (Laker, 2011). There have been several animal models used to evaluate an mTBI including a fluid percussion injury, cortical impact injury, weight drop impact acceleration injury, and blast injury (Bodnar et al., 2019). Currently there is a gap in knowledge regarding the threshold for an mTBI using a rat model. Thus, the goal of this study was to determine the appropriate impact load (0.2J and 0.5J) to induce an mTBI using a weight drop injury device on a rat model. The behavior of rats was evaluated before and after the injury using an open field test to evaluate general locomotive activity and anxious-like behavior and a rotarod assay to assess motor coordination skills. The data obtained from these tests was compiled and evaluated for implications on the effect of mTBI on behavior. In our findings concerning general locomotive activity as well as motor coordination, no evidence of deficit was found after recovery post-impact. There was, however, a significant difference in anxiety level found in injured rats at seven days post impact. Overall, our results suggest that the investigative impact loads, 0.2J and 0.5J, produce evidence of anxious-like behavior that is typically seen following an mTBI.

152
Name: Jones, Sophie
Major: Biological Engineering
Faculty Advisor, Affiliation: Lauren Priddy, Agricultural and Biological Engineering
Project Category: Biological Sciences and Engineering
Co-Author(s): Luke Nichols, Alexis Graham, Kamryn Clymer, Lisa Yang
REU/Research Program: Office of Research and Economic Development Research Grant and Bagley Undergraduate Research Stipend
Other Competition(s): Community Engagement Research Track

Advancement of Methods for Quantifying Osteogenesis in Static and Dynamic Culture

Integration of an implant with bone tissue is critical for long-term implant function. By measuring growth and osteogenic differentiation of preosteoblast cells, one can design implants that more effectively osseointegrate with the surrounding bone. To quantify the impact of dental implant surface modification on osteoblast differentiation, an alkaline phosphatase (ALP) assay was developed. Alkaline phosphatase is the most widely recognized biochemical marker for osteoblast activity. In this study, various concentrations of osteogenic stimuli were tested to determine their effects on preosteoblast differentiation. Ten nM of dexamethasone and 10 mM of beta-glycerophosphate led to the greatest extent of preosteoblast differentiation. While the ALP assay is an effective method of quantifying osteogenic differentiation in static culture, a dynamic perfusion bioreactor is an in vitro device that can more closely mimic a biologically active environment. In particular, the perfusion of media through the bioreactor will provide enhanced delivery of oxygen and nutrients to the cells, and compressive loading will replicate loads applied to bone in vivo. The design and construction of a bioreactor are underway and several prototypes have been created. The chamber is clear polycarbonate, which allows sterilization and view of the bone explant. The compression rod and disc are stainless steel, and tubing for perfusion will be platinum-cured silicone to allow for gas exchange. A flow rate of 1 mL/min with closed media exchanges using a peristaltic pump will be employed. The loading regime will be 1500-3500 microstrain. A pilot study was performed to identify coring, cutting, and imaging methods for preparation and evaluation of pig bone explants (10 mm diameter by 7-10 mm high). The bioreactor will be expanded to include multiple chambers for more high-throughput testing. The bioreactor and the ALP assay are essential tools to provide more accessible, cost-effective models of osteogenesis prior to testing in vivo.

076
Name: Kalchbrenner, Rachel
Major: Psychology
Faculty Advisor, Affiliation: Danielle Nadorff, Psychology
Project Category: Social Sciences
Co-Author(s): Rachel Scott
Other Competition(s): Public Health Research Competition

Backgrounds Come Back Around: Fragile Families and Early Adolescent Substance Abuse

Children in fragile family homes are at an increased risk for dropping out of high school, teen pregnancy, and behavioral problems. Beyond this, family structure is an additional factor for predicting juvenile delinquency. The literature has identified children raised by their grandparents as being particularly at risk for more negative outcomes. Familial instabilities also increase a child's likelihood to use substances. The current study sought to examine if the onset age for substance use (cigarettes, alcohol, and marijuana) and family structure influences the likelihood to get in trouble at school. Participants included 4,898 adult children (aged 22) and their primary caregivers (biological mothers and grandparents) from the 6th wave of Fragile Families and Child Wellbeing Study (FFCWS). Results indicate that age of onset for tobacco, alcohol, and marijuana use were significantly correlated with trouble in school for both those raised by biological mothers and grandparents. However, there were no significant differences in the relations between substance use and trouble in school by caregiver type. These findings suggest that while children raised by their grandparents are still at an increased risk for negative outcomes associated between substance use and trouble at school, they are not at any more risk as compared to their peers who are raised by their biological parents. These findings may inform interventions within school systems and communities. Additional implications regarding early substance use as a predictor of trouble in school will be discussed.

153
Name: Kassuhn, Trinity
Major: Biochemistry
Faculty Advisor, Affiliation: Dr. Carrie Kouba, Biochemistry, Molecular Biology, Entomology, and Plant Pathology; Dr. Andy Kouba, Wildlife, Fisheries, and Aquaculture
Project Category: Biological Sciences and Engineering
Co-Author(s): Namia Stevenson, Isabella Burger
Other Competition(s): Three Minute Thesis Competition

Impact of Varying Concentrations of Bovine Serum Albumin on Fowler's Toad (Anaxyrus Fowleri) Sperm Cryopreservation

The application of sperm cryopreservation for threatened amphibian species is a valuable tool for population and genetic management as it provides long-term security against loss of alleles, genetic drift, and a decreasing gene pool. Bovine serum albumin (BSA) is a cryodiluent that has been shown to provide sperm membrane stabilization and defend against oxidative damage during the cryopreservation process in other taxa; however, due to the novelty of cryopreservation in amphibians and the variation in spermatozoa qualities between different species, it is unknown if BSA leads to higher levels of recovered sperm post-cryopreservation in these groups. This project aimed to determine the impact of different concentrations of BSA on anuran sperm motility and viability in the model organism, Fowler's toad (*Anaxyrus fowleri*). Male *A. fowleri* (n=5) were administered exogenous hormones to stimulate sperm production. Sperm was collected up to six hours post-administration and analyzed for pre-freeze motility and viability immediately after collection. Samples were then pooled and frozen in four different cryoprotectant treatments, all of which had 10% N, N-dimethylformamide and 10% trehalose, with varying BSA concentrations of 0%, 0.0625%, 0.25%, or 1%. Straws were frozen in liquid nitrogen and thawed to determine the effects of BSA on post-thaw sperm motility and viability. Results show that pre-freeze sperm had a significantly higher motility ($p<0.001$) and viability ($p=0.03$) than post-thaw sperm, yet there were no significant differences ($p>0.05$) among the post-thaw sperm values between the different cryoprotectant treatments. These preliminary results indicate that BSA, at the concentrations tested, may not influence the recovery of sperm motility or viability following the cryopreservation process, although larger samples sizes are needed to confirm these findings.

020
Name: King, Claire
Major: Aerospace Engineering
Faculty Advisor, Affiliation: Calvin Walker, Aerospace Engineering; Kyle Ryker, Raspet Flight Research Laboratory
Project Category: Physical Sciences and Engineering

Designing/Integrating an Optical Detect-and-Avoid Sensor with a Group 3 Fixed-Wing UAS and Group 1 Rotorcraft UAS

The FAA currently does not allow the operation of Unmanned Aerial Vehicles (UAVs) in Beyond-Visual-Line-of-Sight (BVLOS) conditions without special waivers. As UAVs become more widely used, regulations will likely broaden to allow for reliable sensors to detect and avoid obstacles when the pilot is not in the line of sight. This project focuses on the design and integration of mounts onboard two UAVs to hold Casia optical Detect-and-Avoid (DAA) sensors. The researcher used SolidWorks to create three designs. The first integration is fitted to the winglet of the TigerShark UAV which holds a single sensor, another holds a single sensor but attaches to the DJI Matrice 600 UAV, and the last is for the DJI Matrice 600 which holds 5 sensors with an overall 360-degree field of view. In conjunction with Raspet Flight Research Laboratory, the researcher combined several fabrication techniques to create each of the parts which included additive printing with PLA, ABS, and Onyx as well as CNC with aluminum. The next step was integrating the mounts with the aircraft after using test prints to ensure a proper fit. Finally, the researcher and the RFRL team completed structural tests and flight tests to ensure the handling qualities of the aircraft were not greatly affected by the added weight and that the software operated properly in the three new hardware setups.

154
Name: Kleitz-Singleton, Felicity
Major: Microbiology
Faculty Advisor, Affiliation: Matthew Brown, Biological Sciences
Project Category: Biological Sciences and Engineering
Co-Author(s): Alexander Tice, PhD

Exploring Vannellid Diversity Through Ecology, Development, and Phylogenomics
Amoebozoa is one of the largest groups in the eukaryotic tree and holds a rich diversity of amoeboid taxa. Despite the evolutionary importance of Amoebozoa, due to its proximity to our own lineage, we still lack a clear picture of the evolutionary relationships amongst the group due to poor sampling and incomplete sequence data. Within the supergroup, members of the Vannellidae family are among the most abundant and widely distributed amoeboid genera across marine, freshwater, and terrestrial ecosystems. Interestingly, despite their vast distribution and diverse ecological niches, vannellid species lack morphological diversity, thus making it difficult to distinguish species within Vannellidae and broadly in Amoebozoa due to undefined species concepts for asexual eukaryotes. My research focuses on further exploring the evolution and diversity of Amoebozoa as well as examining how variation in gene sequences and expression can give rise to species divergence and morphology. A framework for this amoebozoan lineage has already been constructed based on 18S small subunit sequencing, and transcriptomic sequencing will provide better resolution to the branching of species within Vannellidae. The wide ecological distribution of vannellid amoebae is evolutionarily significant and can aid in our understanding of the eukaryotic transition from aquatic to terrestrial life (or vice versa). Here we provide a detailed account of vannellids using phylogenetics and careful morphological characterization. Using this framework to understand the ecological and evolutionary divergence within the group, species pairs from freshwater and marine, terrestrial and aquatic, and fruiting and non-fruiting amoebae will be used to construct and analyze synteny of highly conserved genes to infer phylogenetic proximity. The data obtained from this research will not only give better resolution to the relationships within Amoebozoa but also potentially provide clues to how eukaryotes transitioned from aquatic to terrestrial life.

021
Name: Knight, Adonte
Major: Geosciences/Broadcast Meteorology/Climatology
Faculty Advisor, Affiliation: Andrew Mercer, Geoscience
Project Category: Physical Sciences and Engineering

An Updated Severe Weather Outbreak Ranking Methodology
Previous severe weather outbreak studies have produced work that is focused primarily on tornadoes and their impacts; however, severe weather outbreaks are much more complex and can be categorized based on their dominant mode or modes of severe weather. It is helpful to utilize previous research to establish an index that measures the relative severity of an outbreak, as well as sub-indices that rank outbreaks based specifically on these dominant modes of severe weather (e.g., tornado, wind, and hail). The most recently developed severe weather outbreak ranking scheme utilizes multiples outbreak severity measures (e.g., number of severe weather reports, number of tornado reports, etc.) with varying weights that can be tailored to specific research tasks. The goal of this project was to improve on this approach for ranking outbreaks by extending the period of record (1960 - 2019) and developing new kernel-density based outbreak domains based on specific severe weather mode. The latter of these goals was accomplished utilizing density ratios that measure the density of reports within the outbreak region for each report type. This allows for better representation of the spatial scatter of the reports. This method of ranking severe weather outbreaks through multivariate indices, along with rankings schemes reflecting each report type, will allow analysis of the synoptic scale characteristics that produce such events. Analysis of synoptic patterns using these ranking schemes allows meteorologists to better diagnose future potential outbreak severity by comparing environments with previous outbreak events with similar meteorological conditions.

022
Name: Koehler, Leon
Major: Mechanical Engineering
Faculty Advisor, Affiliation: Davy Belk, Aerospace Engineering
Project Category: Physical Sciences and Engineering
REU/Research Program: Engineering Undergraduate Research Stipend

In-Fuselage EDF Propulsion in Powered Glider-Style Aircraft
The purpose of this research is to determine the performance and viability of in-fuselage electronic ducted fan (EDF) propulsion in glider-style aircraft. Current efficient drones and gliders mostly use propeller-style propulsion. During glides, these propellers are a significant drag source, which reduces the overall efficiency and range. In this study, a mechanism will be developed that hides an EDF in the airplane's fuselage, so that doors can change the shape of the nose cone to ensure optimal aerodynamics during every flight phase, especially during glides. SolidWorks models and simulations will be used for the initial design phase. Afterward, a fully-functional model will be created. Composites like carbon fiber will be used to stiffen the mechanism, which includes two front doors that open when thrust is produced. Closed, they ensure optimal aerodynamics in the gliding flight stages. Also, foam materials will be used in the wing structure in order to ensure a light airframe. The aircraft will have a wingspan of around 2 meters, will have a retractable landing gear for independent take-offs and landings, and will weigh approximately 2-3 kilograms. Furthermore, electronics like a GPS-module and an electronic gyroscope will be installed to determine the aircraft's position and rotation, respectively. Multiple pitot-static tubes will be used to measure the air pressure at several points around the fuselage. All the data will be processed by an Arduino control board. The pressure, speed, and location data will be analyzed at distinct flight stages to determine the overall performance of the ducted fan mechanism.

155
Name: LaBelle, Kylie
Major: Wildlife & Fisheries Science/Wildlife Science
Faculty Advisor, Affiliation: Peter J. Allen, Wildlife, Fisheries, and Aquaculture
Project Category: Biological Sciences and Engineering
Co-Author(s): Manuel Coffill-Rivera, J. Wesley Neal
REU/Research Program: Undergraduate Research Scholars Program

Atlantic Tarpon Scale Ageing and Growth Analysis
Age and growth studies of fish are integral to fisheries management due to their importance in understanding recruitment, longevity, mortality, and age class distribution. These studies aid in describing population trends and guide sustainable management. Atlantic Tarpon (Megalops atlanticus) is classified as a vulnerable species on the IUCN Red List. Because this species has a large range with recreational use as a popular sportfish, there is a great need to understand population age structure. Scale ageing is a nonlethal and noninvasive ageing technique that may be useful for understanding Atlantic Tarpon age and growth. However, ageing scales from fish in tropical regions like Puerto Rico is problematic due to the lack of seasonal changes which lead to periods of slow and fast growth in temperate species. Therefore, this research project assesses the validity of using scales to age Atlantic Tarpon from the lagoon systems of San Juan, Puerto Rico. Scales were collected from of the left side ventral to the dorsal fin and dorsal to the lateral line from 95 fish. Photos were taken of each scale after rehydrating to allow scales to flatten to detect annuli. Ageing methods were standardized and compared between two readers. Image J software was used to compute the area of each scale and to measure scale radius along 3 axes. Results will be discussed in the context of fisheries management for Atlantic Tarpon in tropical fisheries.
Key words: Atlantic Tarpon, Scales, noninvasive, ageing, Puerto Rico, tropical

156
Name: Lawson, Robert
Major: Biochemistry
Faculty Advisor, Affiliation: Steve Elder, Agricultural and Biological Engineering
Project Category: Biological Sciences and Engineering
REU/Research Program: Undergraduate Research Scholars Program

Development of Electrospun Scaffold for Sustained Delivery of Kartogenin
Microfracture is a common procedure used to treat damaged areas of articular cartilage in the knee. Microfracture creates channels in the subchondral bone that allow pluripotent bone marrow stromal cells (BMSCs) to access the defect, where they become entrapped in a fibrin clot, differentiate, and give rise to cartilage. The problem with microfracture is that it gives rise to fibrocartilage instead of a more durable hyaline cartilage, which can limit the effectiveness of the treatment. A possible solution to this problem is to create a cell scaffold augmentation to microfracture that has potential for sustained delivery of kartogenin (KGN), a drug that can stimulate chondrogenic differentiation of BMSCs. Electrospinning is a process that creates a nanofibrous scaffold with an interconnected porous structure that allows BMSCs to migrate and proliferate. It is unknown how KGN affects electrospinning and vice versa. Our hypothesis is that KGN does not interfere with or become degraded by electrospinning. Nanofibrous membranes were created by electrospinning a PCL:PLGA (1:1) blend, with and without 10.2 mg of KGN per gram of polymer. We found that KGN could be loaded with 97% efficiency by measuring the optical absorbance of KGN before and after electrospinning, and HPLC-PDA analyses show that KGN released as the electrospun membrane underwent hydrolysis is approximately 90% undegraded. Scanning electron microscopy qualitatively shows that KGN does not affect the fiber morphology of electrospun scaffolds. Our results indicate that an electrospun PCL:PLGA membrane is a suitable vehicle for sustained delivery of KGN to a cartilage defect.

077
Name: Leach, Macy
Major: Agribusiness
Faculty Advisor, Affiliation: Dr. Seong Yun, Agricultural Economics
Project Category: Social Sciences
Co-Author(s): Dr. Ayoung Kim

Economic Impacts of Mississippi Beach Closures by E. Coli and HAB
Harmful algal blooms (HABs) and *Escherichia Coli* (E. Coli) bacteria are two environmental threats that frequent US coastal regions. HABs can cause massive mortalities in almost all marine life and lead to seafood poisoning upon consumption. Both HABs and E. Coli can also seriously harm humans. During serious HABs or high levels of E. Coli, fishing restrictions are applied, and seafood consumption is significantly reduced. When HABs and E. Coli become pervasive, local governments shut down beaches to limit the chance of infection. This causes significant economic losses in the major local businesses highly depending on hospitality and tourism. This study aims to analyze the severity of economic impacts caused by beach closures from HABs or E. Coli in the Mississippi Gulf Coast. Using the data from the Mississippi beach monitoring program and monthly sales tax report, we first analyzed the correlation between the frequency of beach closures and the reduction of sales tax in relevant industries. We then estimated the county-level economic damages through a panel regression. In the SAEA, we will present analytical models and their policy implications in addition to empirical results.
Keywords: beach closure, economic impact, harmful algal blooms, E. Coli

078
Name: LeBlanc, Lauren
Major: Psychology
Faculty Advisor, Affiliation: Cliff McKinney, Psychology
Project Category: Social Sciences
Co-Author(s): Allyson Russell, Abigail Kukay, Sarah Hovanec

Parent Discipline During Emerging Adulthood: A Person-Centered Approach
Although most parental discipline research examines the effects of discipline in children and adolescents, recent research has demonstrated that emerging adults continue to receive parental discipline. Importantly, a newly validated instrument for assessing discipline specifically during emerging adulthood has been created. Scales from this instrument include maternal and paternal approval, disappointment, and abuse, and these scales were associated with other parenting behaviors and psychological outcomes during emerging adulthood. However, a person-centered approach has not been conducted with this instrument. Given that discipline occurs at an idiographic level and that group norms inform such behaviors, a person-centered approach would identify highly informative emerging adult profiles based on patterns of discipline they receive from their parents. Thus, the current study utilized latent profile analysis of 1,110 participants attending a Southern United States university to identify emerging adult discipline profiles. These groups were then associated with parental and emerging adult psychological problems to gain an understanding of how these factors relate to different patterns of discipline across gender. Results best supported four profiles labeled as approving, distant, disappointed, and abusive. A large multivariate effect was observed for discipline profiles, F(30, 2745.09) = 29.53.These groups reported increasingly higher parental and personal psychological problems across approving, distant, disappointed, and abusive profiles. The interaction effects for gender were small, but it did moderate the associations that discipline profiles had with externalizing problems.

157
Name: Lee, Jacob
Major: Computer Science
Faculty Advisor, Affiliation: Sathish Samiappan, Geosystems Research Institute
Project Category: Biological Sciences and Engineering
Other Competition(s): Three Minute Thesis Competition

Analysis of soil organic carbon and percent nitrogen in Mississippi croplands using hyperspectral remote sensing and deep learning neural networks.
This work is a surface soil reflectance spectroscopy(hyperspectral) study to estimate soil organic carbon (SOC) and percent-nitrogen (%N) concentration. The objective of this research is to (1) improve on accuracy and (2) develop alternate signal representations and (3) discrete non-exhaustive search to ascertain dependencies on the band-wise estimates to SOC and %N. This research contributes to the development of remote sensing based non-invasive, accurate, rapid, and cheaper methods for estimating SOC and %N storage in agricultural ecosystems to monitor nutrients and ensure sustained plant health. Soil samples were collected from croplands across Mississippi, with 349 samples collected in total. Ground truth SOC and %N values were determined using combustion method and a dry combustion analyzer; and 3494 hyperspectral signatures were collected using a Spectral Evolution handheld spectroradiometer in the wavelength range of [350, 2500] nm using a soil probe. This study currently restricts to soil samples with SOC in [0.0, 4.0] and %N in [.05, .42]. To estimate SOC and %N, we have analyzed and compared (1) regression based (multilinear regression(MLR), support vector regression (SVR), ridge regression(RR), random forest(RF), gradient boosting(GB)) and (2) learning based (Backpropagation Neural Networks(BPP), Convolutional Neural Networks (CNN)) approaches on (a) the raw spectrum, (b) a projected representation of the spectrum using principal component analysis (PCA) and (c) Wavelet based representation of the spectrum. Further we used linear discriminant analysis (LDA) on a quantized dataset to strengthen our understanding of the dependencies. Our experiments show MLR models, RR models, SVR models yielding R^2 in [0.8, 0.9] and decision tree models, such as RF and GB, yielding R^2 in [0.85, 0.92].

111
Name: Licona Luque, Ana
Major: Art/Fine Arts
Faculty Advisor, Affiliation: Caroline Hatfield, Art
Project Category: Arts and Humanities (Oral Presentation)

Cuándo & Dónde
Furniture is a utilitarian product that we use every day. How should one approach the design of a furniture piece for it to interact in harmony with its surrounding space? What are the fundamentals of furniture design that one must follow to create a piece that kindly interacts with the human body? And finally, how can something functional like a chair reflect a creative vision? When designing seating products, I think about these questions and consider how to bring my personal taste and experience to the pieces I create. The pieces representing this research are inspired by contemporary Mexican architecture – not only the strong rectilinear design but also the materials and colors. In each work, fibers weave together to create the seat, polished hardwood creates dynamic angular forms, and bright colors highlight the design. The purpose of this research is to find harmony in furniture making and art. By creating handcrafted furniture, I have gained a better understanding of the ways furniture can enhance the human experience, contribute to an interior style, and communicate a creative voice.

079
Name: Lloyd, Haylie
Major: Psychology
Faculty Advisor, Affiliation: Dr. Jarrod Moss, Psychology
Project Category: Social Sciences

Relationship between perceived meaningfulness and gamification on intrinsic motivation for better task-performance
There is little research that addresses engaging intrinsic motivators to produce better task performance during experimental studies, with much of the prior research focusing instead on external rewards to increase motivation. The goal of this study was to examine two potential factors that target participants' intrinsic goals to motivate them to perform better. Participants completed a problem-solving task that requires building a new stick that matches a provided target stick. During the second half of the task, the problems could also be skipped. The primary measures were how long it took participants to solve problems, how many were skipped, and how many times participants triggered a reset of the problem after reaching the move limit. Participants were randomly assigned to one of four conditions: a meaningfulness condition, a game condition, a meaningfulness and game condition, or a control condition. The meaningfulness condition was meant to highlight the meaningfulness of the research and contributions to science by allowing participants to opt in to receive a video explaining the results of the study. The gamification condition added a cover story and score to the task, where solving problems added to the score. Once all problems are completed, they are then directed to a collection of surveys intended to measure individual differences that affect motivation or persistence with the problem-solving task. The results show that there were fewer resets triggered by participants in the gamification condition, and participants in this condition required fewer attempts to solve the problems. Gamifying the task improved performance by increasing the effort devoted to the problem, causing participants to trigger the forced reset less often and solve the problem in fewer attempts. Individuals who are more motivated by finding novel rewards, as assessed by one of the surveys, performed better when they were in the meaningfulness condition.

158
Name: Luke, Caitlin
Major: Mechanical Engineering
Faculty Advisor, Affiliation: Dr. Matthew Priddy, Mechanical Engineering
Project Category: Biological Sciences and Engineering
Co-Author(s): Alexis Graham, Frank Brinkley, Jaden Bennett, Cody Gressett, Micah Foster, Zach Hooper, and Lauren B. Priddy
Other Competition(s): Public Health Research Competition

Replication of cadaver TLIF procedure impact waveform in benchtop setting

Transforaminal lumbar interbody fusion (TLIF) is a surgical procedure performed on the lower spine that involves the insertion of an interbody fusion device (IFD). This procedure is commonly performed to relieve lower back pain caused by disc pathologies and requires the damaged intervertebral disc to be removed and replaced with an IFD. The IFD is inserted in the disc space through a process of malleting by the surgeon which allows for a wide range of variability among insertions. The IFD can be damaged during insertion, and it is uncertain which aspect of the insertion process causes IFD failure due to variations in malleting. Currently there is little to no data on loading conditions of the instruments used to insert IFDs during TLIF procedures that compares studies conducted using a benchtop device to the use of cadavers. In this research, a drop weight benchtop device equipped with force and displacement sensors and a testing method to replicate impact scenarios of TLIF in a cadaveric model were developed. An insertion tool, which is loaded via impaction by a mallet during TLIF, was outfitted with a force sensor for use both on the benchtop device and in the cadaver study. The goal of this research was to develop a benchtop setup capable of recreating the impact waveform generated during impaction in cadaver studies to replace the use of cadavers in this scope of testing. Four waveform features were selected for mimicking the cadavers' impact waveforms: (i) slope of the impact wave, (ii) peak force, (iii) area under the curve, and (iv) impact duration. A full cadaver study using two different cadavers was conducted to validate the benchtop device. For benchtop testing, 18 titanium IFDs of 24 mm length and either 12 mm or 14 mm height were inserted between synthetic bone material (Sawbones) via impaction with varying drop weight masses and drop heights. The average peak force from cadaver testing was nearly matched by two benchtop groups: 12 mm implant, 60 cm drop height, and both 0.75 and 1.0 lb drop weights. Additionally, the positive slope of the impact wave was consistent with that of the cadavers throughout the majority of the benchtop groups.

159
Name: Macke, Erin
Major: Wildlife & Fisheries Science/Wildlife Science
Faculty Advisor, Affiliation: Dr. Raymond Iglay, Wildlife, Fisheries, and Aquaculture
Project Category: Biological Sciences and Engineering
Co-Author(s): Erin N. Macke, Landon R. Jones, E. Cerise Mensah, Jared A. Elmore
Other Competition(s): Community Engagement Research Track

How does wind speed and flight plan influence the sound level of Unoccupied Aircraft Systems?

Unoccupied aircraft systems (UAS) are becoming more common for monitoring wildlife, but sound emitted from UAS may affect animal behavior, by disturbing animals, violating legal restrictions, and/or influencing survey results. Understanding noise levels produced by different UAS models under different environmental and flight conditions can help to mitigate this issue by providing information needed to design flights with minimal disturbance to wildlife. In this study, we measured sound emitted from 4 UAS models (DJI Phantom 3, DJI Matrice 200, DJI Matrice 300, and Autel Evo II) among different background noise levels associated with wind effects and among 8 different altitudes during 3 typical flight plans. Flight plans were conducted by hovering, passing directly overhead, and turning directly overhead at 15 meter increments up to 120 meters above ground level. We recorded the minimum and maximum decibels emitted (about 49.683 dB on average, ranging from 32 dB to78.8 dB) and wind speed (about 1.165 on average, ranging from 0 to 7.1 meters per second) for each flight. Generally, larger UAS models were louder, like the DJI Matrice 200 and DJI Matrice 300 models at similar altitudes and flight characteristics, and sometimes at different altitudes and under different wind conditions. Smaller UAS models were quieter at higher wind speeds than at lower wind speeds. Sound emitted from the UAS models varied during different flight types with louder noise levels when hovering than when simply passing overhead. Therefore, when

possible, we recommend flying smaller size UAS models at higher altitudes, taking off or hovering as far away as possible from the target wildlife, and flying when windspeeds are between 4.5-9 meters per second, to minimize disturbance to wildlife. Our results will help to minimize disturbance to wildlife when conducting UAS flights above or around them.

160
Name: Maynard, Meredith
Major: Culinology
Faculty Advisor, Affiliation: Dr. Juan Silva, Food Science, Nutrition and Health Promotion
Project Category: Biological Sciences and Engineering
Co-Author(s): Angelica Abdallah-Ruiz

The Effect of Ultra Pasteurization Temperatures on the Microbial and Sensory Shelf Life of Reduced Fat Milk
Milk typically has a minimal shelf life (~15-20 days), even after pasteurization. The most common type of pasteurization for milk in the United States is high temperature, short time pasteurization (HTST). This method heats the milk to at least 161ºF for a minimum of 15 seconds. Ultra-Pasteurization (UP) is a method that heats the milk to a temperature between 161ºF and 280ºF. At 280ºF the milk is completely sterilized, which is not always ideal. In this study, the shelf life of reduced fat milk was studied when pasteurized at conventional HTST (~170ºF, 15 sec) as compared to UP (~185F, 15 sec), stored at two temperatures (40 and 50ºF). Raw milk was collected, centrifuged to remove fat to bring it to 2%, homogenized and pasteurized (and cooled) in a HTST at the two temperatures for 15 sec. Milk from each of the treatments was bottled in half-gallon containers and stored at 40 and 50ºF. They were analyzed for Aerobic (APC) and Psychotropic (PPC), Total Coliform (TCC) and *Escherichia coli* (ECC), and Yeast and Mold (YMC) Plate Counts utilizing the respective Petrifilms™. Samples were also tested for spore-forming bacteria by heating to 78C and plated on APC and PPC Petrifilms™. The samples were also tested for *Salmonella and Listeria monocytogenes* through plating on XLD and Modified Oxford Agar, respectively. To test the quality and shelf-life of the pasteurized milks, sensory tests were conducted throughout the three weeks. The microbiological tests conducted showed that the UP milk appears to have lower plate counts due to the higher temperature they were subjected. People that tested the samples (amateurs and experts) did not appear to find differences in the quality of the two milk samples. This shows that Ultra-Pasteurization can be used to extend the shelf-life of milk without affecting the sensory characteristics.

080
Name: McCain, Ashlynn
Major: Psychology
Faculty Advisor, Affiliation: Dr. Cliff McKinney, Psychology
Project Category: Social Sciences
Co-Author(s): Alisson Lass, M.S., Amanda Collins, M.S., Colton Watson, B.S., Julie Miller, Dr. E. Sam Winer
REU/Research Program: Undergraduate Research Scholars Program, Shackouls Honors College Research Fellowship

The Influence of Loneliness, Objectification, and Social Media Usage on Eating Disorder Symptoms
Objectification theory (Frederickson & Roberts, 1997) posits that women in Western societies are sexually objectified, both in person and through media. Exposure to the body ideal has been linked with body surveillance, body shame, and symptoms of eating disorders (ED) in previous studies. The purpose of this study is to determine how feelings of loneliness and social media usage impact ED symptoms through the mediating variables of exposure to the body ideal, body surveillance, and body shame. Both men and women were sampled to better understand how objectification theory applies across genders. Participants (N = 376) were recruited through Amazon MTurk. Participants completed the Social and Emotional Loneliness Scale for Adults (SELSA-s; Cramer et al., 1999), the Body Surveillance subscale and Body Shame subscale of the Objectified Body Consciousness Scale (OBC; McKinley & Hyde, 1996), the Eating Disorder Examination Questionnaire (EDE-Q; Fairburn & Beglin, 2008) and a question about time spent on social media per day. Loneliness within women had a significant indirect effect on ED symptoms, primarily through body shame. Body surveillance also served as a significant, albeit weaker, pathway from loneliness to ED symptoms (β = .16, p < .01.). Given these results, treating women's loneliness may also improve their ED symptoms. Within our male sample, a significant indirect effect was found between social media usage and ED symptoms through body shame (β = .15, p < .01.). Therefore, minimizing time on

social media may improve ED symptoms in men. Body weight/body shape social media exposure had a significant indirect effect on ED symptoms through body shame for men (β = .16, p < .01.), and both body shame and surveillance in women (β = .18, p < .01.). Inferentially, restricting the type of media consumed may improve eating disorder symptoms across genders.

161
Name: McCrory, Abbey
Major: Physical Education/Kinesiology
Faculty Advisor, Affiliation: Harish Chander, Neuromechanics Laboratory, Department of Kinesiology
Project Category: Biological Sciences and Engineering

The impact of noise interference and fatigue on simple and choice response times
Performance, vigilance, and efficiency of any task that involve cognition, concentration, and attention will be negatively affected with the presence of noise, which is seen as a distractor and a stressor, especially in hazardous occupational environments. The addition of musculoskeletal fatigue that commonly accompany occupational work, to noise interruption can further elevate risk and compromising the safety of the worker. The purpose of the study was to investigate the impact of both individually and a combination of a noise interference and a physical workload on simple and choice response time tasks. Sixteen healthy male and female participants [age: 20 ± 1 years; height: 169.48 ± 8.2 cm; weight: 67.93 ± 12.7 kg] performed a simple (SRT) and choice response task (CRT) with three Blazepod™ light response time system by striking with the dominant lower extremity from a seated position (single-task), and while listening to noises from a construction site [65-85dB] (dual-task) through headphones. Participants then performed a low intensity musculoskeletal fatigue task and completed the above measures again. Response times (RT) (ms) from three trials of SRT and CRT, both without and with noise interference, before and after the workload were averaged and a 2 × 2 repeated measures ANOVA was performed using JASP at alpha level of 0.05. Results revealed significant difference in both SRT (p = 0.009) and CRT (0.002). In SRT, RT was significantly faster during post-fatigue measure, suggesting a learning effect improvement rather than a negative fatigue effect. In CRT, RT was significantly slower due to noise interruption, negatively impacting performance, especially in a more challenging CRT compared to SRT. Thus, findings from the current study suggest that noise interruption is significant when the complexity of the response task is greater and that learning effects persist that may influence response time performances.

081
Name: McElreath, Lillian
Major: Educational Psychology
Faculty Advisor, Affiliation: Sareh Karami, Counseling, Educational Psychology, and Foundations
Project Category: Social Sciences

Speech Therapy for ASD: Funding, Curriculum, Potential for Success
Creativity is an essential factor in learning and success, and those with speech abnormalities can have issues implementing creativity in their learning. It is important to be able to adapt and be creative in many aspects of learning. Some examples include problem solving, communication, memory, motivation, and relationship building. In individuals with autism spectrum disorder (ASD), research has shown that there are deficits in Private Speech, which is an essential factor in executive functioning. The literature shows that the use of language is thought to serve a self-regulatory function, which can be an important factor in effectively expressing ideas. State-to-state, different supports are provided to individuals with autism, and states lacking specific mandates that provide therapy and support to this population could be hindering the success of a growing population. In addition, some masters programs may be neglecting to offer courses that comprehensively cover ASD, creating an issue of unprepared clinicians. This paper is intended to assess the funding provided for individuals with ASD and how college curriculums are adapting to serve a growing population. In addition, this paper compiles literature outlining the importance of creativity in gaining knowledge and how speech intervention can encourage self-efficacy and creativity in students with autism.

082
Name: McLain, Anna
Major: Educational Psychology
Faculty Advisor, Affiliation: Hallie Smith, Counseling, Educational Psychology, and Foundations; Hailey Ripple, Counseling, Educational Psychology, and Foundations
Project Category: Social Sciences
Co-Author(s): Mary Charles Bounds, Zoe Smith
REU/Research Program: Pediatric Feeding Disorders Lab
Other Competition(s): Community Engagement Research Track, Three Minute Thesis Competition

Evaluation of a Levels System to Address Food Refusal in Adolescences

A levels system includes a combination of behavioral strategies with the goal of increasing appropriate behaviors and decreasing problem behaviors (Bauer et al., 1986; Hagopian et al., 2003). Specifically, a predetermined behavioral criterion is set, and the participant is assigned to a specified 'level' allowing access to or restriction of a variety of reinforcers based on their ability to meet the criterion. While the use of levels systems has been explored to target various problem behaviors, they have not been evaluated in isolation for the treatment of food refusal. Participants in the current study were a typically developing 11-year-old and a 16-year-old female with high functioning autism spectrum disorder. Both participants presented with food selectivity and consistently consumed small volumes of food during structured mealtimes. Single case design methodology was used to evaluate effects of treatment; specifically, a reversal design was used. During baseline, both participants consumed a low and variable amount of the meal presented to them and during treatment, consumption increased to high and stable levels. Results indicated that a levels system can be used in isolation to address food selectivity and food refusal for adolescents. These findings add to the research on the treatment of feeding difficulties and demonstrate an effective treatment option for adolescents who present with food selectivity and food refusal.

083
Name: Meng, Clare
Major: Human Sciences/Human Dev & Family Studies
Faculty Advisor, Affiliation: Dr. JuYoung Lee, School of Human Sciences
Project Category: Social Sciences
Co-Author(s): Claire Allen, Aubrey Diefenthal, Abby Klutts

The Influence of Adverse Childhood Experiences (ACES) on Depression and Fear of Intimacy in Young Adults

This research examines the effects of childhood maltreatment on college males' fear of intimacy and depression. Previous research has not geared this question towards college students, specifically males. The survey will be conducted among males who are 18 to 25 years old in the United States. It is hypothesized that there will be a positive correlation between adverse childhood experiences (ACES) and depression/anxiety. Secondly, it is hypothesized that there will be a positive correlation between adverse childhood experiences and fear of intimacy. The last hypothesis is that there will be a positive connection between fear of intimacy and depression/anxiety. Participants were recruited from adults ranging from 18-25 years old and completed self-report measures on Qualtrics of the Adverse Childhood Experiences Questionnaire, Hamilton's Depression Rating Scale, and Fear of Intimacy Scale.

162
Name: Mensah, Cerise
Major: Wildlife & Fisheries Science/Wildlife Science
Faculty Advisor, Affiliation: Landon Jones, Wildlife, Fisheries and Aquaculture
Project Category: Biological Sciences and Engineering
Co-Author(s): Jared Elmore, Raymond B. Iglay, Kristine O. Evans, Morgan B. Pfeiffer, Bradley F. Blackwell
Other Competition(s): Community Engagement Research Track

Heating animal decoys for thermal UAS surveys

Unoccupied aircraft systems (UAS or drones) can be an effective way to survey and monitor animal populations. Thermal cameras mounted on drones can improve detection of cryptic species. However, few studies have quantified bias and accuracy of animal counts from thermal images. Conducting surveys with known numbers and locations of animal decoys has been effective in assessing bias and accuracy in UAS studies with visual images but presents difficulties for thermal images. For decoys to be visible in thermal images and accurately represent live animals, they must be heated to temperatures that realistically mimic live animals. We used five media (heated water, foot warmers, and electric heaters, blankets, and socks) to heat animal decoys to mimic body temperatures and appearance in thermal images of three common animals of North America [rock pigeon (Columba livia), Canada goose (Branta canadensis), white-tailed deer (Odocoileus virginianus)] representing three sizes (small, medium, large, respectively). Rock pigeon decoys filled with heated water best mimicked realistic temperatures in thermal images. Canada goose decoys were best heated with a small electric heater in the body and an electric sock in the head cavity. White-tailed deer decoys were best heated with a medium-sized electric heater placed in the body cavity and by filling the hollow leg cavities with heated water. Our results can be applied to realistically mimic live animals of these and other species in thermal images. Wildlife researchers can then conduct thermal decoy surveys to quantify bias and accuracy of animal counts from thermal images collected by UAS or other methods.

163
Name: Mentges, Hunter
Major: Wildlife & Fisheries Science/Wildlife Science
Faculty Advisor, Affiliation: Brian Davis, Wildlife, Fisheries, and Aquaculture
Project Category: Biological Sciences and Engineering
Co-Author(s): J. Taylor Gibson, Ishab Poudel, Pratima Acharya Adhikari
REU/Research Program: URSP

Eggshell Strength in Three Cavity-Nesting Ducks in Mississippi

Wood ducks (*Aix sponsa*), hooded mergansers (*Lophodytes cucullatus*), and black-bellied whistling ducks (*Dendrocygna autumnalis*) are sympatric secondary cavity-nesting duck species in the southeastern United States. Interspecific clutches are common, eggs accumulate in nests from parasitic laying, and strife between females may occur, potentially subjecting eggs to breakage. Understanding the durability of eggs of these species is important for explaining variation in nest and egg hatching success. Our prediction was that eggshell breaking strength (EBS) of hooded merganser eggs would be the greatest among the three species. We collected a total of 67 fresh eggs of the species from nest boxes at two sites in Mississippi in spring-summer 2021. We measured eggshell strength using an Instron Universal Testing Machine (Model 3345; Instron Inc., Norwood, MA) and eggshell thickness using a micrometer (Ames, IA). We measured EBS (Newtons) at the equators of all eggs. We used Tukey's pairwise comparison to test for differences in eggshell strength among species. Mean EBS differed among all species ($P < 0.0001$) and was greatest in hooded merganser, followed by black-bellied whistling duck and wood duck. The EBS was 120.05 (SD = 12.03, $n = 7$) for hooded merganser, 52.44 (SD =10.04, n=30) for black-bellied whistling duck, and 32.95 (SD =3.90, $n = 30$) for wood duck. Eggs of hooded merganser had the highest EBS, likely attributed to greater eggshell thickness among these species. Our results are preliminary, and further analyses will explore if eggshell strength correlates inversely with egg breakage in our study, and we will investigate mineral composition of eggshells for the three species.

084
Name: Miles, Randa
Major: Human Sciences/Human Dev & Family Studies
Faculty Advisor, Affiliation: Dr. JuYoung Lee, Human Sciences
Project Category: Social Sciences
Co-Author(s): Lessley Dooley, Leigh Kathryn McDaniel, Termara Roberts

The Effects of Parenting Styles on Different Aspects of Mental Health
Parents play an important role on the development of a child's mental health. In this research study, the focus is on how each parenting style affects the mental health of a child into adulthood—specifically depression, anxiety, and body dysmorphia. This research study will utilize the BSIQ-SF scale, Depression, Anxiety Stress Scale (DASS-21), and Child Report of Parent Behavior Inventory (CRPBI) scale. These results will be used to better understand the full extent of a parent's influence on mental health development, and how it has affected their children's view during their young adult life. The BSIQ-SF scale will analyze how the young adult participants perceive their own bodies. The DASS-21 scale will measure the participants anxiety and depression, and the CRPBI scale will measure the parental support the participants believe they had growing up. The results of each scale will determine the relationship between each parenting style, and how each parenting style has either negatively or positively affected the development of their child's mental health into their adult life. By combining the results of these scales, there will be a better understanding on what parenting style adjustments need to be made in order to strengthen and improve the mental health and development of future generations.

164
Name: Miller, Hannah
Major: Biochemistry
Faculty Advisor, Affiliation: Dr. Hongxu Dong, Plant and Soil Sciences
Project Category: Biological Sciences and Engineering
Co-Author(s): Lovepreet Singh, Geoff Lalk
REU/Research Program: Undergraduate Research Scholars Program (URSP)

Assessment of Genetic Diversity in Bermudagrass (Cynodon spp.)
One major barrier for cultivar development in bermudagrass (*Cynodon* spp.) is the limited information regarding genetic diversity in this genus. To solve this issue, 206 germplasm accessions with worldwide origin were obtained from USDA-National Plant Germplasm System, Oklahoma State University, and Mississippi State University to form a diversity panel. This germplasm panel comprises of two species that are commonly used in turfgrass breeding: Common bermudagrass (*C. dactylon* var. *dactylon*) and African bermudagrass (*C. transvaalensis*). DNA libraries of 206 bermudagrass accessions were constructed using the ApeKI genotyping-by-sequencing (GBS) procedure and sequenced on an Illumina Novaseq SP platform with 101 bp single end reads. The total number of reads generated was 600,380,494, with an average of 2.9 million reads per sample. With a minor allele frequency of 0.05 and a minimum call rate of 0.5, a total of 37,496 raw single nucleotide polymorphisms (SNPs) were called *de novo* using the UNEAK pipeline of TASSEL 3 standalone. Phylogenetic study grouped these 206 accessions into three groups, with one group consisting of *C. transvaalensis* and *C. dactylon* of African origin, and two other groups of *C. dactylon* of various geographic origins. This is consistent with the results of Bayesian clustering model in Admixture which also revealed three major clusters (K=3). This study provided novel insights into the genetic diversity in the *Cynodon* genus.

085
Name: Miller, Julie Anne M.
Major: Psychology
Faculty Advisor, Affiliation: Dr. Cliff McKinney, Psychology
Project Category: Social Sciences
Co-Author(s): Amanda C. Collins, Ashlynn McCain, J. Colton Watson, E. Samuel Winer
REU/Research Program: Shackouls Honors College Research Fellowship

Investigating Loneliness as a Potential Moderator of the Relation between Fear of Happiness and Anhedonia
Previous research has demonstrated a positive relationship between anhedonia and loneliness (Heinrich & Gullone, 2006; Tan et al., 2020). Reward devaluation theory (RDT) suggests that depressed individuals may devalue, fear, or avoid happiness due to it being associated with negative outcomes (Winer & Salem, 2016). If an individual is fearful of happiness (FHS), they may devalue situations that typically increase positive affect. Loneliness may impact the relationship between FHS and anhedonia. Thus, the current study examined the relationship between FHS and anhedonia and whether loneliness moderated this relationship. We had three hypotheses: FHS would be positively correlated to (1) anhedonia, and (2) loneliness, and (3) loneliness would moderate the relationship between FHS and anhedonia. Participants (N=369) completed the Short Version of the Social and Emotional Loneliness Scale for Adults (SELSA-S; DiTommaso et al., 2004), the Specific Loss of Interest and Pleasure Scale (SLIPS; Winer et al., 2014), the Fear of Happiness Scale (FHS; Gilbert et al., 2012) online via Amazon MTurk. Hypotheses 1 and 2 were supported: FHS was positively correlated with SLIPS, $r(369) = .52$, $p < .001$ and SELSA-S, $r(369) = .33$, $p < .001$. Results from the moderation suggest significant main effects of FHS, $b = .47$, CI [.36, .57], $t = 8.64$, $p < .001$, and SELSA-S, $b = .22$, CI [.17, .27], $t = 9.30$, $p < .001$, on SLIPS. However, contrary to our third hypothesis, SELSA-S did not moderate the relationship between FHS and SLIPS. Our findings suggest that FHS is independently positively related to both anhedonia and loneliness. Loneliness did not moderate the relationship between FHS and anhedonia, suggesting that FHS may be an important factor in the development and maintenance of anhedonia. Thus, for individuals who devalue positive emotions, the extent to which one feels lonely does not buffer against experiencing anhedonia.

086
Name: Millet, Malerie
Major: Educational Psychology
Faculty Advisor, Affiliation: Kasia Gallo, Counseling, Educational Psychology, & Foundations; Jianling Xie, Counseling, Educational Psychology, & Foundations
Project Category: Social Sciences
Co-Author(s): Piper Doherty, Kristieona Epting, Lucy Brake, Jessie Sloan.

Emergency Pivot to Online Instruction of Writing-Heavy Courses Highlights Self-Efficacy of University Faculty
In the wake of the COVID-19 pandemic, universities pivoted to online learning. This posed multiple challenges to faculty. In this qualitative study, we investigated self-efficacy, problem-solving approaches, and motivation of faculty who teach junior/senior level professional writing courses across multiple disciplines at MSU. Writing-heavy courses are difficult to teach online because they require live demonstrations and interaction between the instructor and students.
The following questions guided our study: 1) What tools and resources have instructors leveraged to switch from traditional to online teaching of professional writing courses? 2) How have professors adjusted their writing courses to address course-specific characteristics? and 3) What have professors learned from this experience, about themselves and their course, that was useful at that time and will be useful in the future? We conducted 19 semi-structured interviews with faculty from MSU's six academic colleges. Participants were interviewed via WebEx during summer of 2021. Our analysis consisted of first and second cycle coding to understand participants' experiences. All participants adopted problem-focused coping strategies by seeking out university-provided or external training. All participants were mastery-oriented and quickly learned new skills and increased their understanding of effective distance education. Most participants maintained the integrity of courses by only minimally changing the assignments. Faculty became aware of the students' digital divide and worked to accommodate students' online learning needs. Lastly, all participants believed that emergency online teaching increased their professional self-efficacy by: (a) forcing them to learn new instructional strategies, (b) making them seek strategies to foster ALL students' engagement, and (c) helping them grow as educators.

Our study highlights face-to-face faculty who “bent but did not break” when pivoting online. Participants of our study were overall proud of their pedagogical outcomes during this trying time. It would be interesting to hear from those who felt unsuccessful.

087
Name: Mitchell, Mary
Major: Industrial Engineering
Faculty Advisor, Affiliation: Ben Porter, Psychology
Project Category: Social Sciences
REU/Research Program: Shackouls Honors College Research Fellowship
Other Competition(s): Public Health Research Competition

The Association Between Mental Health and Preventative Regulation Over COVID-19
COVID-19 is a worldwide pandemic that has caused wide-spread actions taken by governments all around the world to slow the spread. During COVID-19, mask mandates, gathering bans, closing of bars, and stay at home orders were all government regulations in the United States that differed by location. Government regulation could have caused a rise or decrease in anxiety and depression throughout the pandemic because government regulations caused people to be required to change their behaviors. Combining CDC’s publicly available data that tracks country level changes in mask mandates, gathering bans, closing of bars, and stay at home orders with publicly available COVIDcast data that tracks county level changes in cases of COVID-19, symptoms, exposures, and mental health effects allows us to examine whether there is a correlation between government regulation and anxiety and depression levels. Each variable represents the proportion of individuals in a particular county endorsing depression or anxiety, respectively. Preventive measures were obtained from CDC datasets which contain relevant orders for each county in the US at each day across the pandemic. Cross-classified mixed models were used to evaluate depression and anxiety separately with each observation nested within county and day. Increased levels of preventive measures were generally associated with increased reports of depression and anxiety, except for complete stay-at-home orders being associated with lower levels of depression. These results show that there is an association between preventive measures and prevalence of mental health issues across the pandemic. However, the current study is not able to determine whether a causal link exists between these variables. Future research should investigate the reason for this association. This research can be useful to officials for planning public health preventive measures and preventing unforeseen impacts on mental health.

023
Name: Moore, Joshua
Major: Software Engineering
Faculty Advisor, Affiliation: Vuk Marojevic, Electrical Engineering
Project Category: Physical Sciences and Engineering
Co-Author(s): Bhandari, Ankit; Powell, Keith
REU/Research Program: AERPAW

4G MIMO Versus SISO with Software Radios
Description: MIMO and SISO are antenna technologies used by wireless networks. SISO (Single Input Single Output) uses one antenna at the transmitter, and one at the receiver. MIMO (Multiple Input Multiple Output) uses multiple antenna elements at the transmitter and the receiver. While SISO is the most straightforward configuration for wireless networks, the added antennas used in MIMO can help when adverse channel conditions are present, and achieve higher data rates due to techniques such as spatial multiplexing and beamforming. MIMO is used in wireless networks such as 4G LTE, 5G NR and WiFi6. This abstract will focus on the results gathered from testing SISO and MIMO, and gathering relevant performance metrics (throughput for uplink and downlink). These results will show the current expected performance in 4G LTE using a COTS (Cheap off the shelf) SDR enabled network. The SDR’s used were b210s connected through USB3.0.
Conclusion: While SISO offers the easiest setup, using MIMO can positively impact data rates for downlink.

165
Name: Moore, Macy
Major: Biological Engineering
Faculty Advisor, Affiliation: Filip To, Agricultural and Biological Engineering
Project Category: Biological Sciences and Engineering
Co-Author(s): Anna Marie Clay

Behavioral analysis of a single, mild traumatic brain injury and repeated subconcussive brain injury using a rodent model.

Subconcussive impacts have become a growing concern particularly with respect to contact sports. It is believed that minimal head impacts can cause cerebral perturbations that initiate an immune response creating a window of vulnerability. Evidence suggests that additional head insults sustained during this window of vulnerability exacerbate cognitive deficits. Therefore, it is important to investigate the systematic perturbation of repetitive low-level impacts. Currently, there is a lack of understanding and analysis of the damage resulting from a single Traumatic Brain Injury (mTBI) and repeated subconcussive (SC) impacts extending over multiple time points (3 and 7 days). To address this knowledge gap, employment of a rat model was used to investigate indications of system perturbation over several time points post-impact between impact loads (single mTBI vs. repeated SC). Evidence of system perturbation included employment of two behavioral tests, open field test (general locomotion and anxiety) and rotarod task (motor coordination). According to our open field results, no evidence was shown upon recovery post-impact for anxiety and general locomotive deficits. However, after 7 days post impact, there was evidence of motor coordination deficits for the repeated SC group but not the single mTBI group. Thus, this work indicates that repeated injuries at a lower injury threshold does show evidence of system perturbation, resulting in motor deficits. Finally, this research is ongoing, and we are currently investigating evidence of inflammation using immunohistochemical assessment of glial cells within the brain tissue.

024
Name: Morgan, David
Major: Computer Science
Faculty Advisor, Affiliation: Melissa Hannis, Center for Cyber Innovation
Project Category: Physical Sciences and Engineering
Co-Author(s): Della Jones, Melissa Hannis
REU/Research Program: CSET report

MSU and Florida A&M CSET assessment research

Through CCI we are working on a multi-part research project that focuses on security risk in businesses. This project has helped us learn from our fellow peers and create connections outside of Mississippi State University by collaborating with Florida A&M. During this project we are split into groups with students from Florida A&M which have different levels of experience with cybersecurity policies. The first part of the project we develop cybersecurity and risk management skills through creating and running assessments on fictional small businesses that we are tasked to make. To make these fictional businesses we do research into a variety of companies to produce a detailed company background. In the company background we come up with general information, financial records, and IT reports about the business. Then we worked together with Florida A&M to make secure network architecture diagrams and physical layout diagrams. Finally, we researched and created cyber/physical company policies using the widely accepted Cybersecurity Maturity Model Certification (CMMC) for the mock company to follow. We worked together from both universities to create multiple businesses and assess them using the Department of Homeland Security's Cyber Security Evaluation Tool (CSET). The data from these assessments will be used to test a tool that assists businesses in determining risk management.

166
Name: Morrow, Brendan
Major: Biochemistry
Faculty Advisor, Affiliation: Florencia Meyer, Biochemistry & Molecular Biology, Entomology & Plant Pathology
Project Category: Biological Sciences and Engineering

Effects of Trace Minerals on the Growth of M. haemolytica and P. multocida

Mannheimia haemolytica is an opportunistic bacterial pathogen that contributes to the nasal flora of cattle. When cattle are under stress, most notably during shipping or infected with a virus, the immune system can become compromised, leading to bacteria invading the lower respiratory tract and causing Bovine Respiratory Disease (BRD). Different trace metals such as cobalt, copper, and zinc have been shown to inhibit bacterial growth. This study aims to find the lowest concentrations of copper, magnesium, and zinc EDTA disodium salts that inhibit the growth of *Mannheimia haemolytica*. Bacteria were grown in the presence of varying concentrations of metal EDTA disodium salts and at different cell densities. To quantify the bacterial replication, a spectrophotometer was used to measure the optical density of the media at 600nm at hourly time intervals throughout 24 hours. The growth of *Mannheimia haemolytica* was inhibited by copper at a concentration as low as 31µM, with near-complete inhibition at 500µM. In the case of EDTA disodium Magnesium, both the 5mM and 1.5mM concentrations already exhibited complete growth inhibition. We observed milder inhibitory effects on the growth of *Pasteurella multocida* with the same concentration of metal salts used on *Mannheimia haemolytica*. Cell viability assays were performed to establish the toxicity of these metal salts on cultured MDBK bovine cells. The effective inhibitory concentration of metal salts on the bacteria showed a minimal cytotoxic effect on bovine cells. Future studies will focus on other microbes that contribute to BRD, with the aim of developing new therapeutic methods to treat BRD in the future.

088
Name: Mosley, Shamaria
Major: Human Sciences/Human Dev & Family Studies
Faculty Advisor, Affiliation: Lori Staton
Project Category: Social Sciences

The Relationship Between Compulsive Buying Behavior and Anxiety

Compulsive Buying Behavior (CBB) is a mental health condition relating to the excessive or impulsive purchasing of products with damaging psychological, social, or financial consequences (Granero et al., 2016). The population struggling with CBB continues to rise as e-commerce and social media fuels consumer culture and instant gratification (Johnson, 2021). While there is research regarding mental disorders and CBB, the investigation of the relationship between anxiety and compulsive buying in young adults is not fully expanded. Therefore, this study aims to analyze the relationship between anxiety and Compulsive Buying Behavior to determine how Compulsive Buying Behavior and its consequences may be reduced. This study observes the relationship between the dependent variable of anxiety against the independent variable of CBB to determine possible correlation. A conversation about how mental health impacts CBB will allow consumers to be more aware of their purchasing decisions and may push people to necessary treatment. The hypothesis of this study states that people with more anxiety are more likely to shop compulsively than people with less to no anxiety. This study looks explicitly at how compulsive shopping behaviors and anxiety may impact young adults within the U.S. A survey was administered to young adults aged 18-25 in the United States to determine this information. The Likert Scale will be used along with the Edward Compulsive Buying Scale and the Zung Self-Rating Anxiety Scale to measure the correlation between compulsive buying behaviors and anxiety. A Qualtrics survey will be sent out to many people to test their anxiety and compulsive buying behavior, and it is voluntary participation. The survey is anonymous.

089
Name: Motes, Shelby
Major: Psychology
Faculty Advisor, Affiliation: Dr. Arazais Oliveros, Psychology
Project Category: Social Sciences
Co-Author(s): Caitlyn Fischtziur
Other Competition(s): Community Engagement Research Track

Adversity and Resilience Training

Every year, more than 4 million referrals are made to child protection agencies and decades of research document that adverse childhood experiences (ACEs) are prevalent, with 53% of US children reporting two or more ACEs. These statistics emphasize just how common potentially traumatic experiences are, and why adults who interact with children need to be educated in ways children might respond to these situations. Although ACEs are associated with greater risk for behavioral and emotional problems, children who exhibit difficulties are not likely to access treatment, but instead may be identified as defiant by schoolteachers or the juvenile justice system. Adversity and Resilience Training (ART) is a brief, scalable educational intervention that aims to provide a better understanding of potentially traumatic experiences and how they shape the lives of children based on the previous training by Dr. Lediya Dumessa. The participants in our replication of ART will consist of student educators, law enforcement, and other child-serving professionals. Participants will go through a 3-hour interactive training focused on improving their knowledge of core concepts in child traumatic stress response and trauma-informed care strategies. We hypothesize that participants' knowledge of trauma will increase from pre- to post-training, along with improved attributions of child behavior and trauma-informed attitudes. We are also hypothesizing that some groups will have a greater uptake in knowledge, notably the people who have experienced more ACEs and the future educators who are currently taking courses at Mississippi State University. Essentially, the training aims to increase the knowledge of child-serving professionals so that they are aware of possible reactions that children they are working with may experience, how to respond appropriately to these events, and take care of themselves so they are less likely to experience burnout or secondary traumatization.

090
Name: Nasekos, Josie
Major: Agricultural Economics
Faculty Advisor, Affiliation: Matthew Interis, Agricultural Economics
Project Category: Social Sciences
REU/Research Program: URSP

Examining Water Expenditures Burden in the Southeastern U.S.

Water accessibility and environmental justice research tends to deal with equal access to safe and clean water. However, are there still inequalities present between socio-demographic groups that do have access to clean water? This research examines water and sewer rates and consumption levels, as well as socio-demographic variables, in order to analyze the issue of water expenditures burden and its relationship to socio-demographic variables, such as race and income level. Data regarding water and sewer rates in the state of Virginia was collected from the University of North Carolina's Environmental Finance Center (EFC) and the American Water Works Association (AWWA), as well as socio-demographic data from the American Community Survey (ACS). The Environmental Protection Agency defines spending over 4.5% of a community's median household income as a high burden of combined water and sewer bill expenditures but using the full income distribution at a local level is a better representative of how water and sewer bill burdens are distributed. Using R, the percentage of "burdened" households per income block group in Virginia are estimated and then regressed on the ACS variables to examine the distribution of water burden over socio-demographics. Understanding how water expenditures burdens are distributed across various demographics can aid policymakers in attempting to redistribute those burdens in a more equitable fashion.

112
Name: Newell, Joseph
Major: English
Faculty Advisor, Affiliation: Dr. Dhanashree Thorat, English
Project Category: Arts and Humanities (Oral Presentation)
Other Competition(s): Three Minute Thesis Competition

Mohja Kahf's Amendment to the Patriarchal, Religious Interpretations of Muslim Women: An Assessment of Hajar-Inspired Personas

Mohja Kahf, a Syrian poet and author, explores themes of gender, religion, and Muslim women's representation in her works like *Emails from Scheherazad, The Girl in the Tangerine Scarf*, and *Western Representations of the Muslim Woman: From Termagant to Odalisque*. Kahf also explores sexuality, love, and desire in her works and even on featured website columns. I focus on her poem "Hajar Enters the Garden, Well Pleased and Well Pleasing" from *Hagar Poems* to offer an elucidation of Kahf's expansion of agency and representation. Scholars like Báez, Omar, Othman suggest that Kahf uses social and psychic conditions like gender, religion, and diaspora to categorize the experiences of migrants and give voice to Hajar, wife of Abraham, mother of Ismael, and faith-seeker through her trust in God while on an isolated land. While previous scholarship emphasizes these themes in isolation, my research suggests that a combination of both gender and religion is necessary to assess the process of Muslim women gaining a voice and highlight the purpose of that voice in a heteronormative, patriarchal society. Kahf, in "Hajar Enters the Garden, Well Pleased and Well Pleasing" from *Hagar Poems*, expands Hajar's representation beyond the common, traditional religious interpretations by showing that stereotypes of domestication inadequately define and represent Hajar and Muslim women. On this premise, my research argues that Kahf creates a presumably Hajar-inspired persona that opposes prescribed religious norms and interpretations to gain sexual and verbal agency in a patriarchal society that reduces Muslim women to gendered norms. My research shows how religion affects writers and how writers, like Kahf, assess the psychology of religion to criticize traditionalism, cope with psychological conflict, and amend the history of Muslim women through literature.

167
Name: Newman, Madison
Major: Animal and Dairy Sciences (Pre-Vet)
Faculty Advisor, Affiliation: Dr. Caleb O. Lemley, Animal and Dairy Sciences
Project Category: Biological Sciences and Engineering
Co-Author(s): Rebecca M. Swanson

Uterine seminal plasma treatment before embryo transfer decreases embryo crown rump length in beef cows

Uterine priming with seminal plasma prior to embryo transfer may increase conception rates and fetal growth. Seminal plasma is known to cleanse the female tract of microorganisms during copulation, activate immune responses in the female by increasing antigens and leukocyte recruitment, and remodel the uterine endometrium to prepare for pregnancy. Thus, our objective was to determine if seminal plasma uterine priming would impact embryo size in beef cattle undergoing embryo transfer. Commercial cows (n = 73) underwent estrous synchronization using the 7-day COSynch+ CIDR protocol and were evaluated for signs of estrus twice daily at 0060 and 1700 hours for four days. Cows in estrus were randomly assigned to a treatment group, seminal plasma (n = 27) or control (n = 27), with cows in treatment receiving 1.5mL of seminal plasma inserted into the uterus using an artificial insemination rod or no treatment, respectively. On day seven, cows underwent embryo transfer using standard techniques. was confirmed and embryo crown-rump measures (CON n = 9; TRT n = 10) were collected via ultrasonography on day 35, 40, and 45 of gestation. Data were analyzed using the mixed procedure of SAS with repeated measures of day for fixed effects of treatment, day, and respective interactions. Data were considered significant if $P \leq 0.05$. Embryo crown-rump length was decreased among seminal plasma treatment animals compared to controls ($P = 0.0170$). Crown-rump length increased with increasing gestational age ($P < 0.0001$). Seminal plasma was found to decrease embryo crown-rump length, which contradicts some literature. Future experiments should evaluate postnatal growth among offspring from seminal plasma treated cows prior to embryo transfer.

054
Name: Nobles, Rachel
Major: Landscape Architecture
Faculty Advisor, Affiliation: Charles Fulford III, Landscape Architecture
Project Category: Arts and Humanities (Poster)

Reflecting on Design: A Study of the Relationship Between Landscape Architecture Students Presentation Graphic Skills and Reflective Writing through Confidence Building Hybrid Assessments

Reflective writing and self-efficacy can be studied to better understand how to motivate students within a design studio. Reflective writing is often overlooked as a mode to advancing knowledge in the design process. This study examines the relationship between reflective writing and self-efficacy and the implications of these factors within landscape architecture. Reflective writing promotes learners to think deeply and critically about what is being taught and the skills that they are developing, it is not just simply re-explaining information, instruction, or facts (Bean 2011). Along with probing deeper into subject matter and personal opinions, reflective writing can foster a connection between professor and pupil. Another benefit of reflective writing is the correlation of longer information retention rate and total class participation (Cannady, Gallo (2014). Self-assessment through writing can lead to a deeper knowledge and reflection on subject matter (Dochy et.al 1999). The research question addresses: Is reflective writing effective at building design confidence levels in the beginning design students by utilizing professional lexicon, graphic and reflection assessments? Data was collected through the use of pre-instruction Likert scale questionnaires, weekly reflective writing prompts, long form writing assignments and graphic skill tests, coupled with a series of timed video drawings every four week with an associated reflective writing. Vocabulary associated with the profession was identified and assessed based on a word mapping key, to measure overall growth. The written assignments were collected, and the data was analyzed. This establishes the graphic skills baseline for each student, as well as demonstrates understanding of design lexicon. The findings will be a quantitative and qualitative assessment concerning the relationship between reflective writing, self-assessment, and graphic skills. Implications for further research will address how reflective writing and self-efficacy will affect the beginning design students' graphic skills and overall approach to the design process.

Key Words: pedagogy, self-reflection, self-efficacy, graphic skills, reflective writing, sketching

168
Name: Norman, Grant
Major: Physical Education/Kinesiology
Faculty Advisor, Affiliation: Stamatis Agiovlasitis, Kinesiology
Project Category: Biological Sciences and Engineering
Co-Author(s): Brantley K. Ballenger, Abby Blakeney, Sydni Carter

The Impact of Age, Body Fat Percentage, and Moderate to Vigorous Physical Activity on Arterial Health

Cardiovascular disease is known to be one of the leading causes of death. Many factors play a role in the development of arterial stiffness, which is indicative of cardiovascular disease. It is thought that increasing moderate-to-vigorous physical activity (MVPA) and managing weight can help to reduce the progression of arterial stiffness that happens due to normal aging. The purpose of this study was to determine whether age, gender, body fat percentage, and MVPA predict carotid-femoral pulse wave velocity (CF-PWV). Forty adults (21 men & 19 women; age 25.7 ± 9.4 years) participated in this study. The participants had arterial stiffness measured by CF-PWV, and body fat percentage by bioelectrical impedance analysis. We then had participants wear an accelerometer on the non-dominant hip for 7 days – at least 10 hours per day. Accelerometer data were analyzed using the Freedson MVPA cut points, which are based on vector magnitude. Results from the multiple regression indicated that the model explained 62.2% of the variance and significantly predicted CF-PWV, $F(4, 34) = 14$, $p < .001$. While age ($b = .111$, $p < .001$) and body fat percentage ($b = .47$, $p = .03$) contributed significantly to the model, gender ($b = .408$, $p = .39$) and MVPA ($b = -.003$, $p = .63$) did not. The final predictive model was: CF-PWV = 2.389 + (.111 × Age) + (.408 × Gender) + (.047 × Body Fat Percentage) + (-.003 × MVPA); for gender: 1 = man and 0 = woman. Of the variables used in the model, age and body fat percentage seem to have the greatest impact on arterial health. Supported by MSU ORED Undergraduate Research Grant and I'm An Athlete Foundation

025
Name: O'Daniel, Avri
Major: Electrical Engineering
Faculty Advisor, Affiliation: Chanyeop Park, Electrical Engineering
Project Category: Physical Sciences and Engineering
Co-Author(s): Robert Calabrese

Effect of Filler Size and Shape on Dielectric Properties of Metal Polymer Composites

Liquid metal polymer composites (LMPCs) are soft, stretchable dielectric materials made of conductive liquid metal particles dispersed in polymers. With their stretchable nature, they are a plausible replacement for typical rigid dielectric materials in devices like capacitors and actuators for stretchable electronics. However, the non-uniform mix of liquid metal particles and polymer results in a low dielectric strength in the LMPC. This is a problem because the lower dielectric strength allows a higher chance of partial discharge and electric breakdown, shortening the lifespan of the material. By changing liquid metal filler size and geometry, we can improve the dielectric strength of LMPCs. This work examines a study on how the shape and size of iron particles affects the electric field and breakdown of LMPCs consisting of polydimethylsiloxane-iron (PDMS-Fe).

In this study, we fabricated PDMS-Fe composites with two different types of iron fillers. The first type consists of small, spherical iron particles and the second type consists of larger, irregular, and sharp iron particles. The composites were then tested for partial discharge and dielectric strength measurements. The study found that the larger, irregular iron particles had a 40% higher partial discharge inception electric field (PDIE) and a 20% higher electric breakdown electric field (E_{bd}) than the small, spherical iron particles. This allowed the conclusion that PDIE and E_{bd} of PDMS-Fe rely greatly on the size and shape of the liquid metal particles.

026
Name: Oldenburg, David
Major: Civil Engineering
Faculty Advisor, Affiliation: Alireza Ermagun, Richard A. Rula School of Civil and Environmental Engineering
Project Category: Physical Sciences and Engineering

Economic and Travel Behavior Impact of Historical Bridge Collapses and Closures Across America

This research systematically collects information on thirty historical bridge collapses and closures in the United States and synthesizes the cause of collapse or closure, as well as their impact on travel behavior. Retrieved information on bridge collapses and closures are categorized into four major components: (1) structural and design characteristics of bridges, (2) causes of collapses or closures, (3) number of fatality and injuries for each case, and (4) time and cost of revitalization. Four observations are discerned from our quantitative analysis. First, bridges can have anywhere from 2 lanes (e.g., the silver bridge in Point Pleasant, WV) to 5 lanes per deck on a two-tier highway (e.g., the cypress street viaduct bridge in Oakland, CA). Second, bridge closures caused by something as little as a cracked beam (e.g., the closure of the I-40 Hernando bridge near Memphis, Tennessee) to a magnitude 7.1 earthquake (e.g., the collapse of Cypress Street viaduct bridge in Oakland California). Third, the number of fatalities and injuries for each case ranges from as many as 46 deaths and countless injuries (e.g., the collapse of the silver bridge in Point Pleasant, WV) to 0 deaths and 0 injuries (e.g., the collapse of I-85 bridge in Atlanta, GA). Fourth, bridge repairs can take anywhere from 1 month (e.g., the collapse of the bay bridge in San Francisco, CA) to 14 months (e.g., the collapse of the I-35 W bridge in Minneapolis, MN). Bridge collapses and closures have significant impact on travel behavior of transport system users including, travel time, mode of travel, route change, trip frequency, the percent of people that change to telework, the change in unemployment rate, consolidated trips, rescheduling activities, and finding alternative location of activities.

Keywords: Bridge collapse; Travel behavior; Transportation; Route choice; Accessibility

169
Name: Paez Mendez, Yvanna
Major: Wildlife & Fisheries Science/Pre-Veterinary
Faculty Advisor, Affiliation: Peter J. Allen, Wildlife, Fisheries, & Aquaculture; J. Wesley Neal
Project Category: Biological Sciences and Engineering
Co-Author(s): Patrick M. Graham, The University of Southern Mississippi; James S. Franks, Jr., The University of Southern Mississippi
REU/Research Program: URSP
Other Competition(s): Community Engagement Research Track

The Effects of Temperature and Salinity on juvenile Atlantic Tarpon *Megalops atlanticus*

Atlantic tarpon *Megalops atlanticus* are highly migratory sport fishes. Juveniles are found in marshes along the northern Gulf of Mexico Coast, which is near the northern limit of their distribution. Juveniles may overwinter in these areas during the first several years of their life. Low temperatures are known to cause mortality in adults, but the challenges of temperature are less understood in juveniles. Furthermore, salinity, which can change dramatically in these habitats, may have a synergistic effect with temperature. To examine the effect of temperature and salinity on juvenile tarpon, fish were collected from the Mississippi Gulf Coast and transferred to the South Farm Aquaculture Facility. The hematology of juvenile tarpon was examined in two different salinity environments (1, 30 ppt) and at two temperatures (15, 25 °C) mimicking conditions found in estuaries, followed by a low temperature tolerance test. Fish were acclimated to treatment conditions for two weeks and then blood samples were collected and analyzed from 14 fish per treatment. Hematological results, including hematocrit, pH, red blood cell concentration, hemoglobin content, and blood osmolality offered valuable insight into physiological challenges with low temperature and variable salinity. For the low temperature tolerance test, fish acclimated to 15°C were transferred to separate tanks and temperature was gradually decreased 1°C / hr until fish lost equilibrium. Fish at low salinity (1 ppt) lost equilibrium more rapidly than fish at high salinity (30 ppt). Results indicate tarpon are susceptible to low temperature, which is exacerbated by low salinity, therefore, resource managers must be cognizant of winter habitat use by juvenile tarpon.

091
Name: Patterson, Camden
Major: Psychology
Faculty Advisor, Affiliation: Mary E. Dozier, Psychology
Project Category: Social Sciences
Co-Author(s): Rachel Kalchbrenner
Other Competition(s): Public Health Research Competition

You Are What You Keep: Community-based Evaluation of the Relationship Between Hoarding Symptoms and Interconnectedness with Items

Hoarding disorder is defined as having persistent difficulty discarding or parting with objects, regardless of the value of an object, which leads to an overwhelming accumulation of objects (American Psychiatric Association, 2013). Participants in a previous study who were diagnosed with hoarding disorder (HD) reported significantly higher scores on the Relationship between Self and Items (RSI) compared to the control group (Dozier et al., 2017). The purpose of this study is to examine the associations between the perceived importance of possessions and hoarding symptoms among older adults. Participants were adults living in the southeastern United States whose ages ranged from 36 to 92 (mean age = 75.23) and mostly female (81.13%). Participants were primarily white (81.13%), and primarily married (43.40%). This study was conducted in person as a survey. Pearson's correlations were conducted using participant reported levels on the Relationship between Self and Items (RSI; Dozier et al. 2017), and the Hoarding Rating Scale (HRS; Muroff et al. 2014). Participants with higher levels of object attachment on the RSI reported higher levels of hoarding severity on the HRS ($r = .177, p < .138$). All in all, hoarding severity is significantly associated with higher levels of object attachment in older adults. Interventions that target object attachment may be beneficial in lessening hoarding severity. Future research should be conducted on whether object attachment could be a strong predictor of hoarding severity in other age groups.

170
Name: Paul, Catherine
Major: Wildlife & Fisheries Science/Wildlife Science
Faculty Advisor, Affiliation: Scott Rush, Wildlife, Fisheries, & Aquaculture
Project Category: Biological Sciences and Engineering
Co-Author(s): Natasha Murphy (Murphy, N. K)

Are Barn Owls potential biological control agents for rodents in the Black Belt?
Sustainable programs of integrated pest management involving native predators are effective, low-cost management techniques as predators can directly reduce the effects of pests on agricultural yields. In this study we evaluated the potential use of one native predator, the Barn Owl (*Tyto alba*), as an integrated element of rodent management. Barn Owls are common, well-studied predators which can be found on all continents and prefer open, agricultural landscapes. These owls regurgitate pellets of non-digestible prey remains (e.g., bone and hair) and cache whole prey at nesting sites. Using pellets and cached prey, we investigated the diet of Barn Owls on a diversified cattle and row crop operation located in the Black Prairie region of Clay County, MS. Each month during 2020-2022, we collected pellets regurgitated by Barn Owls and photographed prey remains from inside active owl nest boxes (n = 6). Prey remains (i.e., skulls, whole animals) were identified using keys. A total of 768 prey items were recorded, with 19 species identified, including mammals, birds, amphibians, and insects. Rodents dominated the diet at 73%, but this proportion varied by season. Rodent prey was most abundant in the winter months 84%) and lowest in summer (60%). *Sigmodon hispidus* (Hispid Cotton Rat) comprised 45% of the diet, second only to unidentifiable rodents at 21%. With these findings, we have taken the first steps towards developing an integrated pest management program and gained insight into how Barn Owls might be incorporated to reduce agricultural losses by controlling small mammals. We recommend that future research explores the landscape use of Barn Owls and prey availability to further refine management applications.

092
Name: Paul, MacKenzie
Major: Psychology
Faculty Advisor, Affiliation: Dr. Jennifer Lemacks, The University of Southern Mississippi, School of Kinesiology and Nutrition
Project Category: Social Sciences
Co-Author(s): Asha Bradley, MPH; Sermin Aras, MS, RD; Jennifer Lemacks, PhD, RD; Tammy Greer, PhD; Michael Madson, PhD
REU/Research Program: Mississippi INBRE Outreach Scholars
Other Competition(s): Public Health Research Competition, Three Minute Thesis Competition

To Sweeten or Not to Sweeten: The Unique Impact of Emotional Support and Fatalism on Sugar Consumption Among Southeastern Native Americans
In 2020, 14.8% of Mississippi adults and 12.6% of Louisiana adults reported having diabetes, as compared to the national average of 10.8%. Furthermore, Native Americans of Mississippi and Louisiana experience disproportionately higher diabetes prevalence at 38% and 34% respectively. Research has shown that excessive sugar consumption and other dietary habits are associated with an increased risk of developing type-2 diabetes. Psychosocial variables such as chronic disease fatalism and emotional support for healthy dietary habits may also influence diabetes self-care behaviors including food consumption patterns like sugar intake. Very few studies have examined these factors among Southeastern Native Americans. Therefore, the objective of this study is to examine the unique impact of emotional support and fatalism on sugar consumption among Southeastern Native Americans. The Community Health Assessment Survey, developed by the Mississippi INBRE Telenutrition Center was utilized to survey 368 adults from Mississippi and Louisiana. Eighty-one of the participants, who self-identified as American Indian or Alaska Native were included in the study. A hierarchal linear regression analysis showed that increased emotional support was uniquely significantly related with reduced sugar consumption ($\beta = -0.307$, $p = 0.004$), and increased fatalism was uniquely significantly associated with elevated sugar consumption ($\beta = 0.286$, $p = 0.007$). More research is necessary to substantiate this relationship among a broader Southeastern Native American population and identify potential implications for diabetes management in this disparate group.

171
Name: Pensa, Mia
Major: Biological Engineering
Faculty Advisor, Affiliation: S. Filip To, Agriculture and Biological Engineering
Project Category: Biological Sciences and Engineering
Other Competition(s): Public Health Research Competition

Experimental Methods in Histological Analysis Relating to Mild Traumatic Brain Injury Using a Rat Model
Repetitive, sub-concussive (SC) brain injuries are becoming a large concern for the sports community, particularly those involved with high-contact sports. It has been suggested that repetitive low-level impacts, otherwise known as sub-concussive impacts, may result in neuroinflammation like the effects of a singular concussive impact. Further, neuroinflammation has the potential to exacerbate the cumulative, neurodegenerative effects of repeated sub-concussive injuries. Unfortunately, minimal data exists with respect to the cumulative effects of multiple SC impacts. Therefore, determining the lower limits of systematic perturbation from repeated SC impacts is of critical importance in expanding our understanding of cerebral vulnerability and recovery. The study will investigate each impact load group (single mTBI vs. repeated SC impacts) over two time points post-impact (3 and 7 days). To investigate evidence of inflammation and cerebral vulnerability will be accessed using immunohistochemical evaluation of glial cells as well as inflammatory cytokine proteins within the brain tissue. T three specific regions of the brain were examined post-experiment: CA1, CA3, and DG. Two types of stains were used to look for different inflammatory proteins: GFAP for astrocytes and IBA-1 for mircoglial There was no statistical difference found in any of the regions in the GFAP+ Cells/mm^2 data. In IBA-1+Cells/ mm2 data, there was statistical difference between the test subjects in the CA1 region. There was no statistical difference in the CA3 and DG region. Since there was no statistical difference in any of the regions using the GFAP stain, this means that there is no clear difference between either of the lower range levels of impact. Thus, making the findings inconclusive. The IBA-1 stain showed statistical difference in the CA1 region only. The results decreased in microglial cells the longer the duration the rat lived. This helps find the opportune length of the experiment.

027
Name: Pettus, Maggie
Major: Computer Science
Faculty Advisor, Affiliation: Adam Jones, Computer Science and Engineering, High Fidelity Virtual Environments Lab
Project Category: Physical Sciences and Engineering
Co-Author(s): Zachery Garris, Daniel Molsbarger, Harish Chander

EEG Electrode Localization with Virtual Reality Technology
Electroencephalography (EEG) is a robust and useful tool for better understanding function within the human brain. Though EEG is often used to analyze gross, time-course changes in brain activity with high temporal resolution, it can also be used to perform low resolution source localization of activity within the brain. However, for source localization to be accurate, the exact location of the EEG system's electrodes must be known relative to each other and the user's head. Methods such as MRI, professional motion capture, and 3D scanning have been used to measure the position of electrodes with a high degree of accuracy. Unfortunately, these approaches are often time consuming and not cost-effective. In this study, we propose a low cost, high accuracy method of measuring the position of electrodes for the purposes of source localization with EEG. To compare the methods of electrode localization, we constructed a full-scale foam human bust and attached placeholder electrodes to it using the standard 10-20 placement system. This head is currently being used to recreate the typical methods for localizing the electrodes; we will then compare those measurements to our VR system method and draw conclusions about the accuracy. We intend to demonstrate in the current work that, with no hardware modification, an off-the-shelf VR system can be repurposed to perform fast, accurate 3D localization of electrodes on a standard EEG cap.

093
Name: Pham, Amy
Major: Food Science & Technology
Faculty Advisor, Affiliation: Dr. Jennifer Lemacks, Education and Human Sciences
Project Category: Social Sciences
Co-Author(s): Mahali Henry, Skyler Hoover Sermin Aras, Tammy Greer, Holly Huye
REU/Research Program: IDeA Network of Biomedical Research Excellence
Other Competition(s): Public Health Research Competition

The Relationship between Gender and Race and Body Image Dissatisfaction in Mississippi

Obesity has been a significant public health issue, which could lead to increased health risks such as nerve damage, stroke or developing chronic diseases such as diabetes. Mississippi is the leading state in the nation with an obesity prevalence of 40.8%. There are several factors that influence obesity such as diet, physical activity and body image. Acceptance of heavier body ideals might limit motivation for weight management among some racial groups as differences in body dissatisfaction have been noted at higher body sizes in African American and Hispanic women compared to white women. The purpose of this research was to examine how gender and race affect individuals' perceptions of their current versus ideal body image (or body image dissatisfaction, BID). This study was a secondary analysis of survey data, which was previously collected at various community outreach events in 2018 and 2019 summer in Mississippi. Perceptions of current and ideal body weight were assessed using the Pulver's Figure Rating Scale and the difference was calculated to determine BID. There were 189 respondents (34% White, 33.6% Black, 32.4% American Indian; 20.3% Male, 79.7% Female). A Chi-Square analysis indicated there was a significant relationship between race and BID (X^2 (df = 4, N = 189) = 12.960, p=0.011). However, there was no significant relationship between gender and BID. Further research is needed to explore this phenomenon in this population to understand implications for weight management practice and intervention.

172
Name: Phillips, Maggie
Major: Biological Engineering
Faculty Advisor, Affiliation: Matthew Ross, Department of Comparative Biomedical Sciences, Center for Environmental Health Sciences, College of Veterinary Medicine
Project Category: Biological Sciences and Engineering
Co-Author(s): Abdolsamad Borazjani
Other Competition(s): Public Health Research Competition

Carboxylesterase 1 (CES1) Releases Oxylipins From Oxidized Triacyglycerols: Examination of Its Substrate Selectivity

Triacylglycerols (TAGs) are the most quantitatively important storage form of fat and are found primarily in cytoplasmic lipid droplets within cells. TAGs are broken down to its component free fatty acids by lipolytic enzymes when fuel reserves are required. However, when TAGs possess large quantities of polyunsaturated fatty acids (PUFAs) they are prone to nonenzymatic oxidation reactions, leading to formation of oxylipins (oxidized forms of fatty acids) that are esterified to the glycerol backbone. Human carboxylesterase (CES1) is a member of the serine hydrolase superfamily and defined by its ability to catalyze the hydrolysis of carboxyl ester bonds in lipids. Although it is known that CES1 is a *bona fide* TAG hydrolase, it is unclear which specific fatty acids are preferentially released during lipolysis. To better understand the biochemical function of CES1 in macrophages, its substrate selectivity when encountering PUFAs must be determined. Thus, this study systematically identifies oxylipins liberated from oxTAGs by CES1, because their release activates signaling pathways important for the development of lipid-driven inflammation. Gaining this knowledge will fill data gaps between CES1 and the lipid-sensing nuclear receptors, PPARγ and LXRα, which are drivers of lipid metabolism and inflammation. Oxidized forms of triarachidonoylglycerol (oxTAG C20:4) and trilinoleoylglycerol (oxTAG C18:2) – containing physiologically relevant levels of oxidized PUFAs – were incubated with recombinant CES1 to assess the release of oxylipins and non-oxidized arachidonic acid (AA) and linoleic acid (LA), which were quantified by LC-MS. CES1 was shown to efficiently metabolize oxTAG C20:4 and oxTAG C18:2, yielding several regioisomers of hydroxyeicosatetraenoic acid (5-, 12-, and 15-HETE) and hydroxyoctadecadienoic acid (9- and 13-HODE), respectively. This study indicates that CES1 can metabolize oxTAG lipids to release oxylipins and PUFAs. It further specifies the substrate selectivity of CES1 in the metabolism of bioactive lipid mediators that can regulate inflammatory activities of immune cells.

173
Name: Phillips, Stephen
Major: Horticulture
Faculty Advisor, Affiliation: Tongyin Li, Plant and Soil Sciences
Project Category: Biological Sciences and Engineering
Co-Author(s): Jacob Arthur, Maddie Thomas, Guihong Bi

Container Production of Hybrid and Heirloom Tomatoes using Grafted Plants with Two Types of Rootstocks
Tomatoes (*Solanum lycopersicum*) are a very common product to find in big box stores and retail garden centers all throughout the southern U.S. However, commercial production of tomatoes looks a little different than the average backyard garden. Grafting tomato plants is a common practice that involves merging two different types of plants to obtain a desired characteristic. In 2021 six different cultivars of tomato were evaluated in a containerized production system, including three heirloom cultivars: 'Brandywine,' 'Mortgage Lifter,' and 'San Marzano.' The other three cultivars were hybrids and consisted of 'Big Beef,' 'Sun Sugar,' and 'Early Girl.' Each cultivar was grafted onto two interspecific hybrid rootstocks, 'Emperador' and 'Maxifort' or grown as non-grafted seedlings. The intended purpose of this project was to evaluate plant growth, yield, and fruit quality of the six cultivars grafted or non-grafted in a containerized production system. Results showed that plant growth and fruit yield of tomatoes were affected by the cultivar and the rootstock during 2021. The cultivars 'Big Beef', 'Mortgage Lifter', and 'Early Girl' produced comparably the highest total yields of 12.01 kg, 11.36 kg, and 11.32 kg per plant, respectively. 'Sun Sugar' produced the lowest total yield of 4.26 kg per plant among cultivars. Fruit number varied among cultivars with 'Sun Sugar' producing the highest fruit number of 336 per plant, and 'Brandywine' producing the lowest fruit number of 21.6 per plant. Both rootstocks, 'Emperador' and 'Maxifort,' increased yield and relative leaf chlorophyll content measured by soil plant analysis development (SPAD) readings during early season compared to non-grafted plants. 'Emperador' and 'Maxifort' increased the stem diameter of tomato plants by 1.20 and 1.52 mm respectively compared to non-grafted plants.

094
Name: Pittman, Leanna
Major: Psychology
Faculty Advisor, Affiliation: Ben Porter, Psychology
Project Category: Social Sciences

Finding Gulf War Veterans on Twitter: Lessons Learned
Twitter is a microblogging app used by millions which can be used to give insight about specific individuals or populations. This platform allows for understanding population level phenomena and populations with high survey burden. The current study details the initial steps for identifying such a cohort (Gulf War Veterans) on Twitter. Specifically, we detail the "lessons learned" in identifying Gulf War Veterans so that an algorithm could be built to automatically identify such veterans. The Gulf War occurred between August 1990 and March 1991. This population is oversampled because many service members began to show physiological symptoms thought to be connected to environmental exposures (Gulf War illness). To identify Gulf War Veterans with nonprivate accounts, we manually searched using hashtags, profile biographies, highly followed Gulf War pages, advocacy accounts, and usernames. Participants were invited to answer a single question: "Are you a Gulf War Veteran?" We direct messaged 114 potential participants with 26 responses of which 23 participants indicating they were a Gulf War Veteran. However, certain accounts could not be messaged. The second method used was to "at" the users. To date, only 20 participants have been "at'ed" with one indicating their involvement in the war (through liking the tweet). The current study highlights two issues with using Twitter for Identifying cohorts. First, it is difficult to elicit responses including those requiring minimal effort. Second, while it is time consuming, manually `identifying nonprivate accounts of individuals in a particular population can be a successful method as demonstrated by 88% of responding individuals indicating that they were in the Gulf War. This research is important because we could use these methodologies to create specific cohorts for many sought after population.

095
Name: Power, Haley
Major: Human Sciences/Human Dev & Family Studies
Faculty Advisor, Affiliation: Tommy Phillips, School of Human Sciences
Project Category: Social Sciences

Social Media Influences on Stress and Lifestyle Practices
The overall purpose of the study is to measure social media usage, levels of stress, and lifestyle practices amongst young adults in the U.S. The goal is to determine how social media usage relates to an individual's stress and lifestyle. It is hypothesized that high social media use is positively correlated with stress, high social media use is negatively correlated with lifestyle practices such as diet and exercise, and stress is negatively correlated with lifestyle practices. We will retain our information using the Qualtrics survey. Measures for lifestyle practices such as healthy nutrition and physical activity were rated on a 4-point Likert scale ranging from never to always in the Healthy Lifestyle and Personal Control Questionnaire (Czapla, et al., 2021). The 10-item Perceived Stress Scale (PSS) was used for measuring stress (Awoke, Mamo, Abdu, & Terefe, 2021). Social media use was measured using Janicke, Narayan, and Senf's survey, which included a 6-point Likert scale ranging from never to at least once a day (2018).
Researchers: Haley Power, Kaitlyn Mitchell, Lamarcus Yates, Hannah Parker, and Amyra Turner

113
Name: Pritchard, Jacob
Major: Philosophy
Faculty Advisor, Affiliation: Joseph Witt, Philosophy and Religion
Project Category: Arts and Humanities (Oral Presentation)

***Novus Miles Christi*: Spiritual Authority and Suffering in the Presbyterian Missionary Movement**
Max Weber's work "The Protestant Ethic and the Spirit of Capitalism" discussed the development of the individualist thought that followed the Protestant Reformation. The spiritual hierarchies of the Roman Catholic tradition were seen as contrary to the equality and individualism within this emerging church. Opposed to the conventional holy orders, the Reformers claimed that every calling was a spiritual calling, resulting in what Weber called the "worldly ascetic." However, the 18th and 19th centuries saw the rise of missionary movements within several of the Protestant sects that contradicted this rejection of hierarchy. Missionaries became the new spiritual elite who were given a special divine calling, distinct from their secular vocation. How did Weber's worldly asceticism transform into the spiritual elitism of the mission movement? This article compares this evolution in the Protestant movements with the evolution of the term *miles Christi*, or "soldiers of Christ," in the church of the 4th century. Martyrdom in the early centuries had given the early church a criterion for sainthood. However, following the Edict of Milan and the institutionalization of Christianity, this kind of martyrdom became unavailable. In its place, the holy men and the monastic orders arose, engaging in a willing suffering and a voluntary persecution that earned them the title once given to the martyrs: *miles Christi*. This article compares the rise of the holy man in the 4th century with the rise of the Presbyterian missionary movement in the 18th and 19th centuries, arguing that Protestants continued this tradition of engaging in suffering in their own way, establishing the missionary as the new "soldier of Christ" and the charismatic authority of the modern age. Weber's theory and historical evidence demonstrates how Protestant movements continued to employ classical Christian ideas within changing social, economic, and political contexts.

096
Name: Pyles, Karly
Major: Psychology
Faculty Advisor, Affiliation: Mary E. Dozier, Psychology; Ben Porter, Psychology
Project Category: Social Sciences
Co-Author(s): Laura Alvarez Rios, Caitlyn A. Nix
Other Competition(s): Public Health Research Competition, Three Minute Thesis Competition

Where Do You Change Your Tampon?: An Assessment of Infrastructure and Usability of Menstrual Product Disposal Devices Across Campus

Menstrual hygiene management refers to access of clean and private means of disposing menstrual products (Sumpter & Torondel, 2013). Lack of access to sanitary disposal measures can make people who menstruate feel embarrassed or anxious about using the restroom when they are in a public space (Schmitt et al., 2018). This study examined the lack of access to proper disposal features for menstrual products in female restrooms on the Starkville campus of Mississippi State University (MSU). Undergraduate research assistants surveyed all the restrooms on MSU's main campus and recorded whether the restroom had the necessary amenities for sanitary disposal of feminine hygiene products. Necessary amenities were defined as having both the infrastructure (i.e., metal disposal bin or trashcan in restroom stall) and its usability (e.g., lining in bin). Building type was coded as "Hard Science," "Liberal Arts," or "Other" and the gender ratio of faculty working in each building was estimated using departmental website photos and names. Logistic regression was used to examine building type and gender ratio as predictors of infrastructure and usability. Predicting infrastructure, there was a significant difference between hard science and liberal arts (OR:0.72, 95% CI [0.55, 0.93]) but not between liberal arts and other (OR:0.87, 95% CI [0.69, 1.08]) or gender ratio (OR:1.02, 95% CI [0.97, 1.07]). Predicting usability, there was a significant difference between hard science and liberal arts (OR:0.66, 95% CI [0.49, 0.91]) but not between liberal arts and other (OR:0.7, 95% CI [0.47, 1.05]) or gender ratio (OR:1.05, 95% CI [0.96, 1.15]). These results can be used to build on the implementation of availability and consistency of the sanitary disposal measures in restrooms across all departments on campus. Future research should continue to examine the underlying reasons for disparities regarding amenities for sanitary disposal on college campuses.

174
Name: Rainey, Wesley
Major: Horticulture
Faculty Advisor, Affiliation: Bi Guihong, Horticulture
Project Category: Biological Sciences and Engineering

Mechanical Harvesting of Tea

Tea is the world's most popular beverage second only to water. The market demand for tea in the US has more than quadrupled in the past two decades. With projected continued strong market growth and increasing consumer interest in purchasing "US grown" or "locally grown" products, the interest in growing tea in the US has been increasing rapidly in recent years. Currently, there are tea growers in more than 15 states in the US. However, there is limited information on domestic tea production, especially mechanical harvesting. Tea production is one of the most labor-intensive agricultural activities. Labor constitutes about 50% of the cost of tea production, and about 70-80% of that goes to hand harvesting. In this study, we explored the potential of mechanical harvesting in the US. Results showed that mechanical harvesting significantly reduced the labor cost and improved productivity.

028
Name: Redder, Zachary
Major: Aerospace Engineering
Faculty Advisor, Affiliation: Yang Cheng, Aerospace Engineering
Project Category: Physical Sciences and Engineering
Co-Author(s): Mac Anderson, Nick Areng, Jacob Escuriex

Optical and Orbital Optimization for Lunar Mapping
Optical imagery or satellite imagery is the use of satellite and onboard optical payload hardware, such as a camera, to accomplish the imaging of a specific region/site, larger areas of sweeping imaging, or even more vast regions of surface imaging, much like how Google can produce maps of the surface of the earth in clear detail. Typically, missions that undertake surface mapping require the use of million-dollar satellites resulting in hardware that is both large and sophisticated. Even if the satellite operation point is not the Earth and is around another space body, as shown in the Lunar Reconnaissance Orbiter (LRO) mission. This mission, among other objects, provides an opportunity to update the previous lunar surface maps; however, could the lunar mapping part of the mission be undertaken by a small-sat-type satellite like the commercially available CubeSat satellite? If this is possible what would the resulting craft look like, & how would the day-to-day function of the imaging satellite operate and how would the collated data, images of the moon's surface, and data transfer function in terms of reliability & timing of the overall mission. To this end, the technical research of the elements of launch and space operation as they impact the structural analysis of the spacecraft during its development phase & the computational analysis and modeling of the data transmission using CubeSat scaled software and hardware limitations are conducted.

114
Name: Reeder, Hailey
Major: English
Faculty Advisor, Affiliation: Eric Vivier, English
Project Category: Arts and Humanities (Oral Presentation)

Competing Masculinities in Shakespeare's *Romeo and Juliet*
This essay examines the range of masculinities presented in William Shakespeare's *Romeo and Juliet*. Drawing upon previous research on gender norms in early modern England, I look specially at the roles of men and how they were expected to present masculinity. Research yielded a firm ideology from the period that illustrates traditional masculinity including strong leadership and dominance over women and household members, violence, and controlling emotions. In comparison, Shakespeare's male characters in *Romeo and Juliet* deviate from these societal expectations of how men should present their masculinity in the Early Modern period. In my essay, I argue that Tybalt and Sampson embody a toxic and medieval identity that uses violence against both men and women to control others and reenforce their dominance while Mercutio paints a very androgynous male that has little interest in women. Finally, Romeo—the Petrarchan lover—changes his gender performance from masculine to a more effeminate identity at will and again changes when Juliet is introduced. Romeo in particular shows how masculinity can change in one person according to their needs or feelings rather than being stuck with one identity like the other characters present. This illustrates the complexities of early modern gender performance in both on-stage performance and real life.

029
Name: Reeves, Jonathan
Major: Aerospace Engineering
Faculty Advisor, Affiliation: Shreyas Narsipur, Aerospace Engineering
Project Category: Physical Sciences and Engineering
Co-Author(s): Emily Erwin, Brooks Wing

Stabilizing a High-Powered Rocket Utilizing Active Control Surfaces
High powered rocket flight is often subject to unpredictable and uncontrollable external and internal forces. External forces can come from the unpredictability of real world operation, most often due to unexpected differences in atmospheric operating conditions from the modeled conditions. Internal forces can come from both imbalance in the loading of the rocket and from imperfections in the construction of the rocket. These forces have the effect of slowly moving the rocket off its predicted flight trajectory and causing the rocket to perform poorly. The current method of minimizing these effects was careful construction to minimize internal forces and careful selection of launch location and time to minimize external forces. To better counteract these forces, this project aims to create a system of actively controllable canards. The canard system will be designed to detect deviation of the rocket from its vertical flight path, and counteract these deviations through actuation of the canards.

175
Name: Rehrig, Devin
Major: Wildlife & Fisheries Science/Wildlife Science
Faculty Advisor, Affiliation: Dr. Heidi Renninger, College of Forest Resources
Project Category: Biological Sciences and Engineering
REU/Research Program: Forestry undergraduate research scholarship program

Can we predict photosynthetic functioning from leaf properties in bioenergy crops?
Short rotation woody crops (SRWC) have been bred to grow at high rates to be used as biomass. After only a short growing period of five to seven years, these hardwoods can be harvested with high yield. Species such as eastern cottonwood (*Populus deltoides*) and hybrid poplar were studied to get further insight into what factors affect the success of these species as a short rotation woody crop to be used for biofuels. In this study, we try to quantify stomata abundance and size and various leaf properties and relate these to the photosynthetic rates in eastern cottonwood and hybrid poplar species. This study is important because if we can successfully link leaf anatomy to certain SRWC, we can select optimal genotypes for biofuel production. Field-planted cottonwoods and hybrid poplars were used to construct photosynthetic carbon dioxide (CO_2) response curves using a LiCor 6400 photosynthesis system. From this machine we received photosynthetic capacity parameters including Rubisco limited carboxylation rates (Vcmax) and electron transport limited carboxylation rates (Jmax). Leaves from these trees were collected and leaf area was estimated using a Li-3100 leaf scanner. After that, an epidermal impression was made in the leaves of our samples using clear nail polish which was placed onto a slide then analyzed under a microscope. Lastly, the leaves were dried, and their dry weight was measured. Dividing the dry weight and the leaf area gave us a calculated leaf mass per area for each leaf. From there, we can seek to establish a correlation of stomata size and abundance, leaf area, and leaf mass per area to photosynthetic rates.

097
Name: Rice, Mary
Major: Fashion Design & Merchandising
Faculty Advisor, Affiliation: Tommy Phillips, School of Human Sciences
Project Category: Social Sciences
Co-Author(s): Tylishia Brown, Morgan Kendrick, Gracie Hester

The Effects of Sleep Deprivation on College Students' Depression and GPA
For many years, there has been speculation surrounding sleep deprivation and its effects on the body and brain. Research often shows that losing sleep can increase the likelihood of mental illness, high blood pressure, and other health issues.

College students are at a high- risk for sleep deprivation, as they are often up late doing work or other extra-curricular activities. The outcome of lack of sleep is very different among college students. For this population, depressive symptoms and grade point average are often impacted. This study aimed to examine the correlation between these factors and sleep deprivation using an online qualtrics survey presented to college students. The purpose of this study is to help college students understand the impact of a sleepless night and how the lack of sleep can affect the overall quality of life.

176
Name: Riggi, Autumn
Major: Plant and Soil Sciences
Faculty Advisor, Affiliation: Dr. Richard L. Harkess, Plant and Soil Sciences
Project Category: Biological Sciences and Engineering
REU/Research Program: CALS URSP

Method and Rate of IBA application in Propagation of *Camellia japonica*
Camellias are famous winter blooming shrubs in the southern United States, with cultural significance extending far beyond that of their blooms, reaching into the collective consciousness in the forms of literature and symbolism. Camellia cultivars are vegetatively propagated by grafting or cuttings. However, rooting camellia cuttings can be difficult and often takes 1½ to 2 months. The purpose of this study was to determine the efficacy of applying auxins in a foliar versus stem dipped application in the propagation of four cultivars of *Camellia japonica*. Foliar applications of rooting hormones are currently being recommended in the field of horticulture, but little information is available specifically to camellia varieties. Four to five node cuttings from four cultivars of *C. japonica* ('Sarah Frost', 'Lady Clare', ' Magnoliaeflora', and an unnamed selection) were used. The experiment was designed as split-split-plot study with main plot being the base of the cuttings dipped in indole butyric acid (IBA) solution or a foliar IBA application after sticking. IBA was applied at a rate of 0, 3000, or 6000 $mg \cdot l^{-1}$. The cuttings were then treated with a foliar application of 0 or 3000 $mg \cdot l^{-1}$ IBA one week after sticking. Treatments had 4 replications with 5 sub-samples. The foliar application decreased or did not improve rooting in all cultivars except 'Sarah Frost.' Basal dip application of IBA is recommended to increase root number, root length, and root structure in *Camellia japonica*. A 3000 $mg \cdot l^{-1}$ IBA produced the most consistent results

115
Name: Rigney, Maeve
Major: Political Science
Faculty Advisor, Affiliation: Catherine Pierce, English
Project Category: Arts and Humanities (Oral Presentation)

***Fragrantasia*: 24 Ekphrastic Poems about Scent**
We are surrounded by scent: fresh-cut grass, gasoline, lavender. Our sense of smell is our oldest sense and has a profound connection to emotion and memory. Perfumers harness this unique connection and use scent to create art. In the same way a painter would mix paint to create visual art, a perfumer combines aroma chemicals to create a perfume. A perfume functions in the same way as a visual art piece: it can convey a message, create an impression of a real-life object, or inspire a sense of beauty. *Fragrantasia* is a chapbook of twenty-four poems that celebrates the artistic value of fragrance. Each poem is inspired by a specific perfume, from timeless classics such as Guerlain's *Mitsouko* to popular releases like Marc Jacobs' *Daisy*. Nineteen of the twenty-four poems use the ekphrastic poetry form to capture the stories that particular perfumes evoke, weaving tales of succubae, young witches, and genies. The remaining five poems are prose poems that specifically focus on how fragrance has preserved my own memory. In addition to the twenty-four poems, *Fragrantasia* also includes a critical introduction that connects fragrance and memory, explores fragrance taxonomies, justifies fragrance as an art, and places my project in conversation with similar poetic works.

055
Name: Robinson, Toussaint
Major: Architecture
Faculty Advisor, Affiliation: Dr. Aaron White, School of Architecture
Project Category: Arts and Humanities (Poster)

Stylistic Analysis: Carlo Fontana's San Marcello al Corso Explored
Through close-reading and analysis, this research analyzes San Marcello al Corso: a building located in Florence, Italy, and designed by Italian architect Carlo Fontana in 1697. Specific focus is placed on doing a sight-led semi-holistic analysis of the artifact. This analysis predominantly includes the collection and scrutinization of plans, sections, elevations, and also photographs that capture the constant relationships existing between major elements such as horizontal pedestals, and vertical composite columns and how they converse with the building as a whole. These predominant elements, their relations, and inherent and possible perceived qualities will be highlighted. This will be done to the end of discovering the overarching consequence of how San Marcello al Corso in its construction achieves qualities of drama and tension through design moves not barring manipulation of scale and juxtaposed bold ornamentation. Seeking to explore such qualities, the research is guided by questions including: "If any, what are some of the possible effects that San Marcello al Corso has on users and onlookers?" Provided there is effect in the building's disposition, "How do these effects affect its return perception?"

177
Name: Rogers, Jordan
Other Institution: Mississippi School for Mathematics and Science
Faculty Advisor, Affiliation: Dr. Shecoya White, Food Science, Nutrition, and Health Promotion
Project Category: Biological Sciences and Engineering
Co-Author(s): Benjamin Wheeler

Effects of chitosan-coating on the quality and shelf-life extension of avocado (Persea americana) cv. Hass
Avocados often suffer from a limited shelf life due to respiration and fungal growth that can cause browning, rotting, and softening. One generally recognized as safe (GRAS) solution that has shown to exhibit antimicrobial, antifungal, and preservative properties in various fruit and vegetable products is Chitosan. Chitosan is a polysaccharide, the deacetylated form of chitin, commonly extracted from shellfish. The objective of this study was to evaluate the effects of a patent-pending chitosan coating on the overall avocado quality and ability to extend shelf life over a 9-day storage period. Avocados were purchased from a local grocery store and either treated with a chitosan coating by immersion or immersed in water (control) and then stored at ambient temperature (25± 2 °C). Changes in brightness, pH, moisture loss, and mold percentage were measured intermittently (0, 2, 7, and 9) over the 9-day storage period. The study results showed the chitosan-treated avocados consistently were brighter and had a lower pH throughout the duration of the study, 6.55 and 6.80 on days 0 and 9, respectively. The control pH was 6.68 and 6.90 on days 0 and 9, respectively. Compared to the control the chitosan-treated avocados had a higher rate of moisture loss throughout the study. The percentage of mold growth and internal grey pulp was less in the treated avocados. Formulation changes would need to be addressed to better control moisture loss prior to being a suitable preservative in the food industry.

178
Name: Rogers, Jordan
Other Institution: Mississippi School for Mathematics and Science
Faculty Advisor, Affiliation: Dr. Barbara L.F. Kaplan, Department of Comparative Biomedical Science
Project Category: Biological Sciences and Engineering
Co-Author(s): Debra Moore, Ashli Brown, Darrel Sparks, Mark Lawrence, Stephen Reichley

Detection of Persistent Organic Pollutants in the Tissues of Dolphins Stranded Along the MS Gulf Coast
Along the coastline of the Mississippi Sound in the Gulf of Mexico, many dolphins have been found dead. Our team has been working with a selection of 86 dolphins to identify potential causes of death. Tissues were obtained from dolphins

found stranded between 2010 – 2019. Numerous tests have been completed to find persistent organic pollutants such as polychlorinated biphenyls (PCBs) and polycyclic aromatic hydrocarbons (PAHs) in blubber, muscle, kidney, and liver. The samples were divided into two time frames: 1.) 2010 – 2018; and 2.) 2019. This allowed the team to investigate possible differences in environmental exposures caused by the more frequent opening of the Bonnet Carre Spillway in 2019, which helps to prevent flooding in New Orleans. It has been proposed that more frequent openings of the spillway might alter marine ecosystems through changes in water salinity or pH. We hypothesized there would be a difference between the chemical burden in tissues from dolphins found before 2019 as compared to 2019. Quantification of 23 PAHs revealed that only 6 were detected, with naphthalene being detected most often with highest levels in blubber and liver. There was no difference in naphthalene levels between time periods. Quantification of 7 PCBs revealed that most were detected regardless of time, with the exception of PCB 28, which was only found in 6 dolphins. Also, biphenyl (without chlorines) was only detected in 1 dolphin. We conclude that dolphins were exposed to persistent organic pollutants but there was not a difference between the 2 time periods. In the future, our team plans to obtain data from stranded dolphins from 2020 and 2021. These data are important because dolphins can be viewed as sentinel animals for human exposure.

179
Name: Rogers, Sarah
Major: Wildlife & Fisheries Science/Wildlife Science
Faculty Advisor, Affiliation: Dana Morin, Wildlife, Fisheries, and Aquaculture
Project Category: Biological Sciences and Engineering
Co-Author(s): Daniela Adjaye, Eric Hileman, Geriann Albers
REU/Research Program: CFR Undergraduate Research Program

Use of Coverboards to Study Southern Short-Tailed Shrews and Southeastern Shrews in Mississippi
Southern short-tailed shrews are abundant throughout the southeastern United States (Genoways and Choate 1998). However, shrews are difficult to detect via live capture methods, resulting in limited knowledge about their ecology. Coverboards are often used to detect herpetofauna, and shrews have been recorded using these coverboards for foraging or shelter. We placed coverboards in a variety of habitat types, including old field, mixed pine/ hardwood forests, and grass with rich soil and clovers at the Mississippi State Dairy Farm to assess the potential to detect southern short-tailed shrews (*Blarina carolinensis*) and southeastern shrews (*Sorex longirostris*). We checked coverboards over a total of 28 days during three different time periods to determine the optimal time to sample for shrews. These time periods included daytime (10:00 am to 2:00 pm), evening (5:00 pm to 8:00 pm), and midnight (10:00 pm to 2:00 am). Only one southeastern shrew was detected throughout the study, and it in the rich soil and clover habitat. In addition, most coverboards contained a potential sign of shrews in the form of scat and burrows. Organisms frequently seen under the coverboards included gastropods, isopods, arachnids, myriapods, and insects. Most of these organisms are suitable prey for shrews. Two woodland voles (*Microtus pinetorum*) were found under one of the old field coverboards. This was the only sighting of mammals under the coverboards, but many contained signs including scat, large burrows, and chew markings on the edges of the coverboards. After temperatures increased, an eastern newt (*Notophthalmus viridescens*) and a skink were sighted under two coverboards in an old field sight. This study showed that coverboards were not an effective method for catching shrews during the cold months but may be more effective in warmer temperatures.

030
Name: Rogers, Titus
Major: Mechanical Engineering
Faculty Advisor, Affiliation: Dr. Heejin Cho, Mechanical Engineering, and Institute for Clean Energy Technology
Project Category: Physical Sciences and Engineering
Co-Author(s): Adam Parsons, Gentry Berry

Design and Implementation of Data Acquisition System for Filter Media Test Stand
Air contamination from radioactive particles can result from routine work and testing in nuclear facilities. Therefore, robust air filtration systems are vital in the nuclear industry, as they protect on-site workers from exposure to contaminated air and prevent the release of contamination into the open environment. An integral component of these

systems is High Efficiency Particulate Air (HEPA) filters, which are highly efficient filters that have a minimum particle removal effectiveness of 99.97 % for aerosol that is 0.3 micrometers in diameter and a maximum airflow resistance of 1-inch water column (in. w.c.) when operating at 1,000 cfm, as specified by the Department of Energy's (DOE) Nuclear Air Cleaning Handbook. When analyzing the performance of a HEPA filter, its resistance to airflow and its particle capture efficiency are considered the primary operating characteristics. Furthermore, the nuclear air cleaning handbook recommends that HEPA filters be replaced when the pressure drop exceeds 4 in. w.c., which can be regarded as a dust holding capacity and is important in the evaluation of the economy of a HEPA filter. To gain an understanding of the relationship between the mass loading of particles and the increase in pressure drop, the Institute for Clean Energy Technology at Mississippi State University has built a small-scale test stand to provide an ideal platform for experimentation. The small-scale test stand is designed to provide conditioned air and a chosen aerosol to test articles while constantly monitoring the pressure drop and particle capture. Also, to control the test stand, a program is built using LabVIEW NXG to provide a user-interface with the test stand, real-time flow characterization, and feedback calculations for automation and effective data collection. This work summarizes the methods used to operate the test stand while discussing the capabilities that allow for excellent automation, testing, and data collection.

031
Name: Roka, Jeevan
Major: Computer Science
Faculty Advisor, Affiliation: Harun Pirim, Industrial and Systems Engineering
Project Category: Physical Sciences and Engineering

Attention-deficit/hyperactivity disorder
Attention-deficit/hyperactivity disorder (ADHD) is a common neurodevelopmental disorder in children, and it affects the daily life activities, personal and social life of the children. It directly affects both home and school life making them more vulnerable to other disorders and dependent on the parents, teachers, and adults. This disorder manifests as a cluster of symptoms seen in the performance and interaction of the children. Psychologically, it harms the children's mentality, and all the symptoms of this disorder, as mentioned by the Diagnostic Statistical Manual (DSM-5), are one way or another connected, and this connection shows that symptoms are important factors to understand ADHD. This research investigates the clinical features of ADHD, the inter-connection between these symptoms, and the signs and symptoms that do not go with the other symptoms but are present in the clinical setting from machine learning perspective. The dataset provided by a recent paper by T. J. Silk et al. (2019)[1] is employed to 1- Run descriptive data analysis including summary statistics, ANOVA, and principle component analysis. 2- Predict ADHD condition using machine learning techniques including kNN, Logistic Regression, Support Vector Machine, and random forest. 3- Construct relationship network between ADHD and non-ADHD people to aid descriptive network analysis. PCA distinguishes ADHD and non-ADHD groups, machine learning techniques predict ADHD or non-ADHD labels with high accuracy.
[1] T. J. Silk et al., "A network analysis approach to ADHD symptoms: More than the sum of its parts", Plos One, 2019

098
Name: Roux, Bailey
Major: Biochemistry
Faculty Advisor, Affiliation: Rahel Mathews, Food Science, Nutrition, and Health Promotion
Project Category: Social Sciences
REU/Research Program: CALS URSP
Other Competition(s): Community Engagement Research Track, Public Health Research Competition

The Impact of the COVID-19 Pandemic on Reported Physical Activity and Weight in Low-Income Parents
Background: The COVID-19 pandemic reshaped many people's lifestyle, in particular low-income families. Purpose: This study evaluated reported changes in physical activity levels and weight in low-income parents. Design: Parents in three Head Start centers in Mississippi were surveyed in January-March 2021. Weight gain, health conditions, and physical activity levels were self-reported. Analysis was completed using SPSS. Findings: Out of 76 respondents, the majority were female (94.7%), single (55.3%), between the ages of 25 and 44 (80.3%), and African American (48.7%). Approximately half

reported a health condition (51.3%, n=39) and an increase in weight (52.6%, n=40). Only 21.1% (n=16) of participants reported increasing physical activity levels. Of those who reported a health condition, 64.1% (n=25) reported an increase in weight, and 76.9% (n=30) reported no change or a decrease in physical activity level. Of those without a reported health condition, 40.5% (n=15) reported an increase in weight and 81.1% (n=30) reported a decrease or no change in physical activity. Discussion: Most parents reported a decrease or no change in physical activity during the pandemic. Maintaining regular physical activity levels may help manage symptoms and risks of many health conditions, including COVID-19. However, during the pandemic, quarantines and closing of businesses may have contributed to more sedentary choices. In addition, low-income families already face hardships accessing resources needed to maintain their health. Conclusion: Health care providers should help patients explore options to increase physical activity in new, COVID-friendly ways.

180
Name: Sandifer, Jessica
Major: Biochemistry
Faculty Advisor, Affiliation: Aswathy Rai, Biochemistry, Molecular Biology, Entomology and Plant Pathology
Project Category: Biological Sciences and Engineering
Co-Author(s): Santanu Kundu
REU/Research Program: Undergraduate Research Program, ORED

Growth Phase-Specific Analysis of Polyhydroxyalkanoate Depolymerase Expression In *Cuprividus necator*
Polyhydroxybutyrate (PHB), a short chain polyhydroxyalkanoate (PHA), is a naturally produced biopolymer in *Cuprividus necator*. Its thermoplastic and mechanical properties are comparable to petroleum-based plastics, making it a renewable and biodegradable alternative for the production of bioplastics and biomedical materials. For example, PHAs are essential components of meshes and sutures, and they are used to encapsulate bioactive agents, such as tumor drugs and antibiotics. Despite these advances, PHB metabolism, intracellular accumulation mechanisms, and PHB degradation are poorly understood, limiting scalability. Here we aim to analyze the gene expression patterns of *phaZ* genes that code for PHA depolymerase, enzymes that function in Polyhydroxybutyrate (PHB) degradation, and utilization in *C. necator*. Hence, understanding the gene expression patterns of *phaZ* genes during the various growth phases of *C. necator* will provide critical insights into PHB utilization, allowing us to manipulate the *phaZ* genes to enhance PHB production.
Source: Pettinari, M. J., & Egoburo, D. E. (2021). Chapter 23 - Manipulation of global regulators in Escherichia coli for the synthesis of biotechnologically relevant products. In V. Singh (Ed.), *Microbial Cell Factories Engineering for Production of Biomolecules* (pp. 437–453). Academic Press. https://doi.org/https://doi.org/10.1016/B978-0-12-821477-0.00018-0

181
Name: Self, Jr., Gerald
Major: Poultry Science
Faculty Advisor, Affiliation: Pratima Adhikari, Poultry Science
Project Category: Biological Sciences and Engineering
Co-Author(s): Ishab Poudel
REU/Research Program: Undergraduate Research Scholars Program

Behavior, Welfare, and Production Effects of Late-Stage Cage Raised Laying Hens in a Cage-Free Environment
A six-week study was conducted to evaluate the behavior, welfare, and production effects on laying hens originally raised in a cage system after being transitioned to a cage-free environment. Out of a total 12 identical cage-free pens. Each pen containing birds contained a littered floor, waterline with nipple-drinkers, hanging feeder, and wooden perch. Furthermore, each pen also contained a Hikvision® Night Vision camera to observe behavioral changes. Hens had an adaptation period of one week to grow accustomed to the surroundings. Production performance data calculated was the feed consumption, hen day egg production (HDEP), hen day egg mass (HDEM), and feed conversion ratio (FCR). Four welfare evaluations were also conducted throughout the trial to evaluate the paw, comb, and feather scores. The HDEP gradually increased from 59.61% to 63.60% through the third week but fell during to 58.87% fourth week due to a dramatic temperature fluctuation. Feed consumption slowly increased post-adaptation through the third week and drastically increased in the fourth week. This indicates colder temperatures leading to an increased feed consumption. The HDEM

gradually increased through the fourth week and fell after the drastic feed consumption increase. Regarding welfare scoring, the paw feather and comb scores all increased from the post-adaptation period to the second week and fell during the third week. However, all scores began to increase during the fourth week. The lowered welfare score of 4.86% for paw; 6.99% for feather; and 5.78% for comb, within the first and second week can be attributed to hierarchal orders being established during the adaptation, and the absence of protective cages between groups. As consumer preference towards cage-free eggs in the market becomes more prevalent, extensive studies that evaluate welfare become more essential to continue the growth of the egg industry.
Key Words: laying hen, cage-free, behavior

182
Name: Shah, Ashutosh
Major: Mechanical Engineering
Faculty Advisor, Affiliation: Dr. Sathish Samiappan, Geosystems Research Institute; Dr. Gray Turnage, Geosystems Research Institute
Project Category: Biological Sciences and Engineering
Co-Author(s): Dr. Santhana Krishnan Boopalan
Other Competition(s): Three Minute Thesis Competition

Invasive Aquatic Plant Species Identification on Nvidia Jetson Nano Using Computer Vision and Deep Learning
Wetland ecosystems are vulnerable to infestation and spread of invasive aquatic plant species. Such species, if left unchecked, can hinder the growth of native plants as well as animals in that ecosystem. The solution to this problem is to correctly identify and treat these plants with suitable herbicides. However, doing so manually is a very time-consuming and labor-intensive task which adds to resource management costs. Identification of such species using computer vision and deep learning models to aid in real-time in-situ decisions like spot-spraying is an area with little existing research. Although in the past, deep neural networks have successfully classified across 80 different object classes, the leaves/stems having similar structures across plant species pose a challenge for classification models.
The goal of this project is to detect, identify, and localize 8 most commonly found invasive aquatic species in Mississippi from a low-fps and low-resolution image stream on a Nvidia Jetson Nano microcontroller running deep learning models like a simple 5-layered Convolutional Neural Network, Resnet-18, and Mobilenet-SSD. For network training, 1600 images were taken using a DSLR camera under natural lighting conditions and were cropped, rotated, and normalized as part of pre-processing augmentation. Both a desktop computer equipped with a GPU for parallel processing and Google Colab's GPU clusters were used for training the model. Similarly taken 400 images were used for testing as well as inferencing on the Jetson Nano.
With a testing accuracy of 87% and inference accuracy of 96%, the trained model was sufficiently robust to detect and classify across the 8 different invasives species. Once optimized for specific applications, the detection system can be deployed on autonomous boats and drones. Making the system more generalized in that it could be used to identify terrestrial plants/trees in addition to aquatic plants is a secondary yet imminent aim.

032
Name: Shirley, Ryan
Major: Aerospace Engineering
Faculty Advisor, Affiliation: Rob Wolz, Aerospace Engineering
Project Category: Physical Sciences and Engineering
Co-Author(s): Katlyn Brashier, Yasmine Broach, Andrew Coleman

Hybrid Rocket Development
A hybrid rocket motor is a type of rocket that uses propellants in two phases. Those phases are usually first a solid state, then a gas or liquid state. Hybrid rockets are greatly efficient. Hybrid rockets are the safest making a chemical explosion during flight highly unlikely. For this seminar, a hybrid rocket motor will be analyzed to determine if it truly is the safest, most efficient type of rocket. The seminar documents the disadvantages (i.e., cost, safety, complexity) associated with traditional solid rockets compared to hybrid rockets and provides evidence of hybrid rockets being overall more

environmentally favorable. After analyzing the data from the SLS solid rocket motor and comparing it to a hybrid rocket of a design in MATLAB. Part of this analysis will also include the cost difference between types of fuel and manufacturing requirements. The initial tasks were researching the problem statement and methodology behind the development of a hybrid propulsion system. The integration of each material and its effectiveness was also investigated. The injector, oxidizer housing, fuel grain, port geometry, and nozzle were the parts discussed and chosen dynamically. Research continued with both experimental and analytical results from previous studies on hybrid rocket or propulsion development. The hybrid rocket designed here is expected to perform at the same level or exceed that of a solid rocket. Much of this research contributed to safety and simplicity of methodology in integrating some parts such as the casing for the fuel and conducting the initial thrust test.

099
Name: Silliaman, MaKailee
Major: Psychology
Faculty Advisor, Affiliation: Carolyn Adams-Price, Psychology
Project Category: Social Sciences
Other Competition(s): Public Health Research Competition

Older Rural African Americans: A Qualitative Examination of Their Experiences with Health Care Professionals
There has recently been increased interest in health inequities between older minorities and older Caucasians, and between urban dwellers and rural dwellers. Older rural African Americans may be particularly at risk for poor health outcomes. In a recently collected sample of rural African Americans over 50 in Mississippi, self-reported health was particularly low, with most participants reporting less than good health. Typically, older African Americans rate their health as poorer than Caucasians, and that difference remains when socioeconomic factors are taken into account (Roth et al., 2016). The purpose of this study was to examine predictors of better self-reported health in older rural African Americans in northeastern Mississippi who do not live in the larger towns in that area (i.e., Starkville, Columbus, or Tupelo). Our participants were 47 older African Americans above the age of 50. On average, participants reported fair to good health, with only one reporting excellent health. Using multiple regression, we examined the following predictors of self-reported health: education, life satisfaction, age, low income, and distance from grocery store. Only two factors were significant predictors: education and distance from the grocery store. Not surprisingly, higher education was predictive of better self-reported health. More surprisingly, residents who lived further from a grocery had higher self-reported health. In the poster we will discuss possible explanations for the positive association between health and distance from the grocery store in our sample, as well as the likelihood that their self-ratings of health are accurate. One implication of our study for public health is that having land and potentially growing food may be a protective factor for health in older rural African Americans.

033
Name: Simek, Austin
Major: Aerospace Engineering
Faculty Advisor, Affiliation: Calvin Walker, Aerospace Engineering
Project Category: Physical Sciences and Engineering
Co-Author(s): Charles Pheng, Gavyn Malagarie
Other Competition(s): Community Engagement Research Track, Three Minute Thesis Competition

Wingtip Aerodynamics
Wings generate lift, as well as drag. There are two distinct types of drag, skin friction drag and drag due to lift, also known as parasitic or induced drag. The goal is to minimize induced drag while keeping an acceptable lift. To achieve this, we will change the wingtip design by adding a winglet and increase the span or spanning. The wing is an SD7062 airfoil that will be used at a low speed, low altitude drone (UAV). The UAV has a one-foot chord wing with a span of eight feet. The wingtip device has a span restriction of 0.75 feet. Using XFLR5, a low order computational fluid dynamics (CFD) program, we modeled the wing and various spanning and winglet configurations to determine which configuration produced the least amount of drag. Then using Solidworks, we created a three-dimensional model of the wing and all the optimal wingtip

devices that we determined with the XFLR5 analysis. We took the Solidworks models and input it into a higher order CFD, ANSYS Fluent, to get a more accurate approximation. Then, we compared the computational work against wind tunnel testing of the base wing, the base wing with the winglet, and the base wing with spanning.

034
Name: Skelton, Kelli
Major: Aerospace Engineering
Faculty Advisor, Affiliation: Dr. Han-gyu Kim, Aerospace Engineering; Dr. Jichul Kim, Aerospace Engineering
Project Category: Physical Sciences and Engineering
Co-Author(s): Jasmine Chin, James Miller Jr., Javion Smith
REU/Research Program: ORED Undergraduate Research Grant

The Advantages of Additive
Our project aims to make significant use of additive manufacturing in rocket structures by reducing structure weight, improving performance, and simplifying the manufacturing process. Important aspects of any rocket are weight and manufacturability, and by 3-D printing the rocket structure, the precision build makes it easier to reduce weight and take the risk out of faulty parts. We plan to use Solidworks to make a computer-aided design (CAD) model rocket that will be 3-D printed. To reduce weight, we will adjust the infill percentage. The infill percentage will be determined by a strength test of different materials. This starts with a compressive material test on PLA, Carbon-filled Nylon, iron-filled PLA, and Carbon-filled Polycarbonate to choose the sturdiest material. Based on the budget of four college students, we chose glass-filled Nylon because the strongest material out of the original list is Carbon-filled Nylon. The increase of payload space is theorized with the assumption that the reduced infill will be strong enough to hold more payload without internal support. To compare the advantages and disadvantages, we are working with Mississippi State's Rocket design team, Space Cowboys, to borrow one of their traditionally manufactured rockets' data to compare to the additive manufactured rocket. Characteristics like speed, altitude, and acceleration will be collected via a flight computer that the team will assemble before launch. At this moment, the model rocket dimensions are 5 ft. with a 6 in. diameter, but that may be subject to change. Once all assembly is done, we plan to launch by the end of the semester, a thorough analysis of our predicted calculations to physical date at a 9,500 ft. and Mach 0.7 speed will be the main focal point in both the space cowboy's rocket and the additive manufactured rocket data analysis.

100
Name: Smith, Adelle
Major: Human Sciences/Human Dev & Family Studies
Faculty Advisor, Affiliation: Dr. Benjamin Burke, Human Development and Family Science
Project Category: Social Sciences

Coping and Romantic Relationships in Adult Gamers
This study examined the relationship between individual coping strategies and romantic relationship satisfaction in a sample of adult video game players (i.e., adult gamers). Prior studies have used gaming and couple perspectives to highlight the perceived damage to couple satisfaction that gaming may cause. However, these studies have been limited by a narrow focus on gaming behaviors and reliance on clinical samples. Therefore, the purpose of this study was to examine coping strategies as related to romantic relationship satisfaction in a community sample of adult gamers. Using the ABC X model of family stress, we analyzed factors involving participant stress, coping strategies, and relationship satisfaction. Additionally, to address potential technoference (i.e., relationship interference caused by technology), we measured time spent playing video games. We hypothesized that higher social coping (i.e., instrumental and emotional support) would be correlated with higher relationship satisfaction. To test this hypothesis, data were from 166 adult gamers (*M* age = 33.54 years old; 58.4% women) in romantic relationships. Self-report questionnaires were utilized to capture data on coping strategies, perceived stress, life satisfaction, relationship satisfaction, and time spent playing video games. Multiple regressions were performed in SPSS version 28. Emotional support did have a significant positive relationship with relationship satisfaction ($\beta = .15$, $p = .05$), but instrumental support did not. Time playing video games and stress level were not correlated with relationship satisfaction, but life satisfaction had a significant positive

relationship with relationship satisfaction (β = .15, p < .001). These findings imply that adult gamers in romantic relationships may be better served by helping professionals who focus on improving life satisfaction and encouraging emotional support, rather than addressing time spent playing games.

101
Name: Smith, Garrett
Major: Political Science
Faculty Advisor, Affiliation: Benjamin Tkach, Political Science
Project Category: Social Sciences
Other Competition(s): Three Minute Thesis Competition

Terrorism Tactics: Vehicular Attacks in Israel
Vehicular ramming attacks are a relatively new phenomenon within transnational terrorism. Their use is concentrated heavily within Israel and the West Bank. Using data from the University of Maryland's Global Terrorism Database, I conduct an analysis on automobile-based terrorist attacks in Israel and the West Bank. I identify relationships between Israeli counterterrorism policy, specifically the institution of barriers to physical movement, and the adoption of vehicle ramming tactics. These walls and checkpoints inadvertently provoke vehicle ramming attacks, even if effective at reducing firearm and explosive-based attacks. Exploration of existing literature on terrorist tactic selection suggests that vehicular attacks should be more widespread, yet these attacks remain limited outside of the Israel-Palestine conflict. This observation remains consistent with the theory that specific Israeli counterterrorist tactics have generated an increase in vehicular terrorism. Early instances of Israeli vehicular attacks provide insight into the mechanisms at play in inducing and sustaining this phenomenon. I conclude by considering the implications of these mechanisms and potential policy recommendations for both Israel and any other democratic state facing these attacks.

102
Name: Smith, Makayla
Major: Sociology
Faculty Advisor, Affiliation: Kathleen Ragsdale, Social Science Research Center; Mary Read-Wahidi, Social Science Research Center
Co-Author(s): Chisopo, A., Marinda, P., Mudege, N., Read-Wahidi, M.R., Ragsdale, K., Kolbila, R., & Smith, M.
REU/Research Program: Gender Impacts Lab

Post-Harvest Fish Loss & Small-Scale Fishery Livelihoods in Zambia & Adjacent Countries: A FishFirst! Zambia Literature Review
Objective: Funded by USAID and Feed the Future Fish Innovation Lab, one FishFirst! Zambia goal is to better understand how gender across three nodes of the small-scale fishery value chain (SFVC)—which includes fishers, processors, and fish sellers—impacts men and women differently to help transition rural households towards better food security, nutrition, and economic development through sustainable fisheries productivity. Methods: To help achieve this goal, we conducted a systematic literature review to explore the impact of post-harvest fish loss (PHFL) along the SFVC in Zambia and other sub-Saharan African (SSA) countries. Targeted databases included, for example, CGIAR, FAO, Feed the Future (USAID), and WorldFish. Peer-reviewed articles published between 2008-2021 that met the inclusion/exclusion criteria were analyzed to explore the connection between PHFL and gender in Zambia and other SSA countries. Results: In Zambia and other SSA countries, gender roles govern many aspects of the SFVC: women are concentrated in processing and selling fish while men are concentrated in fishing. With limited access to basic technologies (ice, etc.) that result in poor processing, storing, and handling, women in the processing and selling nodes tend to suffer higher PHFL. As a result, women experience more economic losses than men, which is detrimental to both household food security and to men's and women's livelihoods, as fish is both a staple food for poorer household and is a primary source of income for poorer households. Summary: The data suggests that there are economic disparities among men and women in Zambia and other SSA countries that can be attributed to PHFL. Interventions to reduce PHFL that target resource limited-persons along the fish processing and selling nodes—such as implementing more sanitary washing and storage solutions tailored to low-resource environments—hold promise to mitigate PHFL among small-scale fishing families and communities.

036
Name: Sparks, Cade
Major: Aerospace Engineering
Faculty Advisor, Affiliation: Rani Sullivan, Aerospace Engineering
Project Category: Physical Sciences and Engineering
Co-Author(s): Shuvam Saha, Corinne Guerra, Nick Mullican, and Dylan Baker

Additively Manufactured Pressure Vessel Burst Test
In aerospace, lighter is always better. Pressure vessels can often reach high weights due to the thickness requirements for the pressures they hold. In this study, pressure vessels are additively manufactured (AM) with different internal wall structures (100% infill and 10% infill). The pressure vessels were designed and tested through finite element analysis (FEA). The control vessel with 100% infill and weight of 274.65 grams was designed to hold an internal pressure of 100 psi and manufactured using carbon reinforced nylon. The FEA results of the control vessel show a factor of safety of 2.494 and a maximum stress of 6688 psi. The FEA of the 10% infill pressure vessel of 176.10 grams resulted in a factor of safety of 4.017 with a maximum stress of 5175 psi. By reducing the infill percentage and subsequently the weight (by 98.55 grams) of the pressure vessel, the factor of safety improved by 161.06%. The additively manufactured test articles will be subjected to burst testing at a later date.

037
Name: Spencer, Evelyn
Major: Aerospace Engineering
Faculty Advisor, Affiliation: Jichul Kim, Aerospace Engineering
Project Category: Physical Sciences and Engineering
Co-Author(s): Student: Alyssa, Dr. Yang Chang

Satellite Maneuvers in Low Earth Orbit
In Earth's orbit, there are more than 23,000 objects in space such as spacecraft, space debris, and space junk. Satellites, especially within Low Earth Orbit (LEO), are constantly subjected to encounter these objects. For satellites in LEO to operate safely, they are equipped with satellite maneuver protocols in construction. These maneuvers consist of an orbit raising maneuver, an orbit lowering maneuver, and an inclination adjustment maneuver. The significance of these adjustment tactics is to prevent satellites from receiving damage, enabling them to continue with their respective missions. After completing research on the issue, a set of models were produced virtually to display the way these maneuver protocols are executed to different scenarios using the STK software. The project involved researching on the topic, such as obtaining information on the significance of these satellite maneuvers and how vast their obstacles were. It also included the challenge of obtaining and learning how to utilize the STK modeling software between two group members. Once the research and models were completed, the resulting maneuver protocols were compared to one another.

183
Name: Stinson, Nicholas
Major: Biochemistry
Faculty Advisor, Affiliation: Natraj Krishnan, Biochemistry, Molecular Biology, Entomology and Plant Pathology
Project Category: Biological Sciences and Engineering
Co-Author(s): Peyton York, Caleb Snoddy, Chance Anderson
REU/Research Program: URSP
Other Competition(s): Public Health Research Competition

A method for quantifying neurodegeneration using a *Drosophila* model of Spinocerebellar Ataxia Type 1
Biomedical research in the past few decades has provided the medical community with valuable information on numerous human diseases, including cancers, cardiovascular diseases (CVD) and neurodegenerative diseases (NDs). NDs are progressive disorders of the nervous system that affect specific cellular populations in the central and peripheral nervous

systems. The application of genetics in simple model systems to address mechanisms of NDs has been receiving increased attention recently. The fruit fly *Drosophila melanogaster* has emerged as a pre-eminent model system for studying mechanisms of neurodegeneration in several major NDs including Alzheimer's, Parkinson's and Huntington's diseases. This model also offers an excellent *in vivo* system for the testing of therapeutic compounds. Spinocerebellar ataxia type 1 (SCA1) is a condition characterized by progressive problems with movement. Patients affected by SCA-1 develop an adult-onset devastating pathology characterized by peripheral axonal motor and sensory neuropathy. A Drosophila model of SCA1 was developed by driving the expression of human Ataxin 1 with a PolyQ repeat of 82 amino acids under the control of elav-Gal4 -a pan-neuronal driver. Previous studies on studying neurodegeneration in Drosophila brains have mostly been subjective. To circumvent this, a method for quantifying neurodegeneration was developed. Whole brain of adult Drosophila SCA1 and parallel controls was used to document and quantify neurodegeneration using laser-scanning confocal microscopy and image processing with Fiji (ImajeJ) of Z-stack images and reconstructing a 3D model of affected brain region using Imaris software. The obtained values of the damaged area were correlated with the volume of the whole brain to quantify the percentage of neurodegeneration and statistically analyzed using a Student's t-test. The development of this method and model has immense public health benefits in the long-term since this would provide a parameter to quantify neurodegeneration in Drosophila models of human NDs leading to developing effective therapeutics.

038
Name: Swann, Brady
Major: Aerospace Engineering
Faculty Advisor, Affiliation: Shreyas Narsipur, Aerospace Engineering; Adrian Sescu, Aerospace Engineering
Project Category: Physical Sciences and Engineering
Co-Author(s): Andrew Griffey, Sean Auer, Owen Cote

Tiger Shark CFD Analysis
The current study focuses on investigating the flight characteristics of the Tiger Shark UAV in cruise at different angles of attack, and to compare the data generated by the Ansys Fluent computational fluid dynamics (CFD) software with the NASA's TetrUSS (Grid Tool, Vgrid, Post grid, USM3D) suite of CFD tools. Drag is a critical flow characteristic that researchers have been studying for decades that, in terms of flight, is the ability to resist any object as it moves through a fluid—in this study's case, air. CFD is the process that was used to assess and determine the flight characteristics of the TigerShark in order to see the problematic geometry configurations of the aircraft and suggest how to streamline them. By the collection of a set of data through a range of CFD cases, the different angles of attack used at a common cruise velocity showed how the drag is built up and that increasing lift leads to flow separation about the wings. Through differing analysis methodologies and tools, the data which was collected was used to determine the lift, drag, pressure distributions and local velocity differences as the aircraft was simulated at different phases of flight. While the wing effects of an aircraft though flight are of primary concern, the impact that the entirety of the aircraft has on the flow characteristics about the wings is examined to achieve predictions for future geometry configurations, thereby requiring three-dimensional simulations to be the primary vehicle of this study.

039
Name: Taylor, Briana
Major: Aerospace Engineering
Faculty Advisor, Affiliation: Jichul Kim, Aerospace Engineering
Project Category: Physical Sciences and Engineering
Co-Author(s): Ben Davis, JP Person, Kyle Ryker
REU/Research Program: ORED

Landing Spot Determination using LiDAR and UAS Integration
The purpose of this project is to use Light Detection and Ranging (LiDAR) systems integrated with an Unmanned Aircraft System (UAS) to determine the safest landing site. This testing will mock that of Mars landings to improve extraterrestrial studies. We will discuss the development and modification of the Random Sample Consensus (RANSAC) algorithm to use

3D point cloud data from LiDAR systems to identify the safest landing site. Following, we will discuss the integration of Motion Capture System (MCS) to Microcontroller Unit (MCU) using raspberry pi applications and Linux programming. Finally, we will discuss MCU to LiDAR system integration using VeloView software applications and MATLAB programming. The VLP-16 LiDAR system could further be integrated with a DJI Matrice 600 (UAS) to demonstrate possibilities of test landings at the Raspet Flight Research Laboratory (RFRL) UAS Testing Center.

184
Name: Taylor, Caera
Major: Biochemistry
Faculty Advisor, Affiliation: Dr. Russell Carr, Center for Environmental Health Sciences, Department of Comparative Biomedical Sciences
Project Category: Biological Sciences and Engineering
Co-Author(s): Kylee J. Burroughs, Shirley X. Guo-Ross, Angela K. Ross, and Katelyn N. Sette

Effect of Cannabidiol on the Viral Immune Response in Juvenile Rat Brains
Cannabidiol (CBD) is a non-psychotomimetic constituent of *Cannabis sativa*. CBD is effective in relieving uncontrolled. seizures in children, but while there are claims that CBD is also effective in treating anxiety, depression, autism, and ADHD, these have not been substantiated in clinical studies. Regardless, anecdotal evidence indicates parents are giving CBD to their children for reducing hyperactivity and restlessness. It is known that CBD has an effect on the adult immune system, including altering the response of immune cells in the brain; however, it is unclear whether or not this altered response occurs in the juvenile brain. To investigate this, 12-day old male rats were orally administered either corn oil, 20 mg/kg CBD, or 60 mg/kg CBD for 5 days. One hour after the last treatment, the rat's immune system was challenged by intranasal administration of either saline or the viral mimic Resiquimod R848 (2.5 μg/g). After 6hrs and 24hrs, brains were collected for mRNA extraction, and Real-Time PCR was performed to determine changes in gene expression of the brain immune cell markers for astrocyte regulation (S100β), astrocyte activation (GFAP), general macrophage activation (Iba-1), and microglial activation (TMEM119). Challenge of the immune system with R848 decreased TMEM119 expression at 6hrs and S100β expression at 24hrs, but CBD exposure did not alter these patterns of expression. However, exposure to R848 increased the expression of GFAP and Iba-1 at 6hrs which was maintained through 24hrs. CBD slowed the initial increase in the expression of these markers at 6hrs with normal levels reached by 24hrs. Our data suggests that CBD exposure alters astrocyte and macrophage activation in response to a viral challenge in the juvenile brain. This occurrence may indicate health consequences in children orally administered CBD.

185
Name: Teel, Gracie
Major: Biochemistry
Faculty Advisor, Affiliation: Dr. Shengfa Liao, Animal and Dairy Sciences; Dr. Shamimul Hasan, Animal and Dairy Sciences; Dr. Jean M. Feugan, Animal and Dairy Sciences
Project Category: Biological Sciences and Engineering
Co-Author(s): Susan Sotak
REU/Research Program: Undergraduate Research Scholar's Program

Effects of dietary supplementation of DL-methionine and the calcium salt of DL-methionine hydroxy analog against the diquat-induced oxidative stress in growing pigs
This research was to study the effects of dietary supplementation of DL-methionine (**DL-Met**) or DL-Met hydroxy analog (in Ca salt form; **MHA-Ca**) on the growth performance and anti-oxidative status of pigs. Twenty barrows (21.8±5.72 kg) were randomly allotted to 4 treatment groups (n=5). Groups 1 and 2 received a basal diet (Diet 1) formulated to meet the NRC (2012) requirements. Group 3 received a DL-Met supplemented diet (Diet 2) containing 25% more SID Met+Cys than Diet 1. Group 4 received Diet 3 supplemented with an amount of MHA-Ca equivalent to that of DL-Met supplemented in Diet 2. After 3 weeks of feeding, pigs were injected with 10 mg/kg-BW diquat in 10 mL saline (for Groups 2, 3 and 4) or just 10 mL saline (for Group 1). The average daily gain (ADG), average daily feed intake (ADFI), and gain-to-feed ratio were determined on days 21 and 28. Blood samples were collected on day 28 and the serum malondialdehyde (MDA, an

oxidative stress marker) concentration and catalase activity were analyzed. Data were analyzed with ANOVA. Results showed that there were no differences in growth performance among the 4 groups of pigs before diquat challenge. After the challenge, however, the ADG and ADFI of Group 2 pigs were lower than Group 1 pigs ($p<0.04$). The additional dietary DL-Met (Group 3) and MHA-Ca (Group 4) did not increase the ADG and ADFI comparing to Group 2 pigs. The serum concentration of MDA was increased in Group 2 vs. Group 1 pigs ($p<0.010$). There was no difference in the MDA concentration among Groups 2, 3 and 4 pigs. The catalase activity was not different among the 4 groups of pigs. These findings suggest that the additional DL-Met or MHA-Ca may not be able to prevent the diquat-induced oxidative stress in growing pigs.

Key words: DL-methionine, DL-methionine hydroxy analog, re-dox status, growing pig.

040

Name: Thomas, Zavian
Major: Electrical Engineering
Faculty Advisor, Affiliation: David Wallace, High Voltage Lab
Project Category: Physical Sciences and Engineering
REU/Research Program: DIS Solar Decathlon

Using Home Assistant as a Central Controller for Smart Home Systems

This research was done to find an optimal solution for controlling and monitoring various appliances and smart home equipment through a central operating system called Home Assistant. The data from the appliances and equipment was taken and optimized for load shedding events. Home Assistant is an open-source operating system that can control and monitor various smart devices, applications, and services such as sensors, energy monitoring equipment, and home appliances. For energy monitoring, Home Assistant can directly monitor the power consumption and usage of high energy loads and display usage data to the homeowner. This data can be retrieved by direct integration with the appliance, with the use of a compatible energy monitoring smart plug integration, or with energy monitoring relay switches connected to a breaker. Using these integrations, Home Assistant can display that data onto a dashboard for the homeowner to view, edit, and control. Home Assistant also can create custom automations to control devices automatically on a set schedule, when a trigger or event occurs. Integration data can also be used for load shedding events where homes need to reduce their energy load for a brief period. It was found that HVAC and hot water heaters are the two largest energy consumers in any household, so a load shedding event should target controlling those appliances to reduce the greatest amount of load possible. When a load shedding event is called, Home Assistant will “prep” the home by cooling or heating the home prior to the load shedding event and preheat the water in the home; this is to maximize comfort for the homeowner during the event. Then, Home Assistant will turn off the HVAC and hot water heater until the event is over.

186

Name: Thompson, Charlotte
Major: Mechanical Engineering
Faculty Advisor, Affiliation: Matthew W. Priddy, Mechanical Engineering; Lauren B. Priddy, Agricultural and Biological Engineering
Project Category: Biological Sciences and Engineering
Co-Author(s): Alexis Graham, Sophie Jones, Darrock Flynn

Design of a Prototype (Low-Cost) Mechanical Loading Bioreactor

Applying mechanical loading on bone is known to stimulate bone cell growth and increase bone density. Most studies on bone growth and healing due to mechanical stimuli have been conducted *in vivo* and follow an individual’s physical activity to measure osteogenic responses, regeneration rates, and bone repair. The *in vivo* studies yield the most realistic data, but the conditions of the subject can be difficult to monitor and control. Alternatively, *in vitro* studies have shown promise for creating preclinical models for mechanical loading of bone-derived cells, examining osteoclast formation and activity, and preforming bone tissue engineering. But, previous *in vitro* studies have primarily been concerned with mechanical loading on cartilage instead of bone. The purpose of this study is to develop a low-cost bioreactor that applies dynamic mechanical loading and determine if it can be used to effectively stimulate bone cell growth *in vitro*. A prototype was

designed to apply a maximum physiological strain of 2000 microstrain on cylindrical bone explants. The prototype was created with medically safe materials and sized to fit within a benchtop incubator. To conduct testing for cyclic and static mechanical loads on a variational schedule, the bioreactor system was designed to consist of a peristaltic pump, linear actuator, load cell, and the use of LabView programming. From this point, we modified the design to house three chambers and leave space for a second system to preform replicated studies with a total of six chambers inside the incubator.

041
Name: Todd, Alayna
Major: Human Sciences/Apparel Textiles & Merchandising
Faculty Advisor, Affiliation: Charles Freeman, Fashion Design and Merchandising
Project Category: Physical Sciences and Engineering

Development of a Compost-Ready PPE for Use in Poultry Production
The poultry industry consistently utilizes compost bins for sustainable waste disposal. Every individual that enters a poultry farm must wear a PPE suit to prevent the spread of diseases to and from the poultry. Once the individual exits the farm, the PPE suit is disposed of in the waste bin. As regulations tighten, poultry farm inspections increase, thus, increasing the amount of PPE waste sent to landfills. To minimize waste and energy consumption, a compostable PPE suit with minimal permeability is to be created. The material's base placard is to be composed of 50% hemp hurd and 50% PLA (polylactic acid) from a Twin-screw extrusion process. Following placard production, the material undergoes a melt-blow process to yield a nonwoven fabric. Preliminary findings indicate that the 50/50 Hemp/PLA material will complete the composting process in 3 to 7 months under standard compost bin conditions of 40-60% humidity and 130-160 °F. Testing of compostability percentages and optimal placard composition are underway.

187
Name: Tomasi, Jessica
Major: Wildlife & Fisheries Science/Aquaculture & Fisheries Science
Faculty Advisor, Affiliation: Mark McConnell, Wildlife, Fisheries and Aquaculture
Project Category: Biological Sciences and Engineering
Co-Author(s): Trey Wall
Other Competition(s): Community Engagement Research Track

Restoring northern bobwhite habitat in rank native warm season grass stands
The northern bobwhite (*Colinus virginianus*; hereafter, "bobwhite") is an upland game bird native to North America that has experienced population declines for decades, largely due to habitat loss and degradation. Efforts to increase bobwhite numbers often include the establishment of native warm season grasses (NWSG); however, NWSG are often planted too thick or are not properly managed, creating stands too dense for bobwhite to exploit. Grasses are important for bobwhite management but stands that are too thick reduce bare ground which restricts movement and mobility as well as invertebrate availability which are essential components for survival and reproduction. We assessed the effectiveness of common management methods for reducing NWSG including broad spectrum herbicide (glyphosate), dormant-season prescribed fire, and dormant-season disking on study plots (10x10m) at a private property in West Point, Mississippi. Using vegetation sampling data taken before and after treatments, we calculated percent reduction of NWSG to determine effectiveness of each treatment. In our study, dormant-season disking reduced NWSG by 39.7% and glyphosate by 59.33%. Dormant-season prescribed fire increased NWSG by 3.73%. Our results suggest that dormant-season disking is an effective option for reducing rank NWSG for bobwhite management.

042
Name: Tran, Quyen
Major: Chemical Engineering
Faculty Advisor, Affiliation: Neeraj Rai, Chemical Engineering
Project Category: Physical Sciences and Engineering
Co-Author(s): Woody N. Wilson

Impact of Solvent on Binding Modes of Furfural on alpha/beta-Mo_2C Catalyst

As the world is moving away from fossil fuels, researchers are seeking new ways to synthesize value-added chemicals and fuels from renewable feedstocks. Furfural is produced from the hydrolysis of biomass hemicellulose and has been identified by the DOE as a viable building block for producing products traditionally made from petroleum sources. To be used in these applications (e.g., rocket fuel, furan resin, etc.), furfural needs to be converted to furfural alcohol. Traditionally, furfural alcohol is produced by catalytically hydrogenating furfural over copper chromite. Unfortunately, this catalyst is extremely toxic to the environment. This research aims to use *ab initio* molecular dynamics to understand the solvation effects of cyclohexane, methanol, and water on the binding modes of furfural over an alternative a/b-Molybdenum Carbide (Mo_2C) catalyst. Radial distribution functions, hydrogen bond analysis, center of mass distance, and binding energy of furfural onto a-Mo_2C and b-Mo_2C (101) surfaces are calculated and discussed to evaluate each solvent's potential for liquid-phase hydrogenation at 300 K. Current results show that each solvent and surface has different effects on the binding modes of furfural, indicating that the solvent and phase of Mo_2C must be carefully chosen for this reaction.

103
Name: Tucker, Bryce
Major: Psychology
Faculty Advisor, Affiliation: Cliff McKinney, Psychology
Project Category: Social Sciences
Co-Author(s): Tram Ngyuen

Maltreatment and Delinquency in Emerging Adults: Moderation by Parent-Child Relationship

Previous research has consistently shown childhood maltreatment to impact delinquency (Hollist et al., 2009). Prior research also suggests that social and environmental factors, particularly familial, influence this relationship. A study found that adolescents from neglectful homes were more likely to externalize problems, such as involvement in delinquency (Steinberg et al., 2006)). Another recent study examined the role of parental warmth (specifically paternal) on alcohol-related problems – considered an aspect of delinquency – and observed that it might hold a protective role against such problems in those who experienced childhood maltreatment (Shin et al., 2019). While previous research has examined parent-child relationship quality and childhood maltreatment concerning delinquency separately, the current study examined parent-child relationship quality as a moderator of the relationship between childhood maltreatment and delinquency based on retrospective reports from emerging adults. Emerging adults (N = 499) completed questionnaires including the Parental Environment Questionnaire (PEQ) to assess parent-child relationship quality, Conflict Tactics Scale: Parent-Child Version (CTSPC) to assess childhood maltreatment by parents, and the Self-Report Delinquency Scale (SRD) to measure delinquency. Participants were instructed to complete measures regarding the first 16 years of their life. The findings suggested that for father-daughter dyads, paternal maltreatment associated positively with delinquency, whereas paternal relationship quality associated negatively. However, father-daughter relationship quality did not moderate the relations between past maltreatment and delinquency. Similarly, maternal maltreatment associated positively with sons' delinquency. However, the interaction for parent-child relationship quality and maltreatment was not significant for sons' delinquency. The current study supports previous findings on maltreatment and delinquency while also providing insight into how maltreatment by mothers and fathers might influence children of the opposite gender. These results have important implications for intervention in emerging adults.

188
Name: Tucker, Emily
Major: Biochemistry
Faculty Advisor, Affiliation: Ramakrishna Nannapaneni, Food Science, Nutrition, and Health Promotion
Project Category: Biological Sciences and Engineering
Co-Author(s): Stephen Schade
REU/Research Program: CALS Undergraduate Research Scholars Program (URSP)
Other Competition(s): Public Health Research Competition

Survival and persistence of *Listeria monocytogenes* Bug600 and ScottA after exposure to high and low concentrations of first generation quaternary ammonium compound (benzalkonium chloride).
The dangerous foodborne bacterial pathogen, *Listeria monocytogenes*, has been historically associated with soft cheeses and ready-to-eat processed meats and seafood. However, within the past two decades, there has been an increase in *L. monocytogenes* outbreaks in produce. Quaternary ammonium compounds (QACs) are the most common broad-spectrum sanitizing agents used in food processing environments. The first generation QAC, benzalkonium chloride (BAC) is the most widely used disinfectant in various formulations to kill bacteria, fungi, and viruses. Even though QAC are used at 50-100 times the minimum bactericidal concentration (MBC), sublethal concentrations were found in some environments. The objective of this study to determine the survival of *L. monocytogenes*, Bug600 and ScottA in various concentrations of benzalkonium chloride (BAC) in water, followed by persistence in high or low nutrient conditions. Using a concentration gradient of BAC in 96 well plates, the growth rate of *L. monocytogenes* was observed by mimicking the conditions that may be encountered in some environments. The MIC of BAC of *L. monocytogenes* was 2 µg/ml for Bug600 or 4 µg/ml for ScottA. When exposed to a lethal concentration of 10-14 µg/ml for 1 h in water, about 2 log CFU/ml of both strains of *L. monocytogenes* survived from the initial 7 log CFU/ml, and none survived after 24 h. However, when the BAC concentrations were diluted by ½ or ¼ to 3.5-7 µg/ml, about 1-2 log CFU/ml of *L. monocytogenes* were recovered in the presence of high or low nutrient conditions, along with two distinct morphotypes of *L. monocytogenes* (small and large colonies) on agar plates. Such colony variants of *L. monocytogenes* are undergoing further investigation for QAC tolerance. These findings are useful in understanding the potential link between extensive QAC usage and occurrence of biocide-tolerant strains of *L. monocytogenes* which may lead to food safety risk.

189
Name: Turnbow, Andrea
Major: Biological Engineering
Faculty Advisor, Affiliation: Dr. Raheleh Miralami, Center for Advanced Vehicular Systems
Project Category: Biological Sciences and Engineering
Co-Author(s): Gehendra Sharma
REU/Research Program: Bagley College of Engineering Undergraduate Research Program

Canine Shunt Design Optimization for Treating Hydrocephalus
Hydrocephalus occurs when excess cerebrospinal fluid (CSF) accumulates in the ventricles of the brain. While this CSF aids in removing waste, providing protection, and maintaining a constant pressure within the brain tissue of humans and animals, a buildup of excess CSF creates increased pressure in the intracranial regions of the brain and can lead to brain damage. To release this fluid and pressure, a ventriculoperitoneal shunt can be inserted to transport the fluid from the ventricles of the brain to the peritoneal cavity of the abdomen. Hydrocephalus can occasionally become a fatal condition when obstructions to the shunt occur, thus, causing shunt failure. These obstructions are often caused by shear stresses applied on the shunt, as well as blockages within the shunt.In order to prevent shunt failure and improve functionality, this research study focuses on exploring canine ventriculoperitoneal shunts through multi-objective design. Through the utilization of previous research, we compare varying combinations of shunt design variables to optimize crucial shunt features and best satisfy the goals of decreasing failure rate and enhancing functionality. Our design parameters for the ventricular catheter to minimize the risk of shunt failures and improve the reliability are the number of holes, inter-segment distance, and outlet hole diameter. As this research continues, we are exploring other geometric parameters to generate robust solutions to different design scenarios by assigning different weight preferences to our design goals. We plan to test these scenarios through modeling and simulating to confirm the best variations of the geometric parameters

for managing hydrocephalus. We hope these variables explored in a canine ventriculoperitoneal shunt can lead the way to improvements in shunts for humans with hydrocephalus as well.

116
Name: Turner, Cecelia
Major: Fashion Design & Merchandising
Faculty Advisor, Affiliation: Dr. Catherine Black, Fashion Design & Merchandising
Project Category: Arts and Humanities (Oral Presentation)

Handbag Design, Development, and Creation
The purpose of this project is to explore the design process and construction of handbags. The design process follows the Functional, Expressive, and Aesthetic (FEA) Consumer Needs Model and integrated Apparel Design (AD) Framework. After conducting a trend analysis and sketching, materials were procured and a pattern was created for one handbag design. Several techniques were researched and samples were created to practice the techniques and construction process. Finally, a finished handbag was created.

043
Name: Turner-Chism, Linah
Major: Geosciences/Professional Geology
Faculty Advisor, Affiliation: Adam Skarke, Geosciences
Project Category: Physical Sciences and Engineering

Mapping Deep-Sea Habitat at Gas Seeps with Sonar Acoustic Backscatter Data
Locations of natural seafloor gas emission, known as cold seeps, are common deep-sea features in the ocean. Recent exploration shows that seafloor environments at cold seeps are characterized by extensive carbonate rock outcrops and complex chemosynthetic ecosystems anchored by extensive endemic mussel (*Bathymodiolus childressi*) beds. Here, we use the acoustic reflectivity of the seafloor at a seep site measured using a multibeam sonar to map the spatial distribution of rock outcrop, sediment, and mussel beds relative to the position of seafloor gas seepage. The data used for this research are from a 1.25 km^2 multibeam sonar and photographic survey of a deep-sea methane seep site at a depth of 1400 m, located approximately 200 km offshore of Cape Cod, Massachusetts. The survey was conducted using an unmanned submersible operating at approximately 6 meters above the seafloor. Visual Object Tagging Tool (VOTT) software was used to manually identify and geolocate sediment, rock, and mussel beds, both alive and dead, in the collected seafloor photographs. Sonar measurements of seafloor acoustic reflectivity, referred to as backscatter intensity, at the photo locations were analyzed to determine if they could be used to predict the presence of observed rock, sediment, and mussel beds. These results were also used to evaluate the spatial distribution of seafloor rock and mussel beds relative to seep sites. The resulting data demonstrates the utility of acoustic backscatter data for seafloor habitat mapping and gives greater insight to geological and ecological processes at cold seep sites.

190
Name: U'Ren, Emma
Major: Biochemistry
Faculty Advisor, Affiliation: Priyadarshini Basu, Biochemistry, Molecular Biology, Entomology, and Plant Pathology
Project Category: Biological Sciences and Engineering
Co-Author(s): Audrey B. Sheridan

Investigating microscopy techniques for studying Small Hive Beetle sperm
Small Hive Beetles (SHB), *Athena tumida* Murray, are a global pest and threat towards *Apis mellifera*, the western honeybee. Currently in the literature, there is a lack of research and understanding of SHB reproductive biology as it relates to the male beetle. For instance, there has not been a method published for how to separate the beetle's sperm bundles. In this study, we will be applying microscopy methods common to other insects species, such as using buffer solutions and

differential staining. If these methods are successful, the results will contribute to a better understanding of the morphometrics, abundance, and anatomy of the sperm. Acquiring knowledge of the reproductive biology of SHB can help researchers to develop new strategies to control small hive beetle reproduction in managed honeybee colonies.

044
Name: Van, Jefferson
Major: Chemical Engineering
Faculty Advisor, Affiliation: Yizhi Xiang, Swalm School of Chemical Engineering
Project Category: Physical Sciences and Engineering
Co-Author(s): Genwei Chen

Hetergenous Plasma Catalysis Methane Aromitization
The 2021 United Nations Climate Summit culminated in an agreement to reduce methane emissions by 30% by 2030 in an ongoing effort to combat climate change. A major contributor of climate change, methane is produced abundantly in numerous industrial processes, and as a byproduct of oil drilling and coal mining, driving down prices below profitability. While large drilling operations benefit from the economy of scale required to make methane collection viable, small drilling operations must resort to gas flaring to meet the imposed restrictions. With the promise of even more cheap, abundant natural gas on the horizon, and the tighter regulations on methane emissions, decentralized methods to convert methane to more valuable resources will reduce carbon emissions from gas flaring, while simultaneously reducing methane emissions. With the overarching objective to elucidate the kinetics and mechanisms that occur during the use of an emerging technology for distributed low temperature chemicals manufacturing, known as plasma catalysis, we tested the influence of reaction conditions (space velocity, partial pressure, temperature, plasma energy, and plasma/catalyst volumetric ratio) of methane flowed through dielectric barrier discharge (DBD) plasma into the reactor bed of a metal impregnated HZSM-5 in order to develop a kinetic model for the plasma catalytic methane aromatization. After testing platinum, gallium, nickel, cobalt, and molybdenum, we found an equivalent molar ratio of gallium to be the most active, furthermore, we found the dominant influence on methane conversion to be the voltage supplied to the DBD plasma, with marginal influence from the partial pressure of methane in the reactant flow when combined with the inert gas argon. The selectivity of aromatics above aliphatics increased in response with an increase in temperature and overall production of aromatics increased until 600 °C, where significant coking was observed on the reactor and catalyst.

191
Name: Wade, Lynn
Major: Biochemistry
Faculty Advisor, Affiliation: Seung-Joon Ahn, Biochemistry, Molecular Biology, Entomology, and Plant Pathology
Project Category: Biological Sciences and Engineering
Co-Author(s): Dr. Gerald Baker

Morphology, behavior, and life cycle of the hibiscus sawfly, *Atomacera decepta* (Hymenoptera: Argidae)
Atomacera decepta, commonly known as the hibiscus sawfly, is considered a minor pest, but it feeds on the foliage of several ornamental plants, including hollyhocks, rose mallows and some other Hibiscus plant, turning it to a lacy skeletons of leaf veins. Such a voracious appetite of the sawfly is an interesting mode of feeding among different herbivorous insects. However, little is known about this insect species. The purpose of this research is to collect basic data of its morphological and behavioral characteristics and to provide better understanding for future research. Discovering characteristics of *A. decepta* has been performed through a few projects. (1) Morphological features of larvae and adults were investigated by observational examinations and scanning electron microscope (SEM). (2) Observations of live sawflies in the natural habitat as well as in the lab were conducted to grasp their basic behaviors and life cycle. (3) As many other sawfly larvae have defensive mechanisms to deter predators like ants, the capability to defend its potential predator was examined. (4) Finally, the larvae were dissected to find out what internal organs might be involved in a defensive mechanism. As a result, this project has provided clearer information about this less-studied insect, but, at the same time, gave an opportunity for more questions to be addressed. Dissection showed that *A. decepta* has a unique internal organization. Observation of the live species showed an interesting pattern of larval feeding and a complete life cycle of its development. A basic

understanding of *A.decepta* characteristics would pave a way for future research on its digestive physiology and defensive chemistry.

104
Name: Wall, Caitlin
Major: Food Science & Technology
Faculty Advisor, Affiliation: Terezie Tolar-Peterson, Food Science, Nutrition and Health Promotion
Project Category: Social Sciences
Co-Author(s): Nicole Reeder, Marina Roberts, Abby Reynolds, Gina Rico Mendez
Other Competition(s): Public Health Research Competition

The Impact of School Meal Programs on Educational Outcomes in African Schoolchildren: A Systematic Review
Malnutrition and hunger can lower a child's ability to learn effectively. Many countries in Africa experience high rates of childhood undernutrition, and school feeding programs are a common tool used to address this challenge. A systematic review was conducted to evaluate the effect of school provided meals on educational outcomes in preschool and primary school children. Specific outcomes of interest in this review included test scores, attendance, and enrollment rates. PubMed and Scopus were used for an electronic search of relevant studies. Studies included in this review were randomized and non-randomized controlled trials, prospective cohort studies, controlled before-after studies, and pre-posttest design studies published in the past 10 years in English in sub-Sahara Africa. Findings from the nine studies included in this review suggest that there is a positive correlation between school feeding programs and educational outcomes; though, potential drawbacks to implementing a school feeding program exist, such as loss of classroom time. In conclusion, it is recommended that school meal programs be implemented and expanded. To improve general wellbeing and learning capabilities of children, school meals should be employed starting at a young age.

045
Name: Wallace, Macey
Major: Civil Engineering
Faculty Advisor, Affiliation: Seamus Freyne, Rula School of Civil & Environmental Engineering
Project Category: Physical Sciences and Engineering

Bridge Conditions in Mississippi and the U.S: A Comparative Study
Bridges are a vital part of the nation's transportation system and affect many aspects of society and economy. Bridges keep the transportation network functional and dependable and have a direct impact on public safety. The goal of this study was to determine weaknesses in Mississippi's bridge network and to compare the condition of Mississippi's bridges with those of the Southeast and the United States as a whole. An analysis of the National Bridge Inventory, a database maintained by the Federal Highway Administration consisting of such information as bridge condition and age, produced several discoveries. Comparisons from 2000 to 2020 show that Mississippi has a lower percentage of bridge area in poor condition than the rest of the U.S., partially due to younger infrastructure. Only three of nine states in the Southeast have a lower share of bridges in poor condition than Mississippi, and most of Mississippi's bridges in poor condition are within the Delta and Southwest regions.

105
Name: Walsh, Isabella
Major: Human Sciences/Human Dev & Family Studies
Faculty Advisor, Affiliation: Dr. Tommy Phillips, Human Development and Family Studies
Project Category: Social Sciences
Co-Author(s): Aly Johns, Kirsten Porch, Brynnan Breland

The Effects Anxiety and Depression Have on College Student's Self-Esteem and Perceived Social Support
Mental health, self-esteem, and perceived social support are all topics very important in one's life but especially during their emerging adulthood years. College students in the United States have had a growing concern with their mental health. More specifically, anxiety and depression are relevant and more common than not among this group of people. Self-esteem is one's thoughts and perceptions about themselves. Perceived social support is one's thoughts on their social situations and interactions they go through. These can be observed as friend groups or romantic relationships. How does a college student's mental health affect their perceived social support and self-esteem? All these factors have been evaluated and studied separately but how they affect each other is the goal of this study. Our first hypothesis is that anxiety and depression are negatively correlated with the perception of self-esteem. The second hypothesis is that anxiety and depression are negatively correlated with perceived social support. Our third and final hypothesis is that self-esteem will be positively correlated with perceived social support. The current research method will be an online survey on Qualtrics that contains questions related to how a student rates their mental health and then how they respond to situations with peers and their overall self-esteem. The measure used for self-esteem is a 4-point Likert scale called Rosenberg Self-Esteem Scale and it includes 10 statements that give a person a score on their level of self-esteem. The Brief Anxiety and Depression Scale or the BADS is a 3-point scare with only 8 items to determine mood impairments. The last scale used for perceived social support is the Multidimensional Scale of Perceived Social Support. This scale is a 7-point scale with 12 items. With all these scales we will be able to determine the relationship between the three variables.

046
Name: Warnsley, Joshua
Major: Industrial Engineering
Faculty Advisor, Affiliation: Nazanin Tajik Morshedlou, Industrial & Systems Engineering
Project Category: Physical Sciences and Engineering
Other Competition(s): Community Engagement Research Track

The nexus between community socioeconomic factors and expected behavioral response to upcoming climate disaster
Evident from the Houston Flood (2016) and Hurricane Ida (2021) to Bomb Cyclone (2019) and Dixie Fire (California 2021), severe weather conditions are known as "the inevitable and the unpredictable". For decades, federal and local emergency agencies have examined the ways and means to prepare communities to withstand climate-driven disruptions and bounce back to normal life after the events occur. Despite all efforts, collected observations show that many of the affected community residents have not responded to the warnings, watches, and alerts as they expected. Reports demonstrate the positive correlations between the number of fatalities and the quality of disaster preparedness and response observed in the affected communities. This study investigates the spatial, economic, and sociodemographic factors that affect resident disaster response assuming they know a catastrophic event is expected to occur. Targeted surveys are designed and distributed among community members within different social, economic, and demographic categories to answer the following research question: (1) What factors prevent people from leaving after noticing a catastrophic event warning, (2) To what extent do people understand the emergency alerts and warning? (3) To what extent the residents know of the accessible social and physical emergency resources in their neighborhood, and (4) To what extent are residents willing to change the natural and built environment to decrease their vulnerabilities against disasters? Results from this study draw practical managerial insight and behavioral incentives that encourage communities to take actions to increase their preparedness for, and consequently decrease their vulnerability to climate driven disruption.

047
Name: Welford, Ethan
Major: Aerospace Engineering
Faculty Advisor, Affiliation: Calvin R. Walker, Aerospace Engineering; Rob R. Wolz, Aerospace Engineering
Project Category: Physical Sciences and Engineering

X-Train
The purpose of this research is to support the development of small, unmanned aircraft system (sUAS) airframe manufacturing by increasing the viable manufacturability window while simultaneously facilitating pilot simulation training. Particularly, this research seeks to verify the validity of sUAS aircraft models within the framework of commercially available simulation software used in concert with full-scale general aviation aircraft. To complete this goal, a general aviation aircraft (Cessna 172 Skyhawk) and sUAS aircraft (RQ-2B Pioneer) were selected and evaluated using the X-Plane 11 simulation software as well as analytical methods. Comparison of the simulation results, analytical results, and aircraft manufacturer data has resulted in the completion of the scope of this research. Given an acceptable level of accuracy using the chosen simulation environment regarding performance, stability, and control of the sUAS airframe further supports the workflow of pre-production aircraft modeling used for pilot training and airframe design validation.

048
Name: Welford, Kylan
Major: Civil Engineering
Faculty Advisor, Affiliation: Saeed Rokooei, Building Construction Science
Project Category: Physical Sciences and Engineering

Exploring Gender Disparity in Engineering and Construction through Perception Analysis
Despite recent efforts to educate and understand the historical issue of gender inequity, the problem still persists particularly in engineering and construction (EC) fields. Studies show that there have been improvements in gender biased issues overall; however, the EC industries prove to be lacking in positive development. This study aimed to gain comprehension of female students' viewpoints on what causes discrimination. Additionally, it sought to distinguish academic and professional obstructions in the lives of females using a quantitative research process. The research was conducted by analyzing results of paper-based questionnaires from 369 EC students. Of the population, 105 were female and 264 were male. Based on the results, it was concluded that the prevalence of role models or accomplishments in individuals directly correlates to their conduct and mindsets. The findings also compared and contrasted distinctions between male and female perceptions of effective factors such as career characteristics, motivating information, inappropriate position, and discrimination that hinder or expedite the existence of women in education and professional industries.

192
Name: Wheeler, Benjamin
Major: Microbiology
Faculty Advisor, Affiliation: Shecoya White, Food Science, Nutrition, and Health Promotion
Project Category: Biological Sciences and Engineering
Co-Author(s): Leah Brown, Courtlone Glaspie
REU/Research Program: Shackouls Honors College Research Fellowship
Other Competition(s): Public Health Research Competition

Efficacy of Lemon Essential Oil Added to Homemade Marinade on Salmonella-Inoculated Chicken Tenders
Salmonella is the second leading cause of foodborne illness in the United States and is infamous for contaminating poultry products. To combat this and other pathogens, antimicrobials such as essential oils have been looked at as replacements to synthetic antimicrobials currently used in the food industry. Essential oils also are popular with consumers due to "Green Consumerism," Americans' hesitancy to consume foods with synthetic chemicals, preferring a "clean label." Marination, already a multifaceted way to enhance meats, can potentially prevent product recalls and protect people

from pathogens when antimicrobials are present in the marinade. The objective of the study was to evaluate the efficacy of various concentrations of lemon essential oil (LEO) in a homemade marinade on *Salmonella* spp. in vitro and on raw chicken tenders. The base marinade was supplemented with the following LEO concentrations: 0% and 5% in vitro and 0%, 5% and 10% LEO or a commercial lemon pepper with lemon juice marinade on chicken tenders. The initial inoculum levels were ~6 log CFU/ml in vitro and ~ 5 log CFU/g for the in vivo study. The in vitro study was a time kill assay that resulted in both the 0% LEO and 5% LEO marinade reduced *Salmonella* by 3 log CFU/ml over a 2-hour period in vitro. On chicken tenders, both the homemade marinades with 0% and 10% LEO and the commercial marinade exhibited a bacteriostatic effect with counts remaining at ~3-4 log CFU/g. The control, unmarinated chicken tenders, on the other hand, grew to be 2-3 log CFU/g (6.6 log CFU/g) after 24 hours. Even though the marinade with 10% LEO was bacteriostatic, the other two marinades exhibited the same effects, thus it would be uneconomical for commercial producers or home cooks to incorporate lemon essential oil in this marinade formulation.

193
Name: White, Emily
Major: Forestry/Environmental Conservation
Faculty Advisor, Affiliation: C. Elizabeth Stokes, Sustainable Bioproducts
Project Category: Biological Sciences and Engineering

Prevention of Chemical Leaching from Treated Wood Pilings Into Coastal Water
Chemically protected wooden pilings are commonly utilized in coastal regions as substructure for docks and piers. Historically, creosote has been the preservative of choice for these materials, but concerns have been raised about the potential for toxic effects on zooplankton populations and other aquatic communities. CCA, chromated copper arsenate, is another industrial wood treatment chemical frequently applied to pilings and may have an even greater potential for leaching harmful chemicals into the surrounding water than creosote. This leaching action may be reduced, however, by the application of polymer coatings. Two thicknesses of polymer coatings were tested by submersion in artificial saltwater, with each piling being housed in its own 55-gallon drum. The water was agitated by 700-gpm aquarium pumps. A set of five uncoated, CCA-treated pilings were used as a control group. Water was sampled once per week for the first month, and then monthly for a total of six months. The water was analyzed for copper, chromium, and arsenic content by ICP-mass spectrometry at MSU's Hand Laboratory. An initial release of the components was found in all pilings, but the uncoated pilings experienced substantially greater levels of leaching than the coated pilings. The project is planned for six total months and will end in April 2022. It is anticipated that the initial release of the components will decrease over time, with the coated pilings experiencing overall much lower concentrations of the potentially harmful components. It is our goal to work with the coating manufacturer to discover the ideal thickness of polymer coatings to prevent leaching of chemicals.

194
Name: White, Logan
Major: Wildlife & Fisheries Science/Pre-Veterinary
Faculty Advisor, Affiliation: Cooper Brookshire, Dept of Clinical Sciences, College of Veterinary Medicine
Project Category: Biological Sciences and Engineering
Co-Author(s): Dr. Keun Seok Seo
REU/Research Program: ORED Undergraduate Research Program
Other Competition(s): Public Health Research Competition

Susceptibility of Clinical Veterinary Escherichia coli Isolates to Chlorhexidine
Chlorhexidine is very commonly used in veterinary settings as a hospital disinfectant, topical medication for bacterial skin infections, surgical patient skin disinfectant, and surgeon hand disinfectant. Chlorhexidine susceptibility is not routinely monitored for in veterinary diagnostic labs for clinical bacterial pathogens, and very little data are published describing susceptibility surveillance of veterinary pathogens. Despite chlorhexidine's status as first-line therapy for antimicrobial wound care and emerging concerns about antimicrobial resistance, clinical chlorhexidine breakpoints have not been established for veterinary associated nosocomial and wound pathogens such as *E. coli*. Most published literature suggests

that wild-type *E. coli* have an approximate chlorhexidine minimal inhibitory concentration (MIC) of approximately 2-8 *u*g/mL, but the widely accepted epidemiologic cut-off is 64 *u*g/mL. Chlorhexidine susceptibility of 44 clinical *E. coli* isolates obtained in 2020 from the Mississippi Veterinary and Research Diagnostic Laboratory (MVRDL) in Pearl, MS was performed. A variety of phenotypes were included in the study, including isolates with suspected Extended Spectrum Beta-lactamase production. Manual micro-broth dilution testing was conducted using standard microbiologic techniques in 96-well plates with chlorhexidine concentrations around the expected MIC range of 2-8 *u*g/mL (0.125-64 *u*g/mL with both positive and negative control wells for each isolate). The MIC was below the estimated epidemiologic cut-off of 64 *u*g/mL for all 44 isolates (95% CI; 0.92-1), which suggests a low probability of chlorhexidine resistance among clinical *E. coli* isolates submitted MVRDL in 2020. However, reports of emerging chlorhexidine resistance have been published, so ongoing monitoring should be continued.

117
Name: Williams, Alysia
Major: Architecture
Faculty Advisor, Affiliation: Alexis Gregory, Architecture, Art, and Design
Project Category: Arts and Humanities (Oral Presentation)
Other Competition(s): Public Health Research Competition

Identifying the sociological impacts of ethics and empathy in architecture education on BIPOC architecture students
This research will identify and analyze the sociological impacts of ethics and empathy on BIPOC (Black, Indigenous, and People of Color) students in architecture. Similarly to the practice, architectural education is bounded by social, economic, political, and cultural forces that either inhibit or propel the aspiring architect as they advance in their education and career[1]. An evaluation of select architectural curricula regarding race in relation to ethics and empathy is necessary to understand the historical institutionalization of architecture education as well as in the architectural profession. Prior research analyzing the academic and professional performances of BIPOC within architecture reveal the marginalization of BIPOC pursuing architecture. Specifically in architectural practice, BIPOC make up 11% of architects according to the National Council of Architectural Registration Boards (NCARB). Of the 11%, African Americans alone only make up 2.7% with less than 1% being African American women. Demographic representations within the architectural practice prove to have a mirroring relationship with the successes of BIPOC architecture students. According to the 2020 National Architecture Accreditation Board (NAAB) Annual Report, BIPOC students in architecture only accounted for 24% of total enrollment. Out of a total of 26,977 students, African Americans make up 1,482, only 5% of enrolled architecture students. Therefore, out of a total of 41.1 million African Americans in the US (13.4% of population), only 3,806 (.00926%) are attributed to architecture[2]. The research will analyze information provided by the National Architecture Accreditation Board (NAAB) regarding longitudinal data observing BIPOC architectural admissions and analyze the architectural curricula for discrepancies between the interrelationships of faculty and BIPOC students. The goal of this research is to bring awareness to the criticality of diversity and inclusion within architecture education through the assessment of ethic and empathetic teaching practices regarding BIPOC students.
[1] Corroto, Carla. “Maintaining Their Privilege: A Framework for Assessing Minority Inclusion in Architecture Schools” *20 on 20/20 Vision: Perspectives on Diversity and Design*. (2003): 103.
[2] Jones, Nicholas; et.al. “2020 Census Illuminates Racial and Ethnic Composition of the Country”. U.S Census Bureau. 2021. https://www.census.gov/library/stories/2021/08/improved-race-ethnicity-measures-reveal-united-states-population-much-more-multiracial.html#:~:text=In%202020%2C%20the%20Black%20or,million%20and%2012.6%25%20in%202010.

056
Name: Williams, Alysia
Major: Architecture
Faculty Advisor, Affiliation: Jacob Gines, Architecture, Art, and Design
Project Category: Arts and Humanities (Poster)

Affordable Multifamily Housing in Relation to Community Revitalization and Social Development: A Cross Analysis of Regional Housing in Urban Contexts

The purpose of this research is to identify and analyze the social, political, and economic factors that attribute to the current housing crisis observed in the United States. This research seeks to analyze the socioeconomic contexts of Salt Lake City, Utah and Jackson, Mississippi to contrast and compare regional approaches and deficits of affordable housing. The cross analysis of contrasting regional contexts contribute to the understanding of the marginalization of housing availability and affordability accessible to those 30% below the Average Median Income (AMI). According to the National Low Income Housing Coalition, approximately 7.2 million affordable housing units are needed for extremely low-income families (30% or below the AMI). 75% of all extremely low-income families pay more than half their total income on rent alone. On average, only 35 out of every 100 extremely low-income families have access to available affordable housing. Comparatively, 31 out of every 100 extremely low-income families have access to affordable housing in Utah, and this number increases to 55 for the state of Mississippi despite being 5th in the nation for eviction rates. Nationally, 3.5 million of the 7.5 million rental homes affordable to extremely low-income people are occupied by higher-earning households. Publicly available data was extracted and analyzed to understand the prevalent issues of poverty, displacement, accessibility, and equitable housing. GIS data was collected to generate composite mapping to further clarify the patterns of urban growth in relation to demographic density and housing availability. The goal of this research is to expose the complexities of housing affordability through the regional cross analyzation of housing insecurity and the assessment of housing practices that contribute to the revitalization and development of a community.

106
Name: Williams, Alyssa (Ally)
Major: Biochemistry
Faculty Advisor, Affiliation: Cliff McKinney, Psychology
Project Category: Social Sciences

The effect of parental psychological control on emerging adults' depression, anxiety, and antisocial problems moderated by the amount of daily contact with their parents

In the authors' prior work submitted for publication, maternal psychological control associated positively with psychological problems in emerging adult daughters, the only gender dyad reporting significant results. Additionally, current data shows that mothers and daughters communicate more verbally and via text messaging than any other gender dyad. Other similarities in contact hours and psychological problems were evident, such that paternal psychological control did not have an association with men's psychological problems, and contact hours between fathers and sons were comparatively low. Therefore, it was hypothesized that daily contact hours with parents would moderate the relation between parental psychological control and emerging adults' psychological problems. Participants included 546 emerging adults from a large Southern United States university who completed online surveys about current parental psychological control, psychological problems, and demographic information about daily parental contact hours. Results of a path analysis in AMOS 28.0 supported the hypothesis. The interaction between paternal psychological control and daily contact hours on sons' depressive problems was significant, $\beta = .17$, $p = .05$, suggesting that paternal psychological control shared a strong positive association with sons' depressive problems when paternal contact hours were high, but this relation was slightly negative when paternal contact hours were low. The interaction between maternal psychological control and daily contact hours on daughters' anxiety trended toward significance, $\beta = .09$, $p = .075$, suggesting that maternal psychological control shared a positive association with daughters' anxiety problems, and that this relation was stronger when maternal contact hours were high. The findings indicate that emerging adults spending more time with their parents is beneficial unless their parents exhibit high psychological control. However, men were more likely to experience depression in response to contact with controlling fathers, whereas women were more likely to exhibit anxiety in response to contact with controlling mothers.

195
Name: Williams, Anna
Major: Mathematics
Faculty Advisor, Affiliation: Dr. Shantia Yarahmadian, Mathematics and Statistics
Project Category: Biological Sciences and Engineering
Co-Author(s): Amin Oroji, Anna Katherine Williams
Other Competition(s): Public Health Research Competition

A Hybrid Differential Equations Model for the Dynamics of Single and Double Strand Break of Cancer Cells treated by Radiotherapy: A Definition for Tumor Life-Span

Based on the Target Theory, the tumor population contains many subpopulations due to the diverse effects of ionizing radiation on human cells. A hybrid differential equations model for the dynamics of single and double-stranded breaks of human cancer cells treated by radiotherapy, which is comprised of a system of ordinary differential equations such that random variable coefficients represent the transition rates between subpopulations, is defined and evaluated. The model defined is used to investigate the dynamics of tumor cell subpopulations, the homogeneity of cell damage, and the repair mechanisms between the two consecutive dose fractions. Radiation particles are capable of causing single or double-strand breaks within cells; thus, two cases are considered. For case one, the tumor cells are divided into three subpopulations: cells with single-stranded breaks, cells with double-stranded breaks, and cells with no DNA fragmentation. For the second case, the difficulty to differentiate between single and double-strand breaks within cancer cells is considered. The second case is divided into two subpopulations: cells with DNA fragmentation and cells without DNA fragmentation. Furthermore, the system stability and numerical bifurcation are investigated using numerical simulation in both cases. For case one, the system was found to be stable for $0 < r < 1$ and $q = 0.5$; consequently, it was determined that for $q < 0.5$, there exists a $0 < r < 1$ where the system is unstable at the equilibrium point (0,0,0). The bifurcation analysis established that there existed no significant differences in the stability regions of the system. For case two, the system was found to be stable for all $0 < r < 1$. Many values of *m* were investigated with differing values of μ to conclude that the parameter μ was no longer influential when *m* exceeded 10. The probability of target inactivity after radiation and target re-activation following the repair mechanism are examined in relation to the tumor life-span.

049
Name: Williams, Harrison
Major: Mechanical Engineering
Faculty Advisor, Affiliation: Dr. Matthew W. Priddy, Mechanical Engineering
Project Category: Physical Sciences and Engineering
Co-Author(s): David Korba, Dr. Like Li
REU/Research Program: Computational Mechanics and Materials

Comparison of cellular automata and continuum phase-field models for grain growth estimation

Repeated heating and cooling in metal-based additive manufacturing (AM) processes result in heterogeneous microstructures and can have a significant effect on the resultant mechanical properties. Cellular automata (CA) and phase-field (PF) are two commonly used mesoscale models to predict microstructural behavior resulting from AM processes. CA inherently describes grain size, shape, and phase volume fraction while intrinsically scaling up to exascale simulations while PF tends to have superiority over results achieved by CA due to limitations of describing curvature-driven interface migration. PF better describes interface geometry, grain mobility/orientation, and morphological change in microstructure evolution based on the total free energy of the material. The disadvantage of PF is computational runtime and complexity, limiting the model in scalable applications. Previous studies compared the two methods for simulating dendritic solidification, but few studies have compared them for modeling recrystallization and grain growth. This work focuses on comparing the two models and their performance in estimating grain growth. Since the constituents of the two models are dissimilar, comparison metrics only include scalability and the models' ability to couple with other methods. The results of this study provide a better understanding of microstructure behavior during AM processes.

050
Name: Wilson, Jackson
Major: Aerospace Engineering
Faculty Advisor, Affiliation: Dr. Shreyas Narsipur, Aerospace Engineering; Dr. Adrian Sescu, Aerospace Engineering
Project Category: Physical Sciences and Engineering
Co-Author(s): Peter Daschbach, Megan Patrick, Justin Williams

Ellipsoidal vs. Spherical Aerodynamics
The goal of this project was to analyze ellipsoidal and spherical projectile aerodynamic performance in both spinning and non-spinning conditions. For our testing procedure, a standard American NFL football and an MLB baseball were selected. At the beginning of the analysis, the group performed basic incompressible calculations based on the known equations and specifications for these types of shapes in their normal environments. This gave a base idea of induced drag force in a range of freestream velocities (50-70 mph for the football and 90-110 mph for the baseball). Next, two 3D models were generated and tested, one for the football and one for the baseball, using CFD (computational fluid dynamics) methods in SolidWorks and Ansys under the same conditions. Airflow around the static projectiles generated higher drag especially in the case of the baseball, but when rotation was applied to the projectiles (600-700 rpm for the football and 1800-2400 rpm for the baseball), drag was reduced, and some lift was generated via the Magnus effect. Finally, a rig on which to mount the football and baseball with a rod and motor was assembled to provide spin. This allowed us to test our theoretical calculations and computational analysis utilizing the wind tunnel and compare them to our theoretical and computational findings. In conclusion, it was found that with the presence of spin, there were drag reductions and magnus forces were present in both the cases considered.

051
Name: Woodard, Katelyn
Major: Chemical Engineering
Faculty Advisor, Affiliation: Dr. Julie Jessop, Swalm School of Chemical Engineering
Project Category: Physical Sciences and Engineering
Co-Author(s): Dr. Sage Schissel, Hasitha Perera
Other Competition(s): Community Engagement Research Track

A Radical Library: Cataloging Radiation Yield of Acrylates Undergoing Electron-beam Polymerization
Electron-beam (EB) polymerization provides a fast, environmentally friendly method to create thin films and coatings for commercial applications. Expanding EB technology to new applications requires a better understanding of how starting materials (i.e., monomers) form free radicals under the EB. Free radical formation dictates the ability for the monomer to polymerize and the properties that final polymer exhibits. One measure of this attribute is the primary radical chemical radiation yield, G(R•), defined as the number of primary radicals formed per 100 electron volts (eV) delivered. The monomers chosen in this study belong to the acrylate family, as this family is industrially prevalent and also exhibits a range of properties, such as number and type of labile bonds, that can be used to understand the influence of these properties on free-radical formation. The concentration of primary radicals was determined based on the absorbance of DPPH, a free-radical inhibitor, at 520 nm after EB irradiation of an acrylate monomer at a given dose (eV) and line speed (ft/s). By plotting changes in DPPH concentration over different EB exposure times through UV-Vis spectroscopic analysis, the rate of primary radical formation was calculated and used to estimate the G(R•) for each monomer in the study. By developing this monomer library, we can relate G(R•) to chemical structure and ultimately polymer properties, providing guiding principles for materials synthesis, selection, and processing, rather than trial and error, as is the current industrial practice. This monomer library can be reliably expanded using the methods developed in this study to further the potential uses for EB polymerization in the industrial field and academia.

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Name: Wright, Nathan
Major: Forestry/Wildlife Management
Faculty Advisor, Affiliation: Courtney Siegert, Forestry
Project Category: Biological Sciences and Engineering
Co-Author(s): Dr. Hiede Renninger Dr. Austin Himes Dr. Waqar Shafqat

Comparative Study of Field Performance and Biomass Production of 6 Populus Species Clones as Short-Rotation Woody Crops in the Southeastern U.S.

Short rotation woody crops grown for bioenergy production represent a pathway in energy independence and sustainability. Eastern cottonwood and its hybrids (Populus spp.) are a promising tree species because of their fast growth and productivity. Additionally, bioenergy tree plantations may provide valuable ecosystem services, including carbon sequestration and agricultural nutrient runoff mitigation. Six clones of hybrid poplar species were planted in the spring of 2021 on the edge of crop fields in riparian areas at two sites in Mississippi. These clones were planted in 3 blocks per site with 24 plots per block, containing various mixtures of clones to test the impacts of taxonomic and functional diversity on productivity and ecosystem service provisioning. Herbaceous weed control was regularly implemented, and growth and survival rate were recorded at the end of the first growing season. Overall, the largest growth on average was recorded by clone 110412 (1.58 meters) and clone 9671 had the highest survival rate (93.8%). Results based on taxonomic and functional diversity are pending. Using these statistics, we will be able to determine which clone is the best to plant in the southeast for biomass production and carbon sequestration.

052
Name: Wunrow, Timothy
Major: Industrial Engineering
Faculty Advisor, Affiliation: Wenmeng Tian, Industrial and Systems Engineering
Project Category: Physical Sciences and Engineering

The Effect of Data Availability and Domain Adaptation for Part Certification in Metal-Based Additive Manufacturing

Part certification is an important task in additive manufacturing (AM) quality assurance. Machine learning has already been extensively applied to AM certification for *in-situ* anomaly detection. However, AM experiments and data collection are costly, making it expensive to obtain enough data to train a reliable model that can be effectively generalized. To make a larger dataset, data from different systems could be combined. However, each set of data may have a different distribution due to the difference in machine setup and sensing configurations. Domain adaptation (DA) is a technique that can be used to adapt the data from one or more “source domains” to enhance the learning of a different but related “target domain”. Therefore, DA can be used to combine the data collected from different AM systems to build more reliable machine learning models for AM anomaly detection. In this research, experimental data are collected from two different metal-based AM part designs for cross-system certification of the direct energy deposition process. The effect of training set size on the anomaly detection prediction accuracy is firstly examined. Furthermore, the two datasets are combined with and without DA to investigate the effects of combining data from different domains on the anomaly detection accuracy.

197

Name: Young, Daniel
Major: Physical Education/Kinesiology
Faculty Advisor, Affiliation: Harish Chander, Neuromechanics Laboratory, Department of Kinesiology
Project Category: Biological Sciences and Engineering
Co-Author(s): Sydni Carter, Sunny Jo Chandler, Abbey McCrory, Seth Freeny, Reuben Burch, Charles Freeman, Adam Knight, Harish Chander

The impact of sub-clinical and clinical compression socks during the modified clinical test of sensory integration of balance

The sensory information needed to maintain postural stability, is acquired from visual, vestibular, and somatosensory-proprioceptive systems and alterations to these systems can affect one's postural control and increase fall risk. Compression socks are used in both clinical and athletic populations to increase postural stability, by aiding in somatosensory-proprioceptive feedback. The purpose of the study was to assess the impact of two types of compression socks [sub-clinical (SC): <20mmHg and clinical (CL): 20-40mmHg] compared against barefoot (BF) during four standing balance testing conditions of the modified clinical test of sensory integration of balance (mCTSIB) [standard eyes open (EO), proprioceptive eyes closed (EC), visual eyes open unstable foam surface (EOF) and vestibular eyes closed unstable foam surface (ECF)]. Twenty male and female young adults [age: 21.5 ± 2 years; height: 169.6 ± 9.2cm; weight: 72.1 ± 16.5kg] completed the mCTSIB on a BTrackS™ balance platform, in BF, SC, and CL, in a counter-balanced order. The center of pressure (COP) path length (cm) was used as an outcome measure of postural stability, with greater path lengths indicating worse postural stability. A 3 (BF, SC, CL) × 4 (EO, EC, EOF, ECF) repeated measures ANOVA was used to assess COP path length at an alpha level of 0.05 using JASP open-source statistical program. Results revealed significant differences between mCTSIB conditions with significantly greater COP path length for ECF compared to EO, EC, EOF, suggesting that postural stability is worse when both vision and somatosensory-proprioceptive systems are altered or compromised. However, no significant differences were evident between compression socks during mCTSIB conditions but presented with better postural stability in SC and CL collectively, suggesting that among young healthy, the SC and CL did not contribute to significantly better postural stability, but trends of better postural stability exist with both SC and CL compression socks.

SUMMER 2022

Undergraduate Research Symposium

Tuesday, August 2nd
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